NEPA TEAM

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Volume 1

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FINAL ENVIRONMENTAL IMPACT STATEMENT

on a

Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

United States Department of Energy
Assistant Secretary for Environmental Management
Washington, DC 20585

NEPA TEAM

Department of Energy

Washington, DC 20585

February 8, 1996

Dear Interested Party:

I am enclosing a copy of the final Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. The Department of Energy, in cooperation with the State Department, prepared the final Environmental Impact Statement.

This study analyzes the potential environmental impacts of adopting a policy to manage foreign research reactor spent fuel containing uranium enriched in the United States. In particular, the study examines the comparative impacts of several alternative approaches to managing the spent fuel. The analyses demonstrate that the impacts on the environment, workers and the general public of implementing any of the alternative management approaches would be small and within applicable Federal and state regulatory limits.

The Department's preferred approach to managing the spent fuel, referred to in the study as the "preferred alternative," is for the Department to receive the spent fuel into the United States, and to manage it at the Department's Savannah River Site in South Carolina and the Idaho National Engineering Laboratory. The spent fuel would be shipped to the United States over 13 years through two military ports. The Charleston Naval Weapons Station in South Carolina would receive about one to two shipments every month beginning in 1996. The Concord Naval Weapons Station in California would receive far fewer shipments (as few as five shipments over a 13-year period) beginning in 1997.

The final Environmental Impact Statement is a three-volume document, approximately 4000 pages in length. Volume 1 (494 pages) describes the policy considerations of adopting a policy to manage foreign research reactor spent fuel, and the potential environmental impacts. Volume 2 (1111 pages) contains eight appendices relating to the technical analyses. Volume 3 (2230 pages) contains the public's comments on the draft Environmental Impact Statement, the Department's responses to those comments, and summaries of the 17 public hearings held throughout the United States during the 90-day comment period on the draft.

If you would like another copy of the entire study, a particular volume, or an additional copy of the Summary, we would be pleased to send it to you. Please let us know by calling the Department's Center for Environmental Management Information at 1-800-736-3282 (toll-free). The entire document will be placed in the public reading rooms and information locations listed in the Summary.

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The Department will not make a final decision on whether to adopt the proposed policy until late March 1996. Thank you for your interest in this proposed action.

Sincerely,

Thomas P. Grumbly
Assistant Secretary for
Environmental Management

Enclosure

Cover Sheet

Responsible Agencies: Lead Agency: United States Department of Energy
Cooperating Agency: United States Department of State

Title: Final Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Contact: For further information, concerning this Final Environmental Impact Statement, contact:

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-67)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

For general information on the United States Department of Energy's National Environmental Policy Act process, call 1-800-472-2756 to leave a message, or contact:

Carol Borgstrom, Director
Office of NEPA Policy and Assistance (EH-42)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585
202-586-4600

Abstract: The United States Department of Energy and United States Department of State are jointly proposing to adopt a policy to manage spent nuclear fuel from foreign research reactors. Only spent nuclear fuel containing uranium enriched in the United States would be covered by the proposed policy. The purpose of the proposed policy is to promote U.S. nuclear weapons nonproliferation policy objectives, by seeking to reduce and eventually eliminate highly-enriched (weapons-grade) uranium from civilian commerce worldwide. Environmental effects and policy considerations of three Management Alternative approaches for implementation of the proposed policy are assessed. The three Management Alternatives analyzed are: (1) acceptance and management of the spent nuclear fuel by the Department of Energy in the United States, (2) facilitate the management of the spent nuclear fuel at one or more foreign facilities (under conditions that satisfy United States nuclear weapons nonproliferation policy objectives), and (3) a combination of elements from one or both of Management Alternatives 1 and 2 (Hybrid Alternative). A No Action Alternative is also analyzed.

For each Management Alternative, there are a number of implementation alternatives. For Management Alternative 1, this document addresses the environmental effects of various implementation alternatives, such as varied policy durations, management of various quantities of spent nuclear fuel, chemical separation, developmental treatment and/or packaging technologies, and differing financing arrangements. Environmental impacts are also examined at various potential ports of entry, along truck and rail transportation routes, at candidate management sites, and for alternate storage technologies. For Management Alternative 2, this document addresses the environmental effects of two implementation alternatives: (1) assisting foreign nations with storage; and (2) assisting foreign nations with reprocessing

of the spent nuclear fuel. With respect to Management Alternative 3, an example Hybrid Alternative is analyzed wherein a portion of the spent nuclear fuel would be processed at overseas facilities and the remaining portion would be managed in the United States.

The United States Department of Energy and United States Department of State, in consultation with other government agencies, designate the acceptance and management of the foreign research reactor spent nuclear fuel in the United States (i.e., Management Alternative 1 with modifications to several basic implementation elements) as the preferred alternative.

Public Comments: The public comment period on the Draft EIS was conducted from April 21, 1995 to July 20, 1995. During this period, DOE held 17 public hearings in the locations most likely to be directly affected by the EIS alternatives, including the 10 candidate ports of entry and 5 candidate spent nuclear fuel management sites. In addition, a public hearing was held in Washington, D.C. The Draft EIS was made available to the public through mailings, requests to DOE's Environmental Management Information Center, and at DOE Public Reading Rooms and other designated information locations.

Foreword

This Final Environmental Impact Statement presents an evaluation of policy considerations and potential environmental impacts resulting from the U.S. Department of Energy and the U.S. Department of State joint proposal to adopt a policy to manage spent nuclear fuel from foreign research reactors. Only spent nuclear fuel that contains uranium enriched in the United States would be covered by the proposed policy. The purpose of the proposed policy would be to promote nuclear weapons nonproliferation objectives of the United States, specifically by seeking to reduce, and eventually to eliminate, highly-enriched (weapons-grade) uranium from civil commerce worldwide. This policy is jointly proposed by the U.S. Department of Energy and the U.S. Department of State. This document was prepared in compliance with the National Environmental Policy Act and in accordance with regulations issued and published by the Council on Environmental Quality (40 CFR Parts 1500-1508) and the U.S. Department of Energy (10 CFR Part 1021).

Environmental effects and policy considerations of several alternative approaches for implementation of the proposed policy are assessed. Three Management Alternatives are analyzed: (1) acceptance and management of the spent nuclear fuel by the Department of Energy in the United States; (2) facilitate the management of the spent nuclear fuel at one or more foreign facilities under conditions that satisfy United States nuclear weapons nonproliferation policy objectives; and (3) a combination of components of Management Alternatives 1 and 2 (Hybrid Alternative Example). A No Action Alternative is also analyzed.

For each Management Alternative, there are a number of alternatives for its implementation. For Management Alternative 1, this document addresses the policy implications and environmental effects of various implementation alternatives such as varied policy durations, management of various quantities of spent nuclear fuel, and differing financing arrangements. Environmental impacts at various potential ports of entry, along truck and rail transportation routes, at candidate management sites, and for alternate storage technologies are also examined. For Management Alternative 2, this document addresses two subalternatives: (1) assisting foreign nations with storage; and (2) assisting foreign nations with reprocessing of the spent nuclear fuel. With respect to Management Alternative 3, a hybrid alternative example is analyzed, utilizing the analysis provided for Management Alternatives 1 and 2, wherein a portion of the spent nuclear fuel would be processed at overseas facilities and the remaining portion would be managed in the United States.

A Notice of Intent to prepare this document was published in the Federal Register on October 21, 1993. Nine public scoping meetings were conducted during November and December of 1993. The period for acceptance of public comments on this document closed on December 8, 1993. However, the United States Department of Energy continued to accept written comments through January 31, 1994. In October 1994, the Implementation Plan for this Environmental Impact Statement was issued to provide guidance for its preparation and to record the U.S. Department of Energy's disposition of comments received during the scoping process.

The Draft Environmental Impact Statement was issued in April 1995. The public comment period on the Draft Environmental Impact Statement was from April 21, 1995 to July 20, 1995. During this period, DOE held 17 public hearings in the locations most likely to be directly affected by the EIS alternatives, including the 10 candidate ports of entry and 5 candidate spent nuclear fuel management sites. In addition,

a public hearing was also held in Washington, D.C. The Draft EIS was made available to the public through mailings, requests to DOE's Environmental Management Information Center, and at DOE Public Reading Rooms and other designated information locations.

Results of the environmental analyses are presented in two volumes. Volume 1 is composed of eight chapters. Chapter 1 gives the background description of the United States nuclear weapons nonproliferation policy and describes the purpose and need for the proposed action. Chapter 2 then states the proposed policy and describes the three Management Alternatives for its implementation. It includes a discussion of the basic implementation components of Management Alternative 1, as well as implementation alternatives that vary one component of the basic implementation of Management Alternative 1. The implementation alternatives include variations on the duration of the policy, alternative amounts of material that might be covered by the policy, and various financing alternatives. The potential ports of entry, transportation routes, candidate spent nuclear fuel management sites and storage technologies are also described. This chapter also describes Management Alternative 2, which contains two subalternatives for its implementation. Subalternative 1 is to provide assistance to foreign nations with storage of the spent nuclear fuel. Subalternative 2 is to provide assistance with reprocessing of the spent nuclear fuel at one or more foreign locations. Management Alternative 3 is also discussed in this Chapter by tiering off the evaluation and analyses provided for Management Alternatives 1 and 2. The potentially affected environment under Management Alternatives 1 and 3 is described in Chapter 3. Essential results of the environmental analyses are then given in Chapter 4, which summarizes the methods used in the evaluation and provides an assessment of the environmental effects. Details of the environmental analyses are provided in the appendices, which comprise Volume 2 of this document. Chapter 5 describes applicable laws, regulations, and other requirements. A list of the preparers of this Final Environmental Impact Statement, agencies consulted, and references are provided in Chapters 6, 7, and 8, respectively. In addition to these two volumes, a Volume 3 (Comment Response Document) has been added to the Final Environmental Impact Statement which contains the written and oral comments received during the public comment period for the Draft Environmental Impact Statement.

In consideration of public comments, DOE has added information to the EIS including: clarification of the proposed U.S. policy on accepting spent nuclear fuel from allies; examination of the consequences of sabotage or terrorist attack; safety of transportation casks; re-examination of the shipboard fire analysis, and general provisions of transportation and emergency response regulations and management. The Naval Weapons Station at Charleston was analyzed in addition to the other terminals of the Port of Charleston within the greater Charleston area that were discussed in the Draft Environmental Impact Statement.

This Final Environmental Impact Statement has a two-fold purpose. The first purpose is to provide decision makers in the U.S. Department of Energy and the U.S. Department of State with an evaluation of the environmental effects of these policies. The second purpose is to inform the public concerning the essential features, policy considerations, and potential environmental effects of the proposed policy, and to provide the public an opportunity to provide feedback to the U.S. Department of Energy and the U.S. Department of State on the proposed policy.

Reader's Guide

In response to comments submitted after issuance of the Draft Environmental Impact Statement in April 1995, and due to additional technical and policy details not available at the time of issuance of the Draft Environmental Impact Statement, Volumes 1 and 2 of the Final Environmental Impact Statement contain revisions and changes. The revisions and changes made since issuance of the Draft Environmental Impact Statement are indicated by a line in the margin of Volumes 1 and 2. A new Appendix H has been added to Volume 2 to describe the general provisions associated with transportation planning for potential

shipments of foreign research reactor spent nuclear fuel. In addition, Volume 1 and each appendix in Volume 2 provide a unique reference list to enable the reader to further review and research selected topics. The U.S. Department of Energy has established reading rooms and information locations across the United States where these references may be reviewed or obtained for review through interlibrary loan. The addresses and phone numbers for these reading rooms and information locations are provided at the end of the accompanying Summary.

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Acronyms and Abbreviations

BNFP	Barnwell Nuclear Fuels Plant
CFR	Code of Federal Regulations
Ci	Curie
cm	centimeter
DOE	Department of Energy
EDE	Effective Dose Equivalent
EIS	Environmental Impact Statement
E-MAD	Engine Maintenance and Disassembly
FAST	Fluorinel Dissolution and Fuel Storage
FMEF	Fuel Maintenance and Examination Facility
g	gram
ha	hectare
HEU	Highly-Enriched Uranium
ICPP	Idaho Chemical Processing Plant
IFSF	Irradiated Fuel Storage Facility
ISO	International Organization for Standardization
kgTM	kilograms of Total Mass
km	kilometer
l	liter
LCF	latent cancer fatality
LEU	Low Enriched Uranium
m	meters
MACCS	MELCOR Accident Consequences Code System
MEI	Maximally Exposed Individual
mg	milligram
mg/l	milligrams per liter
mi	mile
min	minute
ml	milliliter
mm	millimeter
MOTSU	Military Ocean Terminal at Sunny Point
mrem	millirem
MTHM	Metric Tons of Heavy Metal
MTR	Material Test Reactor
NEPA	National Environmental Policy Act
NPAI	Nearest Public Access Individual
NRC	Nuclear Regulatory Commission
NWS	Naval Weapons Station
ppt	parts per thousand
rad	radiation absorbed dose
RBOF	Receiving Basin for Offsite Fuels
rem	roentgen equivalent man
RERTR	Reduced Enrichment for Research and Test Reactors
SNF&INEL Final EIS	Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement
TRIGA	Training, Research, Isotope, General Atomic reactors

1. Introduction

Reducing the threat of the proliferation of nuclear weapons is one of the foremost goals of the United States. Proper management of spent nuclear fuel from foreign research reactors is essential to the efforts aimed at achieving these goals since much of this fuel contains highly-enriched uranium[1] (HEU), which can be directly used in simple nuclear weapons.

The concern over appropriate management of foreign research reactor spent nuclear fuel was reiterated in the Presidential Directive on Nonproliferation and Export Controls, issued by President Clinton on September 27, 1993. In particular, the Presidential Directive included the following language: "We will also seek to minimize the use of highly-enriched uranium in civil nuclear programs. To this end, the Secretary of Energy will review the need for programs to develop alternative fuels for research reactors and accelerate steps towards implementation of a policy of taking back U.S.-origin spent fuels from foreign research reactors."

1.1 Policy Background

Since 1945, every U.S. Administration has recognized that preventing the further spread of nuclear weapons must be a fundamental national security and foreign policy objective of the United States. The initial U.S. approach to nuclear technology was to classify all nuclear activities. However, the United States soon realized that it would be impossible to prevent other nations from acquiring nuclear technology.

Consequently, since the 1950's, beginning with the "Atoms for Peace" program, the United States has provided peaceful nuclear technology to foreign nations in exchange for their promise to forego development of nuclear weapons. In addition, the United States requires that any nuclear technology provided shall be subject to international safeguards and inspections to prevent diversion of materials or technology to nuclear weapons activities.

The Atomic Energy Act of 1946 was the first U.S. legislation regulating nuclear activities. The Act prohibited international nuclear cooperation until effective international safeguards were in place to prevent such cooperation from assisting in the development of foreign nuclear weapons programs. A major revision of the Atomic Energy Act in 1954 provided that foreign countries receiving nuclear assistance had to accept conditions on its use, including making a pledge not to use nuclear materials or equipment provided by the United States for military purposes.

Simply put, peaceful nuclear cooperation, under international safeguards, has been a critical component of U.S. nuclear weapons nonproliferation policy since the beginning of the atomic age. The intent of such peaceful nuclear cooperation is to prevent the development of nuclear weapons programs worldwide.

A major element of the "Atoms for Peace" program for peaceful nuclear cooperation, particularly in the early years, was the provision of research reactor technology and the HEU necessary to fuel the research reactors. Research reactors play a vital role in important medical, agricultural, and industrial applications,

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[1] *Uranium enriched to 20 percent or greater in isotope 235 is known as HEU.*

and also provide a tool for fundamental scientific research. For example, research reactors are a vital tool in cancer therapy and radioimmunoassay blood testing. There are approximately 30,000 medical procedures per day in North America, 8,000 to 10,000 procedures per day in Europe, and 8,000 to 10,000 procedures per day on other continents using medical isotopes produced in research reactors in other countries. Neutron radiography provided by research reactors has enabled researchers to diagnose defects in metals and engines of many varieties and to conduct research on new materials, computer chips, and chemicals. Radioisotopes produced in research reactors have been used in leak detection in industrial components and equipment, aluminum production, and semiconductor and solar panel research. Neutron scattering experiments done in research reactors have provided insight into the biostructure of organic substances and have advanced the development of magnetic and superconducting materials. Research reactors have also been used in the environmental sciences to study waste migration, mine drainage, diffusion and transport of pollutants, water chemistry, sediment transport, atmospheric dispersion, and toxic waste management. Another important use of research reactors is irradiation testing of materials and fuel forms, including safety experimentation, to support advanced fuel design and waste management development for use in the power industry. Research reactors also have served as major training facilities in nuclear technology. For example, the research reactor operating in Austria is used by the International Atomic Energy Agency to train personnel who conduct international inspections of weapons and civil nuclear facilities worldwide.

The transfer of enriched uranium from the United States to other nations under the "Atoms for Peace" program was usually supported by a bilateral research agreement for each foreign research reactor. Before 1964, these agreements provided for the lease of the enriched uranium, with explicit provision for the return of the spent nuclear fuel to the United States. After 1964, most agreements provided for the sale of this material to the foreign nation.

After its use (irradiation) in a research reactor, the used (spent) fuel was generally returned to the United States where it was reprocessed to extract the uranium still remaining in the spent fuel. In this way, the United States maintained control over the HEU, which otherwise could be used in the production of nuclear weapons. The United States began accepting HEU spent nuclear fuel from foreign research reactors in 1958.

After 1964, the operative policy under which the United States accepted foreign research reactor spent nuclear fuel containing uranium enriched in the United States became known as the "Off-Site Fuels Policy." This policy was implemented through a series of *Federal Register* Notices issued until 1987, and was incorporated into bilateral international agreements with recipient countries. The term "Off-Site Fuels Policy" was used to indicate that the spent nuclear fuel had been irradiated at facilities not owned by the Department of Energy (DOE). Under the "Off-Site Fuels Policy," the United States accepted, temporarily stored, and reprocessed spent nuclear fuel containing HEU enriched in the United States. The rationale for the policy was to discourage the stockpiling abroad of spent nuclear fuel containing HEU and to recover the fuel value of the HEU remaining in the spent nuclear fuel.

In response to increasing congressional and public concern about the potential diversion of HEU for use in nuclear weapons by foreign nations, subnational groups, or terrorist organizations, DOE in 1978 initiated the Reduced Enrichment for Research and Test Reactors (RERTR) program. The RERTR program was aimed at reducing the use of HEU in civilian programs by promoting the conversion of foreign research reactors from HEU fuel to low enriched uranium (LEU) fuel. Research reactors are of particular interest in this endeavor because the major civilian use of HEU is as fuel in nuclear research reactors.

As a part of the RERTR program, DOE developed LEU fuel and worked with foreign research reactor operators to modify their reactors to run on such fuel. The foreign research reactor operators who converted to LEU fuel did so in support of nuclear weapons nonproliferation objectives, even though such conversions were expensive and generally resulted in reductions in the capabilities of the reactors and increased operating costs.

From the beginning of the RERTR program, foreign research reactor operators made it clear that their willingness to convert their research reactors to LEU fuel was contingent upon the continued acceptance by DOE of their spent nuclear fuel for disposition in the United States. In 1986, to further encourage foreign research reactor operators to convert to LEU fuel, the DOE "Off-Site Fuels Policy" was extended to include the acceptance of spent nuclear fuel containing LEU enriched in the United States.

The RERTR program has been highly successful and many foreign research reactors have been modified to operate, or have been designed to operate, with the high-density LEU fuels developed by the RERTR program, instead of HEU fuel. Of the 42 foreign research reactors with power levels equal to or above one million watts that use U.S. enriched fuel, 37 could operate with the currently available high-density LEU fuels. Of these, 25 are either operating on LEU fuel, or have ordered LEU fuel, and DOE anticipates that an additional eight reactors will convert to LEU fuel by 2001. Work is underway to develop improved high-density LEU fuels that would enable the remaining HEU fueled reactors to convert as well. Thus, the RERTR program has contributed to a significant reduction in the use of HEU in foreign research reactors.

The RERTR program is also developing the technology necessary to substitute LEU for the HEU in targets that are currently irradiated in reactors to produce the radioisotope molybdenum-99 for use as a diagnostic tool in nuclear medicine. The current limited nuclear commerce in HEU for medical targets can be reduced and eventually eliminated when LEU targets become available. When combined, these RERTR program activities can virtually eliminate the need for civilian commerce in HEU.

In 1988, DOE's "Off-Site Fuels Policy" to accept HEU spent nuclear fuel expired. At the end of 1992, the policy as it applied to the acceptance of LEU spent nuclear fuel also expired. The "Off-Site Fuels Policy" was not immediately renewed because of the need to assess the environmental impacts of a new policy. Because the United States has not been in a position to accept HEU fuel for 6 years [except for two recent "urgent relief" shipments of 252 spent nuclear fuel elements, 153 of which were from Denmark, Austria, Sweden, and the The Netherlands, with the remaining 99 elements from Switzerland and Greece, conducted under DOE's "Environmental Assessment of Urgent-Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel" (DOE, 1994m)], many foreign research reactor operators will soon run out of storage capacity or face safety and regulatory issues associated with the presence of spent nuclear fuel at their sites.

Although those foreign research reactors who could obtain regulatory clearance to build new storage capacity could do so within the duration of the proposed policy, they do not have time to do so in the near term before they run out of space. Storage of the spent nuclear fuel is a concern because it contains both enriched uranium (some of it highly-enriched material suitable for use in nuclear weapons) and highly radioactive waste products. The storage of such spent nuclear fuel must be accomplished with considerable care to ensure that the spent nuclear fuel does not corrode. If it does corrode, it could release fission products within the storage facility (making action to protect the spent nuclear fuel from further degradation difficult). In the extreme, uranium could be released from the spent nuclear fuel and settle to the bottom of the storage facility, creating the potential for a chain reaction.

Even if the spent nuclear fuel is kept in pristine condition (a relatively straightforward task given the resources and determination to store it correctly), the accumulation of large quantities of spent nuclear fuel containing HEU raises the possibility that some of the spent nuclear fuel might be stolen and its uranium diverted into a nuclear weapons program. In addition, spent nuclear fuel storage is an expensive undertaking (partially so because of the steps needed to avoid the problems outlined above) and is limited by local regulation in many countries. As a result, the cessation of the U.S. acceptance of foreign research reactor spent nuclear fuel associated with the expiration of the "Off-Site Fuels Policy" has created significant problems for the research reactor operators and has undercut the perceived reliability of the United States as a partner in peaceful nuclear cooperation, a cornerstone of U.S. nuclear weapons nonproliferation commitments enshrined in the *Treaty on the Non-Proliferation of Nuclear Weapons.*

With respect to the broader role that the United States plays in worldwide peaceful nuclear cooperation, President Reagan warned as early as July 1981, that "if we are not such a partner, other countries will tend to go their own ways and our influence will diminish. This would reduce our effectiveness in gaining the support we need to deal with proliferation problems." (Statement on the U.S. Nuclear Nonproliferation Policy, July 16, 1981.) More recent correspondence from the United States National Security Council, Department of State, Department of Defense, and the Nuclear Regulatory Commission (NRC) underscores the importance and urgency of support for the RERTR program objectives and the need for immediate action to reduce the use of HEU in civil programs. For example, in a recent letter to Secretary of Energy Hazel R. O'Leary, Secretary of State Warren Christopher stated, "The spent fuel acceptance policy which the EIS supports is central to our goal of preventing the spread of nuclear weapons -- and therefore to a major national security objective of this administration" (see Appendix G).

If the United States does not accept the foreign research reactor spent nuclear fuel, some of the foreign research reactors may be forced to shut down, as they will have no way to store any additional spent nuclear fuel. Other research reactor operators may have the option of reprocessing[2] their spent nuclear fuel (separating the uranium from the fission products for use as new fuel) at existing facilities. British and/or French reprocessing plants might accept foreign research reactor spent nuclear fuel for reprocessing, but have done so in the past only on the condition that the reprocessing customer agrees to take back the reprocessing wastes. Some of the countries in which the foreign research reactors are located do not have a domestic waste repository or other facilities for storing the highly-radioactive wastes generated from reprocessing for the near term. Other countries will not allow reprocessing because they object to reprocessing on environmental or nuclear weapons nonproliferation grounds.

While the U.S. Government has full confidence in the physical protection and safeguards systems in place at the British and French reprocessing facilities, reprocessing of spent nuclear fuel containing HEU, as it has been done in the past, would sustain international commerce in HEU, in direct contradiction to the U.S. position on nuclear weapons nonproliferation. It would likely mean that the research reactors pursuing this option would continue operations on the HEU fuel cycle because currently they have a method of disposing of HEU spent nuclear fuel, but not LEU spent nuclear fuel. Neither Dounreay (the British reprocessing facility in Scotland), Marcoule in France, nor any other available facility is currently accepting or has the special equipment that would be used in the United States to reprocess the high density LEU fuels that the United States is encouraging foreign research reactors to use to replace the

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2 *Reprocessing refers to the disassembly of spent nuclear fuel (usually by dissolving it in acid) to allow the uranium, and possibly other fissile materials, to be separated from the fission products and structural parts of the spent nuclear fuel. The fissile materials can then be reused, and the fission products are discharged as waste. These wastes are dissolved in specially formulated molten glass and cast into stainless steel cylinders (or in some cases, in foreign countries, may be mixed with special concretes and poured into steel drums) prior to disposal.*

HEU fuels. Hence, if the research reactors decide to use reprocessing as it has been managed up to this point to prevent backlogs of spent nuclear fuel from building up, they would have to continue to use HEU fuels. This could result in reactor operators delaying or canceling plans to convert to LEU, or in some cases, withdrawing from the RERTR program and reconverting from LEU to HEU fuels. The United Kingdom Atomic Energy Authority is considering adding an LEU processing capability to its plant in Dounreay. At this time, it is not clear that this plant will continue to operate. If the Dounreay facility continues to operate and if an LEU reprocessing capability is installed, that would mean that Dounreay customers could operate their research reactors on LEU.

If some foreign research reactor operators were to withdraw from the RERTR program and rely instead on HEU fuels, with attendant lower costs and enhanced performance, other research reactor operators would be under pressure to convert to the use of HEU for competitive reasons. Since the United States, under the Energy Policy Act of 1992, is barred from exporting HEU to virtually all foreign research reactors, research reactor operators seeking continued use of HEU would be forced to seek alternate suppliers. Russia and China are sources of HEU; and, should they choose to provide a ready supply of HEU, many foreign research reactor operators would be forced to consider abandoning the RERTR program and reconverting to HEU. In addition, the United States is currently attempting to convince Russia and China to implement programs similar to the United States' RERTR program to encourage their nuclear fuel customers to phase out use of HEU in their research reactors. However, if the United States cannot convince those countries to which it has exported nuclear fuel to stop using HEU, the United States would stand little chance of convincing Russia and China to do so with the countries to which they export nuclear fuel.

Additionally, several developed countries involved in the RERTR program are exporters of research reactors. In recent years, they have required that reactors exported to other countries be fueled with LEU. However, if foreign research reactor operators begin delaying or canceling plans to convert to LEU, and thereby continue to use HEU, foreign research reactor purchasers would demand HEU-fueled reactors. This could lead to renewed international commerce in weapons-usable HEU, and would be antithetical to the policy goal of seeking to minimize and eventually eliminate the civil use of HEU.

Another crucial consideration in proposing to accept spent nuclear fuel shipments from foreign research reactors is the *Treaty on the Non-Proliferation of Nuclear Weapons*. The Non-Proliferation Treaty is the basis for the world's nuclear weapons nonproliferation regime. The purpose of the Non-Proliferation Treaty is to keep the number of countries with nuclear weapons from growing. Five countries acknowledge having nuclear weapons: the United States, Russia, the United Kingdom, France, and China. In addition to the five acknowledged nuclear weapons States, 175 other nonnuclear weapons States are members of the treaty. The obligations for compliance with the Non-Proliferation Treaty apply to both nuclear weapons States and nonnuclear weapons States. While nonnuclear weapons States agree not to pursue development or acquisition of nuclear weapons or other nuclear explosive devices, the nuclear weapons States commit to the eventual elimination of their nuclear weapons arsenals and to assist nonnuclear weapons States with peaceful applications of nuclear energy. The Off-Site Fuels Policy and RERTR program are examples of how the United States has helped other nations with peaceful applications of nuclear energy in the past.

The parties to the Non-Proliferation Treaty met in May of 1995 and agreed by consensus to extend the treaty indefinitely and without conditions. Making this vital treaty a permanent part of the international nonproliferation regime was an important U.S. foreign policy achievement. One key to the success of the 1995 Non-Proliferation Treaty Conference was the ability of the United States to convince other

Non-Proliferation Treaty parties that the nuclear weapons States were in compliance with their obligations under Article IV of the Non-Proliferation Treaty to assist the nonnuclear weapons States with applications of nuclear energy for peaceful purposes.

Although the Non-Proliferation Treaty was extended indefinitely at the 1995 Non-Proliferation Treaty Conference, the parties also agreed to review the treaty every five years to ensure that all parties are in compliance. Any country which has been compelled to shut down its research reactors, or has been forced to seek reprocessing, could accuse the United States of not having fulfilled its treaty obligations. This accusation, however ill-founded, could be made not only by the affected countries, but by any country opposed to the interests of the United States.

In the past, some individuals and groups have incorrectly asserted that the U.S. concerns with reprocessing of HEU spent nuclear fuel discussed above are inconsistent with the U.S. policy of continuing to grant prior consent[3] to Japan and Western European nations for reprocessing of power reactor spent nuclear fuel. The U.S. Government believes that the growing quantities of plutonium in international commerce do present a threat to the efforts of the United States and other countries to prevent the proliferation of nuclear weapons. In countries where material control and accounting or physical protection systems are not sufficiently rigorous, there is a risk of diversion or theft of such materials. In addition, even in countries with effective nuclear weapons nonproliferation commitments, the presence of unneeded stocks of plutonium could raise security concerns on the part of neighboring countries. Accordingly, the U.S. Government does not encourage the civil use of plutonium. Nevertheless, the United States is also committed to being a reliable nuclear trading partner and to avoiding interference in peaceful nuclear programs. Therefore, in Western Europe and Japan where there are well-established civil reprocessing and plutonium facilities and comprehensive nuclear weapons nonproliferation commitments, the United States will continue, in appropriate instances, to grant prior consent for reprocessing of plutonium-bearing spent fuels on a predictable and long-term basis. Undertaking the use of U.S. consent rights to block reprocessing would lead to confrontation with, and would jeopardize the support from, nations that are in accord with the broader U.S. nuclear weapons nonproliferation goals and agenda.

1.2 Purpose and Need For Agency Action

Curbing the spread of nuclear weapons has been an important foreign policy and national security objective of the United States for nearly half a century. The proposed action is one action among many being pursued by the United States to reduce the potential for the proliferation of nuclear weapons. More specifically, the proposed action is intended to support the U.S. policy objective of seeking to reduce, and eventually to eliminate, HEU from civil commerce.

The nuclear weapons proliferation concerns addressed by the proposed action stem from the use of HEU as fuel for foreign research reactors and the presence of large residual amounts of HEU in the spent nuclear fuel from these research reactors. HEU can be used directly in simple nuclear weapons. In the past, the United States has encouraged reductions in the use of HEU as research reactor fuel by conducting

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3 *In general terms, the Atomic Energy Act of 1954, as amended, requires that before the United States may export nuclear material (e.g., enriched uranium), nuclear equipment, or sensitive nuclear technology to another country, that country must agree to obtain the consent (i.e., approval) of the United States before it may transfer that material, equipment, or technology to another country. However, in its 1988 agreement for cooperation with Japan, the United States has granted "prior consent" (i.e., approval in advance) for Japan to transfer power reactor spent fuel to France for reprocessing for the life of the agreement (the initial term is 30 years), subject to certain conditions relating to Japan's nuclear weapons nonproliferation activities. The U.S. Government has made a commitment to include a similar arrangement in new agreements that it is currently negotiating with Euratom and Switzerland.*

the RERTR program (to develop high-density LEU fuels to replace the HEU fuels). The United States also previously prevented the development of foreign stockpiles of HEU in foreign research reactor spent nuclear fuel by conducting the "Off-Site Fuels Policy" (i.e., by accepting the spent nuclear fuel into the United States and reprocessing it).

To illustrate the level of concern that exists regarding the proposed action, DOE has received letters from the U.S. Department of State, the Nuclear Regulatory Commission, the Arms Control and Disarmament Agency, the International Atomic Energy Agency, and the foreign research reactor operators, all urging DOE to resume acceptance and management of foreign research reactor spent nuclear fuel. Failure to manage this spent nuclear fuel would encourage international commerce in HEU.

HEU fuel in research reactors is more of a proliferation concern than the plutonium in these reactors for three reasons.

First, it is much easier to fashion a simple nuclear weapon out of HEU than plutonium. The chemical separation of HEU metal from HEU spent nuclear fuel would be simpler than the chemical separation of plutonium metal from LEU spent nuclear fuel. HEU is also less radioactive than plutonium, so it presents less of a health hazard to the people working with it. Furthermore, pure plutonium metal is extremely pyrophoric; that is, small chips of pure plutonium metal can ignite spontaneously unless the metal is handled very carefully in special facilities. All these problems with plutonium make HEU fuel a more attractive target for diversion into a nuclear weapons program.

Second, the amount of HEU that would be removed from current civil commerce under the proposed action is much greater than the amount of plutonium that would be produced in replacement LEU fuel elements in the same reactors. The proposed action involves the removal of approximately 4.6 metric tons (5.1 tons) of HEU. For comparison, the plutonium that would be produced in the replacement LEU nuclear fuel is so dilute that even if all the plutonium were somehow extracted, only about 120 kg (265 lb) of plutonium would be produced. This reduction in the amount of weapons grade material in circulation in the future would significantly reduce the threat of nuclear proliferation.

Third regarding fresh (not spent) nuclear fuel containing HEU, this nuclear material would be ideal for diversion into a nuclear weapons program because it would not require chemical separation as spent nuclear fuel would. In the absence of a policy to eliminate HEU from civil commerce, fresh HEU fuel would be shipped to the foreign research reactors from foreign suppliers such as Russia or China. Such shipments would present an additional proliferation risk that would not exist if research reactors worldwide operate on the LEU fuel cycle.

If the United States takes no action to accept foreign research reactor spent nuclear fuel, or otherwise eliminate much of the HEU it contains (e.g., by blending it with natural or depleted uranium to make LEU), one or more of the following events is almost certain to occur. First, some of the foreign research reactors would simply shut down. This does not solve the concerns regarding foreign research reactor spent nuclear fuel, however, since the countries whose reactors were forced to shut down could argue, rightly or wrongly, that the United States was not living up to its obligations under the *Treaty on the Non-Proliferation of Nuclear Weapons* to assist nonnuclear weapons States in the peaceful application of nuclear energy. In addition, the spent nuclear fuel already discharged by the foreign research reactors would still be in storage at the reactor sites. For about 70 percent of the foreign research reactors, this spent nuclear fuel would contain HEU that could be diverted into the production of nuclear weapons if it were removed from the spent nuclear fuel.

Second, some of the foreign research reactors might continue operating and allow their inventory of spent nuclear fuel to build up, much of it containing HEU. The United States could, theoretically, assist such countries (and those with shutdown reactors still holding spent nuclear fuel) in building modern, diversion-resistant spent nuclear fuel storage facilities. This could be extremely expensive, as there are approximately 104 research reactors located in 41 foreign countries. Furthermore, even if perfectly secure storage facilities were built, all that would be required to frustrate their function would be a coup or other change in government leaving a regime in power that is unconcerned about the proliferation of nuclear weapons. Then the spent nuclear fuel could be diverted into a weapons production program, despite the storage assistance that had been provided by the United States. It seems clear that the potential for such an event to occur would increase with the number of spent nuclear fuel stockpiles that are allowed to build up around the world and the length of time they exist.

Finally, some foreign research reactors would be likely to reprocess their spent nuclear fuel. Much of the U.S.-origin enriched uranium was exported under agreements that require prior consent by the United States before the spent nuclear fuel can be shipped to another country, as would be required for almost all reprocessing of foreign research reactor spent nuclear fuel containing uranium enriched in the United States. However, approximately 50 percent of the foreign research reactor spent nuclear fuel is located in countries where such prior consent is not required. The current practice of the most likely reprocessing plant (i.e., the facility in Dounreay, Scotland) is to allow the customer (i.e., the foreign research reactor operator) to specify the form of the separated uranium and its disposition. Thus, the foreign research reactor operator could specify that any separated HEU should be returned as HEU. Furthermore, neither Dounreay nor any other reprocessing facility currently accepts or has the capability to reprocess the high-density LEU fuels that the United States is encouraging foreign research reactors to use to replace the HEU fuels. Thus, in the absence of action to resolve the questions of the disposition of spent nuclear fuel, outlined above, any foreign research reactor operator that reprocesses to control the inventory of spent nuclear fuel must continue to use, or convert back to, fuel containing HEU. Reprocessing under these circumstances leads to perpetuation of the HEU fuel cycle.

While there is some danger of diversion of the HEU in the spent nuclear fuel while it is in storage, the threat is relatively low since the uranium is an integral part of the solid metal spent nuclear fuel elements and is mixed with highly radioactive fission products. A sophisticated chemical processing plant would be required to separate the uranium and convert it into a form suitable for use in a nuclear weapon. However, once the uranium has been separated from the spent nuclear fuel in a reprocessing plant, the situation is fundamentally changed. Any HEU separated in a reprocessing plant would be readily usable for nuclear weapons production, essentially the same as fresh HEU that has never been in a reactor. Therefore, despite U.S. confidence in the capability and determination of the United Kingdom and France to properly safeguard any separated HEU in their reprocessing plants, once the uranium leaves their facilities, the potential for illegal diversion of the material during transit or in the country of destination increases markedly. The rate of increase for potential diversion depends both on the countries and international waterways through which the material must be shipped, the country of final destination, and the number and size of the shipments being made.

Although it is unlikely that all the HEU that has been exported can be recovered or blended down to LEU through the proposed action, it is in the best interest of the United States to make every effort to ensure the proper management of the largest fraction of this material. Arrangements would have to be worked out with foreign reprocessors that would be supportive of U.S. nuclear weapons nonproliferation objectives to minimize the civil use of HEU worldwide.

By proposing a policy for management of certain foreign research reactor spent nuclear fuel, DOE and the Department of State do not seek to indefinitely accept or otherwise manage spent nuclear fuel from foreign research reactors. Rather, the purpose of the proposed new policy is to remove as much U.S.-origin HEU as possible from international commerce while giving the foreign research reactors and their host countries time to convert to operation with LEU fuel and make their own arrangements for disposition of subsequently generated LEU spent nuclear fuel. The foreign research reactor operators and countries in which the research reactors are operating must be prepared to implement their own arrangements for disposition of their spent nuclear fuel after the policy expires.

1.3 Scope of the Environmental Impact Statement (EIS)

This EIS evaluates the potential environmental impacts that could result from the DOE and Department of State joint proposal to adopt a policy to manage spent nuclear fuel from foreign research reactors. Only spent nuclear fuel containing uranium enriched in the United States would be covered by the proposed policy. The purpose of the proposed policy is to promote U.S. nuclear weapons nonproliferation policy objectives, specifically by seeking to reduce, and ultimately eliminating, HEU from civilian commerce. This EIS identifies and evaluates the potential environmental impacts of management alternatives to the proposed action. Implementation of Management Alternative 1 to the proposed action could include the receipt of foreign research reactor spent nuclear fuel at one or more U.S. marine ports of entry, overland transport to one or more DOE sites, and management (interim storage and ultimate disposition) in the United States. DOE will also analyze near-term chemical separation as an alternative to storing the intact spent nuclear fuel pending ultimate disposition.

Under Management Alternative 1 to the proposed action, DOE would accept or otherwise manage spent nuclear fuel containing HEU and LEU from 41 foreign nations, if such spent nuclear fuel is already discharged[4] or would be discharged within the 10-year policy period. Figure 1-1 displays the geographic locations of these nations. The United States would bear the full cost for the management of the foreign research reactor spent nuclear fuel from developing nations.[5] For developed nations, however, the United States would charge a fee for spent nuclear fuel management activities conducted by the United States.[6]

DOE recognizes that Figure 1-1 lists nations that would currently not be considered to be nuclear weapons proliferation risks. History indicates that the United States cannot predict today, with assurance, which countries may develop into proliferation risks in the future. On the other hand, there are good reasons for accepting spent nuclear fuel from nations that are in accord with U.S. nuclear nonproliferation goals, and that have stable governments and excellent nonproliferation credentials. First, several of these countries manufacture research reactors for sale to third world countries. If the United States refuses to help these countries with the management of the spent nuclear fuel from their research reactors, several of their reactors are likely to convert to use of HEU for fuel. If that occurs, their customers in the third world countries would probably also demand to be supplied with reactors fueled with HEU.

Second, both the Soviet Union and China also exported research reactors in the past. The United States is currently engaged in discussions to convince Russia (as the successor supplier to the Soviet Union's allies) and China to work with their nuclear fuel customers to convert their research reactors from HEU to LEU.

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4 *"Discharged" refers to removal of irradiated fuel from a reactor.*

5 *Developing nations are defined by the World Development Report as having other than high-income economies (World Bank, 1994).*

6 *For purposes of determining which nations are eligible for assistance from the United States in handling their foreign research reactor spent nuclear fuel, Taiwan is considered to be in the high-income economy category.*

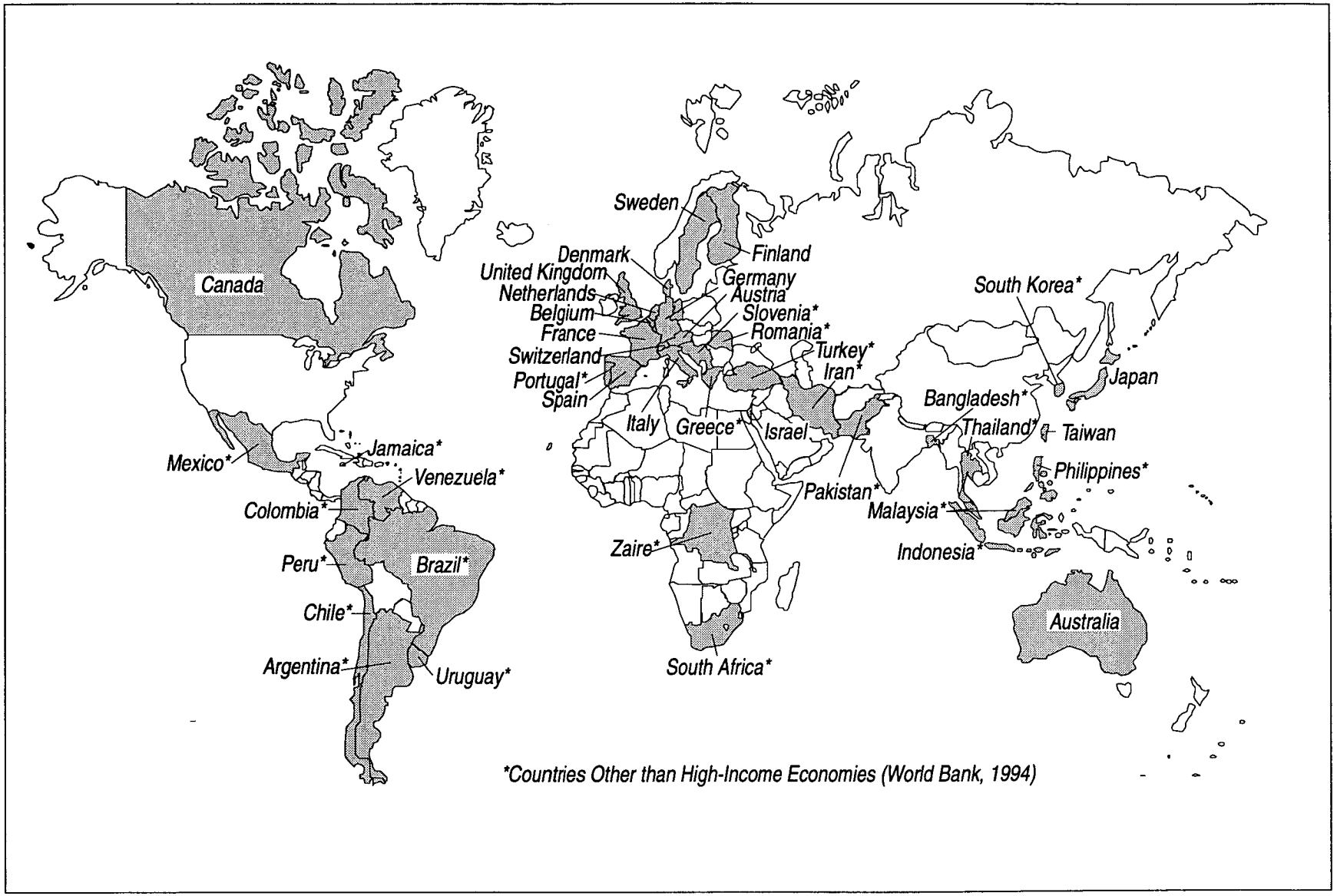

Figure 1-1 Nations with Research Reactors that are Holding or are Expected to Generate Spent Nuclear Fuel Containing Uranium Enriched in the United States

If the United States were to take action that caused its nuclear fuel customers to reconvert their research reactors to HEU, that would likely ensure the failure of U.S. efforts to get Russia and China to encourage their nuclear fuel customers to switch to LEU.

A second alternative (Management Alternative 2) for implementation of the proposed action has been identified and evaluated in this EIS. This alternative includes two subalternatives: (1) to provide assistance to foreign nations with storage of their spent nuclear fuel overseas, and (2) to provide non-technical assistance (financial and/or logistical) in the reprocessing of their spent nuclear fuel. The third alternative (Management Alternative 3) would consist of a combination of various elements of Management Alternatives 1 and 2. For example, a portion of the spent nuclear fuel could be managed overseas, and the remaining portion could be managed in the United States. A No Action Alternative is also evaluated in this EIS.

Under any of these action alternatives, no definitive proposals can be specified at this time for management of the foreign research reactor spent nuclear fuel beyond a 40-year interim management period because insufficient data are available to allow future management proposals to be defined, or for the potential environmental impacts of the final disposition of spent nuclear fuel to be evaluated. As a result, the EIS analysis for the time period beyond 40 years is qualitative rather than quantitative. The qualitative assessment includes consideration of disposal of intact foreign research reactor spent nuclear fuel, as well as disposal of vitrified high-level waste resulting from chemical separation of foreign research reactor spent nuclear fuel.

Certain potential actions discussed in this EIS will depend on decisions to be made under other National Environmental Policy Act (NEPA) analyses. Specifically, the site at which the foreign research reactor spent nuclear fuel would be managed, if accepted in the United States, will be selected based on the analyses documented in the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (Programmatic SNF&INEL Final EIS) (DOE, 1995c). An exception to this would occur if the "No Action" alternative, or any other alternative that does not include acceptance of foreign research reactor spent nuclear fuel, were selected after completion of the Programmatic SNF&INEL Final EIS. In that case, any site at which foreign research reactor spent nuclear fuel management activities might be conducted in the United States would be selected pursuant to the analyses in this EIS.

The Record of Decision for the Programmatic SNF&INEL Final EIS (DOE, 1995c) was issued on May 30, 1995. In accordance with this Record of Decision, all of the aluminum clad foreign research reactor spent nuclear fuel accepted by DOE would be managed at the Savannah River Site in South Carolina, and any other foreign research reactor spent nuclear fuel to be accepted by DOE would be managed at the Idaho National Engineering Laboratory. This is why the Comment Response Document (Volume 3) focuses on the Savannah River Site and Idaho National Engineering Laboratory as sites where any spent fuel accepted in the United States under the proposed policy would be managed, consistent with the Programmatic SNF&INEL Final EIS Record of Decision. Nevertheless, all five of the spent nuclear fuel management sites originally considered in the Draft EIS have been kept in this Final EIS to maintain maximum consistency with the analyses provided in the Programmatic SNF&INEL EIS (DOE, 1995c and 1994m).

In this EIS, DOE and the Department of State, in consultation with other government agencies, designate the acceptance and management of foreign research reactor spent nuclear fuel and target material in the United States as the preferred alternative.

1.4 Decisions to be Made Based on this EIS

The principal policy decision for which this EIS will provide a basis is whether DOE and the Department of State should adopt a policy for the United States to manage foreign research reactor spent nuclear fuel containing U.S.-enriched uranium. A necessary part of this decision is the amount and types of foreign research reactor spent nuclear fuel to be managed under such a policy.

If a decision is made to adopt such a policy, then decisions on management implementation must also be made. This EIS is intended to provide the necessary analysis, not only for the decision on adoption of a policy, but also for decisions on management implementation of such a policy, if adopted. Should the decision be to manage the spent nuclear fuel in the United States, decisions to be made on implementation of such a policy include:

- the duration of any foreign research reactor spent nuclear fuel management policy;
- the modes of ocean and overland transport required for shipping any foreign research reactor spent nuclear fuel to be accepted into the United States;
- the ports of entry through which DOE would receive foreign research reactor spent nuclear fuel;
- the need for the construction of new facilities or modification of existing facilities to manage the foreign research reactor spent nuclear fuel to be accepted, and the design, construction, and operation of any such new or modified facilities;
- whether to use near-term chemical separation of the foreign research reactor spent nuclear fuel, as an alternative to storing intact foreign research reactor spent nuclear fuel; and
- whether to accept uranium target material that was enriched in the United States and irradiated in foreign research reactors during the production of molybdenum-99 for medical purposes (in addition to the foreign research reactor spent nuclear fuel discussed above).

1.5 Relationship of this EIS to Other NEPA Documents and Reports Relating to Spent Nuclear Fuel Management

The relationship of this EIS to other DOE NEPA reviews, either completed or currently under preparation, and other DOE analyses is discussed in this section. These reviews and analyses are:

1. *Environmental Assessment of Urgent-Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel.* This Environmental Assessment covers marine transport, receipt, overland transport, and interim wet storage in the Receiving Basin for Offsite Fuels (RBOF) at the Savannah River Site of up to 409 elements of spent nuclear fuel from foreign research reactors. The Environmental Assessment and associated Finding of No Significant Impact were issued on April 22, 1994.

   The proposed action analyzed in this Environmental Assessment was intended to ensure that the eight research reactors from which urgent-relief spent nuclear fuel shipments were proposed would continue to participate in the RERTR program (a key U.S. nuclear weapons nonproliferation program) until this EIS could be completed and a decision made on whether to adopt and implement the proposed policy to manage foreign research reactor spent nuclear fuel containing uranium enriched in the United States.

2. *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement (Programmatic SNF&INEL EIS).* Volume 1 analyzes at a programmatic level the potential environmental impacts over the next 40 years of alternatives related to the transportation, receipt, processing, and storage of spent nuclear fuel under the responsibility of DOE. This EIS was prepared in compliance with the order of the U.S. District Court for the District of Idaho [*Public Service Company of Colorado v. Andrus*, Memorandum of Opinion (December 22, 1993)]. The Final EIS and the Record of Decision were published on April 28, 1995 and May 30, 1995, respectively. This EIS formed the basis for deciding, on a programmatic level, which sites will be used for the management of the various types of spent nuclear fuel to which DOE holds title. It included the amount of foreign research reactor spent nuclear fuel that might be accepted in its assessment of potential impacts, and addressed the sites at which the foreign research reactor spent nuclear fuel could be stored if a decision is made to accept foreign research reactor spent nuclear fuel. The Record of Decision indicated that aluminum clad spent fuel will be consolidated at the Savannah River Site and non-aluminum clad fuel will be managed at the Idaho National Engineering Laboratory. On October 17, 1995, litigation with the State of Idaho was settled by stipulation of the parties and entry of a Consent Order. This settlement would provide for the transportation of up to 61 shipments of foreign research reactor spent fuel to Idaho National Engineering Laboratory prior to the year 2000, if DOE and the Department of State choose to adopt a policy of accepting such foreign research reactor spent nuclear fuel. After the year 2000, additional shipments of such spent nuclear fuel could be made to Idaho National Engineering Laboratory under the stipulated settlement and Consent Order. Notwithstanding the Record of Decision, a full analysis of all five management sites considered in the Programmatic SNF&INEL Final EIS has also been included in this EIS to maintain maximum consistency with the analysis provided in the Programmatic SNF&INEL EIS.

3. *Waste Management Programmatic EIS.* The Waste Management Programmatic EIS has evolved from the formerly named Environmental Management Programmatic EIS, as was most recently described in a *Federal Register* Notice (55 FR 42633), on August 22, 1990. The Draft Waste Management Programmatic EIS was issued in August 1995 and analyzes programmatic alternatives for DOE-wide management of five waste types: high-level radioactive waste, low-level radioactive waste, low-level mixed waste, transuranic waste, and hazardous waste. DOE expects to issue the Final Waste Management Programmatic EIS in late 1996.

4. *Spent Fuel Working Group Report on Inventory and Storage of the Department's Spent Nuclear Fuel and other Reactor Irradiated Nuclear Materials and their Environmental Safety and Health Vulnerabilities.* The Spent Fuel Working Group Report, dated November 1993, presents a comprehensive assessment of the conditions of spent nuclear fuel and other irradiated materials stored at DOE facilities. Eight DOE sites were identified as containing storage facilities with major vulnerabilities that need to be resolved. The vulnerabilities identified in this report have been considered in the analysis of the actions that would be involved in management of foreign research reactor spent nuclear fuel in the United States.

5. *Plan of Action to Resolve Spent Nuclear Fuel Vulnerabilities.* The Plan of Action to Resolve Spent Nuclear Fuel Vulnerabilities is a three-phased approach to remedy vulnerabilities identified in the Spent Fuel Working Group Report. The Phase-I Plan of Action, dated

February 1994, addressed 31 of 33 high-priority vulnerabilities and 48 lower-priority issues. The Phase-II Plan of Action, dated April 1994, was the product of follow-on work to the Phase-I report, and resolved a majority of the funding issues associated with spent fuel vulnerabilities. The Phase-III Plan of Action, issued in October 1994, focused on the resolution of critical policy issues and provided individual action plans that addressed all the identified vulnerabilities. In the preparation of this EIS on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, the actions being taken to resolve these issues have been evaluated to ascertain that any existing facilities considered for use in receipt, handling, or storage of foreign research reactor spent nuclear fuel are capable of performing satisfactorily. The EIS evaluates storage capabilities and alternatives at the interim storage sites and whether potential storage sites would be capable of immediately implementing the proposed action.

6. *Interim Management of Nuclear Materials Final Environmental Impact Statement.* This EIS considers the impacts of managing nuclear materials stored at the Savannah River Site, including stabilization by separating the nuclear materials from fission and decay products in the chemical separation facilities and conversion of the resulting liquids to solids in waste and material conversion facilities, including the Defense Waste Processing Facility, the FB-, HB, and FA-Lines, and the saltstone facility. The Final EIS was issued in October 1995. A Record of Decision and Notice of Preferred Alternative was published in the *Federal Register* (60 FR 65300) on December 19, 1995. Decisions were made for the majority of materials covered by the EIS in the Record of Decision and processing Mark-16 and Mark-22 fuels and blending down the resulting HEU to LEU was identified as the preferred alternative for those materials. These fuels are similar to the aluminum-based foreign research reactor spent nuclear fuel although significant corrosion has been identified. An amended Record of Decision is expected soon regarding the Mark-16 and Mark-22 fuels. DOE has taken and will take into consideration all Records of Decision on the Interim Management of Nuclear Materials Final EIS in the preparation of this EIS and in reaching a decision on how to implement the proposed policy, if adopted.

7. *Disposition of Surplus Highly Enriched Uranium Environmental Impact Statement.* The Draft EIS, issued in October 1995, assesses the environmental impacts of alternatives for the disposition of U.S.-origin HEU that has or may be declared surplus to national defense and defense-related program needs, in order to eliminate the nuclear proliferation risk and, where practical, recover economic value and peaceful, beneficial reuse of the material. Under the preferred alternative, the HEU would be blended to LEU at four sites, including the Savannah River Site; under this alternative, most of the HEU would be blended to LEU as fuel feed for commercial nuclear power plants to generate electricity, while that which cannot meet commercial fuel specifications would be blended to low level waste. The Final EIS and Record of Decision are scheduled for April and May 1996, respectively.

8. *Storage and Disposition of Weapons-Usable Fissile Materials Programmatic Environmental Impact Statement.* This EIS will assess the environmental impacts of reasonable alternatives for safe, secure and internationally-accountable long-term storage of non-surplus, U.S.-origin plutonium and HEU, long-term storage of plutonium and HEU that are not part of the strategic reserves need for weapons research and development, and post-interim storage of surplus fissile material prior to disposition. This programmatic EIS will also analyze reasonable alternative strategies and technologies for disposition of U.S.-origin plutonium that is or may be declared surplus to defense and defense-related program needs,

in order to eliminate the proliferation risk by making the material as proliferation-resistant as spent fuel. The Savannah River Site will be analyzed in conjunction with the various alternatives for both storage and disposition. The Notice of Intent to prepare a programmatic EIS was issued in June 1994 (59 FR 31985), and the scope of the EIS was revised in April 1995 (60 FR 17344). The Draft EIS is expected in early 1996, and the Final EIS and Record of Decision are expected in late 1996.

9. *Environmental Impact Statement Evaluating Container Systems for the Management of Spent Nuclear Fuel.* This EIS was originally titled *Environmental Impact Statement for a Multi-Purpose Canister System for the Management of Civilian and Naval Spent Nuclear Fuel.* This EIS, as described in 59 FR 53442 (1994), was intended to address the potential environmental impacts associated with alternative systems for storage and transport of spent nuclear fuel assemblies for civilian spent nuclear fuel. DOE decided for programmatic reasons in November 1995 to withdraw its proposal to prepare this EIS. The Department of the Navy has announced in a *Federal Register* Notice (60 FR 62829) that it will take the lead in preparing this EIS for evaluating container systems for the management of Navy spent nuclear fuel. DOE is a cooperative agency on this EIS.

10. *F-Canyon Plutonium Solutions Environmental Impact Statement.* This EIS evaluated the potential environmental impacts over the next 10 years of alternatives for stabilization of plutonium solutions currently stored in the F-Canyon at the Savannah River Site. The plutonium solutions remain from reprocessing operations that DOE suspended in 1992 at the Savannah River Site. The Record of Decision for this EIS announced that DOE would implement the preferred alternative analyzed in the EIS. This alternative is to process the plutonium solutions to plutonium metal.

11. *Defense Waste Processing Facility Supplemental Environmental Impact Statement.* This Supplemental EIS examines the cumulative environmental impacts of modifications made to the Defense Waste Processing Facility and associated high-level waste facilities at the Savannah River Site since the issuance of the 1982 EIS. The preferred alternative for the proposed action under this Supplemental EIS is to continue construction and begin operation of the Defense Waste Processing Facility as designed. The Final Supplemental EIS was completed in November 1994 and the Record of Decision was issued on April 12, 1995 (60 FR 18589). The DOE decision was to complete construction and startup testing and begin operation of the facility as currently designed. One of the Implementation Alternatives considered in the Foreign Research Reactor Spent Nuclear Fuel EIS is to chemically separate a portion of the foreign research reactor spent nuclear fuel at the Savannah River Site and vitrify the resulting high-level radioactive waste in the Defense Waste Processing Facility.

12. *Tritium Supply and Recycling Programmatic Environmental Impact Statement.* This Programmatic EIS evaluated the siting, construction and operation of tritium supply technology alternatives and the recycling facilities at five candidate DOE sites. The EIS also evaluated the use of a commercial reactor for producing tritium. Currently, DOE does not have the capability to produce tritium in the required amounts. The Savannah River Site in South Carolina, which will receive the aluminum-based foreign research reactor spent nuclear fuel, has been identified by DOE as the preferred site for an accelerator, should one be constructed, and the site for the upgrade and consolidation of existing recycling facilities.

The Final Programmatic EIS was completed and issued to the public in October 1995. The DOE Record of Decision was issued on December 12, 1995 (60 FR 63891) with a decision to implement the preferred alternatives.

13. *Stockpile Stewardship and Management Programmatic Environmental Impact Statement.* This EIS was originally a part of the Nuclear Weapons Complex Reconfiguration Programmatic Environmental Impact Statement. The Notice of Intent of this EIS was published on June 14, 1995 (60 FR 31291) after a prescoping workshop on May 19, 1995. This Programmatic EIS will examine activities required to maintain a high level of confidence in the safety and reliability of a reduced stockpile of nuclear weapons in the absence of underground nuclear testing. The Savannah River Site at Aiken, South Carolina, which houses the tritium loading/unloading and surveillance of tritium reservoirs, will receive the aluminum-based foreign research reactor spent nuclear fuel should the proposed action be implemented in the United States. This draft EIS is expected to be issued for public comment in February 1996.

1.6 Structure of this EIS

The remainder of this EIS is structured as follows:

- Chapter 2 presents the proposed action, describes management alternatives for implementation of the proposed action, alternative means of implementing each management alternative, and a No Action Alternative. Chapter 2 specifies the Preferred Alternative that has been developed by DOE and the Department of State.
- Chapter 3 characterizes the affected environments at potential ports of entry and at potential foreign research reactor spent nuclear fuel management locations.
- Chapter 4 addresses the policy considerations and the potential environmental impacts of each management alternative for implementation of the proposed action, alternative means of implementing each management alternative, and a No Action Alternative.
- Chapter 5 describes the international and domestic regulations governing radioactive materials that apply to DOE actions that might be taken under this EIS.
- Chapters 6, 7, and 8 contain primarily reference information, such as the List of Preparers, Agencies Consulted, and References, respectively.

The appendices to this document present details of the evaluations and analyses performed for this EIS.

2. Proposed Action and Alternatives

This chapter states the proposed action and describes the management alternatives analyzed in this Environmental Impact Statement (EIS) for implementation of the proposed action. Environmental and policy impacts from the management alternatives are presented in Chapter 4.

2.1 Overview of the Proposed Action and Alternatives

The U.S. Department of Energy (DOE) and Department of State are jointly proposing to adopt a policy to manage spent nuclear fuel from foreign research reactors. Only spent nuclear fuel containing uranium enriched in the United States would be covered by the proposed action. The purpose of the proposed action is to promote U.S. nuclear weapons nonproliferation policy objectives, specifically by seeking to reduce, and eventually eliminate, highly-enriched uranium (HEU) from civilian commerce.

To implement the proposed action, DOE and the Department of State have considered three foreign research reactor spent nuclear fuel management alternatives. They are:

1. To accept and manage foreign research reactor spent nuclear fuel in the United States (Management Alternative 1);

2. To facilitate the management of foreign research reactor spent nuclear fuel at one or more foreign locations (Management Alternative 2); and

3. A combination of elements from Management Alternatives 1 and 2 (Management Alternative 3, Hybrid Alternative).

The management alternatives of the proposed action are portrayed in Figure 2-1 and are discussed in more detail in Sections 2.2, 2.3, and 2.4.

A No Action Alternative on the part of DOE and the Department of State to address the status of the foreign research reactor spent nuclear fuel has also been considered in this EIS. The No Action Alternative is discussed in Section 2.5.

DOE and the Department of State have identified a preferred alternative for the proposed action. The preferred alternative is described in Section 2.9.

The foundation for the analysis presented in Chapter 4 of this EIS is the evaluation of the components that comprise the basic implementation of Management Alternative 1. The basic implementation concept is an attempt by DOE and the Department of State to avoid unnecessary repetition by selecting a reasonable option for each component and examining them in detail under Management Alternative 1. Since the No Action Alternative would not have any direct environmental impacts in the United States, it requires only policy analysis in this EIS. Management Alternatives 1, 2, and 3, however, would all have environmental impacts in the United States, and the components of the basic implementation provide the parameters with which to analyze their potential environmental impacts in this EIS.

The detail of analysis provided for the basic implementation components is based on the fact that some variation of these components is utilized in each implementation alternative under Management Alternative 1, as well as in Management Alternative 3. In this way, analysis of the implementation

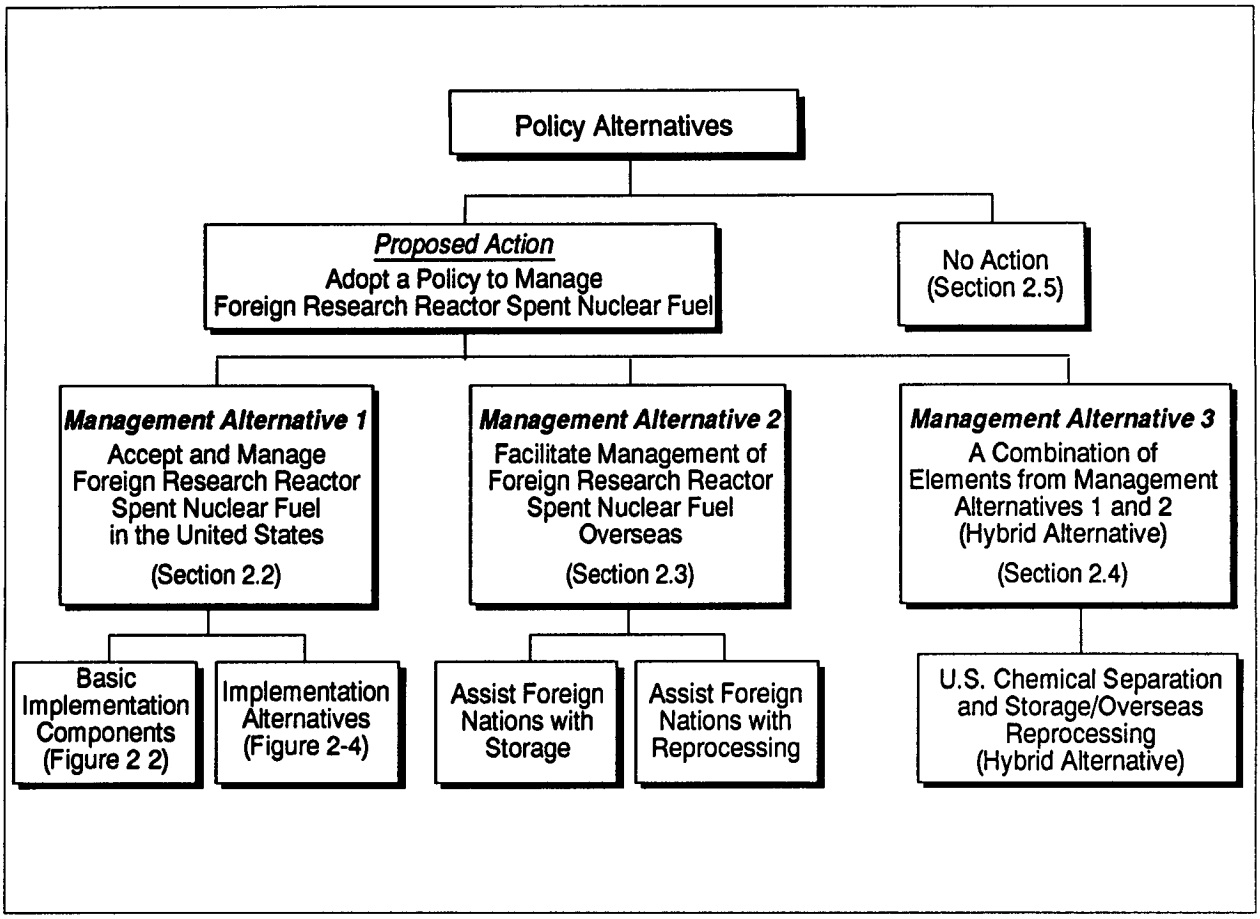

Figure 2-1 Policy and Management Alternatives

alternatives, as well as Management Alternative 3, can be tiered from the analysis of the basic implementation. In and of itself, the basic implementation of Management Alternative 1 is a viable implementation alternative for consideration under Management Alternative 1, along with the other implementation alternatives discussed below. However, the level of detail contained in the analysis of the basic implementation does not indicate any preference for this alternative. Rather, it merely eliminates the need to duplicate information later in the analysis.

The components of the basic implementation of Management Alternative 1 would consist of the following:

1. A policy duration of 10 years.

2. A financing arrangement by which the United States would bear the full cost for transporting and managing the foreign research reactor spent nuclear fuel received from developing countries, but would charge developed countries a competitive fee.

3. The receipt of a fixed amount of foreign research reactor spent nuclear fuel containing uranium enriched in the United States. This fixed amount is up to approximately 22,700 foreign research reactor spent nuclear fuel elements and is based on estimated inventories of foreign research reactor spent nuclear fuel currently stored or to be generated in the 10-year policy period.

4. Taking title to the foreign research reactor spent nuclear fuel at the U.S. territorial waters limit (19 km or 12 mi), or continental U.S. borders for shipments from Canada.

5. Marine transport of the foreign research reactor spent nuclear fuel by chartered and/or regularly scheduled commercial ships.

6. Ports of entry that qualify on the basis of criteria discussed in this EIS.

7. Ground transport from ports of entry to storage sites, and between sites (by truck, rail, or barge, or a combination of these modes.)

8. Potential storage sites identified in the Programmatic SNF&INEL Final EIS (DOE, 1995c) for foreign research reactor spent nuclear fuel, namely the Savannah River Site, the Idaho National Engineering Laboratory, the Hanford Site, the Oak Ridge Reservation, and the Nevada Test Site.

9. Use of dry storage technology for construction of new storage facilities.

The basic implementation components are depicted in Figure 2-2 and described in Section 2.2.1. Environmental impacts and policy considerations of the basic implementation components of Management Alternative 1 are presented in Section 4.2.

Utilizing the components provided above, DOE has evaluated seven implementation alternatives for Management Alternative 1 in addition to the basic implementation. Each implementation alternative is comprised of the same components as the basic implementation; however, for the purpose of analysis, one of the components has been varied. The seven implementation alternatives are given below.

1. Acceptance of amounts of foreign research reactor spent nuclear fuel different from the amounts identified in the basic implementation.

2. Acceptance of foreign research reactor spent nuclear fuel for a period of time different from the time period identified in the basic implementation.

3. Financial arrangements different from those identified in the basic implementation.

4. Taking title to foreign research reactor spent nuclear fuel at locations different from those identified in the basic implementation.

5. Use of wet storage technology for construction of new storage facilities instead of dry storage technology as identified in the basic implementation.

6. Use of near term conventional chemical separation in the United States to reduce the duration of, and amount of, spent nuclear fuel storage required.

7. Use of new developmental treatment and/or packaging technologies in addition to storage as identified in the basic implementation.

Implementation alternatives for Management Alternative 1 are discussed in Section 2.2.2. The environmental impacts and policy considerations of the implementation alternatives are discussed in Section 4.3.

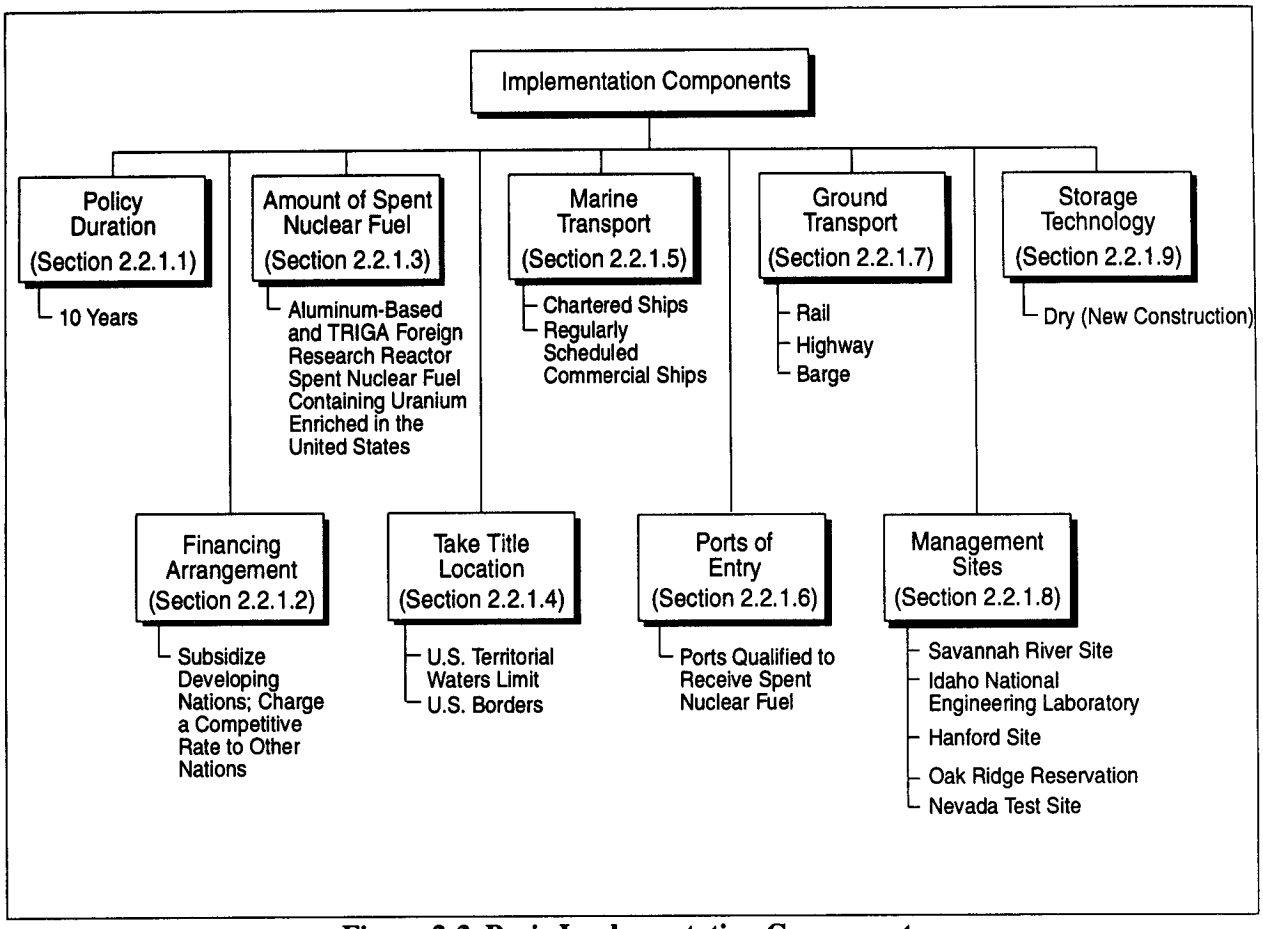

Figure 2-2 Basic Implementation Components

Qualifying Fuel Types and Policy Stipulations

This policy applies solely to aluminum-based and TRIGA[1] research reactor fuels and target materials containing HEU and low enriched uranium (LEU) of U.S. origin. Aluminum-based fuel is clad in aluminum and has an active fuel region that consists of an alloy of uranium and aluminum or a dispersion of uranium-aluminide, uranium-oxide[2] or uranium-silicide in aluminum. TRIGA fuel consists of an alloy of uranium and zirconium and is clad in either aluminum or stainless steel. Fuels containing significant quantities of Uranium-233 (^{233}U) are excluded. Target materials are the residual materials from isotope production targets in research reactors.

The policy would include the following stipulations:

- Spent nuclear fuel (either and/or both HEU and LEU) would be accepted from research reactors operating on LEU fuel or in the process of converting to LEU fuel when the policy becomes effective.

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1 *TRIGA stands for Training, Research, Isotope, General Atomic reactors.*

2 *This uranium-oxide composition refers to aluminum-clad fuel plates or tubes containing dispersions of U_3O_8 in aluminum. It does not include fuels containing UO_2 pellets clad in aluminum, zircaloy, stainless steel, or other materials, or uranium-silicide in aluminum.*

- Spent nuclear fuel (HEU and/or LEU) would be accepted from research reactors which operate on HEU fuel when the policy becomes effective and which agree to convert to LEU fuel. Spent nuclear fuel would not be accepted from research reactors that could convert to LEU fuel but refuse to do so.

- Spent nuclear fuel (HEU) would be accepted from research reactors having lifetime cores, from research reactors planning to shut down by a specific date while the policy is in effect, and from research reactors for which a suitable LEU fuel is not available.

- Spent nuclear fuel (HEU and/or LEU) would be accepted from research reactors that are already shut down.

- Unirradiated fuel (HEU and/or LEU) from eligible research reactors would be accepted as spent nuclear fuel.

- For research reactors with both HEU and LEU spent nuclear fuel available for shipment, LEU spent nuclear fuel would not be accepted until the HEU spent nuclear fuel is exhausted, unless there are extenuating circumstances (e.g., deterioration of one or more LEU elements sufficient to cause a safety problem).

- Spent nuclear fuel (HEU and/or LEU) would not be accepted from new research reactors starting operation after the date of implementation of the policy.

Ultimate Disposition

Ultimate disposition of DOE's spent nuclear fuel, including foreign research reactor spent nuclear fuel, is a high priority. For planning purposes, DOE has determined that its spent nuclear fuel that is not otherwise managed (e.g., chemically separated, with the high-level waste being converted into a vitrified glass for repository disposal) is authorized for disposal in a geologic repository. The Nuclear Waste Policy Act of 1982 (as amended) authorizes disposal of the foreign research reactor spent nuclear fuel in a geologic repository (if DOE takes title to such spent nuclear fuel). However, since the repository characterization program is in its early stages, the waste acceptance criteria for deposit of DOE's spent nuclear fuel in a repository have not been developed. Thus, a determination cannot be made at this time as to the requirements that must be met to allow placement of the foreign research reactor spent nuclear fuel in the repository. As a result, the EIS analysis for the time period beyond 40 years is qualitative rather than quantitative. The qualitative assessment includes consideration of disposal of intact foreign research reactor spent nuclear fuel, disposal of vitrified high-level waste resulting from chemical separation, as well as utilization of various potential new technologies to process the spent nuclear fuel into a more stable form prior to its ultimate disposition. In the event that the geologic repository schedule is delayed beyond the 40-year program period, DOE would continue to manage the foreign research reactor spent nuclear fuel or any resultant stable waste forms in existing facilities at the DOE management site(s) until a geologic repository becomes available. Decisions regarding the actual disposition of DOE's spent nuclear fuel will follow appropriate review under the National Environmental Policy Act (NEPA).

2.2 Management Alternative 1 - Manage Foreign Research Reactor Spent Nuclear Fuel in the United States

2.2.1 Basic Implementation Components

2.2.1.1 Policy Duration

The policy duration of the basic implementation of Management Alternative 1 would be 10 years, beginning on the date when the management policy becomes effective. Spent nuclear fuel containing HEU and LEU of U.S. origin that is currently being stored or is to be generated during the 10-year period of the policy would be accepted.

Actual shipments of spent nuclear fuel to the United States could be made for a period of 13 years starting from the effective date of the policy implementation, as long as the spent nuclear fuel was generated within the 10-year policy period. The 3 additional years would allow for a cooling time for fuel discharged from a reactor late in the policy period, logistics in arranging for shipment of this fuel, as well as other unplanned for potential delays.

2.2.1.2 Financing Arrangements

The United States would bear the full cost of transporting and managing the foreign research reactor spent nuclear fuel received from developing countries. Developing countries are defined by the World Bank as those countries having other than high-income economies (World Bank, 1994). For developed countries, however, the United States would charge a competitive fee for the handling, storage, conditioning (as needed), and any disposal activities conducted by the United States. Tables 2-1 and 2-2, which provide estimates of the number of elements that may be accepted, identify those countries defined as developing countries.

2.2.1.3 Amount of Foreign Research Reactor Spent Nuclear Fuel

The analysis in this EIS is based primarily on the number of individual elements of foreign research reactor spent nuclear fuel that could be accepted. When appropriate, the analysis also uses two other measures to express the amounts in understandable terms:

- Mass of Heavy Metal. This is the mass of all the heavy metal atoms in the spent nuclear fuel (mostly uranium), excluding the mass of other materials such as alloys, cladding, and structural materials. The international standard unit of measure for this quantity is metric tons of heavy metal (MTHM).

- Volume. The volume of the spent nuclear fuel is important because it determines the number of shipments and the storage space required. The volume is expressed in cubic meters.

The amount of foreign research reactor spent nuclear fuel that would be accepted under the basic implementation is up to approximately 19.2 MTHM, with a volume of approximately 110 m^3 (4,100 ft^3), representing approximately 22,700 individual spent nuclear fuel elements. The number of elements cited for acceptance under the policy includes those elements at issue in the Environmental Assessment of Urgent Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel (DOE, 1994m).

Table 2-1 Estimated Number of Aluminum-Based Spent Nuclear Fuel Elements Generated by Foreign Research Reactor Operators by January 2006

Country	*Estimated Number of Spent Nuclear Fuel Elements*	*Initial Mass of Uranium (MTHM)*[a]	*Estimated Number of Shipments*
Argentina[b]	283	0.071	9
Australia	975	0.427	9
Austria	157	0.191	5
Belgium	1,766	0.730	59
Brazil[b]	155	0.099	5
Canada	2,831	4.478	116
Chile[b]	58	0.012	2
Colombia[b]	16	0.002	1
Denmark	660	0.529	22
France	1,962	3.442	149
Germany	1,504	0.909	49
Greece[b]	239	0.113	8
Indonesia[b]	198	0.236	6
Iran[b]	29	0.006	1
Israel	192	0.111	6
Italy	150	0.043	5
Jamaica[b]	2	0.001	1
Japan	2,981	3.134	99
Korea (South)[b]	168	0.321	7
Netherlands	1,488	1.404	49
Pakistan[b]	82	0.016	3
Peru[b]	29	0.039	1
Philippines[b]	50	0.024	2
Portugal[b]	88	0.054	3
South Africa[b]	50	0.010	2
Spain (from Scotland)[c]	40	0.016	1
Sweden	1,113	1.374	37
Switzerland	159	0.128	5
Taiwan	127	0.066	4
Thailand[b]	31	0.005	1
Turkey[b]	69	0.089	2
United Kingdom	12	0.004	1
Uruguay[b]	19	0.018	1
Venezuela[b]	120	0.082	4
Total	17,803	**18.184**	**675**

[a] *To derive uranium mass in kilograms, multiply the amounts by 1,000.*

[b] *Countries with other than high-income economies (World Bank, 1994).*

[c] *40 Spent nuclear fuel elements of Spain's JEN-1 Reactor core are stored in Dounreay, Scotland.*

Implementation of Management Alternative 1 would involve less than 1 percent of the total mass of heavy metal that DOE currently manages as spent nuclear fuel (DOE, 1994c), and approximately 10 percent of the volume.

Table 2-2 Estimated Number of TRIGA[a] Reactor Spent Nuclear Fuel Elements Generated by Foreign Research Reactor Operators by January 2006

Country	Estimated Number of Spent Nuclear Fuel Elements	Initial Mass of Uranium (MTHM)[b]	Estimated Number of Shipments
Austria	106	0.020	3
Bangladesh[c]	100	0.049	3
Brazil[c]	75	0.014	3
Finland	171	0.033	6
Germany	358	0.068	12
Indonesia[c]	245	0.047	8
Italy	386	0.072	13
Japan	326	0.062	11
Korea (South)[c]	336	0.064	11
Malaysia[c]	94	0.047	3
Mexico[c]	186	0.035	6
Philippines[c]	128	0.079	4
Romania[c]	1,451	0.189	48
Slovenia[c]	393	0.075	13
Taiwan	144	0.086	5
Thailand[c]	136	0.035	4
Turkey[c]	79	0.015	2
United Kingdom	90	0.017	3
Zaire[c]	136	0.026	4
Total	**4,940**	**1.033**	**162**

[a] *TRIGA is an acronym for Training, Research, Isotope, General Atomic reactors.*

[b] *To derive uranium mass in kilograms, multiply the amounts by 1,000.*

[c] *Countries with other than high-income economies, developing countries (World Bank, 1994)*

The Notice of Intent [59 Fed. Reg. 54336 (1993)] for this EIS estimated that 15,000 spent nuclear fuel elements would be accepted under the proposed action. This estimate [representing 12 MTHM, with a volume of approximately 89 m^3 (3,200 ft^3)] was prepared in early 1993, based on a projected 10-year period of generation of spent nuclear fuel at foreign research reactors in 28 foreign countries, plus the spent nuclear fuel available at these foreign research reactors as of 1993.

Since preparation of the 1993 spent nuclear fuel projection, however, cooperative understandings have been reached with several other foreign research reactor operators concerning their participation in the proposed spent nuclear fuel management program. In addition, the period of time over which the management policy would be in effect has been delayed by 3 years (to mid-1996) and thus at least 3 more years' worth of spent nuclear fuel has accumulated. Thus, the amount of spent nuclear fuel from foreign research reactors that would be accepted under the basic implementation is increased to a new total of up to 19.2 MTHM, with a volume of approximately 110 m^3 (4,100 ft^3), representing approximately 22,700 spent nuclear fuel elements of the type considered in the 1993 projection. Of this amount, approximately 4.6 MTHM is HEU, and 14.6 MTHM is LEU foreign research reactor spent nuclear fuel.

Tables 2-1 and 2-2 provide an estimate of the amount of spent nuclear fuel that has been or would be generated in each country by late 2005 (10 years from the effective date of the policy implementation), as estimated by Argonne National Laboratory based on information provided by the foreign research reactor operators (Matos, 1994). A list of the foreign research reactors included in the proposed policy is provided

in Appendix B. Table 2-1 shows the inventory of aluminum-based fuel clad in aluminum, while Table 2-2 shows zirconium-based TRIGA fuel clad in either aluminum or stainless steel. These two tables are combined to yield the approximately 22,700 elements (or about 19.2 MTHM) that are estimated to be currently stored or generated by the year 2005. The tables also provide the estimated number of shipments expected from each country. The number of shipments is a key parameter in evaluating the risks associated with the handling and transportation of the foreign research reactor spent nuclear fuel.

It should be noted that the number of elements and number of shipments presented for each country in Tables 2-1 and 2-2 are estimates based on projections of the numbers of elements to be generated over a ten-year period into the future. These estimates are intended to conservatively bound the total number of foreign research reactor spent nuclear fuel elements and shipments associated with the proposed policy. However, the actual distribution of elements and shipments among the listed countries might change, within the limits of the total number of elements and shipments listed, based on actual experience gained during the lifetime of any policy that may be established.

For the purpose of analysis, the foreign research reactor spent nuclear fuel has been categorized by fuel type (aluminum-based or TRIGA) and geography (Eastern or Western) depending on the location of the likely port(s) of entry to the United States. As noted in Section 2.6.4.1, foreign research reactor spent nuclear fuel from Europe, Africa, and the Middle East and parts of Central and South America is likely to enter the United States from the east coast (Eastern) and the rest from the west coast (Western).

The distribution of the foreign research reactor spent nuclear fuel under the basic implementation is as follows:

- By Fuel Type: Aluminum-based — approximately 17,800 elements, 18.2 MTHM, 105 m^3 (3,900 ft^3)

  TRIGA — approximately 4,900 elements, 1.0 MTHM, 5 m^3 (200 ft^3)

- By Geography: Eastern — approximately 16,400 elements, 14.4 MTHM, 80 m^3 (3,000 ft^3)

  Western — approximately 6,300 elements, 4.8 MTHM, 30 m^3 (1,100 ft^3)

The assumptions used in estimating the number of shipments are included in Appendix B (Section B.1.6). Characteristics of the foreign research reactor spent nuclear fuel that would be accepted are provided in Section 2.6.1.

2.2.1.4 Location for Taking Title to Foreign Research Reactor Spent Nuclear Fuel

Under the basic implementation of Management Alternative 1, DOE would take title to the foreign research reactor spent nuclear fuel at the limit of U.S. territorial waters, or continental U.S. borders for shipments from Canada. Where DOE takes title would not have an effect on the environment. Title location of the spent nuclear fuel is relevant to questions that include the source and extent of liability for damage in the event of an accident outside the scope of Price-Anderson Act coverage. The Price-Anderson Act [42 U.S.C. §2210 (1988)] provides a mechanism by which DOE could pay for damages arising out of a nuclear incident that occurs within the United States.

2.2.1.5 Marine Transport

Under the basic implementation of Management Alternative 1, the foreign research reactor spent nuclear fuel would be shipped by chartered and/or regularly scheduled commercial ships from foreign ports to the United States. Chartered shipments would be on purpose-built ships or general purpose commercial cargo ships meeting appropriate International Marine Organization regulations. Regularly scheduled commercial shipments would be on general purpose commercial ships carrying other cargo at the same time.

Marine transport of the foreign research reactor spent nuclear fuel, as well as ground transport between ports and management sites in the United States, would be carried out in approved and certified spent nuclear fuel casks. These casks would be certified for use in the United States by the U.S. Department of Transportation if the cask was designed and fabricated in a foreign country, or by the U.S. Nuclear Regulatory Commission (NRC) if the cask was designed and fabricated in the United States. The design and fabrication of casks in a foreign country is based on the International Atomic Energy Agency standards which are the bases for those promulgated by the NRC. Marine transport activities are discussed in more detail in Section 2.6.3.

All ships entering U.S. territorial waters are required to comply with U.S. Coast Guard safety regulations and are subject to U.S. Coast Guard inspection. In addition, international transportation of hazardous material is governed by the International Movement of Dangerous Goods Code, which is one of a series of safety codes associated with the International Maritime Organization. This code establishes the international rules for shipping hazardous cargos, which includes foreign research reactor spent nuclear fuel. While most nations have agreed to follow the International Maritime Organization codes, including the International Movement of Dangerous Goods Code, compliance by individual shippers would be voluntary.

Unless DOE were to take title to the foreign research reactor spent nuclear fuel overseas (Section 2.2.2.4), the responsibility for shipping the spent nuclear fuel to the United States (if the fuel is to be accepted into the United States) belongs to the foreign research reactor operators. Under these conditions, DOE would ensure that the shipment of the spent nuclear fuel was accomplished on well-equipped, -maintained, and -operated ships through the contract that would be signed between DOE and every participating foreign research reactor operator. DOE would require the use of carriers that commit to following the International Movement of Dangerous Goods Code and all other safety requirements, such as the Safety of Life at Sea, through these contracts. If DOE were to be responsible for shipping, only shipping firms that guaranteed to follow U.S. Coast Guard regulations and international safety codes would be used to ship foreign research reactor spent nuclear fuel.

2.2.1.6 Port(s) of Entry

The basic implementation of Management Alternative 1 would involve receipt of foreign research reactor spent nuclear fuel at any of the 10 ports of entry chosen on the basis of criteria discussed in Section 2.6.3.1. All 10 candidate ports offer standard cargo container unloading services. These potential ports of entry have been identified subsequent to the application of criteria, (including appropriate experience, safe transit, adequate facilities, and population) to the universe of potential U.S. marine ports of entry. These ports are: Charleston, SC (includes Naval Weapons Station [NWS] Charleston and Wando Terminal); Galveston, TX; Hampton Roads, VA (includes Newport News, Norfolk, and Portsmouth terminals); Jacksonville, FL; Military Ocean Terminal Sunny Point (MOTSU), NC; NWS Concord, CA; Portland, OR; Savannah, GA; Tacoma, WA; and Wilmington, NC. The geographic location of each of these ports is displayed in Figure 2-3. This EIS will also assess the potential impacts of foreign

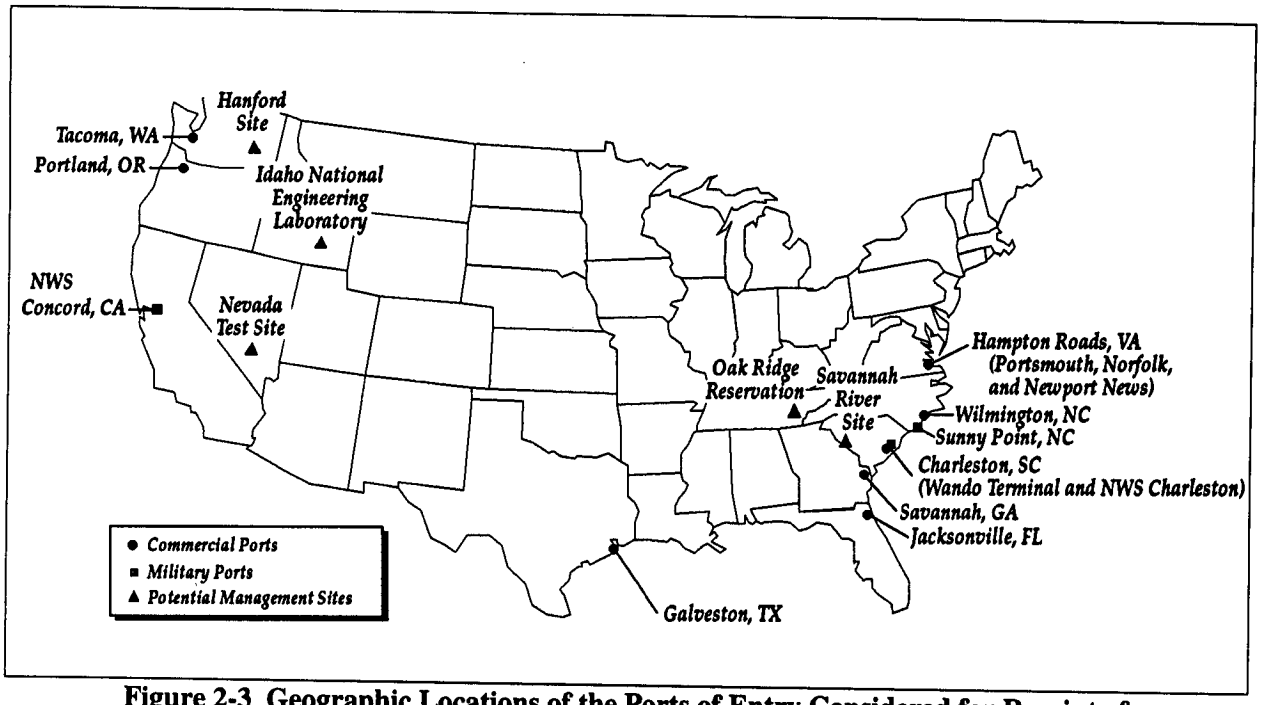

Figure 2-3 Geographic Locations of the Ports of Entry Considered for Receipt of Foreign Research Reactor Spent Nuclear Fuel

research reactor spent nuclear fuel at three high-population-density ports to bound the results of the impact analysis. These high-population-density ports are: Elizabeth, NJ; Long Beach, CA; and Philadelphia, PA. The port identification and evaluation process is discussed in Section 2.6.3 and in Appendix D.

2.2.1.7 Ground Transport

The basic implementation of Management Alternative 1 would involve shipment of foreign research reactor spent nuclear fuel from the ports of entry (both seaports and Canadian border crossings) to potential management sites. It could also involve shipment of foreign research reactor fuel between management sites. As explained in Section 2.6.4.1, the unavailability of certain sites to accept foreign research reactor spent nuclear fuel at the beginning of the management policy period would necessitate temporary receipt and management of foreign research reactor spent nuclear fuel at an available site and subsequent transportation to another site. The ground transport options and route identification process are discussed in Section 2.6.4.

Both rail and highway shipping capabilities are available at all ports of entry and each management site under consideration, with the exception of the Nevada Test Site, which has no rail capability. The shipment of foreign research reactor spent nuclear fuel was analyzed along representative highway and railway routes between all ports and the potential management sites as applicable. Barge transportation is also considered where applicable. The only management sites reasonably accessible by barge are the Savannah River Site and the Hanford Site from the ports of Savannah, GA and Portland, OR, respectively.

2.2.1.8 Foreign Research Reactor Spent Nuclear Fuel Management Sites

Potential sites considered by DOE for the receipt and management of foreign research reactor spent nuclear fuel under this EIS are the same as those considered in the Programmatic SNF&INEL Final EIS (DOE, 1995c). They are the Savannah River Site, the Idaho National Engineering Laboratory, the

Hanford Site, the Oak Ridge Reservation, and the Nevada Test Site. Site-specific activities associated with the basic implementation of Management Alternative 1 and the implementation alternatives are discussed in Section 2.6.5. There are only two sites in the United States that could start receiving these shipments quickly: the Savannah River Site and the Idaho National Engineering Laboratory.

2.2.1.9 Storage Technologies

Under the basic implementation of Management Alternative 1, DOE would receive and manage foreign research reactor spent nuclear fuel for a period starting in approximately mid 1996, and continuing for 40 years until ultimate disposition. During the first few years, storage would take place in existing storage facilities that use both wet and dry storage technologies. For the period beyond those first few years, when construction of new facilities may become necessary, the storage technology identified for the basic implementation of Management Alternative 1 is dry storage. However, construction of new wet storage facilities is considered as an implementation alternative. Storage technologies and storage facilities considered under the basic implementation of Management Alternative 1 and implementation alternatives are discussed in Section 2.6.5.

2.2.2 Implementation Alternatives for Management Alternative 1

Environmental effects of each of the implementation alternatives are evaluated in this EIS. The range of these alternatives is presented in Figure 2-4. Chapter 4, Section 4.3, provides results of the analysis.

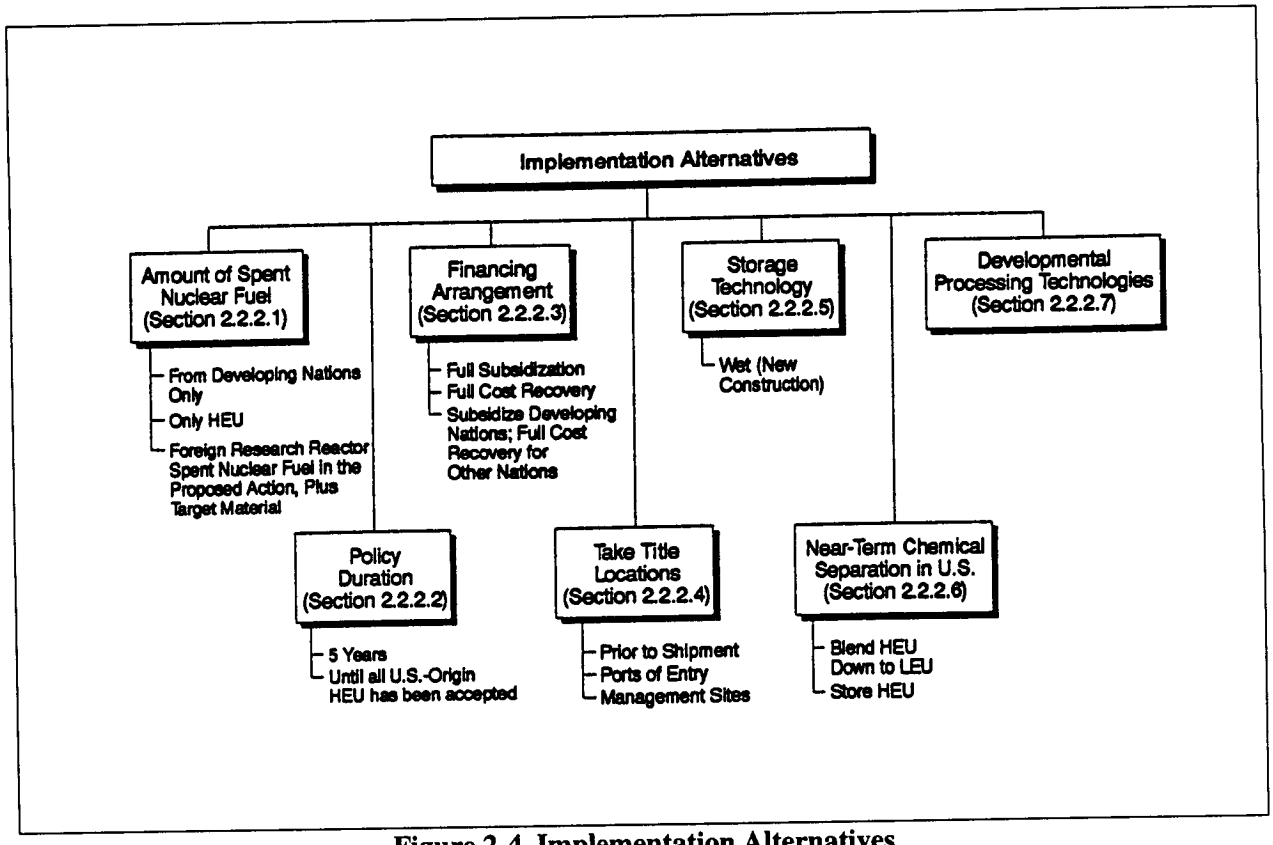

Figure 2-4 Implementation Alternatives

2.2.2.1 Implementation Alternative 1 - Alternative Amounts of Spent Nuclear Fuel to be Accepted

This implementation alternative involves choosing to accept and manage one of three subalternative amounts of foreign research reactor spent nuclear fuel:

1a. Accept spent nuclear fuel (HEU and/or LEU) only from developing countries. The foreign research reactor spent nuclear fuel from these countries contains approximately 1.9 MTHM, representing 5,000 individual elements, with a volume of 13 m^3 (500 ft^3).

1b. Accept only HEU from the research reactors eligible under the proposed action. The amount of this HEU would be approximately 4.6 MTHM, representing 11,200 elements, with a volume of 61 m^3 (2,250 ft^3).

1c. In addition to foreign research reactor spent nuclear fuel, accept HEU and LEU target materials that were used in Canada, Belgium, Argentina, and Indonesia for the production of medical isotopes. Isotope production targets[3] are irradiated in research reactors and dissolved in acid or base to extract radioisotopes that are used in medical imaging applications. The residual materials after dissolution and extraction of the radioisotopes are referred to here as target material. It is expected that this target material would contain about 0.6 MTHM, representing the uranium content of approximately 620 typical foreign research reactor spent nuclear fuel elements.

Under the last subalternative, HEU target material would be accepted until a suitable LEU target is available. After such a time, target material would be accepted from a foreign research reactor only if that foreign research reactor agrees to convert to use of LEU target.

2.2.2.2 Implementation Alternative 2 - Alternative Policy Durations

The basic implementation of Management Alternative 1 has a duration of 10 years. Two policy duration subalternatives were assessed. These are:

2a. *Five-Year Policy:*

- For foreign research reactors operating on LEU fuel or in the process of converting to LEU fuel when the policy becomes effective, spent nuclear fuel (HEU and LEU) currently stored or generated during the 5-year policy period would be accepted.
- For foreign research reactors operating on HEU fuel when the policy becomes effective and agreeing to convert to LEU fuel, or having life time cores, or planning to shut down by a specific date while the policy is in effect, or for which a suitable LEU fuel is not available, HEU fuel currently stored or generated during the 5-year policy period would be accepted.
- For foreign research reactors that are already shut down, spent nuclear fuel (HEU and LEU) currently stored would be accepted.

[3] *Canada, Argentina, and Belgium currently use aluminum-based targets containing HEU, and Indonesia currently uses a target that consists of a layer of HEU oxide material plated on the interior surface of a stainless steel tube.*

The amount of spent nuclear fuel estimated to be accepted for a 5-year policy period under this subalternative is up to approximately 18,800 individual elements containing approximately 13 MTHM, with a volume of 87 m^3 (3,300 ft^3). The distribution by fuel type and geography is as follows:

- By Fuel Type: Aluminum-based — approximately 14,100 elements; 12 MTHM, 83 m^3 (3,100 ft^3).

  TRIGA — approximately 4,700 elements, 1.0 MTHM, 4 m^3 (200 ft^3).

- By Geography: Eastern — approximately 13,400 elements, 9.5 MTHM, 65 m^3 (2,400 ft^3)

  Western — approximately 5,400 elements, 3.4 MTHM, 22 m^3 (900 ft^3)

This subalternative would allow shipments and receipt of foreign research reactor spent nuclear fuel to be made for 8 years starting from the effective date of the policy implementation, as long as the fuel had been generated within the 5-year policy period. The additional 3 years would allow for a cooldown time of fuel discharged late in the 5-year period, the logistics in arranging shipment of this fuel, as well as other possible delays from strikes, court actions, and mechanical problems.

2b. *Indefinite HEU/10-Year LEU Policy:*

- For foreign research reactors operating on LEU fuel or in the process of converting to LEU fuel when the policy becomes effective, LEU spent nuclear fuel currently stored or generated in the 10-year policy period would be accepted within the time period allowed in the basic implementation (13 years). Acceptance of HEU spent nuclear fuel that had been or would be discharged from the reactor would continue indefinitely, until all such HEU spent nuclear fuel had been accepted.

- For foreign research reactors operating on HEU fuel when the policy becomes effective and agreeing to convert to LEU fuel, or planning to shut down by a specific date within 10 years of the effective date of the policy, LEU spent nuclear fuel generated in the 10-year policy period would be accepted within the time period allowed in the basic implementation (13 years). Acceptance of HEU spent nuclear fuel would continue indefinitely, until all such HEU spent nuclear fuel had been received.

- For foreign research reactors operating on HEU fuel when the policy becomes effective and for which a suitable LEU fuel is not available, or having life time cores, HEU spent nuclear fuel would be accepted:

  - from foreign research reactors with lifetime cores, until all such HEU spent nuclear fuel had been accepted, and

  - from other foreign research reactors until all HEU spent nuclear fuel at the reactor on the date the policy becomes effective, or generated within 5 years of that date, had been accepted.

- For foreign research reactors that are already shut down, the LEU spent nuclear fuel would be accepted within the period allowed in the basic implementation. The HEU spent nuclear fuel would be accepted indefinitely, until all such HEU spent nuclear fuel had been accepted.

Under this implementation subalternative, the total amount of foreign research reactor spent nuclear fuel that would be accepted is the same as in the basic implementation of Management Alternative 1.

2.2.2.3 Implementation Alternative 3 - Alternative Financing Arrangements

Under the basic implementation, the costs of participation would be fully subsidized by the United States for developing countries, however, developed countries would be charged a competitive fee.

For this implementation alternative, the cost impacts of the following subalternatives arrangements were evaluated:

- Subsidize all countries;
- Charge all countries the full cost of accepting and managing the foreign research reactor spent nuclear fuel (a full-cost recovery fee); and
- Subsidize developing countries as in the basic implementation, and charge developed countries a full-cost recovery fee.

A full-cost recovery fee would be based on the estimated cost to the United States for the safe, final disposition of the spent nuclear fuel within the United States. This fee could be based on: (1) the cost of chemically separating spent nuclear fuel and disposal of vitrified high-level waste, or (2) interim storage of the spent nuclear fuel followed by direct ultimate disposition.

In theory, this arrangement would cost the United States nothing. All costs would be borne by the foreign nations. However, many developing, and some developed nations probably would decline to pay these high costs, which could lead to HEU spent nuclear fuel stockpiled around the world, much of it remaining in the countries least able to protect it. For many countries, this arrangement would have the same impact as the No Action Alternative.

The amount of spent nuclear fuel that would be accepted under this implementation alternative would be the same as that identified under the basic implementation, or under the implementation subalternatives discussed in Section 2.2.2.1. The actual amount of spent nuclear fuel received could be less than that identified under the basic implementation because, as stated above, some countries may consider the higher fee to be a disincentive. The analysis of environmental impacts for this EIS, however, considered the amount of spent nuclear fuel to be received for this implementation alternative to be unchanged for use as an upper bounding case.

2.2.2.4 Implementation Alternative 4 - Alternative Locations for Taking Title

In the basic implementation, DOE would take title to the foreign research reactor spent nuclear fuel at the limit of U.S. territorial waters (19 km or 12 mi), or the continental U.S. border for shipments from Canada. The location for taking title is relevant to questions of liability and regulatory authority. For example, if DOE were to take title at the foreign research reactor site, there could be additional regulatory burdens on DOE, due to the laws of a particular country being imposed upon the owner of the spent nuclear fuel. The taking of title prior to shipment might impose upon DOE additional legal liability for damages not associated with a nuclear incident covered by the Price-Anderson Act. DOE and the Department of State considered the following three subalternative approaches regarding the locations for taking title to the foreign research reactor spent nuclear fuel:

- Taking title to the foreign research reactor spent nuclear fuel before shipment,
- Taking title at the port(s) of entry, and
- Taking title at the management site(s).

The amount of spent nuclear fuel that would be accepted under this implementation alternative would be the same as that identified under the basic implementation or under the implementation subalternatives discussed in Section 2.2.2.1.

2.2.2.5 Implementation Alternative 5 - Wet Storage Technology for New Construction

Under the basic implementation, storage requiring new construction would employ dry storage technology. As an implementation alternative, DOE has assessed the use of wet storage technologies for new construction, which use water-filled pools to store spent nuclear fuel. Wet storage methods have been used historically at DOE sites and by the nuclear industry.

The amount of spent nuclear fuel that would be accepted under this implementation alternative would be the same as that identified under the basic implementation or under the implementation subalternatives discussed in Section 2.2.2.1.

2.2.2.6 Implementation Alternative 6 - Near Term Conventional Chemical Separation in the United States

Under this implementation alternative, near term conventional chemical separation would be conducted at either the Savannah River Site or the Idaho National Engineering Laboratory. There are both advantages and disadvantages to chemical separation of foreign research reactor spent nuclear fuel. The advantages include the following:

- The high-level radioactive waste from the foreign research reactor spent nuclear fuel would be transformed into forms that are more suitable (i.e., more compact and stable) for storage than intact aluminum-based spent nuclear fuel.
- The high-level waste would be converted to a form that is expected to be acceptable for disposal in a geologic repository.
- Construction of some or all of the new spent nuclear fuel storage space would be avoided.
- The conventional chemical separation facilities already exist, as well as the waste treatment facilities required to put the high-level radioactive and other wastestreams in forms suitable for disposal. In contrast, there are the large technical, cost, and regulatory uncertainties associated with direct disposal of intact foreign research reactor spent nuclear fuel (much of it containing HEU).
- If disposal of intact spent nuclear fuel is shown to be technically infeasible, or if the waste acceptance criteria for a geologic repository require significant dilution of the HEU due to criticality concerns, DOE estimates that the life-cycle costs of chemical separation may be substantially lower than the cost of storage and geologic disposal of intact spent nuclear fuel. (Alternatively, if direct disposal of intact foreign research reactor spent nuclear fuel,

including that containing HEU, is shown to be technically feasible, DOE estimates that the costs of chemical separation and the storage/direct disposal option would be nearly the same.)

The disadvantages include the following:

- Chemical separation would increase the total volume of the waste (including liquid high-level waste raffinates, transuranic wastes, various solid and liquid low-level wastestreams, acidic wastes, chelating and complexing agents, and solvents). Volume reduction and other treatments would be used to prepare these wastes for disposal. (Because the requirements for direct disposal of aluminum-based spent nuclear fuel have not been established, the character and volumes of waste associated with direct disposal are uncertain.)

- The separated uranium, which DOE would prefer to blend down to LEU, would have to be stored until it could be sold or otherwise disposed of.

- The forms of the wastes generated by chemical separation are complex, involving corrosive, flammable and toxic liquids.

- The use of chemical separation by the United States as a spent nuclear fuel management technology could increase the accumulation of stockpiles of HEU unless the HEU is blended down. The United States does not engage in chemical separation for nuclear explosive purposes, and seeks to eliminate, where possible, the accumulation of stockpiles of HEU or plutonium. The United States nuclear weapons nonproliferation policy on reprocessing is summarized in the White House Fact Sheet on Nonproliferation and Export Control Policy dated September 27, 1993. A copy of this policy is included in Appendix G of this EIS.

Taking these advantages and disadvantages into account, chemical separation of foreign research reactor spent nuclear fuel in existing facilities is not preferred by DOE as a technology for routine management of spent nuclear fuel in the United States. Nonetheless, chemical separation remains a reasonable alternative in light of DOE's substantial technical experience in these operations and the availability of existing facilities.

DOE is considering the development and use of various alternatives to chemical separation for foreign research reactor spent nuclear fuel stabilization, interim storage and conditioning for disposal under Management Alternative 1, Implementation Alternative 7 in this EIS. This initiative is discussed in more detail in a DOE memorandum of December 28, 1994 from Thomas P. Grumbly to Jill E. Lytle (see Appendix G). In fact, development, demonstration and implementation of a new treatment and/or packaging technology is a key element of the preferred alternative as described in Section 2.9.

The Nuclear Waste Policy Act of 1982 (as amended) authorizes disposal of the foreign research reactor spent nuclear fuel in a geologic repository (if DOE takes title to such fuel). The foreign research reactor spent nuclear fuel, and/or the high-level radioactive waste that would result from chemical separation of the foreign research reactor spent nuclear fuel, would require storage until its disposal in such a geologic repository. A determination of whether the foreign research reactor spent nuclear fuel can be safely disposed of in a geologic repository will depend on the outcome of scientific analyses, including a repository performance analysis considering the final form in which the foreign research reactor spent nuclear fuel would be emplaced in the repository.

Near term conventional chemical separation of foreign research reactor spent nuclear fuel at the other three potential foreign research reactor spent nuclear fuel management sites was not analyzed because the Oak Ridge Reservation and the Nevada Test Site do not have facilities in which such chemical separation could be conducted, and the facilities at the Hanford Site are no longer operable. To consider chemical separation at any of these three sites, the foreign research reactor spent nuclear fuel would need to be stored in the United States during the period of time that a new chemical separation facility at one of these sites was designed, a project-specific NEPA review was conducted, and the facility constructed and put into operation. Such activities could not be completed in the near term and, accordingly, these sites were not considered reasonable alternatives for near term chemical separation.

Solid low-level radioactive waste and wastewater generated by chemical separation would be managed in the same manner as the similar wastes generated by the storage of the intact foreign research reactor spent nuclear fuel. Discussion of waste generation from storage is included in Appendix F, Section F.4. Chemical separation would also generate five types of waste that would not result from storage of intact foreign research reactor spent nuclear fuel: high-level radioactive waste, hazardous waste, mixed hazardous and radioactive waste, and low-level "saltstone" waste.

Following chemical separation of the foreign research reactor spent nuclear fuel, the resulting high-level radioactive wastes would be managed along with substantial existing inventories of identical waste. Management of the high-level radioactive wastes would include the following:

1. The high-level wastes would be transferred to storage tanks and kept there pending processing;

2. The wastes would be pretreated in preparation for further processing;

3. To preclude the necessity for transporting liquid high-level wastes, these wastes would be processed on the sites where they were generated:

    a. At the Savannah River Site, the wastes would be:

        1) Vitrified in the Defense Waste Processing Facility;

        2) The borosilicate glass resulting from vitrification would be stored pending disposal;

    b. At the Idaho National Engineering Laboratory, the wastes would be:

        1) Calcined to produce a more easily stored waste form;

        2) Stored in the calcine form pending development of a process and facility for final processing;

        3) After further research and development regarding conversion techniques and waste forms, the calcine would be converted to a form suitable for geologic disposal and stored pending disposal;

4. The final waste form would be transported to and disposed of in a geologic repository.

Transuranic wastes[4] would be stored on the site where the chemical separation would be accomplished until a permanent disposal facility, such as the Waste Isolation Pilot Plant, becomes available. Site treatment plans for low-level and transuranic mixed wastes are now being developed. Hazardous wastes would be sent to a licensed commercial treatment, storage and disposal facility. Saltstone, a mixture of low-level waste and concrete that is a by-product of high-level radioactive waste vitrification at the Savannah River Site's Defense Waste Processing Facility, would be pumped into above-ground concrete vaults onsite, where it would harden into a concrete monolith.

The Savannah River Site currently has chemical separation facilities. This capability, however, is limited to aluminum-based spent nuclear fuel. In contrast, the Idaho National Engineering Laboratory has facilities that can chemically separate both aluminum-based and TRIGA foreign research reactor spent nuclear fuel. However, these facilities would require some upgrades in order to accomplish this chemical separation. The existing dissolvers and calcination vessel could be used at the start of chemical separation activities, but would have to be replaced within a few years. A new tank farm and set of calcine bins would have to be built. Furthermore, this site does not have an existing vitrification facility or a glass waste storage building, as the Savannah River Site does. Upgrading the facilities at the Idaho National Engineering Laboratory would require additional time and funding. This EIS analyzes the impacts of chemically separating aluminum-based foreign research reactor spent nuclear fuel at both the Savannah River Site and the Idaho National Engineering Laboratory, but considers chemical separation of TRIGA foreign research reactor spent nuclear fuel only at the Idaho National Engineering Laboratory.

Under the near term chemical separation alternative, there are two components: Extent of the Chemical Separation and Uranium Disposition. Each of these components is discussed below.

Extent of the Chemical Separation

At each of the two potential sites, the foreign research reactor spent nuclear fuel could be chemically separated in a dedicated mode or as part of larger scale chemical separation activities.

Chemical Separation at the Savannah River Site Dedicated to Foreign Research Reactor Spent Nuclear Fuel: DOE would chemically separate all 18.2 MTHM of the aluminum-based foreign research reactor spent nuclear fuel, shown previously in Table 2-1. The Savannah River Site has facilities that could perform the chemical separation, so no new chemical separation facilities would need to be constructed.

DOE and the Department of State have included in this EIS analysis all 18.2 MTHM of aluminum-based foreign research reactor spent nuclear fuel in Table 2-1 because this is the maximum that could be considered. It is not possible to specify how much of the aluminum-based foreign research reactor spent nuclear fuel might be chemically separated before the chemical separation facilities would have been shut down, so the analysis is based on the entire amount. If chemical separation of all the foreign research reactor spent nuclear fuel were selected, existing chemical separation facilities would be required to remain operational for the 13-year duration of receipts. Maintenance and operation of a facility dedicated solely to chemical separation of foreign research reactor spent nuclear fuel is considered to be an inefficient use of such facilities. Thus, this is a nonpreferred subalternative.

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[4] *No transuranic waste would be generated if the transuranic elements (mostly plutonium) were not extracted during chemical separation. The trace amounts of these elements that exist in the foreign research reactor spent nuclear fuel could remain in the high-level wastestream.*

Chemical Separation at the Idaho National Engineering Laboratory Dedicated to Foreign Research Reactor Spent Nuclear Fuel: DOE would restart the facilities and chemically separate all the aluminum-based and TRIGA foreign research reactor spent nuclear fuel, shown previously in Tables 2-1 and 2-2. The Idaho National Engineering Laboratory does not have all the facilities required to perform the chemical separation, so some new facilities would need to be constructed. Furthermore, DOE announced a Record of Decision on May 30, 1995 for the Programmatic SNF&INEL Final EIS. Chemical separation at Idaho National Engineering Laboratory was not included in this Record of Decision, so additional site-specific NEPA documentation would be required to restart these chemical separation facilities.

DOE and the Department of State have included in this analysis all 19.2 MTHM of foreign research reactor spent nuclear fuel in Tables 2-1 and 2-2, because this is the maximum that could be considered. It is not possible to specify how much of the foreign research reactor spent nuclear fuel might be chemically separated in this case, so the analysis is based on the entire amount. Up to approximately 12 years of operation would be required to chemically separate this amount. The construction and operation of new facilities for chemical separation dedicated to foreign research reactor spent nuclear fuel is considered inefficient, and therefore, this subalternative is not preferred.

Chemical Separation at the Savannah River Site as Part of Larger Scale Activities: DOE is in the process of preparing other NEPA reviews and making decisions that could affect the decisions to be made in this EIS. The Interim Management of Nuclear Materials Final EIS (DOE, 1995a) analyzed alternatives for stabilization of nuclear materials currently stored at the Savannah River Site that represent health and safety risks, as stored in their current forms and locations. The nuclear materials in the Interim Management of Nuclear Materials Final EIS that most closely resemble the aluminum-based foreign research reactor spent nuclear fuel are the Mark-16 and Mark-22 fuels. The preferred alternative for these fuels, as announced in the *Federal Register* (60 FR 65300), is chemical separation. Therefore, the near term chemical separation of aluminum-based foreign research reactor spent nuclear fuel at the Savannah River Site as part of larger scale activities is predicated upon a decision by DOE to use the chemical separation facilities at the Savannah River Site to chemically separate the Mark-16 and Mark-22 fuels under the Interim Management of Nuclear Materials Final EIS.

The Programmatic SNF&INEL Final EIS (DOE, 1995c) considered the alternative site(s) where DOE's spent nuclear fuel (including foreign research reactor spent nuclear fuel) would be managed. DOE announced in its Record of Decision on May 30, 1995 that it intends to consolidate all its aluminum-based spent nuclear fuel at the Savannah River Site. DOE could also chemically separate other aluminum-based spent nuclear fuel that is transported to the Savannah River Site under this EIS.

The aluminum-based foreign research reactor spent nuclear fuel shown in Table 2-1 would be chemically separated along with other DOE aluminum-based spent nuclear fuel selected for chemical separation. This could amount to a maximum of 18.2 MTHM of aluminum-based foreign research reactor spent nuclear fuel, 0.56 MTHM of target material under Implementation Subalternative 1c (Section 2.2.2.1), approximately 28.8 MTHM of other aluminum-based spent nuclear fuel currently stored at the Savannah River Site (Wichmann, 1995), and approximately 3.4 MTHM of aluminum-based spent nuclear fuel that could be transported to the Savannah River Site (Wichmann, 1995). In all, about 51 MTHM could be chemically separated at the Savannah River Site, requiring up to approximately 13 years of operation. The environmental impacts analysis is presented in Section 4.3.6.

Chemical Separation at the Idaho National Engineering Laboratory as Part of Larger Scale Activities: Volume 2 of the Programmatic SNF&INEL Final EIS (DOE, 1995c) includes a brief analysis of the alternative of restarting the chemical separation facilities at the Idaho National Engineering Laboratory for

stabilization of nuclear materials. These facilities are currently being cleaned up in preparation for decommissioning, so restarting them would require additional site-specific NEPA documentation, but DOE is not currently performing NEPA analysis on restarting these facilities.

Volume 1 of the Programmatic SNF&INEL Final EIS (DOE, 1995c) considered the alternative site(s) where DOE's spent nuclear fuel (including foreign research reactor spent nuclear fuel) would be managed. DOE could chemically separate other spent nuclear fuel that is transported to the Idaho National Engineering Laboratory under this EIS.

All the aluminum-based spent nuclear fuel would be chemically separated along with all the TRIGA foreign research reactor spent nuclear fuel and certain other spent nuclear fuel from the Idaho National Engineering Laboratory. The amount of aluminum-based spent nuclear fuel would be approximately 51 MTHM, as described above. The additional spent nuclear fuel would include 1.0 MTHM of TRIGA foreign research reactor spent nuclear fuel and approximately 13 MTHM of TRIGA and zirconium-based spent nuclear fuel from onsite facilities (Cottam, 1995). In all, about 65 MTHM could be chemically separated under this program at Idaho National Engineering Laboratory, requiring up to approximately 12 years of operation. The environmental impact analysis is presented in Section 4.3.6.

Uranium Disposition

Chemical separation, as the name implies, would separate the uranium from the waste products. The separated LEU could be sold to the commercial sector for reuse as reactor fuel. The HEU disposition issue is being considered in a separate DOE NEPA document, the Disposition of Surplus Highly Enriched Uranium EIS. If DOE decides to blend down the HEU that is within the scope of the Disposition of Surplus Highly Enriched Uranium EIS, then the HEU that would be recovered in this implementation alternative would also be blended down. Conversely, if DOE decides not to blend down the HEU that is within the scope of the Disposition of Surplus Highly Enriched Uranium EIS, then the HEU that would be recovered in this implementation alternative would also not be blended down. Until this decision is made, however, DOE may decide to blend down HEU in specific instances. For example, DOE recently announced its decision (60 FR 65300), to blend down the HEU solutions at the Savannah River Site under the Interim Management of Nuclear Materials Final EIS.

The options for HEU disposition at the Savannah River Site are:

1. Blending it down to less than 20 percent enrichment inside the chemical separation facilities;

2. Blending it down to less than two percent enrichment inside the chemical separation facilities and then processing it to an oxide in the existing FA-Line at the Savannah River Site; and

3. Completing construction of the Uranium Solidification Facility at the Savannah River Site, then processing the HEU directly to an oxide, followed by storage in a safe, secure facility.

The options for HEU disposition at Idaho National Engineering Laboratory are:

1. Blending it down to less than 20 percent inside the chemical separation facilities, and

2. Processing the HEU directly to an oxide.

Some minor modifications to the facility would be necessary to blend down the HEU. No modifications would be necessary to process it directly to an oxide. For either option, additional NEPA documentation would be required.

Under any of the blending down options, the nuclear weapons nonproliferation goal would be satisfied because the material would not be usable in weapons after it was blended down. This material could be returned to the commercial sector and reused in nuclear reactors.

If the HEU were not blended down, DOE and the Department of State might be accused of accepting the foreign research reactor spent nuclear fuel in order to stockpile HEU for future weapons use. To address this concern, DOE and the Department of State would, over time, place the separated HEU under International Atomic Energy Agency safeguards. DOE and the Department of State have identified three possible means of implementing this International Atomic Energy Agency safeguards initiative which would require the use of a finite storage area (Material Balance Area) subject to inspections by the International Atomic Energy Agency. These are:

1. DOE could use the only available Material Balance Area: Vault 16 at the Y-12 Plant on the Oak Ridge Reservation. This vault's capacity is about 40 MTHM of HEU and it presently contains only about 10 MTHM, so the available capacity is about 30 MTHM. Chemical separation of all the spent nuclear fuel in this implementation alternative would recover less than 25 MTHM of HEU, so there is sufficient capacity in Vault 16 to store all this material.

2. A new Material Balance Area could be set up at the Savannah River Site or the Idaho National Engineering Laboratory.

3. The HEU could be stored in existing vaults, and brought out to a temporary Material Balance Area for each International Atomic Energy Agency inspection.

If a decision is made to chemically separate the foreign research reactor spent nuclear fuel, it would be DOE's preference to blend down the HEU to LEU and thus preclude the possibility of this material ever being used in a nuclear weapon.

2.2.2.7 Implementation Alternative 7 - Developmental Treatment and/or Packaging Technologies

Under this implementation alternative, DOE and the Department of State would initiate a development program that could lead to a decision to construct and operate a new facility for treatment and/or packaging of foreign research reactor spent nuclear fuel. The purpose of this potential new facility would be to treat, package and store the foreign research reactor spent nuclear fuel in a manner suitable for geologic disposal, without necessarily separating the fissile materials. Other goals of the development process would be to define a technology and facility that would operate safely, meet or exceed all applicable environmental requirements (including minimization of waste volumes, toxicity, and mobility), and be consistent with U.S. nuclear weapons nonproliferation policies.

There are numerous technologies that DOE and the Department of State could consider under such a development program. These technologies could be applied at any one of the five potential foreign research reactor spent nuclear fuel management sites, and most would require the construction of totally new facilities (although some could be implemented through modifications to existing facilities). The potential environmental impacts of the construction and operation of such a new facility cannot be estimated at this time because the technologies are still developmental and the hypothetical new facility has not been designed. Implementation of any of these technologies would require additional NEPA analysis and documentation, including additional opportunities for public review and comment.

Many of the potentially applicable technologies are already being considered under the DOE Office of Spent Fuel Management Technology Integration Working Group. A development program, such as the one that would be implemented under this alternative, is outlined in the DOE Spent Nuclear Fuel

Technology Integration Plan (DOE, 1994c). A number of these developmental technologies have progressed beyond initial technical feasibility studies and have reasonably defined cost and schedule estimates for further development. Technologies, such as the Plasma Arc Treatment Process and the Electrometallurgical Treatment Process, are being developed by the Pacific Northwest Laboratory and the Argonne National Laboratory, respectively. Other developmental technologies, however, require additional evaluation prior to undergoing detailed development efforts. Some of the development technologies and criticality prevention techniques are briefly described below. Criticality prevention is discussed in Section 2.6.1.

Developmental Treatment Technologies

Chop and Dilute: The foreign research reactor spent nuclear fuel could be rendered into shards in a mechanical chopper and added to shards of depleted uranium-aluminum alloy to prevent a criticality in the repository. The mixture would have an enrichment of no more than one percent (WSRC, 1994a).

Chop and Poison: The foreign research reactor spent nuclear fuel could be rendered into shards in a mechanical chopper and a neutron poison could be added to prevent a criticality in the repository (WSRC, 1994a). A neutron poison is an element that absorbs neutrons without fissioning, thus preventing a fission chain reaction.

Melt and Dilute: The foreign research reactor spent nuclear fuel could be melted with depleted uranium metal added to the molten mixture to prevent a criticality in the repository (WSRC, 1994a).

Melt and Poison: The foreign research reactor spent nuclear fuel could be melted and a neutron poison could be added to the molten mixture to prevent a criticality in the repository (WSRC, 1994a).

Electrometallurgical Treatment: The foreign research reactor spent nuclear fuel could be dissolved, then the aluminum could be separated from the uranium and fission products in an electrorefiner. DOE has proposed to demonstrate this process as a management option for a variety of DOE-owned spent nuclear fuel. This process would produce a mineral waste form containing most of the fission products and a metal alloy containing the rest of the fission products (DOE, 1994c).

Plasma Arc Treatment: The foreign research reactor spent nuclear fuel would be placed directly into a plasma centrifugal furnace with other material (low-enriched uranium, depleted uranium, and neutron absorbers) where it would be melted and converted into a ceramic material.

Chloride Volatility Treatment: The foreign research reactor spent nuclear fuel could be completely volatized to chlorides. This process is being investigated at the Idaho National Engineering Laboratory and would require about 15 years to develop. Then the uranium could be separated and the fission products could be converted to oxides or fluorides for vitrification (DOE, 1994c).

Glass Material Oxidation and Dissolution System: The foreign research reactor spent nuclear fuel could be converted to a glass form in this single-step process. This process was recently invented at Oak Ridge National Laboratory, and has been demonstrated at the laboratory scale. The foreign research reactor spent nuclear fuel would be melted together with glass frit and all process chemistry would occur in this molten mixture. Then, depleted uranium would be added to resolve criticality concerns before the mixture is poured into canisters (DOE, 1994c).

Dissolve and Dilute: The foreign research reactor spent nuclear fuel could be dissolved in acid and depleted uranium could be added to the solution to reduce the enrichment to no more than one percent to prevent a criticality in the repository. Then the solution would be vitrified (WSRC, 1994a).

Dissolve and Poison: The foreign research reactor spent nuclear fuel could be dissolved in acid and a neutron poison could be added to prevent a criticality in the repository. Then the solution would be vitrified (WSRC, 1994a).

Developmental Packaging Technologies

Direct Disposal in Small Packages: This is a variation of the "direct disposal"concept. The foreign research reactor spent nuclear fuel could be packed intact into small waste packages to limit the amount of fissile material in any single package. Neutron poisons would also be packed in the packages in the spaces between the fuel element plates or rods to prevent a criticality in the repository.

Can-in-Canister: The foreign research reactor spent nuclear fuel could be canned, then the cans could be encapsulated in glass inside of canisters. The encapsulation process could be performed in the Defense Waste Processing Facility at the Savannah River Site, using a high-level waste glass. In effect, the cans containing foreign research reactor spent nuclear fuel would displace an equal volume of high-level waste glass inside standard Defense Waste Processing Facility canisters.

2.3 Management Alternative 2 — Facilitate the Management of Foreign Research Reactor Spent Nuclear Fuel Overseas

Under this management alternative, DOE and the Department of State would seek to encourage and facilitate the management of foreign research reactor spent nuclear fuel overseas in a manner that would be consistent with U.S. nuclear weapons nonproliferation policy. DOE and the Department of State have evaluated the following two subalternatives:

1a. Overseas Storage - Encourage and assist foreign research reactors that are able to store their spent nuclear fuel in facilities in their own countries, or in developing countries, as a step toward the final disposition of the spent nuclear fuel. U.S. assistance would be provided to ensure that appropriate storage technologies, regulations, and safeguards were applied.

In some cases, this subalternative might be implemented by expansion of the storage facilities located at the foreign research reactor sites. However, many foreign research reactor operators are associated with academic institutions with limited budgets, or have building restrictions for site-specific reasons (e.g., no physical space for expansion). Thus, the opportunities for expanded spent nuclear fuel storage at foreign research reactor sites may be limited or even nonexistent. In countries with established nuclear power programs, management might also be provided at the sites where such countries will store their power reactor spent nuclear fuel. Some foreign research reactor operators may also be able to make arrangements for indefinite storage at sites in developing countries. Ultimate disposition of the foreign research reactor spent nuclear fuel would still have to be arranged at the conclusion of the management period. In the meantime, foreign research reactor spent nuclear fuel containing HEU would be stored in up to 41 countries around the world.

1b. Overseas Reprocessing - Provide nontechnical (financial and/or logistical) assistance to foreign research reactors and reprocessors to facilitate reprocessing spent nuclear fuel overseas in facilities operated under international safeguards sufficient to satisfy U.S. nuclear weapons nonproliferation concerns. Wherever possible, the wastes resulting from this reprocessing would be returned to the country in which the spent nuclear fuel was irradiated. If the reprocessing wastes cannot be returned to the country in which the spent nuclear fuel was irradiated, such wastes might be accepted by the United States for storage and ultimate geologic disposal.

The advantages and disadvantages of the technology used for reprocessing overseas would be essentially the same as those described for chemical separation in the United States as discussed in Section 2.2.2.6.

The overseas reprocessing option will be evaluated in terms of whatever is supportive of the U.S. nuclear weapons nonproliferation policy on HEU minimization. For example, factors such as the following would have to be considered:

- An expectation that HEU separated during reprocessing would be blended down to LEU for research reactors which are converting to LEU.
- The foreign reprocessors would provide the capability to reprocess LEU as well as HEU.
- Research reactors would be encouraged to convert to LEU if an LEU fuel exists or is developed that will allow such operation.

Arrangements would have to be worked out with foreign reprocessors that would be supportive of U.S. nuclear weapons nonproliferation objectives to minimize the civil use of HEU worldwide.

Reprocessing of spent nuclear fuel is a well-established technology which is based on the same principles as chemical separation in the United States as discussed in Section 2.6.5.2, and an international commercial market has developed with a total annual capacity of several thousand MTHM (BNFL, 1994; Cogema, 1994). Large portions of this capacity are oriented toward commercial spent nuclear fuel. While these facilities are technically capable of reprocessing foreign research reactor spent nuclear fuel with relatively minor modifications [e.g., blending of the foreign research reactor spent nuclear fuel in the dissolver(s) with depleted uranium], for contractual, economic, and schedule considerations, these commercial spent nuclear fuel reprocessing facilities are less inclined to consider the potential foreign research reactor spent nuclear fuel market.

Several large (hundreds of MTHM per year) spent nuclear fuel reprocessing facilities exist for LEU spent nuclear fuel, and the annual capacity of existing facilities for research and HEU spent nuclear fuel is in the tens of MTHM range. The British facilities at Dounreay are currently capable of reprocessing foreign research reactor spent nuclear fuel. The French facilities at Marcoule are planning reprocessing of French research reactor spent nuclear fuel in the near future, and the Dounreay facility is pursuing additional contracts with foreign research reactor operators for reprocessing their spent nuclear fuel. The estimated schedule of foreign research reactor spent nuclear fuel shipments corresponds to a maximum of 2 MTHM per year, which could be accommodated by the existing reprocessing capacity for these fuels. Significantly, the most likely candidate facilities for reprocessing foreign research reactor spent nuclear fuel are located in Europe and are operated under Euratom and International Atomic Energy Agency safeguards. These facilities also offer full spent nuclear fuel management capabilities, including spent nuclear fuel storage prior to reprocessing, solidification of wastes, product and waste transportation, and assay adjustments (i.e., blending of HEU to LEU). Arrangements for shipment and disposition of the processing wastes would have to be implemented. Most processing contracts with European facilities require return of the wastes to the generator (in this case, the foreign research reactor operators) of the spent nuclear fuel.

DOE has considered the possibility of accepting, in the United States, the vitrified waste from the reprocessing of foreign research reactor spent nuclear fuel overseas. The environmental impacts from the receipt and storage of the waste in the United States are presented in Section 4.4.2.

2.4 Management Alternative 3 - Combination of Elements from Management Alternatives 1 and 2 (Hybrid Alternative)

In implementing the proposed action, DOE and the Department of State could combine implementation elements from the management alternatives analyzed in Sections 2.2 and 2.3. For example, DOE and the Department of State could consider partial storage or reprocessing overseas and partial storage or chemical separation in the United States. The impacts to the U.S. environment from hybrid alternatives would be bounded by the analysis presented in this EIS for each of the implementation alternatives for Management Alternative 1, because for each implementation alternative, the analysis considers the maximum amount of spent nuclear fuel that could be accepted, stored, and/or chemically separated in the United States.

For the purpose of illustration, DOE and the Department of State have considered an example of a hybrid alternative which is a combination of implementation elements of Management Alternatives 1 and 2. This hybrid alternative is described below.

Under this hybrid alternative, DOE and the Department of State would provide nontechnical (financial and/or logistical) assistance to foreign research reactor operators and reprocessors to facilitate the reprocessing of any foreign research reactor spent nuclear fuel at western European reprocessing facilities (i.e., Dounreay or Marcoule), as in Management Alternative 2, for foreign research reactors in countries that could accept back the reprocessed waste; and DOE and the Department of State would accept and manage the rest of foreign research reactor spent nuclear fuel in the United States, as in Management Alternative 1.

In order to comply with U.S. nuclear weapons nonproliferation policy, bilateral agreements would need to be established with the foreign governments involved to ensure that the conditions discussed in Section 2.3 for overseas reprocessing (Management Alternative 2, Implementation Alternative 1b) would be met before DOE and the Department of State would consider implementation of this hybrid alternative.

Based on the current capabilities of the reprocessors overseas, the spent nuclear fuel to be considered for reprocessing would be aluminum-based. TRIGA spent nuclear fuel could also be considered if such capability is developed; however, for the purposes of the analysis, TRIGA spent nuclear fuel would be assumed to be accepted in the United States for storage. Table 2-3 lists the countries that may be able to accept the reprocessing waste and the amount of spent nuclear fuel to be considered for reprocessing overseas. Table 2-4 shows the amount of spent nuclear fuel that would be accepted in the United States.

Under this hybrid alternative, the aluminum-based foreign research reactor spent nuclear fuel to be accepted in the United States would be chemically separated at the Savannah River Site as in Implementation Alternative 6, which is discussed in Section 2.2.2.6. The TRIGA spent nuclear fuel would be transported to the Idaho National Engineering Laboratory, where it would be stored at existing storage facilities until ultimate disposition. The distribution of the spent nuclear fuel considered in this hybrid alternative is consistent with the Programmatic SNF&INEL Final EIS (DOE, 1995c) Regionalization by Fuel Type alternative.

All the other components of this hybrid alternative are the same as the basic implementation of Management Alternative 1, specifically:

- a policy duration of 10 years with a period of acceptance of spent nuclear fuel in the United States of 13 years;

Table 2-3 Spent Nuclear Fuel Considered for Reprocessing Overseas (Hybrid Alternative Example)

Country	Number of Elements	Mass (MTHM)[a]
Belgium	1,766	0.730
France	1,962	3.442
Germany	1,504	0.909
Italy	150	0.043
Spain	40	0.016
Switzerland	159	0.128
United Kingdom	12	0.004
Total	**5,593**	**5.272**

[a] *To derive mass in kilograms, multiply by 1,000.*

Table 2-4 Amount and Distribution of Foreign Research Reactor Spent Nuclear Fuel to be Accepted in the United States (Hybrid Alternative Example)

Type	Number of Elements	Mass (MTHM)[a]	Number of Shipments
Aluminum-Based	12,210	12.912	406
Eastern[b]	7,593	8.647	275
Western[b]	4,617	4.263	131
TRIGA	4,940	1.033	162
Eastern[b]	3,245	0.528	107
Western[b]	1,695	0.505	55
Total	**17,150**	**13.945**	**568**

[a] *To derive mass in kilograms, multiply by 1,000.*

[b] *Refers to the location of the likely port(s) of entry to the United States.*

- a financing arrangement by which the United States would bear the full cost for transporting and managing the foreign research reactor spent nuclear fuel received from developing countries, but would charge developed countries (if any) a competitive fee;
- taking title to the foreign research reactor spent nuclear fuel at the U.S. territorial waters limit or continental U.S. borders for shipments from Canada;
- marine transport of the foreign research reactor spent nuclear fuel by chartered and/or regularly scheduled commercial ships;
- ports of entry that qualify on the bases of criteria discussed in this EIS; and
- ground transport from ports of entry to the Savannah River Site and Idaho National Engineering Laboratory by truck, rail, or barge, or a combination of these modes.

The impacts to the U.S. environment from this hybrid alternative would be bounded by the Savannah River Site portion of Implementation Alternative 6 (Near Term Chemical Separation in the United States at the Savannah River Site), which considers the acceptance of approximately 22,700 elements of foreign research reactor spent nuclear fuel in the United States versus approximately 17,100 (13.9 MTHM) elements in this hybrid alternative; the chemical separation of approximately 17,800 aluminum-based elements versus approximately 12,200 aluminum-based elements in this hybrid alternative; and the storage of approximately the same number of TRIGA elements as under the basic implementation.

The environmental impacts and policy considerations of the hybrid alternative are discussed in Section 4.5.

2.5 No Action Alternative

In the No Action Alternative, the United States would neither manage foreign research reactor spent nuclear fuel containing uranium enriched in the United States, nor provide technical assistance or financial incentives for overseas storage or reprocessing. In this case, no foreign research reactor spent nuclear fuel shipments to the United States and no assistance to foreign countries for managing foreign research reactor spent nuclear fuel overseas would take place. The No Action Alternative would have environmental impacts outside the United States which are not in the scope of this EIS. Policy considerations are discussed in Section 4.6.

2.6 Characteristics of the Components of the Basic Implementation

This section summarizes information on the selection process for some of the components of the basic implementation, as well as characteristics, assumptions and physical parameters used in the environmental impact analysis. This section provides characteristics of the spent nuclear fuel to be received, the types of transportation casks considered, the marine ports considered and method of their identification, the ground transportation routes considered, method of identification, typical characteristics of the wet and dry storage technologies, descriptions of the designs of facilities for both dry and wet storage technologies, descriptions of chemical separation facilities, and details on the site-specific options in managing the foreign research reactor spent nuclear fuel.

2.6.1 Characteristics and Types of Foreign Research Reactor Spent Nuclear Fuel

Spent nuclear fuel is fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated. Fuel in a reactor consists of fuel elements that come in many configurations; but generally consist of the fuel matrix, cladding and structural parts. The matrix, which contains the fissionable material is typically in the form of plates or cylindrical pellets. The cladding (typically zirconium, aluminum, or stainless steel) surrounds the fuel, confining and protecting it. Structural parts (generally nickel alloys, stainless steel, zirconium, or aluminum) hold the fuel elements in the proper configuration in the reactor core.

Spent nuclear fuel is radioactive because of the presence of the radioactive isotopes, which are products of the fission process. The radiation of most concern from spent nuclear fuel is gamma rays. Although the radiation levels can be very high, the gamma ray intensities are readily reduced by shielding the spent nuclear fuel elements with such materials as steel, lead, concrete, and water during the various management phases of handling, transporting, or storing the spent nuclear fuel elements.

An issue associated with the management of spent nuclear fuel containing significant amounts of fissionable material is the potential for a self-sustaining nuclear fission process called criticality. Prevention of criticality conditions enters in the design of the spent nuclear fuel transportation casks, the spent nuclear fuel storage and processing facilities, and the spent nuclear fuel packaging for ultimate disposition. In general, criticality prevention is accomplished by either controlling the amount of fissionable material present within a certain volume (dilution or spatial separation techniques) or by introducing neutron absorbing materials that reduce the number of neutrons available to the fission process (poisoning technique). The criticality issue has been addressed in all implementation alternatives considered for the management of the foreign research reactor spent nuclear fuel.

Two types of foreign research reactor spent nuclear fuel are covered under the proposed action. They are aluminum-based fuel and TRIGA reactor type fuel. The aluminum-based fuel refers to fuels that consist of an alloy of uranium and aluminum, or a dispersion of uranium-bearing compound in aluminum, both

clad in aluminum. The enrichment of uranium can be either HEU or LEU. Details on the physical and nuclear characteristics of the aluminum-based foreign research reactor spent nuclear fuel can be found in Appendix B. The aluminum-based fuels are used in various reactor types in different forms and geometries. The spent nuclear fuel element geometries are either cylindrical, boxed type, annular with hundreds of involute plates, or pin cluster. The aluminum-based fuel forms are either plates, tubes, rods, or pins. The ^{235}U[5] content of a fuel element prior to irradiation in a reactor (i.e., fresh fuel element) can vary from about 3 g (.11 oz) to about 8,500 g (300 oz). The length of an individual element can vary from 22 cm (8.7 in) to about 300 cm (118 in).

The TRIGA reactor fuel uses uranium-zirconium hydride (U-Zr-H_x) fuel material in which the hydrogen moderator is homogeneously contained within the fuel material. The initial ^{235}U content of each rod varies between 38 g (1.3 oz) and 133 g (4.7 oz). The overall length of a TRIGA fuel rod is approximately 76 cm (30 in), and the weight is between approximately 1 kg (2.2 lb) and about 4 kg (8.8 lb). Details on the physical and nuclear characteristics of the TRIGA foreign research reactor spent nuclear fuel can be found in Appendix B.

In contrast, a typical nuclear power reactor fuel (e.g., pressurized water reactor fuel) is three to five percent enriched uranium-oxide. The fuel form is ceramic pellets combined into rods, and the cladding is zircaloy or stainless steel. A typical pressurized water reactor fuel assembly weighs 682 kg (1,500 lb) and has a length of 389 cm (13 ft). Figure 2-5 graphically depicts the differences in size of a typical pressurized water reactor assembly, a typical aluminum-based fuel element, and a TRIGA fuel element. Additional detailed information on the aluminum-based and TRIGA fuels are provided in Appendix B of this EIS.

In addition to aluminum-based and TRIGA-type spent nuclear fuel, target material containing HEU is considered for management under Implementation Alternative 1, subalternative 1c (Section 2.2.2.1). Targets are irradiated in a research reactor to produce molybdenum-99, a medical isotope. Molybdenum production peaks at a low burnup, about three percent. Once the target is removed from the reactor, the fuel is dissolved in acid, and molybdenum-99 is separated from the solution. The residual material after removal of molybdenum-99 is called target material, and is currently kept in solution form. The target material considered for management would be put in U_3O_8 or UO_2 form and canned for transport to the United States. It is expected that the target material would contain about 0.6 MTHM (the uranium content of 620 typical Material Test Reactor [MTR] elements) and a volume of 6.5 m^3 (229.5 ft^3). This material could be brought to the United States in cans having a cavity of 6.4 cm (2.5 in) in diameter and 28 cm (11 in) long, and containing between 40 g to 200 g (1.41 oz to 7 oz) of ^{235}U each.

2.6.2 Transportation Casks

Spent nuclear fuel elements are transported in stainless steel packages called transportation casks, or just casks. A typical cask for the transportation of foreign research reactor spent nuclear fuel elements is shown in Figure 2-6. Detailed descriptions of typical casks are provided in Appendix B (Section B.2).

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5 *During the enrichment process, the amount of fissionable Uranium-235 (^{235}U) is increased. Uranium increased to less than 20 percent ^{235}U is called LEU. Uranium enriched to 20 percent or greater ^{235}U is called HEU.*

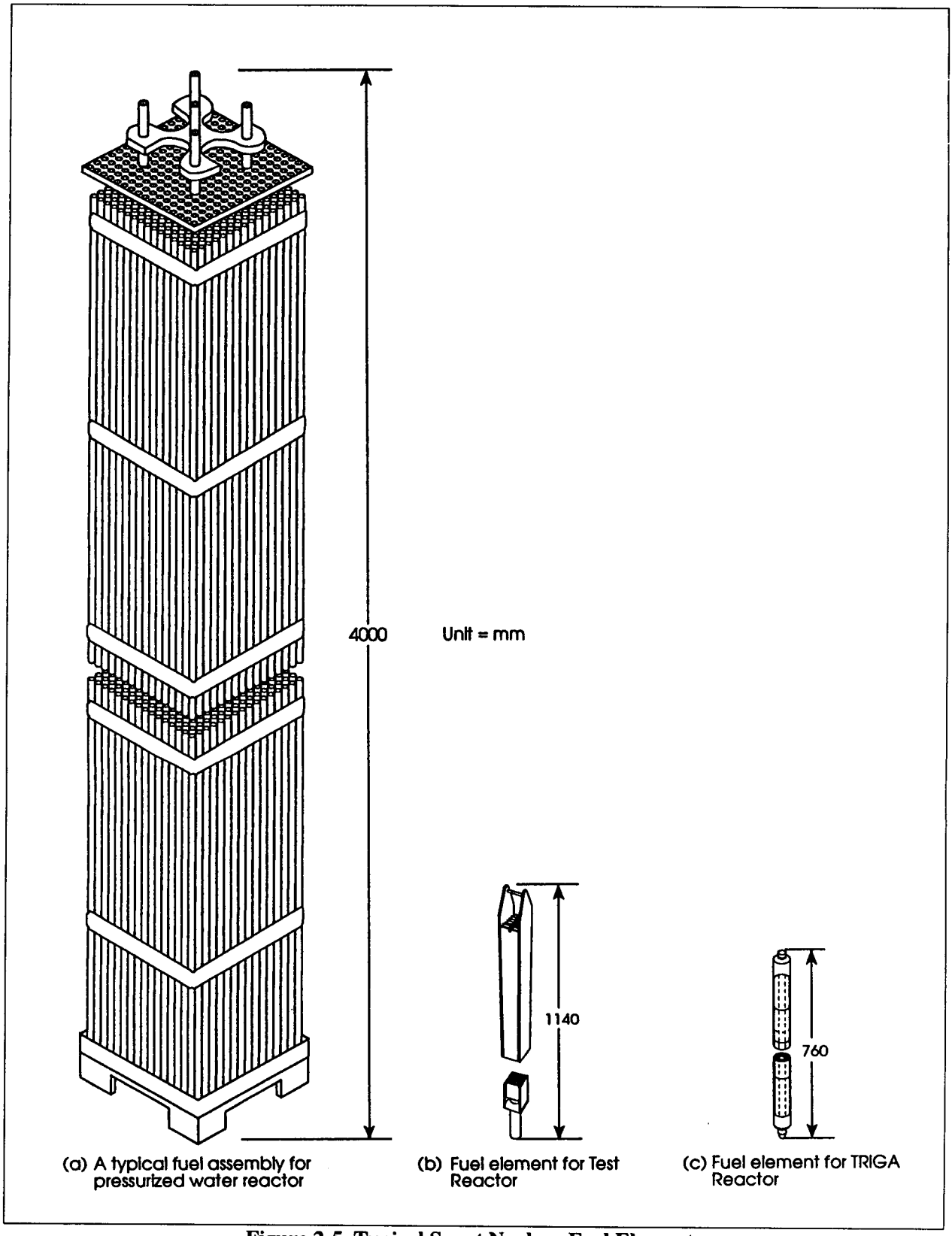


Figure 2-5 Typical Spent Nuclear Fuel Elements

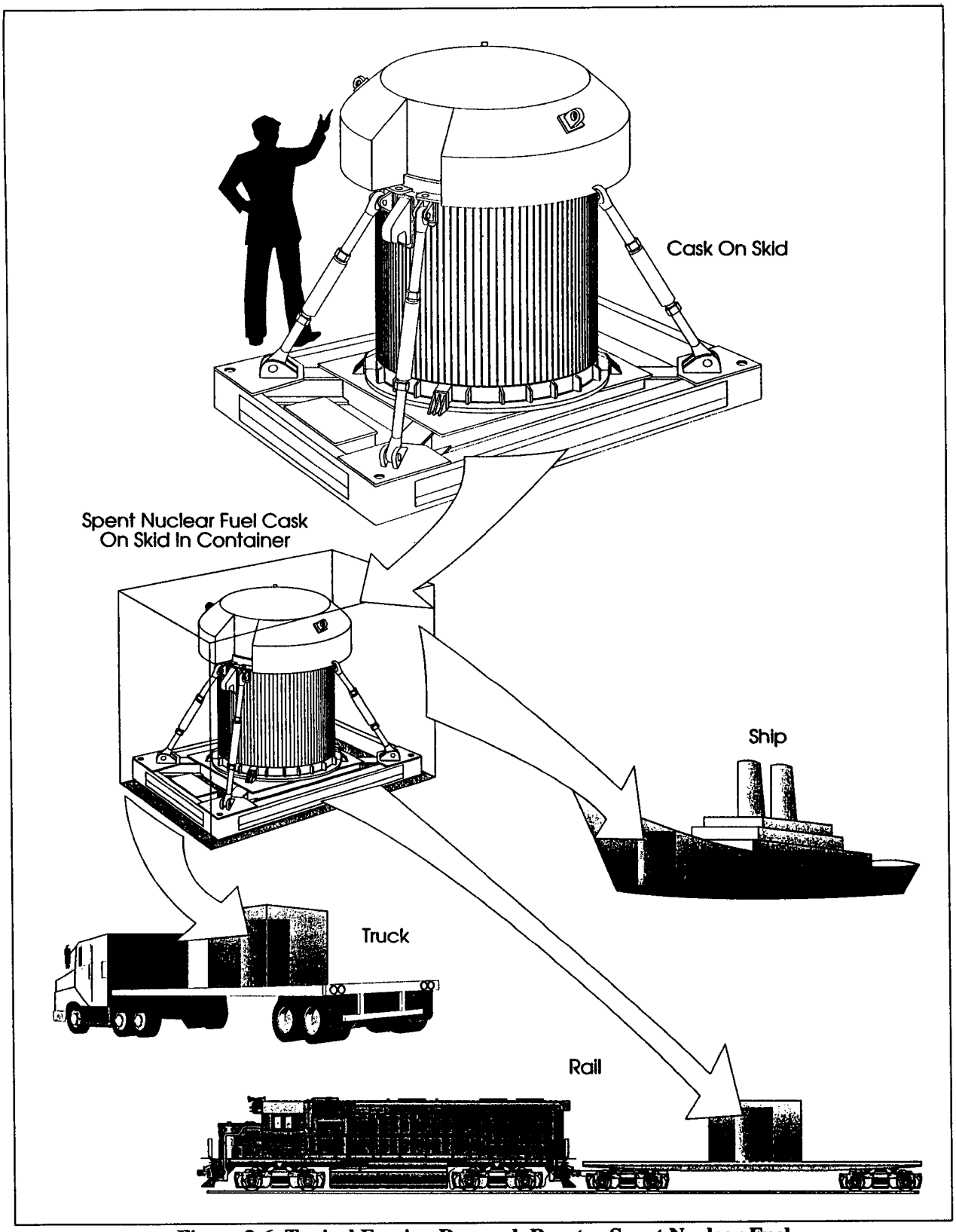


Figure 2-6 Typical Foreign Research Reactor Spent Nuclear Fuel Transportation Cask

Table 2-5 Representative Transportation Casks for Foreign Research Reactor Spent Nuclear Fuel

Transportation Cask	*Country of Origin*	*Certificate of Compliance*	*Estimated Capacity Number of Elements*
Marine Transport			
LHRL-120	Australia	USA/0389/B(U)F	114
GNS-11	Germany	USA/0381/B(U)F	21-33
TN-1	Germany	USA/0316/B(U)F	126
IU-04	France	USA/0100/B(U)F	36-40
TN-7 (TN-7/2)	Germany	USA/0130/B(U)F	60-64
NAC-LWT	United States	USA/9225/B(U)F	48-64
UNIFETCH	United Kingdom	GB/1113/B(M)F	24-40
GOSLAR	Germany	USA/0094/B(M)F	13
Ground Transport (Between Sites)			
NL1-10/24	United States	USA/9023/B( )F	120-160
IF-300	United States	USA/9001/B( )F	84-112
BMI-1	United States	USA/5957/B(U)F	24
GE-2000	United States	USA/9228/B(U)F	24
TN-8	Germany	USA/9015/B()F	36-48
NLI-1/2	United States	USA/9010/B( )F	48-64
NAC-LWT	United States	USA/9225/B(U)F	48-64

A full cask can carry from 13 to 120 spent nuclear fuel elements from foreign research reactors, depending on fuel element design, size, and cask capacity. The casks are certified as "Type B" under regulations. To receive this certification, a cask must successfully pass tests simulating severe accident conditions. The tests include being dropped onto an unyielding surface, dropped onto a steel post, subjected to extremely high temperatures of 802°C (1,475°F) for 30 minutes, and submersion in water for 8 hours.

As discussed in Section 2.7.2, "Type B" casks have been used for years to transport spent nuclear fuel elements within the United States and around the world (DOE, 1994d). To date, no spent nuclear fuel transportation cask has ever been punctured or released any of its radioactive contents, even in actual highway accidents (NRC, 1993).

The casks are designed to provide shielding from radiation. However, a low radiation field is present outside the cask — usually less than one mrem per hour at 1 m (3.3 ft) away from the cask.

Table 2-5 identifies typical transportation casks that could potentially be used for transporting foreign research reactor spent nuclear fuel from the foreign research reactor sites to the candidate United States ports of entry and to the potential management sites. A majority of these have already been used by DOE for transporting foreign research reactor spent nuclear fuel.

As explained in Section 2.6.4, the inability of certain management sites to accept foreign research reactor spent nuclear fuel at the beginning of the implementation period could necessitate temporary (as long as 10 years from the start of the policy) management of foreign research reactor spent nuclear fuel at an available site and the eventual transport of this foreign research reactor spent nuclear fuel to another site. At the time of the intersite transport, the foreign research reactor spent nuclear fuel elements would contain less radioactivity and less heat because of the decay process. The transportation, therefore, could be carried out in casks with larger capacity than those considered for marine transport. Such casks, currently licensed only for the transportation of commercial spent nuclear fuel in the United States, would need to be certified for foreign research reactor spent nuclear fuel. The size of these casks would allow the transport

of up to 4 (truck-size casks) or up to 10 (rail-size casks) times as many elements in a single shipment as those considered for the marine transport casks. The bottom part of Table 2-5 identifies typical casks for intersite transportation. Description and design information is included in Appendix B (Section B.2).

2.6.3 Marine Transport and Ports

This section describes the potential activities related to foreign research reactor spent nuclear fuel marine port identification and marine transport activities.

2.6.3.1 Marine Port Identification

In this EIS, port screening and selection were performed to identify candidate ports of entry for the foreign research reactor spent nuclear fuel. The criteria used in this process were based on several sources, including:

- A DOE-sponsored workshop on port selection criteria for spent nuclear fuel held at the U.S. Merchant Marine Academy at Kings Point, NY, on November 15-16, 1993 (USMMA, 1994).
- Public input to the scoping meetings for this EIS, as summarized in the DOE Implementation Plan (DOE, 1994h).
- Factors identified in Section 3151 of the National Defense Authorization Act for Fiscal Year 1994.

These sources are described in more detail in Appendix D. After consulting the above-mentioned sources, a list of criteria for ports eligible to receive spent nuclear fuel was developed. These criteria are:

- Appropriate port experience - port terminal(s) and operators should routinely handle containerized dry cargoes that require the same type of handling as containerized spent nuclear fuel, or will have the capability to handle these cargo types during the proposed management policy period;
- Port transit - the port should be within reasonable distance from the open sea, with a good ship channel;
- Appropriate port facilities - the port should have adequate crane(s), piers, and depth of water alongside the pier;
- Ready intermodal access - the port should have ready access for intermodal transport; and
- Low human population - the human population of the ports and along transportation routes to potential management sites should be low to the extent feasible and maximum extent practicable.

These criteria, taken collectively, provided DOE and the Department of State with the basis for identifying and analyzing potential ports of entry. Additionally, port identification was expanded (i.e., the NWS Charleston was added to the Port of Charleston) as a result of public comment on the Draft EIS.

2.6.3.2 Marine Transport and Port Activities

2.6.3.2.1 Marine Transport

DOE and the Department of State estimate that approximately 721 cask loads of foreign research reactor spent nuclear fuel would be sent to the United States by ship over the 13-year acceptance period under the basic implementation of Management Alternative 1. The International Maritime Organization currently limits the typical commercial cargo ship (Class INF-2) to a maximum of 200 petrabecquerels of radioactivity (IMO, 1993), which equates to approximately 5.4 million Ci. A typical cask of foreign research reactor spent nuclear fuel is predicted to contain 1 million Ci (see Appendix C). Therefore, a shipment in a commercial cargo ship could contain several casks.

Two types of analysis were conducted to evaluate the impacts of the marine transport of foreign research reactor spent nuclear fuel: first, assuming there are no accidents (incident-free); second, assuming various accidents occur. The incident-free analyses were conducted for ships' crews and port workers, assuming ships carrying two and eight casks of foreign research reactor spent nuclear fuel. Accident analyses were conducted for accidents in port and for accidents in coastal waters and the open ocean. The number of shipments is a parameter of primary importance in the incident-free analysis as well as the accident analysis in port, coastal waters, and open ocean. As noted above, 721 shipments were considered for the basic implementation of Management Alternative 1. In implementing the proposed policy, DOE would attempt to minimize the number of shipments by maximizing the number of casks that would be carried in a single shipment. However, for the purpose of assessing the environmental impacts, a single-cask per shipment assumption is made for the purpose of conservatism. The number of shipments for the implementation alternatives discussed in Sections 2.2.2.1 through 2.2.2.7 and Management Alternative 3 discussed in Section 2.4 are roughly proportional to the amount of foreign research reactor spent nuclear fuel to be accepted in the United States under each alternative. The exact number of shipments assumed in the analysis is provided in Appendices C and D, Section C.4 and D.4, respectively. The results of both the incident-free and the accident analyses are presented in Chapter 4, with details in Appendices C and D.

There are four types of ships that could be used to transport foreign research reactor spent nuclear fuel casks. These are:

Container vessels: These are typically large ships specifically intended for the transport of containerized cargo. Some modern container ships can transport up to about 5,000 containers, although a more typical capacity is in the range of 800 to 1,000 containers. A principal advantage of container ships, because of standardization of containers, is that the vessel can be rapidly loaded or off-loaded at those ports equipped with container gantry cranes. Containers can be removed from, or placed on, the vessel at an average rate of about 45 containers per hour. At well-equipped container ports, two cranes are used to move containers.

Roll-on/roll-off ships: These ships are vehicle carriers used for the ocean transport of cars and trucks. The ships are loaded and unloaded using a ramp between the vessel and dock. Typically, the vessel carries its own ramp, which is deployed by an on-board crane, hydraulic cylinders, or chain drives. The ramp may extend from the stern of the vessel or from a hatch in the side of the vessel hull. At docks intended for roll-on/roll-off service, additional ramps may be deployed from the dock to expedite loading or unloading. This type of ship could carry foreign research reactor spent nuclear fuel casks secured on trailers.

General/cargo (breakbulk) ships: General cargo vessels are smaller ships that typically call on less well-developed or equipped ports. They have on-board jib or boom type cranes that can be used to load or unload the ship if dockside crane service is not available. As the name implies, these vessels are intended to accommodate a wide variety of cargoes that may have any reasonable configuration. Since the advent of the widespread use of containers, most of these ships are equipped with lock fixtures to secure containers during transport. If necessary, containers can be lifted on and off these ships by using four-legged slings between the corners of the container and hook of the crane.

Purpose-built ships: For the purposes of this EIS, the ships discussed here are specifically designed to transport spent nuclear fuel casks. These ships are not used for the transport of any other cargo, and they operate as chartered vessels. Casks are loaded directly into the holds of the ship because the cargo compartments contain the hardware needed to mate with the tiedown fixtures of the cask. If the ship has no crane, dockside cranes are used for loading and unloading. The cargo compartments are typically intended to handle only one cask type, however, other casks may be used with minor modifications. For the relatively efficient transport of spent nuclear fuel, the casks are large. These type vessels are intended for the transport of commercial power nuclear reactor fuel, and they generally operate between nuclear installations (power plants and spent nuclear fuel end-use facilities) having dedicated docks. Commercial docks are not normally used, but could be. These vessels have double bottoms and hulls and collision damage-resisting structures within the hull. The vessel crew is trained in the handling of the cargo and in emergency response like most other commercial vessels.

The potential exists that spent nuclear fuel would be accepted from all 41 countries that have expressed interest in this program. Ships carrying the foreign research reactor spent nuclear fuel would follow normal shipping routes from a convenient port in or near the country of origin, and would go to a U.S. port that is consistent with the port identification, evaluation, and selection process as described in Appendix D.

Regularly scheduled commercial service cargo ships could be used to ship foreign research reactor spent nuclear fuel. Some, if not most, of the regularly scheduled commercial ships might initially call at a port other than the port of destination of the foreign research reactor spent nuclear fuel, and may make additional stops. Therefore, marine transport may involve entry into and departure from intermediate ports and shipping in coastal waters. Typically, ships spend 1 day in each port of call and 1 or 2 days passing between ports.

Risks to the ships carrying foreign research reactor spent nuclear fuel and to the spent nuclear fuel itself can arise from natural sources, such as storms at sea, and from other events, such as collisions with other ships and marine obstacles, as well as from fires. Modern technology and good communications help minimize these risks by keeping ships informed of severe weather and other shipping and marine obstacles. Risk to the cargo is further reduced through proper stowing and securing, and through daily cargo inspections while at sea to ensure that the cargo remains secured.

Regardless of the technology and practices mentioned above, accidents involving ships carrying foreign research reactor spent nuclear fuel would be possible. Consequences of accidents at sea have been evaluated and are discussed in Chapter 4, and described in more detail in Appendix C.

The presence of a cask containing foreign research reactor spent nuclear fuel onboard could result in a radiation dose to some of the ship's crew due to radiation that emanates from the cask. Most of the ship's crew would be relatively far away from the cargo (and the cask), and therefore, would receive essentially no radiation dose. However, the daily inspection of the cargo would bring an inspector in close proximity

to the cask containing the foreign research reactor spent nuclear fuel for a short period of time. Effects on inspectors and other incident-free impacts were evaluated, and are described in Chapter 4 and detailed in Appendix C.

Both commercial and military ports were evaluated for potential use as ports of entry for the foreign research reactor spent nuclear fuel. DOE determined that the security provisions specified by 10 CFR 73, which are required for all spent fuel shipments, could be implemented at either commercial or military ports. Any additional security that might be available at a military port would not be required for foreign research reactor spent nuclear fuel shipments.

2.6.3.2.2 Port Activities

Entry into a port by commercial vessels is accomplished under the control of the port authority. The port authority is responsible for the area from the sea buoy to the dock, except where the approaches are long, such as the case with the Chesapeake Bay. Normally, each ship is required to have a pilot familiar with local conditions to direct it while underway in the harbor or channel and during both entry and exit approaches. The pilot's job is to ensure that the ship follows the marked channel and arrives safely at its dock or other assigned location. In the event of bad weather or low visibility, radar and other instruments are available on all ships that would be considered for carrying foreign research reactor spent nuclear fuel.

In most cases, the ship moves directly to its assigned dock. However, if the assigned dock is still occupied or is not immediately available for other reasons, the ship may anchor in the harbor or its approaches for a period of time prior to docking. Most ocean-going vessels are not highly maneuverable in confined spaces, so docking is normally accomplished with the help of one or more tugs.

At the ship's first port of call in the United States, the U.S. Coast Guard and other authorities would inspect the ship, its cargo, and documentation. In the case of radioactive cargoes, the NRC may inspect the container with the radioactive material and its documentation. State and local officials could also perform inspections of documents and cargo. At ports of call after the initial port(s) of entry, additional inspections may be performed by Federal, State, or local officials.

Except for roll-on/roll-off ships, all cargo ships that would potentially carry foreign research reactor spent nuclear fuel are unloaded with cranes. Unloading of a foreign research reactor spent nuclear fuel cask, whether in a container or not, involves connecting a lifting fixture to the container or to the cask pallet, lifting the container or cask, and placing it dockside, either on an intermediate vehicle or directly on the primary mode of land transportation. Typically, container ships can be unloaded at the same rate as they are loaded (approximately 45 containers per hr), while unloading a cask on a handling platform in a breakbulk ship would require more time.

All shipments of foreign research reactor spent nuclear fuel would be anticipated well in advance, so the container housing the foreign research reactor spent nuclear fuel cask would normally be loaded immediately on the ground transportation to be used to carry it out of the port. Should there be a delay, the container may be temporarily stored at the port for up to 24 hours. Port security at any of the ports selected for analysis is adequate to protect the container in the event of this unexpected delay.

In spite of all of the precautions taken, accidents in the port would be possible. In fact, most ship accidents occur in or around ports. DOE has had no radioactivity released in the past due to port accidents; however, a range of accidents, both at the dock and in the port or its approaches, has been evaluated. See Chapter 4 for a discussion of the results of these analyses.

All ports considered for receiving foreign research reactor spent nuclear fuel would have emergency plans for responding to an accident in the port.

2.6.4 Ground Transport Route Options and Route Identification Process

2.6.4.1 Ground Transport Route Options

Route options for the potential ground transportation of foreign research reactor spent nuclear fuel depend on the marine ports considered, the management sites and the various ways that foreign research reactor spent nuclear fuel would be distributed among the potential management sites according to the alternatives considered in the Programmatic SNF&INEL Final EIS (DOE, 1995c). Accordingly, routes and the amount of fuel to be shipped would be established based on one of the following spent nuclear fuel distributions:

- an even distribution of foreign research reactor spent nuclear fuel between the Savannah River Site and the Idaho National Engineering Laboratory under the Decentralization and the 1992/1993 Planning Basis alternatives;
- a distribution that sends TRIGA spent nuclear fuel to the Idaho National Engineering Laboratory and aluminum-based spent nuclear fuel to the Savannah River Site under the Regionalization by Fuel Type alternative;
- a distribution that sends the spent nuclear fuel entering the United States from the Eastern ports to the Savannah River Site or the Oak Ridge Reservation and the spent nuclear fuel entering the United States from the Western ports to the Idaho National Engineering Laboratory, the Nevada Test Site, or the Hanford Site under the Regionalization by Geography alternative; or
- a distribution that sends all foreign research reactor spent nuclear fuel to one of the five potential management sites under the Centralization alternative.

For the purposes of this EIS, the distribution of foreign research reactor spent nuclear fuel between sites under Regionalization by Geography and by Fuel Type has been analyzed in detail. The more detailed planning performed in preparation for the analyses of the various alternatives considered in this EIS did not reveal any physical situation in which an even distribution of the spent nuclear fuel between two sites was advantageous. Furthermore, the impacts of activities associated with the even distribution at either site would be bounded by and equal to roughly 50 percent of the impacts of the centralization of all foreign research reactor spent nuclear fuel management activities at that site. As a result, this alternative is not analyzed in detail in this EIS.

An additional factor which would affect the route options for ground transportation is the inability of certain potential spent nuclear fuel management sites to implement the foreign research reactor spent nuclear fuel management policy immediately. Of the five sites, only two (the Savannah River Site and the Idaho National Engineering Laboratory) would be immediately available in late 1995. The other three could become available at a later date when appropriate facilities for accepting and managing foreign research reactor spent nuclear fuel become available. This constraint affects the ground transportation route options in the case that a site, other than the Savannah River Site or the Idaho National Engineering Laboratory, is considered and for DOE's spent nuclear fuel management under either the Regionalization by Geography or the Centralization alternative. If the Nevada Test Site, the Oak Ridge Reservation, or the Hanford Site is one of the management sites, the foreign research reactor spent nuclear fuel would have to

be shipped first to one of the available management sites (the Savannah River Site and/or the Idaho National Engineering Laboratory) and later, when appropriate facilities are completed, to either the Nevada Test Site, the Oak Ridge Reservation, or the Hanford Site.

Certain assumptions are required in order to simply and consistently describe the manner in which foreign research reactor spent nuclear fuel would be transported to the management sites. The shipments, which were identified earlier in Tables 2-1 and 2-2, were divided into east coast and west coast shipments, depending on the country of origin. Spent nuclear fuel shipments from Europe, Africa, the Middle East, and parts of Central and South America were designated as east coast shipments. All others were designated as west coast shipments. Shipments from Canada were assumed to enter the United States from either an eastern or western point of entry, depending on the point of origin in Canada. Under these assumptions, for the basic implementation of Management Alternative 1, the Eastern points of entry would receive 651 cask shipments (535 from ports, 116 from Canada) and the Western ports of entry would receive 186 cask shipments (all from ports).

No intersite shipments would be necessary under the Programmatic SNF&INEL Final EIS alternatives (DOE, 1995c) that use the Savannah River Site and/or the Idaho National Engineering Laboratory for managing the foreign research reactor spent nuclear fuel. The estimated number of shipments for the basic implementation of Management Alternative 1 in these cases would be as follows:

- Decentralization, 1992/1993 Planning Basis, or Regionalization by Geography to the Savannah River Site and the Idaho National Engineering Laboratory - the Savannah River Site would receive 651 casks from the east coast and the Idaho National Engineering Laboratory would receive 186 casks from the west coast.

- Regionalization by Fuel Type - the Savannah River Site would receive 675 casks of aluminum-based fuel; 544 from the east coast and 131 from the west coast. The Idaho National Engineering Laboratory would receive 162 casks of TRIGA-type fuel; 107 from the east and 55 from the west.

- Centralization to the Idaho National Engineering Laboratory or Centralization to the Savannah River Site - the site would receive 837 casks; 651 from the east coast and 186 from the west coast.

A two-phased program would be required if a site other than the Idaho National Engineering Laboratory or the Savannah River Site is considered as a central or regional site. Phase 1 is defined as the period from the beginning of the policy (late 1995) until the Phase 2 site (the Hanford Site, the Nevada Test Site and/or the Oak Ridge Reservation) would be ready to receive fuel, which is estimated to be 10 years for new construction; less time would be required for refurbishment of an existing facility. During Phase 1, DOE would manage the fuel at the Savannah River Site and/or the Idaho National Engineering Laboratory. During Phase 2, DOE would ship any fuel that is being managed during Phase 1 at a non-Phase 2 site to a Phase 2 site, and manage the fuel at that site until a repository becomes available. The phases are defined to help describe the implementation of the foreign research reactor spent nuclear fuel management policy and to analyze the transportation impacts of the implementation of the policy.

If the Hanford Site, the Nevada Test Site, and/or the Oak Ridge Reservation were selected under the Programmatic SNF&INEL EIS, DOE and the Department of State would select from the following four strategies for managing fuel at the Savannah River Site and/or the Idaho National Engineering Laboratory during Phase 1. DOE could: (1) divide the fuel by geography, (2) divide the fuel by type (aluminum-based and TRIGA), (3) ship all fuel to the Savannah River Site, or (4) ship all fuel to the Idaho National

Engineering Laboratory. Therefore, in Phase 2, the Hanford Site and the Nevada Test Site could receive all foreign research reactor spent nuclear fuel, or TRIGA or Western spent nuclear fuel managed at the Idaho National Engineering Laboratory during Phase 1. Similarly, the Oak Ridge Reservation could eventually receive all foreign research reactor spent nuclear fuel or the aluminum-based or Eastern spent nuclear fuel managed at the Savannah River Site during Phase 1.

An assumption on the rate at which spent nuclear fuel arrives is necessary to estimate the number of shipments that would arrive during Phases 1 and 2. The demand to ship fuel by the foreign research reactor operators would be highest at the beginning and the end of the proposed policy period. However, the limited availability of casks would compel DOE to receive fuel at a steady rate. DOE could control the rate at which fuel is delivered by managing the contracts with shippers. Therefore, for the purposes of this analysis, it would be reasonable to assume that the 837 casks would arrive at a uniform rate during a 13-year period. Based on this rate of about 65 casks per year, it is estimated that 644 casks would be received during Phase 1 (approximately 10 years), and 193 casks would be received during Phase 2.

The projected number of shipments for the two-phased regionalization and centralization approaches are shown in Tables 2-6 and 2-7. The projections are based on the types and locations of spent nuclear fuel described in Appendix B, and the strategies and arrival rate assumptions described above. Each projection is described in more detail and shown on a map in Appendix E.

As noted earlier, the impact analysis from transportation depends on the location of entry (Eastern or Western ports) and number of shipments that would reach the United States. The discussion above pertains to the basic implementation of Management Alternative 1. In considering the implementation alternatives discussed in Sections 2.2.2.1 through 2.2.2.7 and Management Alternative 3, discussed in Section 2.4, both the number of shipments and locations of entry would vary with each alternative. The detailed distribution and number of shipments assumed to set up the ground transportation routes for each alternative are provided in Appendix E, Section E.8.

2.6.4.2 Route Analysis

Foreign research reactor spent nuclear fuel shipments would have to comply with both NRC and Department of Transportation regulatory requirements. The highway routing of spent nuclear fuel is systematically determined in accordance with Department of Transportation regulations [49 CFR 171-179 and 49 CFR 397].

The Department of Transportation routing regulations require that these shipments be transported over a preferred highway network including:

- Interstate highways;
- An interstate system bypass or beltway around a city; or
- State-designated preferred routes.

The selection of the preferred highway routes are consistent with the U.S. Department of Transportation's published guidelines (DOT, 1992).

In addition to defining routes, 49 CFR Part 397 contains the driver safety requirements for highway carriers of packages of radioactive material exceeding a quantity of material known as a "highway route-controlled quantity." All spent nuclear fuel shipments would be expected to exceed this quantity.

Table 2-6 Shipment Summary for Regionalization by Geography Alternatives

Spent Nuclear Fuel Site Option Western/Eastern	*Phase 1 Approach*	*Phase 1 Port-to-Site Shipments*	*Site-to-Site Shipments*[a]	*Phase 2 or Port-to-Final Site Shipments*	*Total Number of Shipments*[a]
INEL/ORR	Geographic	East to SRS: 501 West to INEL: 143	SRS to ORR: 126/51	East to ORR: 150 West to INEL: 43	963/888
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	SRS to ORR: 130/52	East to ORR: 150 West to INEL: 43	967/889
	All to INEL	644	None	East to ORR: 150 West to INEL: 43	837
NTS/SRS	Geographic	East to SRS: 501 West to INEL: 143	INEL to NTS: 36/15	East to SRS: 150 West to NTS: 43	873/852
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	INEL to NTS: 31/13	East to SRS: 150 West to NTS: 43	868/850
	All to SRS	644	None	East to SRS: 150 West to NTS: 43	837
NTS/ORR	Geographic	East to SRS: 501 West to INEL: 143	SRS to ORR: 126/51 INEL to NTS: 36/15	East to ORR:150 West to NTS: 43	999/903
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	SRS to ORR: 130/52 INEL to NTS: 31/13	East to ORR: 150 West to NTS: 43	998/902
	All to SRS	644	SRS to ORR: 161/65	East to ORR: 150 West to NTS: 43	998/902
	All to INEL	644	INEL to NTS: 161/65	East to ORR: 150 West to NTS: 43	998/902
HS/SRS	Geographic	East to SRS: 501 West to INEL: 143	INEL to HS: 36/15	East to SRS: 150 West to HS: 43	873/852
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	INEL to HS: 31/13	East to SRS: 150 West to HS: 43	868/850
	All to SRS	644	None	East to SRS: 150 West to HS: 43	837
HS/ORR	Geographic	East to SRS: 501 West to INEL: 143	SRS to ORR: 126/51 INEL to HS: 36/15	East to ORR: 150 West to HS: 43	999/903
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	SRS to ORR: 130/52 INEL to HS: 31/13	East to ORR: 150 West to HS: 43	998/902
	All to SRS	644	SRS to ORR: 161/65	East to ORR: 150 West to HS: 43	998/902
	All to INEL	644	INEL to HS: 161/65	East to ORR: 150 West to HS: 43	998/902

SRS = Savannah River Site, INEL = Idaho National Engineering Laboratory, HS = Hanford Site, ORR = Oak Ridge Reservation, NTS = Nevada Test Site

[a] *Truck/rail shipments, assuming that the truck casks used for interstate shipments are capable of carrying 4 times as much fuel, and rail casks 10 times as much fuel as the shipping cask received from the foreign research reactor.*

Rail routing is not covered by specific Department of Transportation and NRC regulations. Therefore, carriers would generally select the most direct route, which would serve to reduce travel time and radiation exposure consistent with track class and other rail service requirements.

NRC regulations concerning physical security and notification are set forth in 10 CFR 71 and 10 CFR 73, respectively. Carriers are required to submit proposed routes for spent nuclear fuel shipments to NRC for approval, and NRC publishes a public information circular that lists routes that have been evaluated and approved for specific spent nuclear fuel shipments (NRC, 1993).

Table 2-7 Shipment Summary for Centralization Alternatives

Spent Nuclear Fuel Site Option	*Phase 1 Approach*	*Phase 1 Port-to-Site Shipments*	*Site-to-Site Shipments*[a]	*Phase 2 or Port-to-Final Site Shipments*	*Total Number of Shipments*[a]
SRS	N/A - Single phase			837	837
INEL	N/A - Single phase			837	837
HS	Geographic	East to SRS: 501 West to INEL: 143	From SRS: 126/51 From INEL: 36/15	From East: 150 From West: 43	999/903
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	From SRS: 130/52 From INEL: 31/13	From East: 150 From West: 43	998/902
	All SRS	644	161/65	From East: 150 From West: 43	998/902
	All INEL	644	161/65	From East: 150 From West: 43	998/902
ORR	Geographic	East to SRS: 501 West to INEL: 143	From SRS: 126/51 From INEL: 36/15	From East: 150 From West: 43	999/903
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	From SRS: 130/52 From INEL: 31/13	From East: 150 From West: 43	998/902
	All SRS	644	161/65	From East: 150 From West: 43	998/902
	All INEL	644	161/65	From East: 150 From West: 43	998/902
NTS	Geographic	East to SRS: 501 West to INEL: 143	From SRS: 126/51 From INEL: 36/15	From East: 150 From West: 43	999/903
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	From SRS: 130/52 From INEL: 31/13	From East: 150 From West: 43	998/902
	All SRS	644	161/65	From East: 150 From West: 43	998/902
	All INEL	644	161/65	From East: 150 From West: 43	998/902

SRS = Savannah River Site, INEL = Idaho National Engineering Laboratory, HS = Hanford Site, ORR = Oak Ridge Reservation, NTS = Nevada Test Site

[a] *Truck/rail shipments assuming that the truck casks used for intersite shipments are capable of carrying 4 times as much fuel and rail casks 10 times as much fuel as the shipping cask received from the foreign research reactor due to consolidation.*

The HIGHWAY and INTERLINE computer codes are used to assist in route selection and estimations of exposed population (DOE, 1995c). The collective population risk, maximally exposed individual (MEI) risk, accident risk, accident consequence, and nonradiological risk assessments are performed using the RADTRAN and RISKIND computer codes established for shipment by both railroad and highway. Additional details of the treatment and analysis methodology used in the ground transportation assessment are given in Appendix E.

2.6.5 Activities and Alternatives at the Foreign Research Reactor Spent Nuclear Fuel Management Sites

The potential sites for receipt and management of foreign research reactor spent nuclear fuel are the same as those considered in the Programmatic SNF&INEL Final EIS (DOE, 1995c), namely: the Savannah River Site, the Idaho National Engineering Laboratory, the Hanford Site, the Oak Ridge Reservation, and the Nevada Test Site.

Since foreign research reactor spent nuclear fuel is part of the overall DOE spent nuclear fuel management program, the potential site-specific options are consistent with the site management alternatives considered in the Programmatic SNF&INEL Final EIS. The alternatives are: Decentralization and 1992/1993 Planning Basis (even distribution of foreign research reactor spent nuclear fuel between the Idaho National Engineering Laboratory and the Savannah River sites), Regionalization (distribution by fuel type and geography), and Centralization (all foreign research reactor spent nuclear fuel at the potential site).

As discussed earlier, the site-specific foreign research reactor spent nuclear fuel management options also depend on the availability of the management sites to implement the policy immediately. Of the five sites, only the Savannah River Site and the Idaho National Engineering Laboratory will be available in late 1995. The other three could become available at a later date when construction or refurbishment of appropriate facilities is completed. This constraint has resulted in the two-phased approach considered in some cases (see discussion in Section 2.6.4.1). For the purpose of the site impact analysis, the implementation of the policy was divided into two functional periods — the period during which receipt and management of foreign research reactor spent nuclear fuel is accomplished by using existing facilities (Phase 1), and the period during which new or refurbished facilities are used (Phase 2). For the environmental impact analysis, the first is characterized by operational activities only, while the second involves impacts from construction and operation activities.

Section 2.6.5.1 provides an overview of the storage technologies and descriptions of the storage facilities considered under the implementation alternatives of Management Alternatives 1 and 3. Section 2.6.5.2 provides a description of chemical separation, which is considered as an implementation alternative to storage.

The site-specific options selected for impact analysis are described separately in the sections devoted for each site (Sections 2.6.5.3.1 through 2.6.5.3.5).

2.6.5.1 Storage Technologies

The purpose of a spent nuclear fuel management facility is to provide an environment for the storage of spent nuclear fuel that protects the public, onsite workers, and the environment. The principal hazard presented by spent nuclear fuel is its inventory of radioactive elements that are the products of the reactions in a nuclear reactor. In addition, the fissionable uranium and plutonium remaining in the spent nuclear fuel has the potential of sustaining a fission chain reaction, which would generate additional radiation and fission products.

The management facility is designed to prevent the stored spent nuclear fuel from achieving a fission reaction (termed "criticality") and to isolate the radioactive materials within the spent nuclear fuel from the public and workers. Criticality is prevented by such methods as:

- maintaining a minimum separation distance between adjacent spent nuclear fuel elements;
- limiting the concentration of fissionable materials in each spent nuclear fuel storage container;
- installing neutron-absorbing materials between spent nuclear fuel elements; and
- controlling the presence and/or concentration of other materials that would enhance the ability of the stored spent nuclear fuel to become critical.

Protection of the public and workers from the radioactive materials within each spent nuclear fuel element is achieved by:

- enclosing or encapsulating the spent nuclear fuel so that any accidental release of radioactive material is retained;
- maintaining a benign chemical and thermal environment around the spent nuclear fuel so that its structural integrity is preserved;
- providing adequate shielding of the radiation emanating from the spent nuclear fuel so that dose rates outside the facility are lowered; and
- utilizing security barriers to isolate spent nuclear fuel from workers and public.

The technology for safely storing spent nuclear fuel (as defined by the above criteria) has been in use, in one form or another, for over 40 years in the nuclear industry. Spent nuclear fuel storage is generally characterized as either wet or dry, denoting whether the spent nuclear fuel elements reside in a water-filled pool or a dry atmosphere. Details of the concepts are provided in Appendix F, Section F.1.

The wet pool type of spent nuclear fuel storage is used at almost every water-cooled nuclear reactor in the world. There are currently more than 600 operating water-cooled power and research nuclear reactors, each with an individual storage pool. The pool design uses common materials (water and concrete) for spent nuclear fuel shielding, heat removal, and the confinement of any radioactive material that might be released from the spent nuclear fuel. An additional benefit is the ability to visually inspect spent nuclear fuel, since the water purity and clarity are maintained at a high level. Spacing, fissionable material limits, and in some cases, the use of neutron-absorbing material prevent criticality in a wet storage environment. The pool is enclosed in a suitably qualified structure or building. Construction of a wet storage facility involves excavating earth, backfilling, pouring concrete, setting piping, erecting a building around the pool, and installing piping, electrical systems, and heating, ventilating, and air conditioning systems. In many ways, a spent nuclear fuel storage pool is like a swimming pool, except its depth is greater and its concrete walls and floors are much thicker to provide for structural integrity. Wet storage facility designs include sophisticated methods of leak detection. To negate corrosion, the pool water purity and quality are carefully maintained and controlled.

Dry storage technology involves the encapsulation of spent nuclear fuel in a steel cylinder that may be placed in a concrete or massive steel cask or structure. The spent nuclear fuel is stored in racks within the cylinder or suspended from plates placed at variable distances in the cylinder, in either air, or inert atmosphere. Foreign research reactor spent nuclear fuel elements with suspect cladding integrity would be placed in sealed cans before they are placed in the cylinder (canning). Casks or structure materials, usually some form of concrete, steel, iron, or lead provide shielding and heat removal. Spacing, fissile material limits, and neutron absorbing materials are used to prevent criticality. Different forms of dry fuel storage have been used for over 40 years in the nuclear industry. Several nuclear power plants in the United States have licensed, built, and operated dry storage facilities during the last 7 years. NRC has reviewed and approved several manufacturers' designs for dry fuel storage of commercial spent nuclear fuel. Canada has been storing spent commercial nuclear power plant fuel in dry storage casks since 1975. Australia has been successfully storing its research reactor spent nuclear fuel since 1963 (Silver, 1993) in dry environment, and Japan has had 12 years of experience with dry storage of research reactor spent nuclear fuel (Shirai et al., 1991). The Savannah River Site has an ongoing developmental program on dry storage technology which would be used to implement this worldwide experience in the United States, and to finalize design parameters for a foreign research reactor spent nuclear fuel dry storage facility.

Dry storage methods are not as efficient in removing heat from the spent nuclear fuel as wet storage pools. Thus, as explained in Appendix F, this EIS assumes that high decay heat foreign research reactor spent nuclear fuel would initially be placed in wet storage. This would allow sufficient time for the spent nuclear fuel radioactive decay heat to decrease and not be a deciding factor in sizing a dry storage facility.

Dry storage facility construction involves the preparation and pouring of concrete foundations upon which the concrete or metal cask or building is then erected. Metal casks would be built away from the DOE site in a factory, since they involve thick metal fabrication techniques not used at DOE facilities. Concrete casks or buildings are constructed at the site using the same general principles (e.g., forms, rebar) as in nonnuclear concrete construction. Qualified concrete foundation pads are also poured for support bases of the casks.

Whether wet or dry storage were used, the facility would be designed to withstand natural phenomena such as earthquakes, floods, tornadoes, hurricanes, high and low temperatures, and wind generated missiles (branches, poles, etc.). The design would also include provisions to preclude sabotage or terrorist acts. Security requirements for a dry storage facility after the spent nuclear fuel has decayed to low levels of radioactivity and is no longer self-protecting would be met by the establishment of a Perimeter Intrusion Detection and Alarm System zone, which is the standard procedure for DOE. Each design has specific provisions for periodic inspection or surveillance, and must meet the highest quality standards associated with all safety requirements specified for nuclear facilities.

The current alternative types of storage technology are discussed and evaluated in detail in Appendix F. The basic categories are: wet (pool), dry concrete vault or building, dry concrete horizontal cask/module, dry concrete vertical cask/silo, dry metal vertical cask, hot cells, multi-purpose casks, and dry inground vertical holes. There are significant differences between these technologies in terms of construction, operations and maintenance costs and various design details. However, these differences do not result in any important variations in environmental impacts and consequences. With the exception of multi-purpose casks (which are still under development), all of these technologies have proven records of successful safe operation while storing spent nuclear fuel. Appendix F provides detailed descriptions concerning generic dry and wet storage facilities for foreign research reactor spent nuclear fuel. Brief descriptions of both wet and dry storage facilities are provided in the following sections.

2.6.5.1.1 Description of Dry Storage Facilities

Spent Nuclear Fuel Storage Using a Modular Dry Vault:

An aboveground dry vault is a self-contained concrete structure that would allow for dry spent nuclear fuel handling and storage. This design represents an integrated spent nuclear fuel storage approach and would consist of four major components: a receiving/loading/inspection area, spent nuclear fuel storage canisters, a shielded canister handling machine, and a modular array for storing the spent nuclear fuel storage canisters. Figure 2-7 displays an illustration of a typical modular dry vault storage facility. The receiving area would use a wet pool for unloading the casks and for short-term (1 to 3 years) storage of foreign research reactor spent nuclear fuel elements with a heat load exceeding 40 Watts per element. The vault would consist of several modular units, and each unit could provide storage for hundreds of spent nuclear fuel assemblies. The vault itself would contain a charge/discharge bay with a spent nuclear fuel handling machine above a floor containing steel tubes that house the (removable) spent nuclear fuel canisters. The bay would be shielded from the stored spent nuclear fuel by the thick concrete floor and shield plugs inserted into the top of the steel storage tubes. The steel tubes would serve as secondary containment for the foreign research reactor spent nuclear fuel and would descend into an open storage

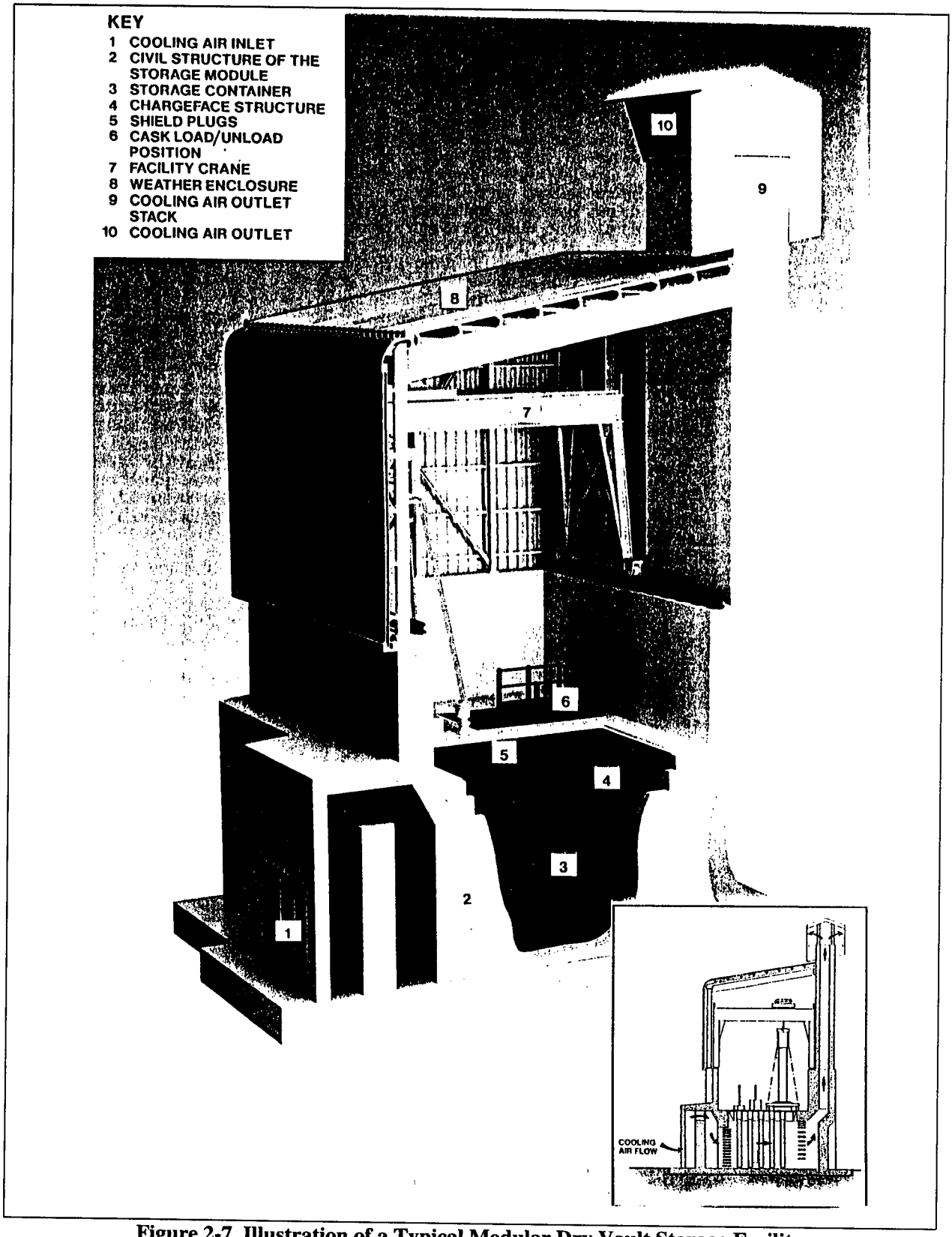


Figure 2-7 Illustration of a Typical Modular Dry Vault Storage Facility

Table 2-8 Summary of Modular Dry Vault Storage Parameters for Foreign Research Reactor Spent Nuclear Fuel[a]

Construction Phase:	
Disturbed Land Area	3.7 ha (9 acres)
Facility: size (area) concrete steel	 5,000 m^2 (54,000 ft^2) 21,800 m^3 (28,500 yd^3) 5,200 metric tons (5,750 tons)
Soil Moved	11,000 m^3 (14,400 yd^3)
Equipment Fuel	835,000 l (221,000 gal)
Construction Debris/Waste	1,800 m^3 (2,400 yd^3)
Work Force	190/yr (average), 234/yr (peak)
Duration (years)	4 years for construction, 1.5 years for design
Capital Cost	$370 million[b]
Operation Phase:	
Electricity	800 - 1,000 MW-hr/yr (staging facility)
Water	2.1 million l/yr (550,000 gal/year) during receipt 0.9 million l/yr (238,000 gal/yr) thereafter
Wastestreams Solid Low-Level Waste Waste Water	 22 m^3/yr (780 ft^3/yr) during receipt 1 m^3/yr (35 ft^3/yr) thereafter 1.59 million l/yr (420,000 gal/yr) during receipt 0.4 million l/yr (109,000 gal/yr) thereafter
Staff (Full-Time Equivalents)	30 during receipt 8 thereafter
Annual Operating Cost	$15.6 million during handling, $0.6 million during storage[b]

[a] *Staging facility parameters are based upon the regionalized, small wet pool (Dahlke, et al., 1994)*

[b] *Cost estimates are in 1993 dollars (EG&G, 1993)*

area. Large, labyrinth air supply ducts and discharge chimneys would permit natural convection cooling of the steel spent nuclear fuel storage tubes, while the perimeter concrete walls would provide for shielding. The design would allow for expansion by adding additional units of arrays to the end of the vault or by construction of another vault. The vault facility would also include a receiving and loading bay that would allow handling of shielded transportation casks and unloading of the foreign research reactor spent nuclear fuel into the short-term wet storage pool. The receiving bay provides for spent nuclear fuel inspection, canning as required and could be used for spent nuclear fuel characterization with additional equipment and modifications. Although it is not expected that the physical condition of the foreign research reactor spent nuclear fuel elements would require extensive canning, the capability of canning the entire foreign research reactor spent nuclear fuel inventory would be provided by the design. Table 2-8 summarizes modular dry vault storage parameters for foreign research reactor spent nuclear fuel storage.

In operation, the transportation cask would be lifted by a crane and placed in the unloading area of the small wet pool. The fuel elements would be removed underwater, examined, and if the heat generation rate is below 40 Watts per element, the spent nuclear fuel would be placed within the transfer canister. The transfer canister would be subsequently drained, dried, and seal-welded. The handling machine then would place the spent nuclear fuel inside of the spent nuclear fuel storage canister, and would transport the loaded canister to the storage tubes. The handling machine would include radiation shielding. Heat dissipation would be accomplished by natural convection from the surfaces of the handling machine and canister. Decay heat would be dissipated by natural convection: air would enter through inlet ducts at the bottom of the vault module, pass around the outside of the steel storage tubes containing the spent nuclear

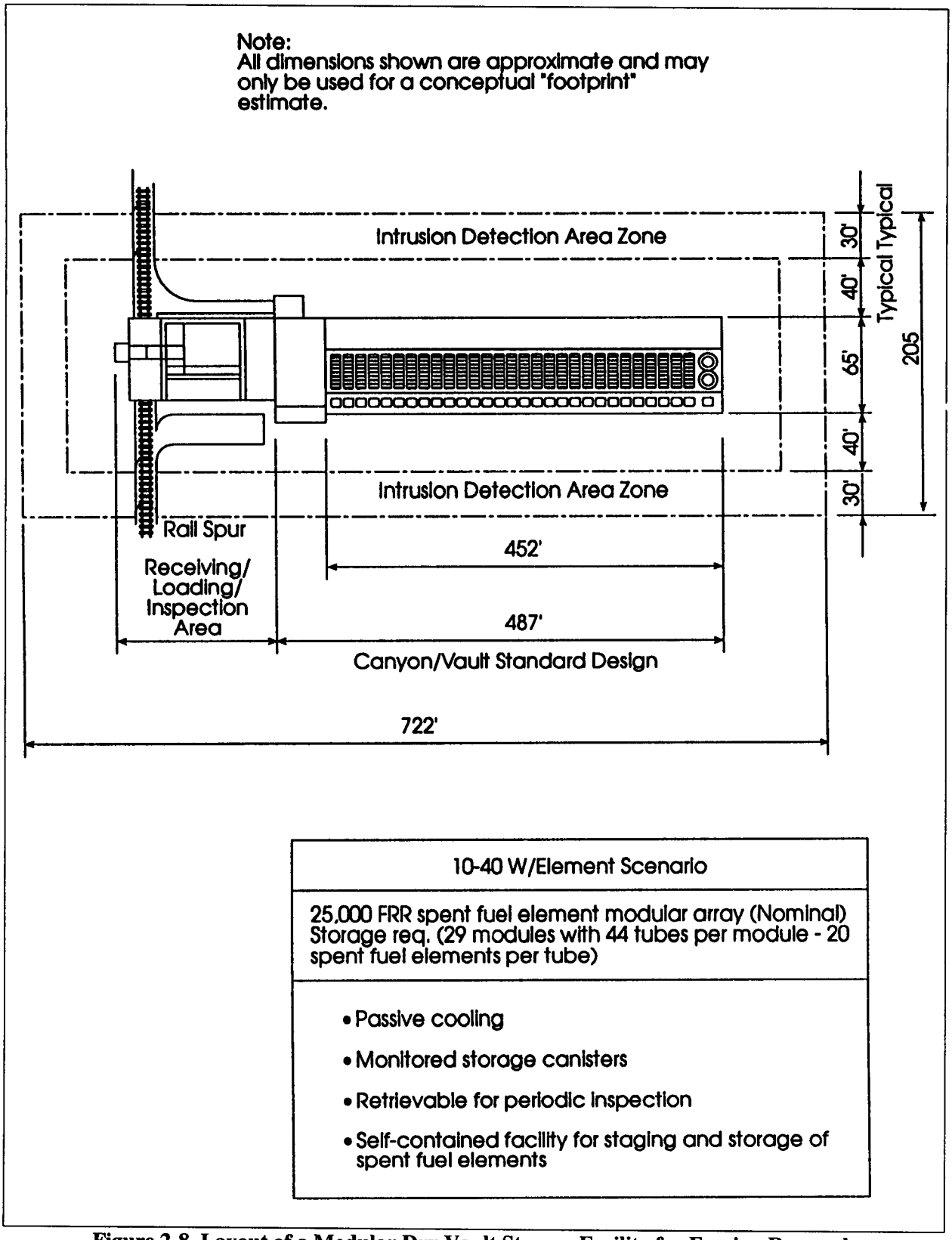


Figure 2-8 Layout of a Modular Dry Vault Storage Facility for Foreign Research Reactor Spent Nuclear Fuel (10 Watt to 40 Watt Element Basis)

fuel canisters, and exit through outlet ducts at the top of the module. Therefore, the vault would be a complete, integrated facility with all of the required capabilities for foreign research reactor spent nuclear fuel handling and storage.

The vault facility would store spent nuclear fuel in canisters that are approximately 40.6 cm (16 in) in diameter by 4.6 m (15 ft) long. As currently envisioned, foreign research reactor spent nuclear fuel would be stored within the canister in 5 levels with 4 elements per level, for a total of 20 spent nuclear fuel elements per canister (MTR-type design). The vault design would allow for 36 to 44 canisters per array unit, depending upon the decay heat of the spent nuclear fuel and a cladding temperature limit nominally 175°C (347°F) for aluminum-cladding with an air inlet temperature of 49°C (120.2°F). Thus, the number of vault units/arrays required for the storage of elements having a decay heat between 10 Watts and 40 Watts per element would be 27.

Most of the foreign research reactor spent nuclear fuel is expected to have decay heats between 10 Watts and 40 Watts per element. For "cold" fuel (less than 10 Watts per element), potentially more than 44 spent nuclear fuel canisters could be placed per vault unit. However, this would require a customized design, which could unnecessarily increase costs and implementation time. Figure 2-8 displays the layout of the modular dry vault storage facility (10 Watt to 40 Watt element basis).

Criticality concerns would be addressed primarily by the tube spacing in the vault. Borated concrete could also be used. For foreign research reactor spent nuclear fuel, criticality would not be expected to be a significant concern because a considerable fraction of the fissile uranium would have been consumed, and neutron-absorbing fission products would be present.

This vault design, without a pool, has been licensed by NRC for the Fort St. Vrain nuclear power plant site. It represents a complete, stand-alone facility that could be dedicated to foreign research reactor spent nuclear fuel without requiring the utilization of any other facilities at the host site. Cask handling, spent nuclear fuel transfer to a canister, and spent nuclear fuel storage could be accomplished within the facility. Additional facilities or modifications to the inspection area, including a pool, would be required for foreign research reactor spent nuclear fuel characterization.

The cost to construct a modular dry vault storage facility with a staging area sufficient to unload, characterize, can, temporarily store in a small pool, and transfer the spent nuclear fuel to the vault storage area is estimated to be $370 million. The annual operating cost for this facility is estimated to be $15.6 million during the period of handling and transfers of the spent nuclear fuel and $0.6 million during the period of storage. The cost estimate for the facility is based on a cost report prepared by Idaho Inc. (EG&G, 1993) with the addition of the cost of a small wet storage facility reported by Dahlke et al. (Dahlke et al., 1994).

Spent Nuclear Fuel Storage Using Dry Casks:

Dry cask storage would include the use of concrete casks, both vertical and horizontal versions, metal casks, and multipurpose casks and would consist of the following components:

- A staging facility for cask receipt and unloading, and for loading foreign research reactor spent nuclear fuel into the dry storage casks. The staging facility would have a wet pool for unloading the casks and for short-term (1 to 3 years) storage of spent nuclear fuel with a heat load exceeding 40 Watts per element. This facility would include capabilities for drying the spent nuclear fuel/canister, inserting the spent nuclear fuel/canister with helium or nitrogen, and welding the storage canister closed.

- An inspection/characterization facility, for examining spent nuclear fuel integrity and canning leaking spent nuclear fuel as required. This may be incorporated into the staging facility (as an inspection cell) or be immediately adjacent to it. Although it is not expected that the physical condition of the foreign research reactor spent nuclear fuel elements would require extensive canning, the capability of canning the entire foreign research reactor spent nuclear fuel inventory would be provided by design.

- A dry storage cask (usually concrete). This would provide for the shielding and the structural stability of the spent nuclear fuel storage. The Multi-purpose Canister undergoing development could also be used (see Appendix F, Section F.1).

- A transfer mechanism, such as a dedicated truck/trailer combination with a ram for horizontal modules or a crane for vertical modules.

- A separate spent nuclear fuel canister may or may not be used. If used, it would typically be approximately 4.6 m (15 ft) long and 1.7 m (5.5 ft) in diameter, and would weigh approximately 33 metric tons (36 tons).

The dry cask approach would require the staging facility to receive and inspect the spent nuclear fuel shipment. The transportation cask would be unloaded in a small wet pool within the facility. Subsequently, spent nuclear fuel would be loaded into the dry cask (or spent nuclear fuel canister for the horizontal cask), and the cask would be placed on a concrete slab located outdoors. The horizontal approach would use a dry spent nuclear fuel transfer canister for containing the spent nuclear fuel. This would be placed within a shielded transfer cask and moved to the outside modular storage facility. A hydraulic ram would insert the transfer canister inside the horizontal storage module, followed by sealing with a shield plug. Thus, dry cask storage would always rely on the use of another facility.

Dry storage casks would be designed to withstand normal loads and design basis accident effects, such as earthquakes, tornadoes, and floods. Concrete would provide radiation shielding for gamma rays and neutrons. Natural air circulation would dissipate the heat; air would enter through inlet vents near the bottom of the cask, pass around the spent nuclear fuel canister, and exit near the top. Screens and grills would keep birds and animals out of the cooling duct area.

Some of the potential management sites have facilities which could be used for cask receipt and unloading and spent nuclear fuel inspection and transfer to storage. Utilization of these facilities would be considered.

The application of dry cask storage technology to foreign research reactor spent nuclear fuel would depend upon the heat load. Horizontal casks are anticipated to be slightly more restrictive than the vertical casks with respect to the heat load and are thus the focus of discussion. The standard design for a horizontal fuel canister would provide for 24 or 52 sleeves (i.e., pressurized water reactor or boiling water reactor spent nuclear fuel, respectively), each about 4.6 m (15 ft) long. As with the vault approach, it would be conservatively assumed that each sleeve contains 5 foreign research reactor spent nuclear fuel elements (i.e., in layers) within a basket or can arrangement for maintaining spacing and retrievability. Also, as with the vault approach, the number of dry storage casks would depend upon the decay heat of the spent nuclear fuel and a cladding temperature limit [nominally, 175°C (347°F) for aluminum-cladding with an air inlet temperature of 49°C (120.2°F)]. The 24-sleeve design would allow for a maximum of 120 elements for foreign research reactor spent nuclear fuel with 40 Watts to 80 Watts per element of

decay heat, while the 52-sleeve design would provide for a minimum of 260 elements per dry storage cask with 10 Watts to 40 Watts per element. Thus, based on the total number of elements for which the facilities are sized, the number of casks required would be:

- ninety-four casks, predicated upon a 3-year cooldown period (i.e., less than 40 Watts per element). Note that this value is conservative and corresponds to a maximum of around 40 percent of the NRC-licensed heat loads per cask. Again, most foreign research reactor spent nuclear fuel is expected to have decay heats between 10 Watts and 40 Watts per element. Initially, foreign research reactor spent nuclear fuel with higher heat loads could be unsuitable for the dry storage cask pending detailed heat transfer analysis and a final determination of limiting fuel storage temperature for aluminum-based and TRIGA-type spent nuclear fuel. However, the relatively high decay heat spent nuclear fuel represents such a small percentage of the currently identified foreign research reactor spent nuclear fuel that its impact would be small, such that after 3 years of wet storage, it would all be below a heat output of 40 Watts per element.

Figure 2-9 displays the general layout for the dry cask storage facility predicated upon a horizontal cask design. Table 2-9 summarizes dry cask storage parameters.

Dry storage cask technology would require a separate staging facility for foreign research reactor spent nuclear fuel unloading, canning, and storage cask loading, and transportation cask maintenance. This facility would have the following operational areas:

- Transportation Cask Handling: this incorporates transportation cask maintenance, truck/railcar unloading, decontamination/washdown, radioactive material control, and cask sampling/flushing/degassing.
- A Small Wet Storage Pool: for fuel transfer and short-term storage.
- Spent Nuclear Fuel Unit Handling: fuel removal, decontamination, fuel drying, fuel canning, inserting with helium, and thermal measurements.
- Spent Nuclear Fuel Unit Transfer: this constitutes placement of the spent nuclear fuel into the cask or canister, followed by sealing.
- Radwaste Treatment: this includes collection, treatment, and preparation for disposal of contaminated effluents, and radioactive waste treatment and solidification.
- Heating, Ventilating, and Air Conditioning: this represents the component of the facility that helps ensure that contamination of workers and the environment is avoided.

The inspection/characterization facility would include a shielded dry hot cell for spent nuclear fuel analysis and examination, and canning of leaking spent nuclear fuel. All equipment and instrumentation within the cells would be remotely operated. The facility would be maintained under negative pressure with exhaust through high-efficiency particulate air filters to mitigate the environmental effects of any radionuclide releases. This facility is normally immediately adjacent to, or within, the staging facility.

Dry cask storage is unique among the three storage technologies because of its ability to be operationally integrated with existing facilities, which allows for faster implementation as compared to the other two storage technologies. Several management sites have facilities with spent nuclear fuel handling capabilities similar to the requirements of the staging facility. Potential examples include the Receiving

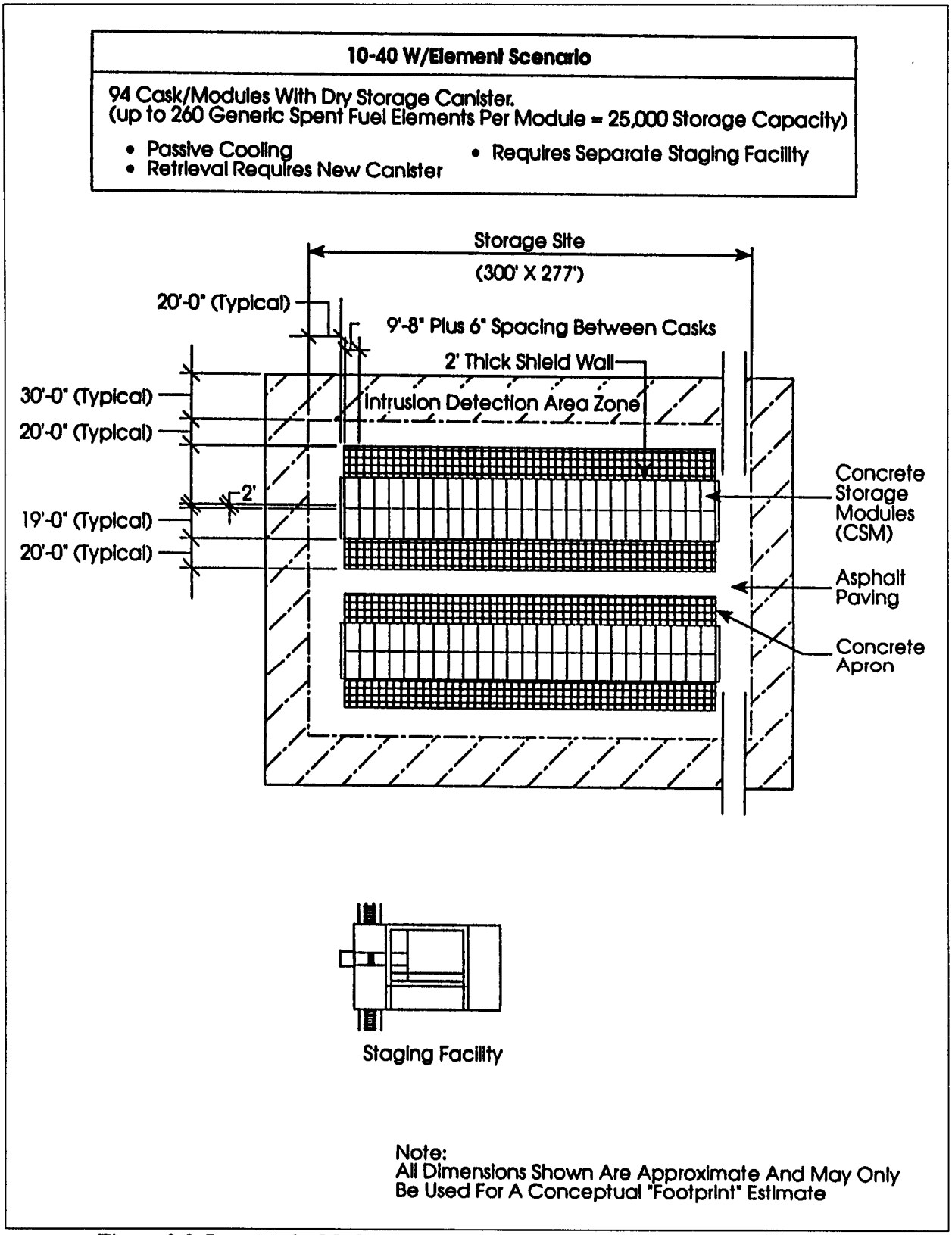


Figure 2-9 Layout of a Modular Dry Cask Storage Facility for Foreign Research Reactor Spent Nuclear Fuel (10 Watt to 40 Watt Element Basis)

Table 2-9 Summary of Dry Cask Storage Parameters for Foreign Research Reactor Spent Nuclear Fuel[a]

Construction Phase:	
Disturbed Land Area	3 ha (7.7 acres)
Facility: size (area) concrete steel	 2,200 m^2 (24,000 ft^2) 17,500 m^3 (22,900 yd^3) 4,500 metric tons (5,000 tons)
Soil Moved	11,000 m^3 (14,400 yd^3)
Equipment Fuel	810,000 l (214,000 gal)
Construction Debris/Waste	1,800 m^3 (2,400 yd^3)
Work Force	50/yr for staging facility 50 per 24 cask array, 1 array per year
Duration (years)	5.5 for staging facility 4 years for construction, 1.5 years for design
Capital Cost	$366 million[b]
Operation Phase:	
Electricity	800 - 1,000 MW-hr/yr (staging facility)
Water	2.1 million l/yr (550,000 gal/year) during receipt 0.9 million l/yr (238,000 gal/yr) thereafter
Wastestreams Solid Low-Level Waste Waste Water	 16 m^3/yr (565 ft^3/yr) during receipt 1 m^3/yr (35 ft^3/yr) thereafter 1.58 million l/yr (412,000 gal/yr) during receipt 0.4 million l/yr (109,000 gal/yr) thereafter
Staff (Full-Time Equivalents)	30 during receipt 8 thereafter
Annual Operating Cost	$17.3 million during handling, $0.3 million during storage[b]

[a] *Staging facility parameters are based upon the regionalized, small wet pool (Dahlke et al., 1994)*

[b] *Cost estimates are in 1993 dollars (EG&G, 1993)*

Basin for Offsite Fuels (RBOF) at the Savannah River Site and the CPP-666 storage pool area at the Idaho National Engineering Laboratory. For dry cask storage, the spent nuclear fuel would be shipped to the existing facility and unloaded from the transportation cask. The spent nuclear fuel would be inspected, canned if identified as a leaking element, and placed inside the storage canister. Spent nuclear fuel elements with heat loads exceeding 40 Watts per element would be stored in the existing facility to allow cooldown prior to cask storage. After filling, the canister would be sealed and placed inside the storage cask. The only new construction required would be the concrete storage pad (for vertical casks) or the concrete storage modules (for horizontal casks).

The cost to construct a dry cask storage facility with a staging area sufficient to unload, characterize, can, temporarily store in a small pool, and transfer the spent nuclear fuel to the cask storage area is estimated to be $366 million. The annual operating cost for this facility is estimated to be $17.3 million during the period of handling and transfers of the spent nuclear fuel and $0.3 million during the period of storage. The cost estimate for the facility is based on a cost report prepared by Idaho Inc. (EG&G, 1993) with the addition of the cost of a small wet storage facility reported by Dahlke et al. (Dahlke et al., 1994).

2.6.5.1.2 Description of Wet Storage Facilities

A wet storage facility consists of a spent nuclear fuel storage area and support areas (Dahlke et al., 1994). The spent nuclear fuel management area would provide for the receipt of cask transport vehicles, cask unloading and decontamination, and spent nuclear fuel handling, transfer, and storage. Support areas would provide for the equipment necessary to maintain and operate the storage area (e.g., heating, ventilating, and air conditioning; water treatment; and waste management). The general layout of a wet storage facility is presented in Figure 2-10. The wet storage facility would be constructed as a safety class structure that meets all current nuclear regulations to withstand natural events such as seismic activity, tornadoes, and floods, as well as aircraft impact. Systems supporting the operation of the spent nuclear fuel management facility would also be required to meet these safety requirements. The facility would be equipped with a 118-metric ton (130-ton) overhead crane and a 9-metric ton (10-ton) spent nuclear fuel handling crane. Figure 2-11 displays a schematic of the facility, and Table 2-10 summarizes wet storage parameters for foreign research reactor spent nuclear fuel handling and storage.

Each cask transport vehicle would enter the facility through one of two bays where it would be monitored and washed to remove transportation dust. When the external surfaces are cleaned, the cask would be placed into a decontamination room where the cask would be prepared as needed to facilitate underwater unloading. The cask would then be placed in an unloading pool. The cask receiving area can accept two simultaneous shipments on 3 m by 24.4 m (10 ft by 80 ft) trucks or railcars, and casks weighing up to 114.3 metric tons (126 tons) each with a total individual cask and transport vehicle weight of 176 metric tons (195 tons). There are two unloading pools [6.1 m long and wide by 11.0 m deep (21 ft long and wide by 36 ft deep) and 6.4 m long by 5.8 m wide by 13.4 m deep (21 ft long by 19 ft wide by 44 ft deep)] and two decontamination rooms. Prior to being placed in one of the two storage pools, each fuel element would be checked to ensure that it is properly configured for direct transfer to the fuel storage pool buckets. If not, it would be transferred to the fuel cutting/canning pool [10.4 m long by 5.8 m wide by 9.4 m deep (34 ft long by 19 ft wide by 31 ft deep)] where it would be prepared for transfer to the storage pool buckets.

If cask measurements indicated that the spent nuclear fuel might be leaking, the spent nuclear fuel would be transferred to the isolation pool [3.7 m long by 3.0 m wide by 9.4 m deep (12 ft long by 10 ft wide by 31 ft deep)] for sipping. Sipping is a methodology for determining leaking spent nuclear fuel. This pool would be equipped so that wet sipping, dry sipping, or vacuum sipping of the suspect spent nuclear fuel element could be performed. An identified leaking spent nuclear fuel element would then be transferred to the cutting/canning pool where it would be canned before transfer to one of the storage pools. If it was not found to be leaking, it would be transferred directly to a storage pool.

All six pools in this facility (two unloading, two storage, one cutting/canning, and one leak check/isolation) would be hydraulically connected by a transfer channel/pool which would be 6.1 m long by 3.3 m wide by 9.4 m deep (20 ft long by 11 ft wide by 31 ft deep). Gates between this transfer channel and each pool would allow for hydraulic watertight isolation of the other pools. All pools and channels would be constructed of concrete with stainless steel floors and liners. Pool water leak detection and collection systems in accordance with NRC Regulatory Guide 1.13 (NRC, 1975) and American National Standards Institute, Standard N305-1975 (ANSI, 1975) would be provided for the pools.

Each of the two storage pools would be 16.5 m long by 10.4 m wide by 9.4 m deep (54 ft long by 34 ft wide by 31 ft deep), and each would contain 40 stainless steel storage racks. This would provide 1,000 storage holes with a 20 cm (8 in) spacing maintained between adjacent holes. The 20 cm (8 in) space provides neutron isolation between adjacent spent nuclear fuel elements, and would ensure criticality safety. Each rack would be 2.0 m square and 3.2 m high (6.7 ft square and 10.5 ft high) and consist of a

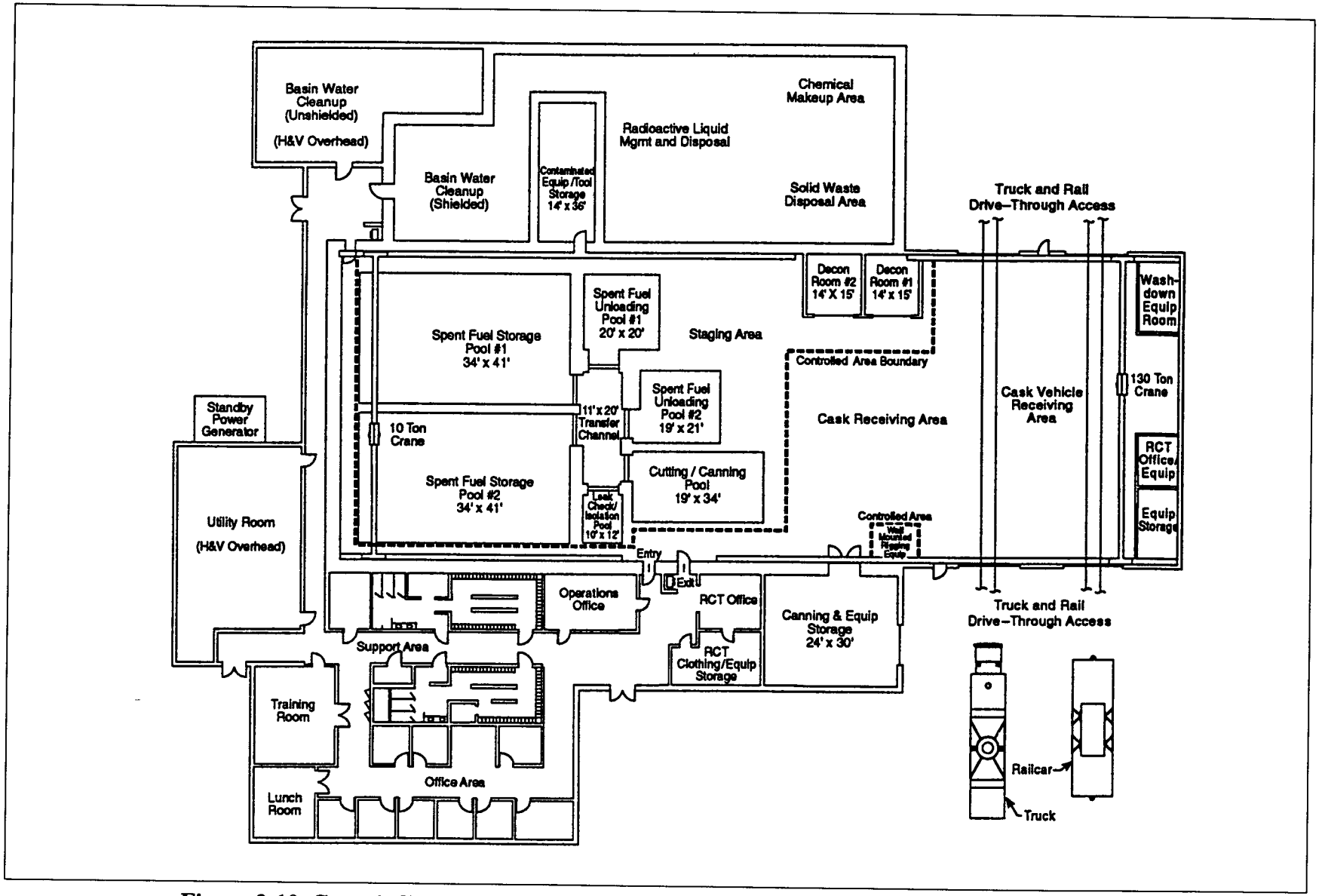


Figure 2-10 Generic Wet Storage Facility for Foreign Research Reactor Spent Nuclear Fuel

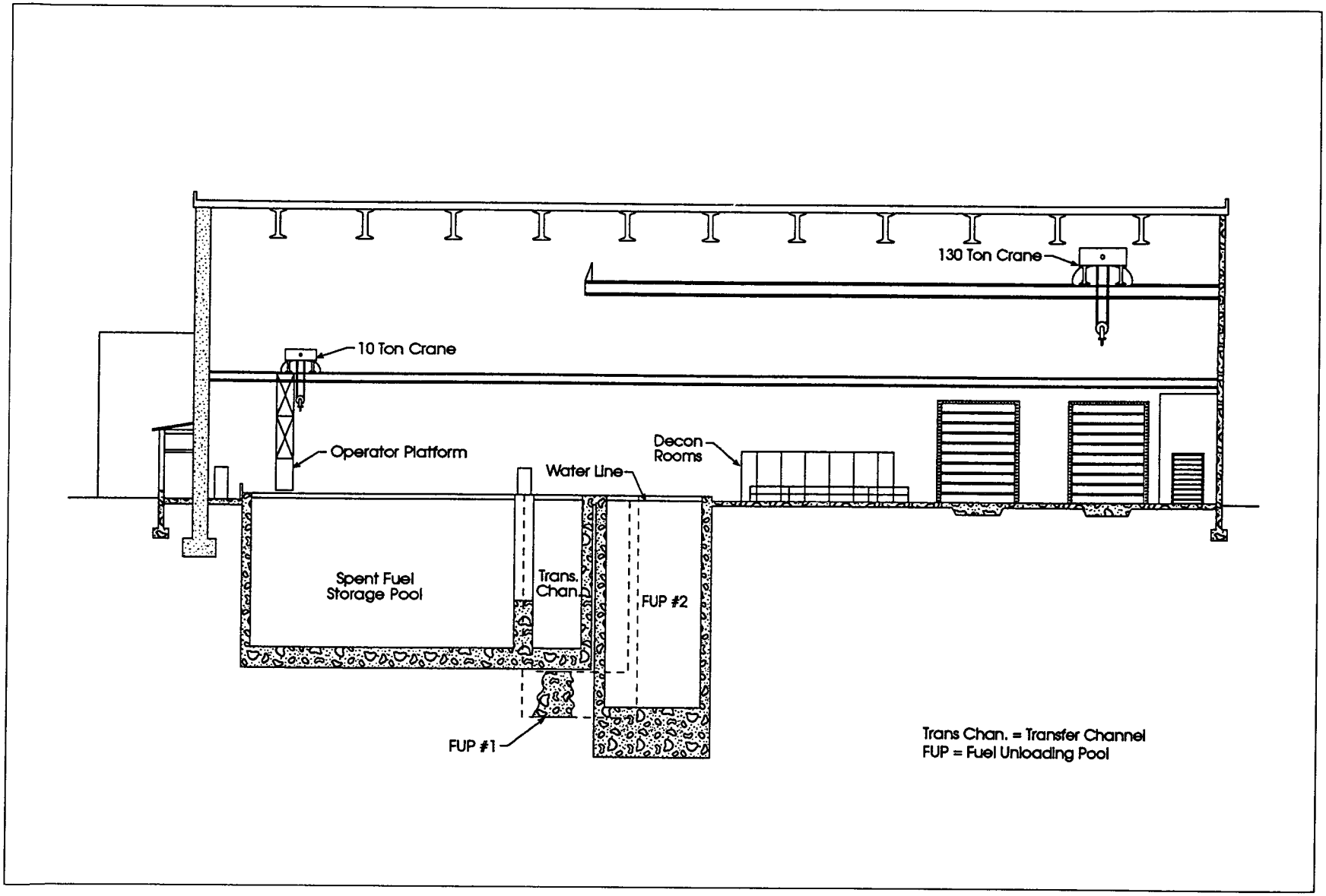


Figure 2-11 Schematic of a Wet Storage Facility for Foreign Research Reactor Spent Nuclear Fuel

Table 2-10 Summary of Wet Storage Parameters for Foreign Research Reactor Spent Nuclear Fuel

Construction Phase:	
Disturbed Land Area	2.8 ha (7 acres)
Facility: size (area) concrete steel	 3,800 m^2 (41,000 ft^2) 12,400 m^3 (16,260 yd^3) 3,100 metric tons (3,443 tons)
Soil Moved	18,000 m^3 (24,000 yd^3)
Equipment Fuel	600,000 l (159,000 gal)
Construction Debris/Waste	2,600 m^3 (10,300 yd^3)
Work Force	157/yr (average), 184 peak
Duration (years)	4 years for construction, 1.5 years for design
Cost	$449 million[a,b]
Operation Phase:	
Electricity	1,000 - 1,500 MW-hr/yr
Water (liters)	2.7 million l/yr (720,000 gal/yr) during receipt 1.5 million l/yr (409,000 gal/yr) thereafter
Waste Streams:	
High-Level Waste	none
TRU	none
Solid Low-Level Waste	16 m^3/yr (580 ft^3/yr)
Waste Water	1.59 million l/yr (420,000 gal/yr) during receipt 0.4 million l/yr (109,000 gal/yr) thereafter
Staff (Full-Time Equivalents)	30
Annual Cost	$23.3 million during handling, $3.5 million during storage[b]

[a] *Cost estimates are in 1993 dollars (EG&G, 1993)*

[b] *The cost may include duplicate facilities and equipment present in both the staging and the rest of the wet storage facility.*

5 by 5 array of 25 spent nuclear fuel positions. A hinged lid would be above each of these spent nuclear fuel positions. Spent nuclear fuel elements would be stored in the racks so that at least 30 cm (12 in) of rack would protrude above the top of the fuel. Each position in the rack can hold up to three storage buckets, which would be stacked vertically on top of each other. The bucket, made up of 3.175 mm (0.125 in) thick stainless steel, would be fitted with ceramic spaces to prevent galvanic corrosion, and could store either two or four spent nuclear fuel elements, depending on the specific fuel design. This would provide a total capacity of approximately 12,000 elements for each storage pool.

The heating, ventilation, and air conditioning system for the wet storage facility would include a room of air supply equipment and a room for air exhaust equipment with separate filtering and monitoring. All exhaust air would be directed through pre-filters, high-efficiency particulate air filters, radiation monitors, filter fire protection components, and heat recovery coils before it would exhaust to the atmosphere.

The wet storage facility's water treatment system would consist of redundant pumps, piping, filters, deionizers and microorganism control systems. A heat removal system would be sized to maintain the bulk water temperature to acceptable levels. The system's filters and deionizers would include anion and cation exchangers that maintain water chemistry and remove radionuclides from the pool water.

The staff required to operate the wet storage facility would be a maximum of 30 when 24-hour-a-day fuel loading was being performed.

No high activity solid radioactive waste would be generated by the wet storage facility (equivalent to Class B or C low-level waste) over the life of the facility. Low-level solid radioactive waste that would be generated over the life of the facility would be about 640 m^3 (22,600 ft^3). Nonradioactive solid waste generated over the facility's life would be about 300 m^3 (10,600 ft^3). All ventilation air would pass through roughing and high-efficiency particulate air filters prior to exhaust. No nonradioactive, hazardous air emissions would be generated by this facility.

The cost to construct a wet storage facility with a staging area sufficient to unload, characterize, can, and transfer the spent nuclear fuel to the storage area is estimated to be $449 million. This cost may include some duplicate facilities and equipment present in both the staging facility and the rest of the wet storage facility which were costed separately. The annual operating cost for this facility is estimated to be $23.3 million during the period of handling the spent nuclear fuel and $3.5 million during the period of storage. The cost estimate for the facility is based on a cost report prepared by Idaho Inc. (EG&G, 1993).

2.6.5.2 Chemical Separation

Chemical separation involves separating the fissile material in the spent nuclear fuel from the other material (i.e., cladding material, fission products, etc.). Uranium and plutonium isotopes constitute the fissile materials; and with foreign research reactor spent nuclear fuel, relatively little plutonium and actinide elements are produced because the ^{238}U precursor is present in relatively small quantities. Waste materials would be mainly fission products (radioactive species such as cesium and strontium) in the form of liquid raffinates, low-level radioactive wastes, mixed radioactive/chemical wastes, waste acids, chelating and complexing agents, and organic solvents. The highly radioactive nature of fission products would require that the chemical separation activities be performed. Plutonium can be handled in facilities without radiation shielding, although these materials would still have to be handled under special procedures and precautions due to their radioactive, fissile nature. The other waste forms would require specialized handling, including volume reduction in some cases, to allow for safe storage and disposal.

Aqueous chemical methods are the only processing method applied on a large scale. All existing plants use an extraction process, which has been used for some 40 years. The spent nuclear fuel is initially dissolved in an acid and contacted with an organic solvent containing an extractant, such as tributylphosphate. The uranium and plutonium form a complex with the tributylphosphate and transfer to the organic phase. The cladding and waste materials remain in the aqueous phase, which is termed high-level waste. The uranium and plutonium are subsequently recovered by contact of the organic phase with weak acidic solutions. Vitrification of the high-level waste is the preferred waste management approach.

As discussed in Section 2.2.2.6 chemical separation is not a preferred technology for managing spent nuclear fuel in the United States.

Processing facilities exist at several DOE and foreign sites. The main domestic facilities are located at the Savannah River Site and Idaho National Engineering Laboratory. The main foreign facilities are in France and the United Kingdom.

Savannah River Site Facilities

At the Savannah River Site, two facilities are available to chemically separate the foreign research reactor spent nuclear fuel. These facilities are the F- and H-Canyons. The F- and H-Canyon facilities are nearly identical structures that use similar radiochemical processes for the separation and recovery of plutonium, neptunium, and uranium isotopes. The F-Canyon primarily recovered ^{239}Pu and ^{238}U from irradiated natural or depleted uranium, and the H-Canyon primarily recovered ^{238}Pu, ^{237}Np, and ^{235}U from irradiated reactor fuels and targets. The following paragraphs apply to both canyons unless noted.

The F- and H-Canyons are reinforced concrete structures, 255 m long by 37 m wide, and 20 m high (836.6 ft by 308 ft by 121.4 ft). They are named for the two areas ("canyons") in each structure that house the large equipment (tanks, process vessels, evaporators, etc.) used in the chemical separations processes performed in each facility. These areas are 170 m long by an average of 6 m narrow and 20 m deep (557.7 ft by 19.7 ft by 65.6 ft). The two canyons are parallel and open from floor to roof. A center section, which has four floors or levels, separates the canyons. The center section contains office space, the control room for all facility operations, chemical feed systems, and support equipment such as ventilation fans. Processing operations involving high radiation levels (dissolution, fission product separation, and high-level radioactive waste evaporation) occur in the "hot" canyon, which has thick concrete walls to shield people outside the facility and in the center section from radiation. The final steps of the chemical separations process, which generally involve lower radiation levels, occur in the "warm" canyon. Figure 2-12 shows the layout of F-Canyon.

Services typical for a large industrial facility are required to support the canyon operations. Such services include steam and cooling water for process vessels and a ventilation system.

A separate ventilation system serves portions of the facility, such as the hot and warm canyons, that contain the radioactive process equipment. This system ensures that the air pressure in such areas is below the pressure of the air outside the facility and the area occupied by workers. This design helps prevent the release of radioactive material outside the facility by ensuring that air always flows from the outside of the facility to the inside of the process areas. Air in the process areas is exhausted from the facility through a large filter that removes 99.5 percent of any airborne radioactive material from the air. A 61-meter-tall (200-ft) stack behind each canyon discharges this air to the atmosphere. This stack is the pathway for airborne emissions associated with the normal operation of the canyons.

Even though DOE has maintained the chemical separation facilities since their construction, they contain equipment and systems that have become degraded because of their age and changes in mission. In some cases the degraded condition of equipment can pose operational limitations. For example, at one time the H-Canyon contained equipment that provided the capability to dissolve not only aluminum-clad reactor fuel but also fuel clad in stainless steel. The electrolytic dissolver used for this purpose is no longer functional and has been abandoned in place.

Because of the ages of the facilities, they do not satisfy all current DOE requirements for the design and construction of nuclear facilities. For example, the canyons and associated B-Line facilities were built (during the Cold War when a primary concern was the potential for an attack) to resist a large external blast. The blast-resistant features of the canyons also make them resistant to such external natural phenomena as tornadoes and earthquakes. However, the canyons were not designed to withstand a severe earthquake (defined as producing a lateral ground acceleration that is 20 percent that of gravity or 0.2 g), as they would be if DOE were to build them today.

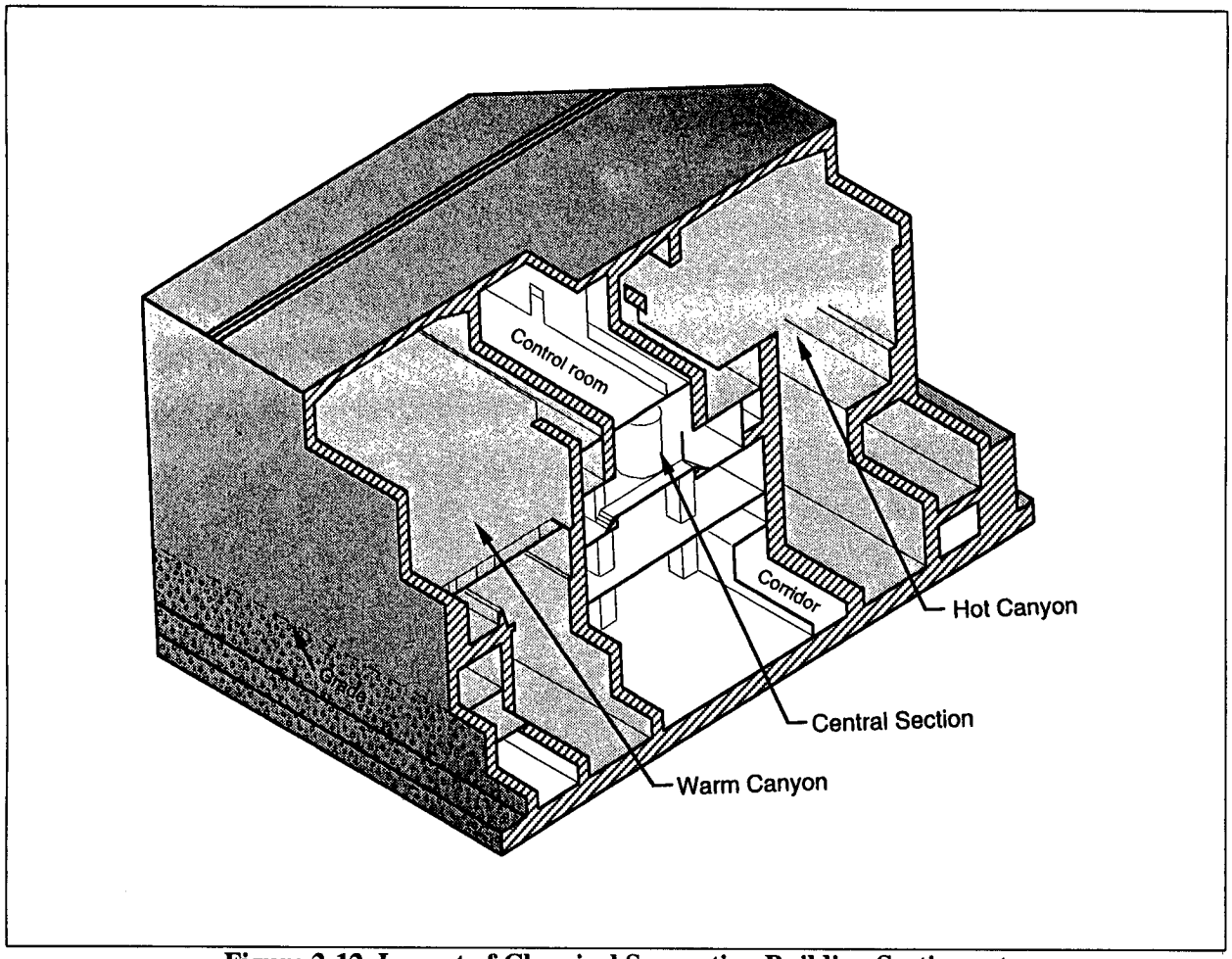


Figure 2-12 Layout of Chemical Separation Building Sections at Savannah River Site

The continued use of these facilities to chemically separate nuclear materials is an important factor for DOE consideration. Because the facilities do not meet current design and construction requirements, a facility-related vulnerability could produce environmental impacts (DOE, 1995a). As discussed above, the canyons would not maintain structural confinement of nuclear materials in a severe earthquake. The estimates of potential environmental consequences from accidents took this acknowledged vulnerability into consideration. If DOE were to design and construct a new facility, there would likely be no environmental consequences from a severe earthquake because a new facility would be designed to withstand such a force.

Similarly, in the Final Interim Management of Nuclear Materials EIS (DOE, 1995a), DOE considered other types of facility vulnerabilities in estimating the potential consequences from accidents. Some examples are (1) a fire that could spread in a facility until it breached containers of nuclear material due to a lack of detection or extinguisher systems, (2) systems that cool nuclear materials stored in tanks that could leak and transfer such material outside the facility before detection, or (3) piping configurations in the canyons that personnel could use inadvertently to transfer solutions of nuclear material to an outside facility tank where they could overflow or spill.

DOE has conducted many reviews to evaluate facility vulnerabilities and has assessed its facilities for compliance with current requirements. DOE has also analyzed the effect on workers and the public from normal and potential accident conditions which could result from operation of facilities with these vulnerabilities. The analysis work was accomplished as a part of ongoing safety review programs and is separate from the NEPA process. Such impact information is represented in the Final Interim Management of Nuclear Materials EIS and in this EIS. The analysis of impacts has, in some cases, prompted DOE to take corrective action based on potential impact alone. For example, DOE has disconnected some tanks of radioactive solutions in the canyons from the canyon cooling system and has isolated canyon tanks by removing interconnected piping to preclude leaks or an inadvertent transfer which could result in a release of radioactive material outside the canyon. In other cases, the potential impact was determined to be small and not sufficient to warrant actions beyond those which could be taken using existing facilities, equipment, and personnel. For example, one vulnerability common to many facilities is that the facility could sustain structural damage in the event of a severe earthquake. This type of earthquake has been estimated to occur once every several thousand years. It would be prohibitively expensive to modify facilities to ensure that no structural damage would occur from such an accident. Rather, DOE has provided mitigation for the consequences of such accidents using engineering safeguards, such as structurally reinforcing tanks, and administrative controls, such as limiting the amount of radioactive material that can be contained in a facility.

H-Canyon Process

The H-Canyon utilized a modified plutonium uranium extraction process (HM process). The HM process unit operations were dissolution, head end, first solvent extraction cycle, second uranium solvent extraction cycle, and second neptunium (or second actinide) solvent extraction cycle. Figure 2-13 shows the historic general H-Canyon process flow.

- Dissolution - Irradiated foreign research reactor spent nuclear fuel was brought into the hot canyon in water-filled casks and through an air lock by railcar. The spent nuclear fuel consists of HEU and LEU aluminum-based irradiated fuel. The spent nuclear fuel was removed from the casks and loaded into a dissolver tank. Heated nitric acid in the tank dissolved the foreign research reactor spent nuclear fuel, resulting in a solution containing enriched uranium, ^{237}Np, small quantities of plutonium, and fission products from the reactor irradiation process, and the cladding material. ^{237}Np should be insignificant in the chemical separation of foreign research reactor spent nuclear fuel.

- Head End - The head end process prepared the target solution for uranium, plutonium, and neptunium separation. First, gelatin was added to precipitate silica and other solid impurities. Then the solution was transferred to a centrifuge, where silica and other impurities were removed as waste, and the clarified product solution was adjusted with nitric acid and water. The wastestream generated from the head-end process was chemically neutralized and sent to high-level waste tanks.

- First Cycle - First cycle operation removed fission products and other chemical impurities, and separated the solution into two product streams for further processing. The chemical properties of acid/solvent/product solutions in contact with each other caused the fission products, the uranium, and the neptunium to separate from the solution containing plutonium.

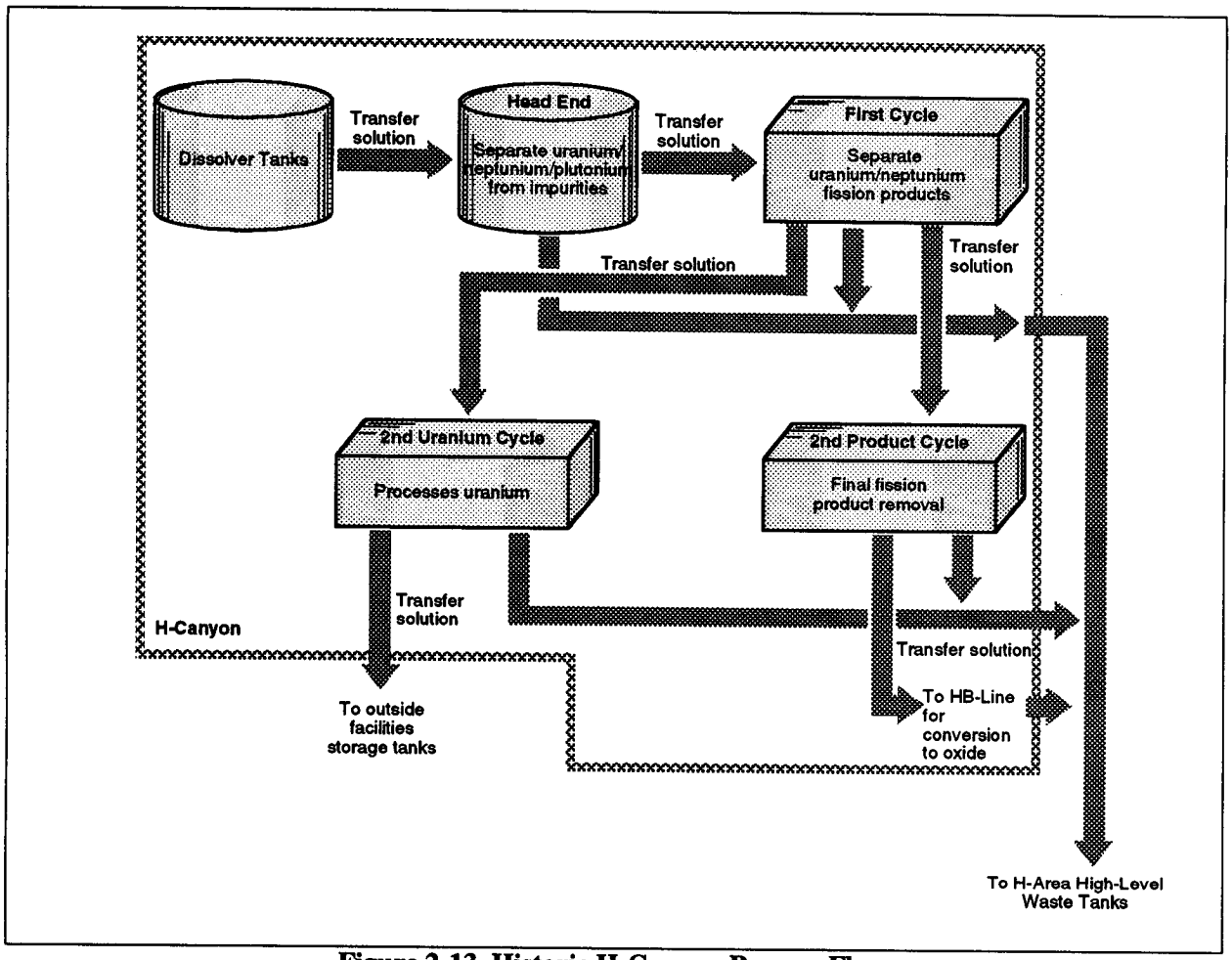


Figure 2-13 Historic H-Canyon Process Flow

- Second Uranium Cycle - The second uranium cycle purified the uranium solution from the first cycle and prepared the uranium for transfer. The purification occurred in a manner similar to that described for the first cycle. The ^{235}U product solution was transferred to storage tanks.

- Second Product Cycle - The second product cycle purified the neptunium solution from the first cycle by removing residual fission products, and prepare the neptunium for transfer. The process occurred in a manner similar to that for the first cycle. The impurities were removed and sent to the low-activity waste unit operation for processing. This cycle would probably be bypassed in the chemical separation of foreign research reactor spent nuclear fuel. Trace neptunium would be discarded as waste.

- High- and Low-Activity Waste - These unit operations reduced the volume of the aqueous streams containing fission products. The streams originate from the separation process unit operations, such as the first cycle. The fission product streams were then separated and sent to high-level waste tanks.

- Solvent Recovery - The primary purpose of this unit operation was to recover and recycle the solvent used in the first cycle. This operation reconditioned and removed impurities from the solvent. The purified solvent was returned to the first and second cycle, cycle reuse and the impurities were transferred to low-activity waste for processing.

F-Canyon Process

The Plutonium Uranium Extraction process at the F-Canyon includes unit operations such as dissolution, head end, first cycle, second uranium cycle, and second plutonium cycle. Unit operations that support the product recovery process were high-activity waste, low-activity waste, and solvent recovery. These were similar to those described for the HM process at H-Canyon with the exception of the Plutonium Uranium Extraction process. In the Plutonium Uranium Extraction process, the second plutonium cycle was equivalent to the second product cycle in the HM process.

Idaho National Engineering Laboratory Facilities

The Idaho Chemical Processing Plant (ICPP) facilities would use a Uranium Extraction process to chemically separate the foreign research reactor spent nuclear fuel for recovery of uranium, and isolation and solidification of the waste fission products resulting from the process. The principal facilities for foreign research reactor spent nuclear fuel chemical separation would be CPP-601, CPP-666, and CPP-602.

Foreign research reactor spent nuclear fuel would be received at the ICPP by truck or rail shipment. Both water-cooled and dry storage facilities would be used. Head-end equipment for initially dissolving or processing the spent nuclear fuel would be available. Aluminum-based clad fuel chemical separation could be conducted in CPP-601. TRIGA-type fuels would be processed in the Fluorinel Dissolution Process in CPP-666. The Fluorinel Dissolution Process cell could require some equipment modifications and additions to accommodate stainless steel-clad dissolution of the TRIGA fuel. However, the process knowledge and equipment is readily available. A new processing facility for uranium fuels is partially completed at the ICPP site. This facility, the Fuel Processing Restoration, is structurally complete but would require completion of services and installation of equipment for foreign research reactor spent nuclear fuel chemical separation.

The high-level liquid waste generated at ICPP during chemical separation of the spent nuclear fuel assemblies would be stored in several large stainless steel underground tanks until it could be processed. Liquid wastes would be converted to a solid calcine form, and then stored dry in bins housed in concrete vaults.

Aluminum and zircaloy fuel processing at ICPP consists of three principal stages. The first is the dissolution stage where fuels were dissolved forming a controlled solution. The second stage is the extraction process, which consists of first, second, and third extraction cycles. These cycles serve to separate and purify the uranium from fission products and material wastes prior to final operations. In the final operation, the solution is fed through a denitrator that conditions the feed material to a solid uranium product that can be packaged, transported, and recycled.

Foreign Reprocessing Facilities

Both France and the United Kingdom have modern fuel cycle facilities and offer reprocessing services to international customers. Either country could sign contracts with foreign research reactor owners/operators for receipt and reprocessing of their spent nuclear fuel, treatment of the waste, and fabrication of fresh fuel. Both France and the United Kingdom would require the country operating the reactor to take back the treated waste.

The French UP1 plant at Marcoule has reprocessed a variety of nuclear fuels, including gas/graphite power reactor fuel and magnesium-clad natural uranium metal fuel. The UP2 plant at La Hague is nearing completion of major renovations that will double its throughput and make it dedicated to oxide fuels. The UP3 plant, also at La Hague, is the newest French reprocessing plant. It started operations in 1990 and is also dedicated to oxide fuels. The French are vigorously engaged in reprocessing commercial power reactor fuel for foreign customers.

The British Prototype Fast Reactor Reprocessing Plant at Dounreay is a small plant associated with the Prototype Fast Reactor. However, it has established a precedent by receiving some research reactor spent nuclear fuel for reprocessing. The Magnox Fuel Reprocessing Plant at Sellafield reprocesses magnesium-clad uranium metal fuel from British gas-cooled reactors. The Thermal Oxide Reprocessing Plant (Thorp) is another large plant at Sellafield for Advanced Gas Reactor and light water reactor fuels. It started operating in January of 1994 and about two-thirds of its scheduled business through 2004 is for foreign customers.

2.6.5.3 Site Management Options

2.6.5.3.1 The Savannah River Site

Only two possible management sites, the Savannah River Site and the Idaho National Engineering Laboratory, would be capable of receiving and managing foreign research reactor spent nuclear fuel at the beginning of the proposed policy implementation period as described in Management Alternative 1.

If the Savannah River Site is the site for managing all DOE-owned spent nuclear fuel, foreign research reactor spent nuclear fuel would be received and managed there until ultimate disposition. If the Savannah River Site is not the site, foreign research reactor spent nuclear fuel could be received and managed at the Savannah River Site until another site(s) would be ready to receive the foreign research reactor spent nuclear fuel. The construction of new facilities for managing foreign research reactor spent nuclear fuel is estimated to take about 10 years; modifications to existing facilities could take less. For the purposes of the analyses, the period for Phase 1 is assumed to be 10 years. The period following Phase 1 until ultimate disposition is referred to as Phase 2 (approximately 30 years). The amount of spent nuclear fuel that could be received at the Savannah River Site under the basic implementation of Management Alternative 1 is dictated by the distribution considered in the Programmatic SNF&INEL Final EIS (DOE, 1995c) and discussed in Section 2.6.4.1. Accordingly, the Savannah River Site could receive one-half of the foreign research reactor spent nuclear fuel under the Decentralization and the 1992/1993 Planning Basis alternatives, all of the aluminum-based foreign research reactor spent nuclear fuel under the Regionalization by Fuel Type alternative, only the foreign research reactor spent nuclear fuel from Eastern ports under the Regionalization By Geography alternative, or all foreign research reactor spent nuclear fuel (both aluminum-based and TRIGA) under the Centralization alternative.

As a potential Phase 1 site under Management Alternative 1, the Savannah River Site would receive and manage foreign research reactor spent nuclear fuel at its existing wet storage facilities: RBOF and L-Reactor disassembly basin are considered for this purpose. RBOF is located at the H-Area. It is a facility with provisions for the receipt and storage of irradiated nuclear fuel elements. Since 1963, irradiated spent nuclear fuel elements have been received from offsite reactors and from the Savannah River Site reactors. RBOF provides the capability for underwater unloading of the transportation casks and the handling and storage of the foreign research reactor spent nuclear fuel. The foreign research reactor spent nuclear fuel would be stored in RBOF until the storage capacity is exhausted. Currently, RBOF has space for approximately 1,170 foreign research reactor spent nuclear fuel elements. This capacity could be increased to a total of 2,425 elements by rearranging and consolidating existing inventory. Descriptions of RBOF, the Savannah River Site reactor disassembly basins, and dry cask storage are provided in Appendix F, Section F.3.

The Savannah River Site reactor disassembly basins are not currently configured for storage of MTR type foreign research reactor spent nuclear fuel, however, minor modifications which would provide new storage racks, new handling equipment, safety documentation, etc., along with upgrades in progress to address vulnerabilities associated with water chemistry control, would permit receipt and management of foreign research reactor spent nuclear fuel. Installation of racks equivalent to those in RBOF would provide storage for approximately 20,000 foreign research reactor spent nuclear fuel elements per reactor basin. DOE is considering the L-Reactor disassembly basin for this purpose in this EIS. The modifications to RBOF and L-Reactor disassembly basin are part of the ongoing programs at the site to be performed independent of the proposed action in this EIS.

Between RBOF and the L-Reactor disassembly basin there would be sufficient storage capacity and handling capability to accommodate the receipt and management of foreign research reactor spent nuclear fuel during the estimated 10-year time period for Phase 1.

An additional option to enhance storage capacity during Phase 1 would be to use the existing facilities of RBOF and/or L-Reactor disassembly basin to unload the transportation casks, and provide storage capacity in dry storage casks which would be placed near the existing facility. The storage capacity available and estimated maximum receipt rate of foreign research reactor spent nuclear fuel at the Savannah River Site are shown in Figure F-16 of Appendix F.

As a Phase 2 site, the Savannah River Site would continue to receive foreign research reactor spent nuclear fuel beyond Phase 1 in a new dry storage facility that would be constructed at the H-Area. The location is preferred among a number of sites considered as discussed in Section F.4.1. Foreign research reactor spent nuclear fuel managed during Phase 1 would be transferred to the new facility for management during Phase 2 (approximately 30 years), until ultimate disposition. The dry storage would encompass a number of design examples which were provided in Section 2.6.5.1.1 and Appendix F. Figure 2-14 depicts the facilities and locations considered at the Savannah River Site.

The analysis of environmental impacts from management of foreign research reactor spent nuclear fuel at the Savannah River Site is based on the above considerations. The analysis options selected do not represent all possible combinations, but a reasonable set which provides a typical, and in many cases, bounding estimate of the resulting impacts.

The specific analysis options under the basic implementation of Management Alternative 1, discussed in Section 2.2.1, are as follows:

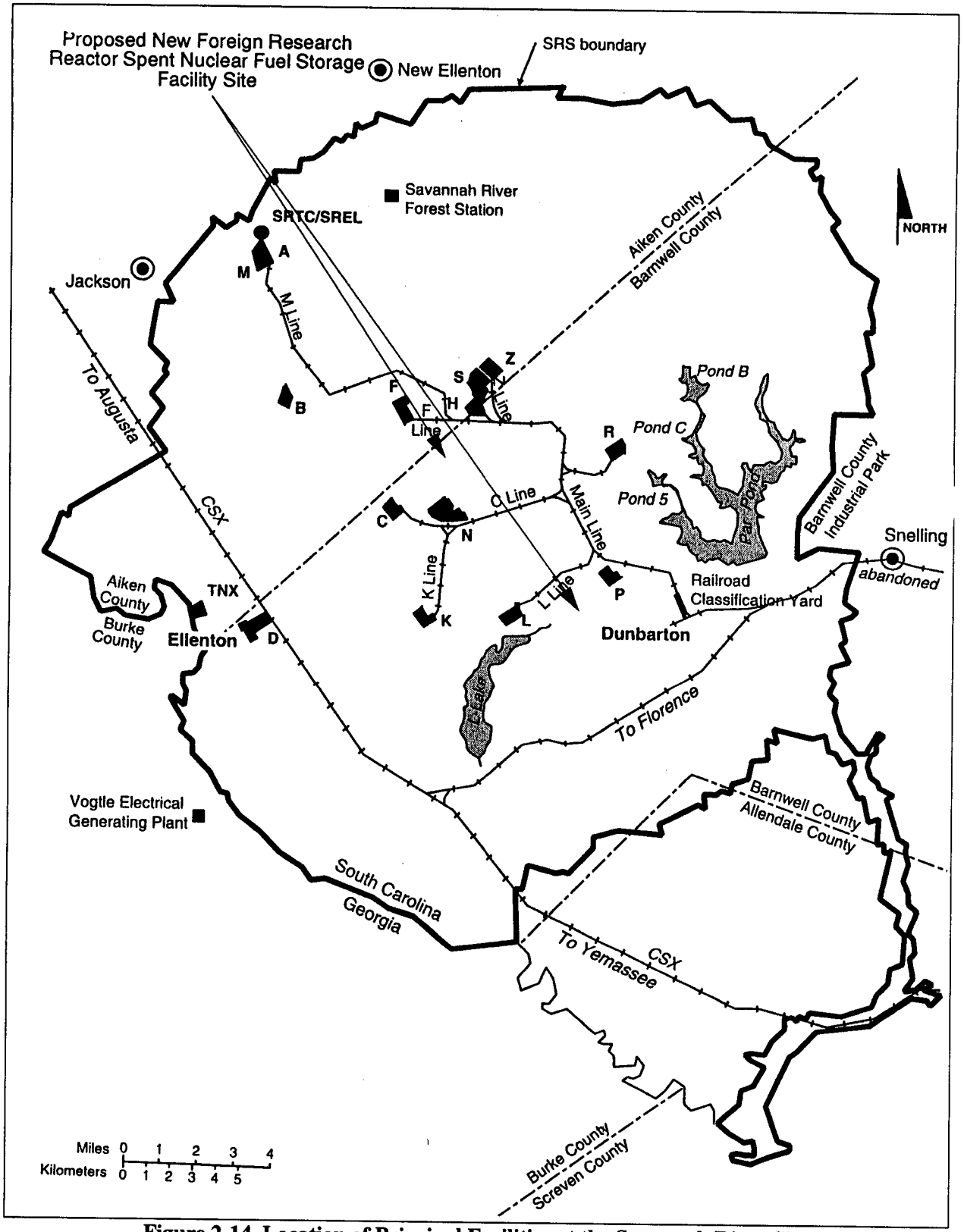


Figure 2-14 Location of Principal Facilities at the Savannah River Site

1A. The Savannah River Site would receive and manage foreign research reactor spent nuclear fuel during Phase 1 and store it at the RBOF and/or the L-Reactor disassembly basin. For the purpose of the analysis, the amount of fuel to be managed is all foreign research reactor spent nuclear fuel that would be received in a 10-year period (17,500 elements). The fuel would be shipped offsite at the end of Phase 1.

1B. Foreign research reactor spent nuclear fuel managed under analysis option 1A would be transferred to a newly constructed dry storage facility, where it would be managed until ultimate disposition. Spent nuclear fuel arriving in the United States after Phase 1 concludes would be received and managed at the new dry storage facility. For the purpose of the analysis, the amount of spent nuclear fuel that would be managed would be all the foreign research reactor spent nuclear fuel (22,700 elements).

The implementation alternatives of Management Alternative 1, discussed in Section 2.2.2, introduce additional analysis options that could be considered for the Savannah River Site as follows:

- Under Implementation Subalternative 1a (Section 2.2.2.1), the amount of fuel to be received in the United States would be reduced to 5,000 elements. In this case, the Savannah River Site would be likely to receive and manage foreign research reactor spent nuclear fuel in existing facilities during the Phase 1 period. The impacts would be bounded by analysis option 1A (above). Impacts of construction and operation of the dry storage facility considered in analysis option 1B would bound those of the facility required to accommodate this amount of fuel. The spent nuclear fuel would either be shipped offsite after Phase 1, or it would be managed along with the rest of the spent nuclear fuel that would be managed at the Savannah River Site.

- Under Implementation Subalternative 1b (Section 2.2.2.1), the Savannah River Site would receive only HEU from the foreign research reactors eligible under the policy. The amount of HEU would be approximately 4.6 MTHM, representing 11,200 elements. The impacts from the management of this amount of fuel at the Savannah River Site would be bounded by analysis options 1A and 1B above.

- Under Implementation Subalternative 1c (Section 2.2.2.1), the Savannah River Site would receive target material in addition to the foreign research reactor spent nuclear fuel considered under the basic implementation of Management Alternative 1. The receipt and management of this material, which, in uranium content, represents approximately 620 typical foreign research reactor spent nuclear fuel elements, would increase the impacts of analysis options 1A or 1B (above) by a small percentage.

- Under Implementation Subalternative 2a (Section 2.2.2.2), the duration of the policy would be decreased to 5 years; and, therefore, the amount of spent nuclear fuel available for management would also be decreased. The impacts from the management of the decreased amount of spent nuclear fuel at the Savannah River Site would be bounded by analysis options 1A or 1B above.

- Under Implementation Subalternative 2b, (Section 2.2.2.2) the acceptance of a small portion of the spent nuclear fuel would be extended over an indefinite period of time, but the amount of spent nuclear fuel to be received and managed would remain constant. The impacts would be the same as in analysis options 1A or 1B.

- Under Implementation Alternative 3 (Section 2.2.2.3), DOE and the Department of State would consider alternative financial arrangements. These arrangements would affect the amount of spent nuclear fuel that would be managed in the United States because the foreign research reactors would consider their own alternatives as to whether or not to send the spent nuclear fuel to the United States. The amount of foreign research reactor spent nuclear fuel in this case cannot be quantified. The upper limit, however, is considered under analysis options 1A and 1B (above), which would be bounding.

- Under Implementation Alternative 4 (Section 2.2.2.4), DOE and the Department of State would consider alternatives for the location where title of foreign research reactor spent nuclear fuel would be taken. The choices do not affect the management options at the Savannah River Site.

- Under Implementation Alternative 5 (Section 2.2.2.5), DOE would consider wet storage technology for Phase 2 management. DOE would implement this alternative by constructing a new wet storage facility at the H-Area or by using the Barnwell Nuclear Fuels Plant (BNFP), owned by Allied General Nuclear Services. DOE would have to acquire the facility which could be ready for use in approximately 5 years. Therefore, if the Savannah River Site was a selected site under either the Regionalization by Fuel Type or Centralization alternatives, Phase 2 at the Savannah River Site could start as early as 5 years from the start of the implementation period if BNFP were used under this implementation alternative. The new wet storage facility is described in Section 2.6.5.1.2. BNFP is described in Appendix F, Section F.1. For this implementation alternative, an analysis option 1C is considered, which is similar to 1B, as follows:

1C. The spent nuclear fuel managed under analysis option 1A would be transferred to a newly constructed wet storage facility or the BNFP where it would be managed until ultimate disposition. Spent nuclear fuel arriving in the United States after Phase 1 concludes (i.e., during Phase 2) would be received and managed at these facilities. For the purpose of the analysis, the amount of spent nuclear fuel that would be managed in these facilities would be all the foreign research reactor spent nuclear fuel (22,700 elements).

- Under Implementation Alternative 6 (Section 2.2.2.6), DOE and the Department of State would consider chemical separation of foreign research reactor spent nuclear fuel in the United States. As noted in Section 2.3.6, the Savannah River Site is limited to chemical separation of aluminum-based foreign research reactor spent nuclear fuel.

Under Management Alternative 2, discussed in Section 2.3, DOE and the Department of State would assess the management of foreign research reactor spent nuclear fuel in a foreign location which would include an evaluation of foreign reprocessing with acceptance by the United States of the vitrified high-level waste resulting from reprocessing. The waste would be received and managed at the Defense Waste Processing Facility at the Savannah River Site. DOE and the Department of State estimate that the total volume of the vitrified high-level waste would be about 2.4 m^3 (85 ft^3) and it would fill about 16 European-size canisters. A European-sized canister is about four times smaller than the canister used in the Defense Waste Process Facility at the Savannah River Site. Some modification to the waste handling facility at the Savannah River Site would be necessary to accommodate the smaller canisters.

Under Management Alternative 3 (Hybrid Alternative) discussed in Section 2.4, the Savannah River Site would receive the aluminum-based fuel which would not be reprocessed overseas. This spent nuclear fuel would be processed at the Savannah River Site chemical separation facilities in the same manner as

Implementation Alternative 6 above. The amount of aluminum-based spent nuclear fuel to be chemically separated would be approximately 12,200 elements, 12.9 MTHM, 72 m^3 (2,700 ft^3) as indicated in Table 2-4.

Table 2-11 presents an overview of the foreign research reactor spent nuclear fuel management options, quantities of foreign research reactor spent nuclear fuel assumed for the analysis, and facilities considered.

Table 2-11 Proposed Quantities of Foreign Research Reactor Spent Nuclear Fuel and Management Options at the Savannah River Site

FRR EIS Management Alternative / *Management Alternative 1*		*FRR SNF Elements*	*Percentage of FRR SNF Total Elements*	*Storage Option/Technology*					
				Dry Storage	*Wet Storage*			*Existing Facilities Plus Dry Cask*[c]	*Chemical Separation*
				New	*Existing*[a]	*BNFP*[b]	*New*		
All FRR SNF	Phase 1	17,500	77%	NA	A	NA	NA	A	NA
	Phase 2[d]	22,700	100%	A	NA	A	A	NA	NA
Eastern FRR SNF	Phase 1	12,600	56%	NA	A	NA	NA	A	NA
	Phase 2	16,400	72%	A	NA	A	A	NA	NA
Aluminum-based FRR SNF	Phase 1	13,600	60%	NA	A	NA	NA	A	NA
	Phase 2	17,800	78%	A	NA	A	A	NA	NA
Chemical Separation/Storage	Phase 2	17,800	78%	NA	A	NA	NA	A	A
Management Alternative 3									
Aluminum-Based FRR SNF Chemical Separation/Storage		12,300	54%	NA	A	NA	NA	A	A

A = Applicable
NA = Not Applicable
FRR = foreign research reactor
SNF = spent nuclear fuel

[a] *RBOF and L-Reactor basin*

[b] *BNFP could be available for use 5 years after the start of implementation.*

[c] *Dry cask storage would use an existing facility for loading operations.*

[d] *Phase 2 values represent total number of foreign research reactor spent nuclear fuel elements requiring management at the site.*

2.6.5.3.2 Idaho National Engineering Laboratory

Only two possible management sites, the Savannah River Site and the Idaho National Engineering Laboratory, would be capable of receiving and managing foreign research reactor spent nuclear fuel at the beginning of the proposed policy implementation period.

If the Idaho National Engineering Laboratory is the site for managing all DOE-owned spent nuclear fuel, foreign research reactor spent nuclear fuel would be received and managed there until ultimate disposition. If the Idaho National Engineering Laboratory is not the site, foreign research reactor spent nuclear fuel could be received and managed at the Idaho National Engineering Laboratory until another site(s) would be ready to receive the foreign research reactor spent nuclear fuel. The construction of new facilities for managing foreign research reactor spent nuclear fuel is estimated to take about 10 years; this period is referred to as Phase 1. The period following Phase 1 until ultimate disposition is referred to as Phase 2 (approximately 30 years). The amount of spent nuclear fuel that could be received at the Idaho National Engineering Laboratory under the basic implementation of Management Alternative 1 is dictated by the

distribution considered in the Programmatic SNF&INEL Final EIS (DOE, 1995c). Accordingly, the Idaho National Engineering Laboratory could receive one-half of the foreign research reactor spent nuclear fuel under the Decentralization and the 1992/1993 Planning Basis alternatives, all of the TRIGA-type foreign research reactor spent nuclear fuel under the Regionalization by Fuel Type alternative, only the foreign research reactor spent nuclear fuel from Western ports under the Regionalization By Geography alternative, or all foreign research reactor spent nuclear fuel under the Centralization alternative.

As a potential Phase 1 site, the Idaho National Engineering Laboratory would receive and manage foreign research reactor spent nuclear fuel at existing dry and wet storage facilities. The existing facilities identified for this purpose would be the Fluorinel Dissolution and Fuel Storage (FAST) facility in CPP-666, the Irradiated Fuel Storage Facility (IFSF) in CPP-603, and the CPP-749 storage area. Descriptions of these facilities are provided in Appendix F, Section F.3.

The FAST facility is a modern underwater storage facility which has been used in the past for receipt and storage of foreign research reactor spent nuclear fuel. It has the capability to receive and unload spent nuclear fuel casks at a rate of approximately five per week. Storage capacity for up to 8,400 foreign research reactor spent nuclear fuel elements could be provided in a 10-year period by using the spent nuclear fuel storage racks that would be installed. The capability of the FAST facility to receive foreign research reactor spent nuclear fuel in the near term is limited due to the number of activities scheduled through FY 1998. Considering these activities, DOE estimates that 3,600 elements could be received by the end of 1999 at the FAST facility.

The IFSF is a shielded dry storage vault originally constructed for Fort St. Vrain reactor fuel. The storage capacity available is for approximately 9,000 foreign research reactor spent nuclear fuel elements. However, as with the FAST facility, many activities are already scheduled for the facility. Considering these activities, foreign research reactor spent nuclear fuel could not be received until sometime in FY 1997 and could continue at the rate of 50 shipments per year (approximately 1,500 elements) thereafter.

The CPP-749 underground spent nuclear fuel storage area is a dry storage facility with a remote unloading area and vault storage. With some refurbishment it could provide space for 3,600 elements starting in FY 1998. The spent nuclear fuel would go through the IFSF to be placed in baskets and transferred to a compatible storage cask. The refurbishments of existing facilities are part of the ongoing programs at the site, to be performed independent of the proposed action in this EIS.

Between these facilities there is sufficient storage space and handling capacity to accommodate the receipt and management of foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory during the Phase 1 period. The storage capacity available and estimated maximum receipt rate of foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory are shown in Figure F-18 of Appendix F.

An additional option to enhance storage capacity during Phase 1 would be to use the existing facilities to unload the transportation casks, and provide storage capacity in dry storage casks which would be placed near the existing facility. Descriptions of the Idaho National Engineering Laboratory existing facilities are provided in Appendix F. The location of these facilities at the Idaho National Engineering Laboratory are shown in Figure 2-15.

As a Phase 2 site, the Idaho National Engineering Laboratory would continue to receive and manage foreign research reactor spent nuclear fuel at existing facilities until a new dry storage facility were to become operational at the site. Foreign research reactor spent nuclear fuel managed at existing facilities

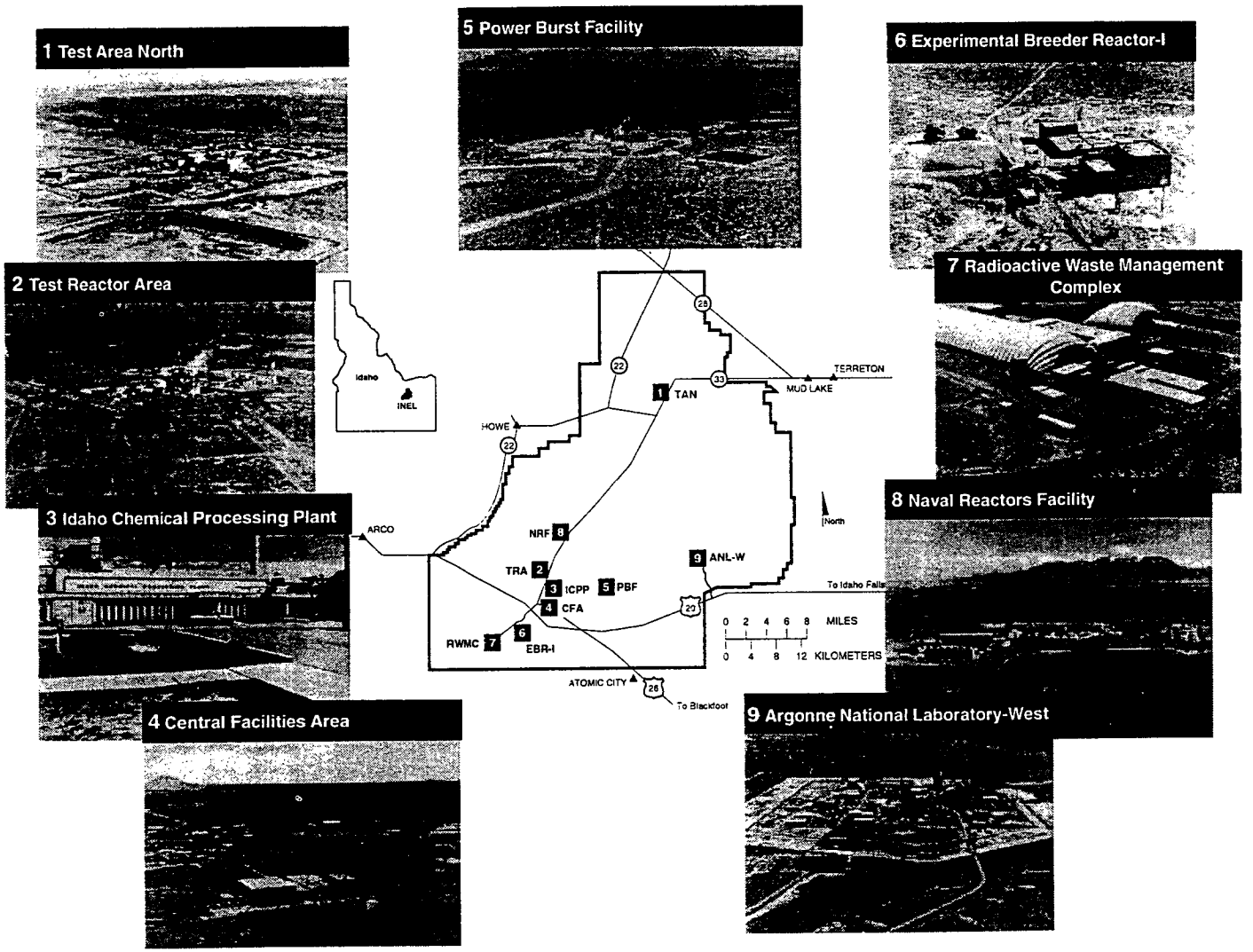


Figure 2-15 Location of Principal Facilities at the Idaho National Engineering Laboratory

would then be transferred to the new facility where it would remain until ultimate disposition. The new facility would also receive foreign research reactor spent nuclear fuel shipments directly from ports after the 10-year policy period. Dry storage encompasses both the dry vault design and the dry cask design as described in Section 2.6.5.1.1.

The analysis of environmental impacts from management of foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory is based on the above considerations. The analysis options selected do not represent all possible combinations, but a reasonable set which provides a typical, and in many cases, bounding estimate of the resulting impacts.

The specific analysis options under the basic implementation of Management Alternative 1, discussed in Section 2.2.1, are as follows:

2A. The Idaho National Engineering Laboratory would receive and manage foreign research reactor spent nuclear fuel during Phase 1 and store it at the FAST, the IFSF, and/or the CPP-749 facilities. For the purpose of the analysis, the amount of fuel to be managed is all foreign research reactor spent nuclear fuel that would be received in a 10-year period (17,500 elements). The fuel would be shipped offsite at the end of Phase 1.

2B. Foreign research reactor spent nuclear fuel managed under analysis option 2A would be transferred to a newly constructed dry storage facility where it would be managed until ultimate disposition. Spent nuclear fuel arriving at the United States after Phase 1 concludes would be received and managed at the new dry storage facility until ultimate disposition. For the purpose of the analysis, the amount of spent nuclear fuel that would be stored in the dry storage facility would be all the foreign research reactor spent nuclear fuel (22,700 elements).

The implementation alternatives of Management Alternative 1 discussed in Section 2.2.2 introduce additional analysis options that could be considered for the Idaho National Engineering Laboratory as follows:

- Under Implementation Subalternative 1a (Section 2.2.2.1), the amount of spent nuclear fuel to be received in the United States would be reduced to 5,000 elements. In this case, the Idaho National Engineering Laboratory would be likely to receive and manage foreign research reactor spent nuclear fuel in existing facilities during the Phase 1 period. The impacts would be bounded by analysis option 2A above. The dry storage facility considered in analysis option 2B would be sized to accommodate this amount of fuel. The fuel would either be shipped offsite after Phase 1 or it would be managed along with the rest of the spent nuclear fuel that would be managed at the Idaho National Engineering Laboratory.

- Under Implementation Subalternative 1b (Section 2.2.2.1), the Idaho National Engineering Laboratory would receive only HEU from the reactors eligible under the proposed action. The amount of HEU would be approximately 4.6 MTHM, representing 11,200 elements. The impacts from the management of this amount of fuel at the Idaho National Engineering Laboratory would be bounded by analysis options 2A and 2B above.

- Under Implementation Subalternative 1c (Section 2.2.2.1), the Idaho National Engineering Laboratory would receive target material in addition to the foreign research reactor spent nuclear fuel considered under the basic implementation of Management Alternative 1. The

receipt and management of this material, which represents, in uranium content, approximately 620 typical foreign research reactor spent nuclear fuel elements, would increase the impacts of analysis options 2A or 2B (above) by a small percentage.

- Under Implementation Subalternative 2a (Section 2.2.2.2), the duration of the policy would be decreased to 5 years and therefore the amount of spent nuclear fuel available for management would also be decreased. The impacts from the management of the decreased amount of spent nuclear fuel at the Idaho National Engineering Laboratory would be bounded by analysis options 2A or 2B above.

- Under Implementation Subalternative 2b, (Section 2.2.2.2) the acceptance of a small portion of the spent nuclear fuel would be extended over an indefinite period of time, but the amount of spent nuclear fuel to be received and managed would remain constant. The impacts would be the same as in analysis options 2A or 2B.

- Under Implementation Alternative 3 (Section 2.2.2.3), DOE and the Department of State would consider alternative financial arrangements. These arrangements would affect the amount of spent nuclear fuel that would be managed in the United States because the foreign research reactors would consider their own alternatives about whether to send the spent nuclear fuel to the United States. The amount of foreign research reactor spent nuclear fuel in this case cannot be quantified. The upper limit, however, is considered under analysis options 2A or 2B which would be bounding.

- Under Implementation Alternative 4 (Section 2.2.2.4), DOE and the Department of State would consider alternatives for the location where title of the foreign research reactor spent nuclear fuel would be taken. The choices do not affect the management options at the Idaho National Engineering Laboratory.

- Under Implementation Alternative 5 (Section 2.2.2.5), DOE would consider construction of a new wet storage facility at the Idaho National Engineering Laboratory for Phase 2 until ultimate disposition. The new wet storage facility is described in Section 2.6.5.1.2. For this implementation alternative, an analysis option 2C, which is similar to analysis option 2B, is considered as follows:

2C. The spent nuclear fuel managed under analysis option 2A would be transferred to a newly constructed wet storage facility where it would be managed until ultimate disposition. Spent nuclear fuel arriving in the United States after Phase 1 concludes (i.e., during Phase 2) would be received and managed at the new wet storage facility until ultimate disposition. For the purpose of the analysis, the amount of spent nuclear fuel that would be managed in the wet storage facility would be all the foreign research reactor spent nuclear fuel (22,700 elements).

- Under Implementation Alternative 6 (Section 2.2.2.6), DOE and the Department of State would consider chemical separation of foreign research reactor spent nuclear fuel in the United States. As noted in the discussion in Section 2.3.6, chemical separation of both aluminum-based and TRIGA foreign research reactor spent nuclear fuel is evaluated for the Idaho National Engineering Laboratory.

Under Management Alternative 3 (Hybrid Alternative), discussed in Section 2.4, the Idaho National Engineering Laboratory would receive the foreign research reactor TRIGA spent nuclear fuel. This spent nuclear fuel would be managed at the Idaho National Engineering Laboratory in existing facilities until final disposition. The amount of TRIGA spent nuclear fuel to be stored would be 4,900 elements, 1.0 MTHM, and about 4 m^3 (200 ft^3) as indicated in Table 2-4.

Table 2-12 presents an overview of the foreign research reactor spent nuclear fuel management options, quantities of foreign research reactor spent nuclear fuel assumed for the analysis, and facilities considered.

Table 2-12 Proposed Quantities of Foreign Research Reactor Spent Nuclear Fuel and Management Options at the Idaho National Engineering Laboratory

FRR EIS Management Alternative		*FRR SNF Elements*	*Percentage of Total FRR SNF Elements*	*Storage Option/Technology*					
				Dry Storage		*Wet Storage*		*Existing Facilities plus Casks*[c]	*Chemical Separation*
Management Alternative 1				*New*	*Existing*[a]	*New*	*Existing*[b]		
All FRR SNF	Phase 1	17,500	77%	NA	A	NA	A	A	NA
	Phase 2[d]	22,700	100%	A	NA	A	NA	NA	NA
Western FRR SNF	Phase 1	4,800	21%	NA	A	NA	A	A	NA
	Phase 2	6,300	28%	A	NA	A	NA	NA	NA
TRIGA FRR SNF	Phase 1	3,800	17%	NA	NA	NA	A	A	NA
	Phase 2	4,900	22%	NA	A	A	NA	NA	NA
Chemical Separation/Storage		22,700	100%	NA	A	NA	A	A	A
Management Alternative 3									
TRIGA FRR SNF/ Storage		4,900	22%	NA	A	NA	A	A	NA

A = Applicable
NA = Not Applicable
FRR = foreign research reactor
SNF = spent nuclear fuel

[a] *IFSF, CPP-749*

[b] *FAST*

[c] *Existing facilities augmented by dry cask storage.*

[d] *Phase 2 values represent total number of foreign research reactor spent nuclear fuel elements requiring management at the site.*

2.6.5.3.3 The Hanford Site

Options for receiving and managing foreign research reactor spent nuclear fuel at the Hanford Site are primarily dictated by the Programmatic SNF&INEL Final EIS (DOE, 1995c) alternatives, and the lack of suitable facilities at the Hanford Site to receive foreign research reactor spent nuclear fuel at the beginning of the proposed policy period.

If the Hanford Site is the site to manage DOE-owned spent nuclear fuel under the Programmatic SNF&INEL Final EIS, foreign research reactor spent nuclear fuel would be received and managed first at the Savannah River Site and/or the Idaho National Engineering Laboratory for the period (Phase 1) required for the Hanford Site to have new facilities constructed and operational to accommodate the spent nuclear fuel. As discussed in previous sections, Phase 1 is estimated to be about 10 years. At the end of Phase 1 (e.g., start of Phase 2) the Hanford Site would be able to receive and manage foreign research reactor spent nuclear fuel that would be shipped from the Savannah River Site and/or the Idaho National

Engineering Laboratory and directly from the ports for those shipments made after Phase 1 concludes. Management of the foreign research reactor spent nuclear fuel would continue at the Hanford Site until ultimate disposition.

The amount of spent nuclear fuel that would be received and managed at the Hanford Site under the basic implementation of Management Alternative 1 is dictated by the distribution considered in the Programmatic SNF&INEL Final EIS (DOE, 1995c). Accordingly, in Phase 2, the Hanford Site could receive the TRIGA foreign research reactor spent nuclear fuel managed at the Idaho National Engineering Laboratory during Phase 1, Western foreign research reactor spent nuclear fuel under the Regionalization By Geography alternative, or all foreign research reactor spent nuclear fuel under the Centralization alternative.

Under the basic implementation of Management Alternative 1, and as a Phase 2 site, the Hanford Site would receive and manage foreign research reactor spent nuclear fuel at a new dry storage facility constructed at the 200 Area Plateau or the Fuel Material Examination Facility (FMEF), which is a partially completed, large, hot cell facility. The new dry storage facility is described in Section 2.6.5.1.1. Description of the FMEF is provided in Appendix F, Section F.3. Figure 2-16 displays the potential construction locations for foreign research reactor spent nuclear fuel storage at the Hanford Site. FMEF is located near the Fast Flux Test Facility.

The analysis of environmental impacts from management of foreign research reactor spent nuclear fuel at the Hanford Site is based on the above considerations. The analysis options selected do not represent all possible combinations, but a reasonable set that provides a typical, and in some cases, bounding estimate of the resulting impacts.

The specific analysis option under the basic implementation of Management Alternative 1, discussed in Section 2.2.1, is as follows:

3A. The spent nuclear fuel managed at the Idaho National Engineering Laboratory and/or the Savannah River Site during Phase 1 would be shipped to the Hanford Site where it would be managed at a new dry storage facility constructed either at the 200 Area Plateau or at FMEF. Spent nuclear fuel arriving in the United States after Phase 1 concludes (i.e., during Phase 2) would also be received and managed at the new facility until ultimate disposition. For the purposes of the analysis, the total amount of spent nuclear fuel that would be managed in the dry storage facility would be all the foreign research reactor spent nuclear fuel (22,700 elements). If the Hanford Site were to receive TRIGA from the Idaho National Engineering Laboratory or only western spent nuclear fuel, the dry storage facility would be sized accordingly. The impacts from a smaller size facility would be bounded by the option analyzed.

The implementation alternatives of Management Alternative 1, which are discussed in Section 2.2.2, introduce additional analysis options that could be considered for the Hanford Site as follows:

- Under Implementation Subalternative 1a (Section 2.2.2.1), the amount of spent nuclear fuel to be received in the United States would be reduced to 5,000 elements. In this case, the Hanford Site would receive the foreign research reactor spent nuclear fuel from the Idaho National Engineering Laboratory and/or the Savannah River Site and manage it in facilities sized for this amount. The impacts from the management of this amount of spent nuclear fuel would be bounded by analysis option 3A.

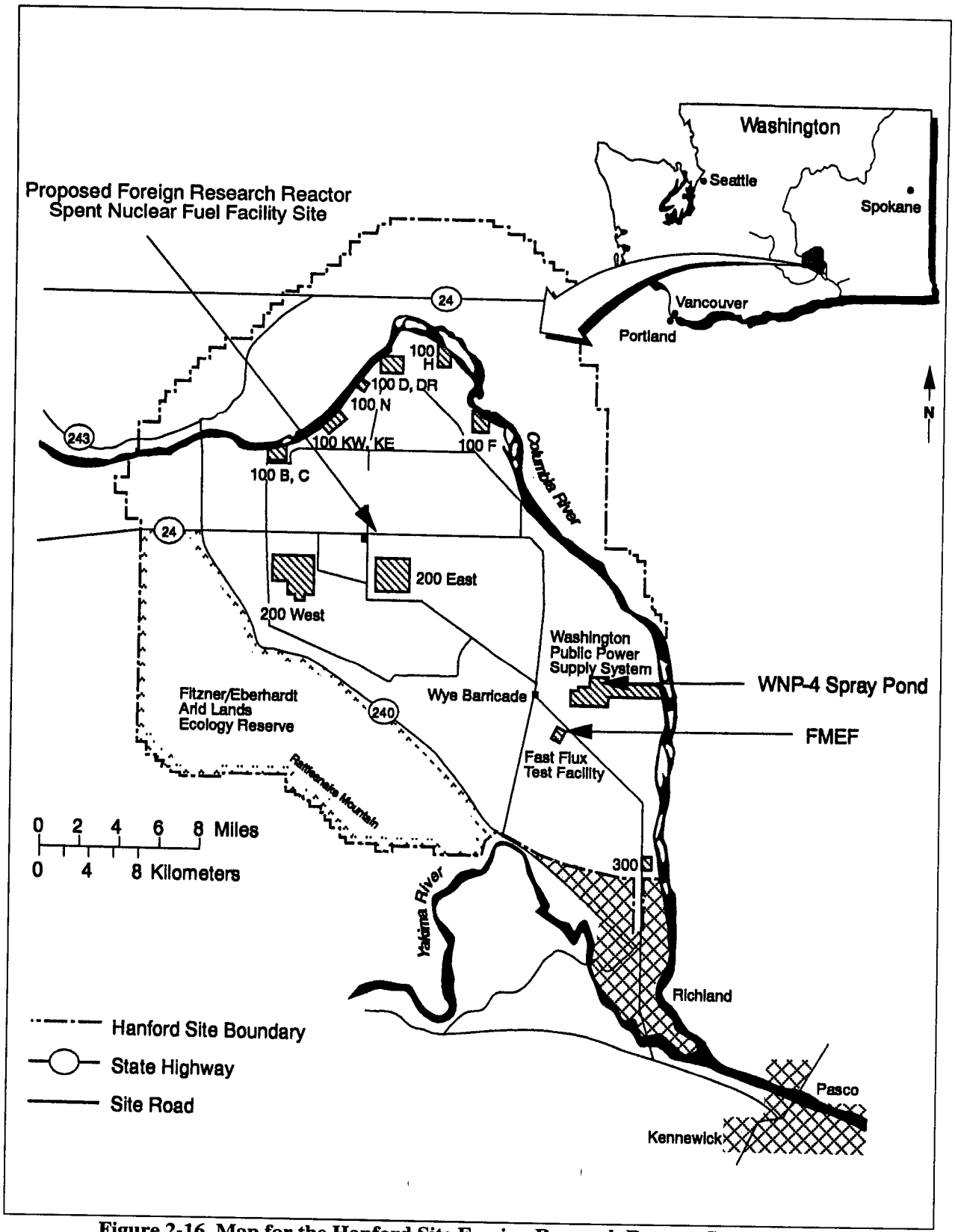


Figure 2-16 Map for the Hanford Site Foreign Research Reactor Spent Nuclear Fuel Storage (in the 200 Areas)

- Under Implementation Subalternative 1b (Section 2.2.2.1), the Hanford Site would receive only HEU from the Idaho National Engineering Laboratory and/or the Savannah River Site. The amount would be approximately 4.6 MTHM, representing 11,200 elements. The impacts from the management of this amount of fuel at the Hanford Site would be bounded by analysis option 3A above.

- Under Implementation Subalternative 1c (Section 2.2.2.1), the Hanford Site would receive target material in addition to the foreign research reactor spent nuclear fuel considered under the basic implementation of Management Alternative 1. The receipt and management of this material, which represents in uranium content approximately 620 typical foreign research reactor spent nuclear fuel elements, would increase the impacts of analysis option 3A by a small percentage.

- Under Implementation Subalternative 2a (Section 2.2.2.2), the duration of the policy would be decreased to 5 years; and, therefore, the amount of spent nuclear fuel available for management would also be decreased. In this case, the Hanford Site would receive all foreign research reactor spent nuclear fuel from the Savannah River Site and/or the Idaho National Engineering Laboratory. The impacts from the management of the decreased amount of spent nuclear fuel at the Hanford Site would be bounded by analysis option 3A above.

- Under Implementation Subalternative 2b (Section 2.2.2.2), the acceptance of a small portion of the fuel would be extended over an indefinite period of time, but the amount of spent nuclear fuel to be received and managed would remain constant. The impacts would be the same as in option 3A.

- Under Implementation Alternative 3 (Section 2.2.2.3), DOE and the Department of State would consider alternative financial arrangements. These arrangements would affect the amount of spent nuclear fuel that would be managed in the United States as the foreign research reactors would consider their own alternatives on whether to send the spent nuclear fuel to the United States. The amount of spent nuclear fuel in this case cannot be quantified; however, the upper limit, which is considered under analysis option 3A, would be bounding.

- Under Implementation Alternative 4 (Section 2.2.2.4), DOE and the Department of State would consider alternatives for the location where title of the foreign research reactor spent nuclear fuel would be taken. The choices do not affect the management options at the Hanford Site.

- Under Implementation Alternative 5 (Section 2.2.2.5), DOE would consider construction of a new wet storage facility at the Hanford Site for Phase 2 until ultimate disposition. For this implementation alternative, an analysis option 3B, which is similar to 3A, is considered as follows:

3B. The spent nuclear fuel managed at the Idaho National Engineering Laboratory and/or the Savannah River Site during Phase 1 is shipped to the Hanford Site where it would be managed at a new wet storage facility constructed at either the 200 Area Plateau or the WNP-4 Spray Pond facility. Spent nuclear fuel arriving in the United States after Phase 1 concludes (i.e., during Phase 2) would also be received and managed at the new facility until ultimate disposition. For the purposes of analysis, the total amount of spent nuclear

fuel to be managed in the wet storage facility would be all the foreign research reactor spent nuclear fuel (22,700 elements). If the Hanford Site were to receive only TRIGA fuel from the Idaho National Engineering Laboratory, or only western fuel, the wet storage facility would be sized accordingly. The impacts from a smaller size facility would be bounded by the option analyzed.

- Under Implementation Alternative 6 (Section 2.2.2.6), DOE and the Department of State would consider chemical separation of foreign research reactor spent nuclear fuel in the United States. Based on the discussion in Section 2.3.6, the Hanford Site would not be considered as a site for chemical separation. The Hanford Site is also not considered under the Hybrid Alternative discussed in Section 2.4.

Table 2-13 presents an overview of the foreign research reactor spent nuclear fuel management options, quantities of foreign research reactor spent nuclear fuel assumed for the analysis, and facilities considered.

Table 2-13 Proposed Quantities of Foreign Research Reactor Spent Nuclear Fuel and Management Options at Hanford Site

Management Alternative 1		*FRR SNF Element*	*Percentage of Total FRR SNF Elements*	*Storage Option/Technology*			
				Dry Storage		*Wet Storage*	
				New at FMEF	*New*	*New at WNP-4*	*New*
All FRR SNF	Phase 2	22,700	100%	A	A	A	A
Western FRR SNF	Phase 2	6,300	28%	A	A	A	A
TRIGA FRR SNF	Phase 2	4,900	22%	A	A	A	A

A = Applicable
FRR = foreign research reactor
SNF = spent nuclear fuel

2.6.5.3.4 The Oak Ridge Reservation

The options for receiving and managing foreign research reactor spent nuclear fuel at the Oak Ridge Reservation are primarily dictated by the Programmatic SNF&INEL Final EIS (DOE, 1995c) alternatives and the lack of suitable facilities at the Oak Ridge Reservation to receive foreign research reactor spent nuclear fuel at the beginning of the proposed policy period.

If the Oak Ridge Reservation is the site to manage DOE-owned spent nuclear fuel under the Programmatic SNF&INEL Final EIS, foreign research reactor spent nuclear fuel would be received and managed first at the Savannah River Site and/or the Idaho National Engineering Laboratory for the period (Phase 1) required for the Oak Ridge Reservation to construct and to place in operation new facilities to accommodate the spent nuclear fuel. As discussed in previous sections, Phase 1 is estimated to be about 10 years. At the end of Phase 1 (e.g., start of Phase 2) the Oak Ridge Reservation would be able to receive and manage foreign research reactor spent nuclear fuel that would be shipped from the Savannah River Site and/or the Idaho National Engineering Laboratory and directly from the ports for those shipments made after Phase 1 concludes. Management of the foreign research reactor spent nuclear fuel would continue at the Oak Ridge Reservation until ultimate disposition.

The amount of spent nuclear fuel that would be received and managed at the Oak Ridge Reservation under the basic implementation of Management Alternative 1 is dictated by the distribution considered in the Programmatic SNF&INEL Final EIS (DOE, 1995c). Accordingly, in Phase 2, the Oak Ridge Reservation could receive aluminum-based foreign research reactor spent nuclear fuel managed at the Savannah River

Site during Phase 1, Eastern foreign research reactor spent nuclear fuel under the Regionalization by Geography alternative, or all foreign research reactor spent nuclear fuel under the Centralization alternative.

Under the basic implementation of Management Alternative 1, and as a Phase 2 site, the Oak Ridge Reservation would receive and manage foreign research reactor spent nuclear fuel at a new dry storage facility to be constructed at the West Bear Creek Valley Site. The location is preferred among the four locations considered in a siting study performed for spent nuclear fuel management (MMES, 1994). The four locations considered are shown in Figure 2-17. Description of the new dry storage facility is provided in Section 2.6.5.1.1.

The analysis of environmental impacts from management of foreign research reactor spent nuclear fuel at the Oak Ridge Reservation is based on the above considerations. The analysis options selected do not represent all possible combinations but a reasonable set that provides a typical, and in some cases, bounding estimate of the resulting impacts.

The specific analysis option under the basic implementation of Management Alternative 1, discussed in Section 2.2.1, is as follows:

4A. The spent nuclear fuel managed at the Idaho National Engineering Laboratory and/or the Savannah River Site during Phase 1 would be shipped to the Oak Ridge Reservation where it would be managed at a new dry storage facility until ultimate disposition. Spent nuclear fuel arriving in the United States after Phase 1 concludes (i.e., during Phase 2) would also be received and managed at the new facility until ultimate disposition. For the purposes of the analysis, the total amount of spent nuclear fuel that would be managed in the dry storage facility would be all the foreign research reactor spent nuclear fuel (22,700 elements).

The implementation alternatives of Management Alternative 1, which are discussed in Section 2.2.2, introduce additional analysis options that could be considered for the Oak Ridge Reservation as follows:

- Under Implementation Subalternative 1a (Section 2.2.2.1), the amount of spent nuclear fuel to be received in the United States would be reduced to 5,000 elements. In this case, the Oak Ridge Reservation would receive the foreign research reactor spent nuclear fuel from the Idaho National Engineering Laboratory or the Savannah River Site and manage it in facilities sized for this amount. The impacts from the management of this amount of spent nuclear fuel would be bounded by analysis option 4A.

- Under Implementation Subalternative 1b (Section 2.2.2.1), the Oak Ridge Reservation would receive only HEU from the Idaho National Engineering Laboratory and/or the Savannah River Site. The amount of spent nuclear fuel would be approximately 4.6 MTHM, representing 11,200 elements. The impacts from the management of this amount of fuel at the Oak Ridge Reservation would be bounded by analysis option 4A above.

- Under Implementation Subalternative 1c (Section 2.2.2.1), the Oak Ridge Reservation would receive target material in addition to the foreign research reactor spent nuclear fuel considered under the basic implementation of Management Alternative 1. The analysis assumes that the receipt and management of this material, which represents in uranium content approximately 620 typical foreign research reactor spent nuclear fuel elements, would increase the impacts of analysis option 4A by a small percentage.

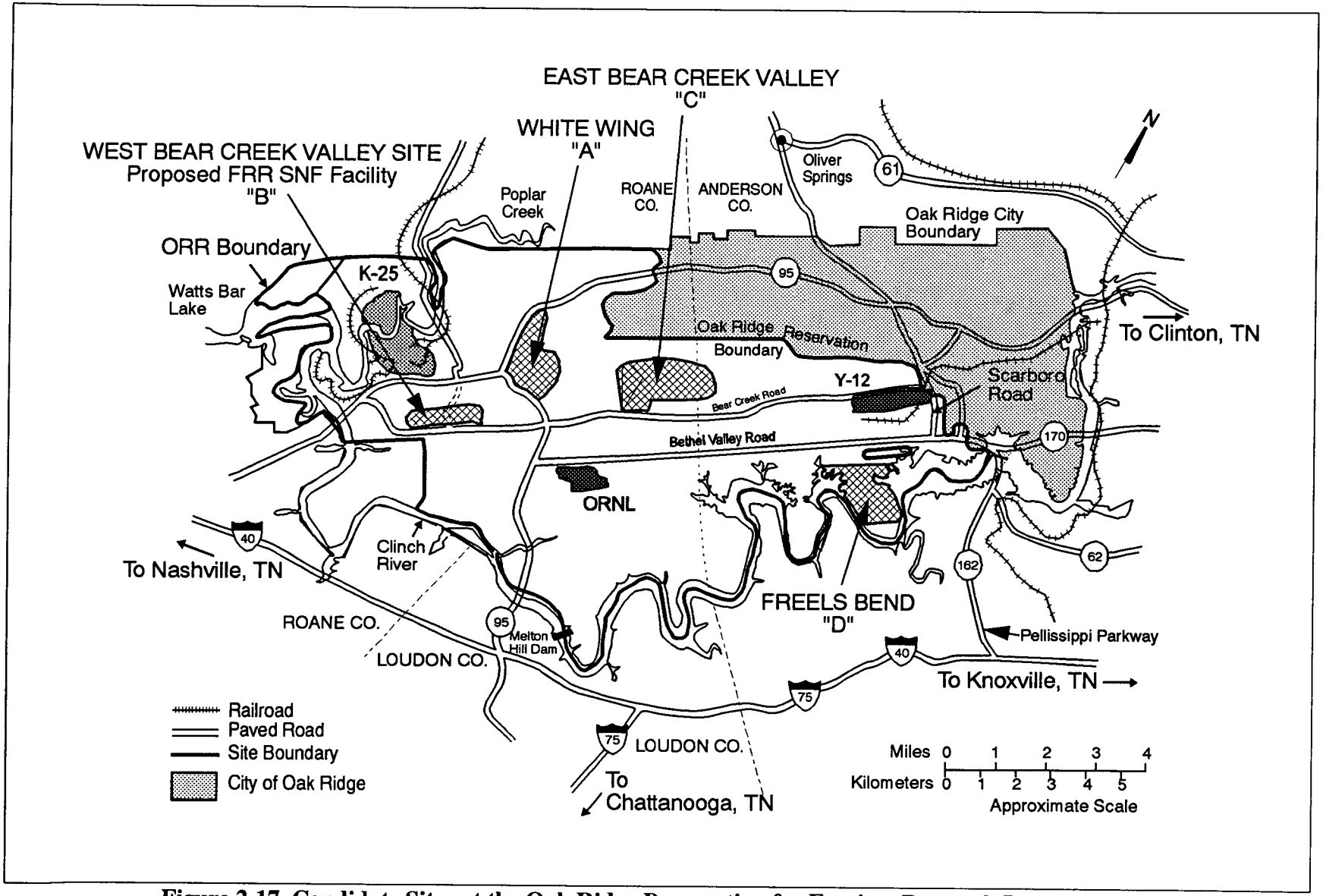


Figure 2-17 Candidate Sites at the Oak Ridge Reservation for Foreign Research Reactor Spent Nuclear Fuel Storage

- Under Implementation Subalternative 2a (Section 2.2.2.2), the duration of the policy would be decreased to 5 years; and, therefore, the amount of spent nuclear fuel available for management would also be decreased. In this case, the Oak Ridge Reservation would receive all foreign research reactor spent nuclear fuel from the Savannah River Site and/or the Idaho National Engineering Laboratory. The impacts from the management of the decreased amount of spent nuclear fuel at the Oak Ridge Reservation would be bounded by analysis option 4A above.

- Under Implementation Subalternative 2b (Section 2.2.2.2), the acceptance of a small portion of the spent nuclear fuel would be extended over an indefinite period of time, but the amount of spent nuclear fuel to be received and managed would remain constant. The impacts would be the same as in option 4A.

- Under Implementation Alternative 3 (Section 2.2.2.3), DOE and the Department of State would consider alternative financial arrangements. These arrangements would affect the amount of spent nuclear fuel that would be managed in the United States as the foreign research reactors would consider their own alternatives on whether to send the spent nuclear fuel to the United States. The amount of spent nuclear fuel in this case cannot be quantified; however, the upper limit, which is considered under analysis option 4A, would be bounding.

- Under Implementation Alternative 4 (Section 2.2.2.4), DOE and the Department of State would consider alternatives for the location where title of the foreign research reactor spent nuclear fuel would be taken. The choices do not affect the management options at the Oak Ridge Reservation.

- Under Implementation Alternative 5 (Section 2.2.2.5), DOE would consider construction of a new wet storage facility at the Oak Ridge Reservation for Phase 2 until ultimate disposition. For this implementation alternative an analysis option 4B, which is similar to 4A, is considered as follows:

4B. The spent nuclear fuel managed at the Idaho National Engineering Laboratory and/or the Savannah River Site during Phase 1 would be shipped to the Oak Ridge Reservation where it would be managed at a new wet storage facility. Spent nuclear fuel arriving in the United States after Phase 1 concludes (i.e., during Phase 2) would also be received and managed at the new facility until ultimate disposition. For the purposes of analysis, the total amount of spent nuclear fuel to be managed in the wet storage facility would be all the foreign research reactor spent nuclear fuel (22,700 elements).

- Under Implementation Alternative 6 (Section 2.2.2.6), DOE and the Department of State would consider chemical separation of foreign research reactor spent nuclear fuel in the United States. Based on the discussion in Section 2.3.6, the Oak Ridge Reservation would not be considered as a site for chemical separation. The Oak Ridge Reservation is also not considered under the Hybrid Alternative discussed in Section 2.4.

Table 2-14 presents an overview of the foreign research reactor spent nuclear fuel management options, quantities of foreign research reactor spent nuclear fuel assumed for the analysis, and facilities considered.

Table 2-14 Proposed Quantities of Foreign Research Reactor Spent Nuclear Fuel and Management Options at Oak Ridge Reservation

Management Alternative 1		*FRR SNF Elements*	*Percentage of Total FRR SNF Elements*	*Storage Option/Technology*	
				Dry Storage (New)	*Wet Storage (New)*
All FRR SNF	Phase 2[a]	22,700	100%	A	A
Eastern FRR SNF	Phase 2	16,400	72%	A	A
Aluminum-based FRR SNF	Phase 2	17,800	78%	A	A

A = Applicable
FRR = foreign research reactor
SNF = spent nuclear fuel
[a] *Phase 2 values represent total number of foreign research reactor spent nuclear fuel elements requiring management at the site.*

2.6.5.3.5 The Nevada Test Site

The options for receiving and managing foreign research reactor spent nuclear fuel at the Nevada Test Site are primarily dictated by the Programmatic SNF&INEL Final EIS (DOE, 1995c) alternatives, and the lack of suitable facilities at the Nevada Test Site to receive foreign research reactor spent nuclear fuel at the beginning of the proposed policy period.

If the Nevada Test Site is the site to manage DOE-owned spent nuclear fuel under the Programmatic SNF&INEL Final EIS, foreign research reactor spent nuclear fuel would be received and managed first at the Savannah River Site and/or the Idaho National Engineering Laboratory for the period (Phase 1) required for the Nevada Test Site to have new facilities constructed and operational to accommodate the spent nuclear fuel. As discussed in previous sections, Phase 1 is estimated to be about 10 years. At the end of Phase 1 (i.e., start of Phase 2) the Nevada Test Site would be able to receive and manage foreign research reactor spent nuclear fuel that would be shipped from the Savannah River Site and/or the Idaho National Engineering Laboratory and directly from the ports for those shipments made after Phase 1 concludes. Management of the foreign research reactor spent nuclear fuel would continue at the Nevada Test Site until ultimate disposition.

Although the Nevada Test Site has no existing facilities to receive foreign research reactor spent nuclear fuel at the beginning of the management period, it has facilities that could be modified to receive foreign research reactor spent nuclear fuel within 5 years. These facilities are large hot cells located in the Nevada Research and Development Area on Jackass Flats. Presently these facilities (e.g., the Engine Maintenance and Disassembly [E-MAD] facility) have little usage, but some are in acceptable condition. To use the E-MAD facility, a small pool would have to be constructed to be used for transferring the spent nuclear fuel from the transportation casks to containers designed for dry storage. A description of the E-MAD facility is included in Appendix F (Section F.1). The E-MAD facility could be ready within 5 years of the start of the proposed policy period.

The amount of spent nuclear fuel that would be received and managed at the Nevada Test Site under the basic implementation of Management Alternative 1, is dictated by the distribution considered in the Programmatic SNF&INEL Final EIS (DOE, 1995c). Accordingly, during Phase 2, the Nevada Test Site could receive TRIGA foreign research reactor spent nuclear fuel managed at the Idaho National Engineering Laboratory during Phase 1, only Western foreign research reactor spent nuclear fuel under the Regionalization By Geography alternative, or all foreign research reactor spent nuclear fuel under the Centralization alternative.

As a Phase 2 site, the Nevada Test Site would receive and manage foreign research reactor spent nuclear fuel at a newly constructed dry storage facility or a modified E-MAD facility. Description of the new dry storage facility is provided in Section 2.6.5.1.1. Figure 2-18 displays the potential construction location and the area where the E-MAD facility is located at the Nevada Test Site.

The analysis of potential environmental impacts from management of foreign research reactor spent nuclear fuel at the Nevada Test Site is based on the above considerations. The analysis options selected do not represent all possible combinations, but a reasonable set that provides a typical, and in some cases, bounding estimate of the resulting impacts.

The specific analysis option under the basic implementation of Management Alternative 1, discussed in Section 2.2.1, is as follows:

5A. The spent nuclear fuel managed at the Idaho National Engineering Laboratory and/or the Savannah River Site during Phase 1 would be shipped to the Nevada Test Site where it would be managed at a new dry storage facility or a modified E-MAD facility. Spent nuclear fuel arriving in the United States after Phase 1 concludes (i.e., during Phase 2) would also be received and managed at the new or E-MAD facility until ultimate disposition. For the purposes of the analysis, the total amount of spent nuclear fuel that would be stored would be all the foreign research reactor spent nuclear fuel (22,700 elements).

The implementation alternatives of Management Alternative 1, discussed in Section 2.2.2, introduce additional analysis options that could be considered for the Nevada Test Site as follows:

- Under Implementation Subalternative 1a (Section 2.2.2.1), the amount of spent nuclear fuel to be received in the United States would be reduced to 5,000 elements. In this case, the Nevada Test Site would receive the foreign research reactor spent nuclear fuel from the Idaho National Engineering Laboratory or the Savannah River Site and manage it in facilities sized for the reduced amount. The impacts from the management of this amount of spent nuclear fuel would be bounded by analysis option 5A.

- Under Implementation Subalternative 1b (Section 2.2.2.1), the Nevada Test Site would receive from the Idaho National Engineering Laboratory and/or the Savannah River Site only HEU. The amount of HEU would be approximately 4.6 MTHM, representing 11,200 elements. The impacts from the management of this amount of fuel would be bounded by analysis option 5A above.

- Under Implementation Subalternative 1c (Section 2.2.2.1), the Nevada Test Site would receive target material in addition to the foreign research reactor spent nuclear fuel considered under the basic implementation of Management Alternative 1. The receipt and management of this material, which represents in uranium content approximately 620 typical foreign research reactor spent nuclear fuel elements, would increase the impacts of analysis option 5A by a small percentage.

- Under Implementation Subalternative 2a (Section 2.2.2.2), the duration of the policy would be decreased to 5 years; and, therefore, the amount of spent nuclear fuel available for management would also be decreased. In such a case, the Nevada Test Site would receive all foreign research reactor spent nuclear fuel from the Savannah River Site and/or the

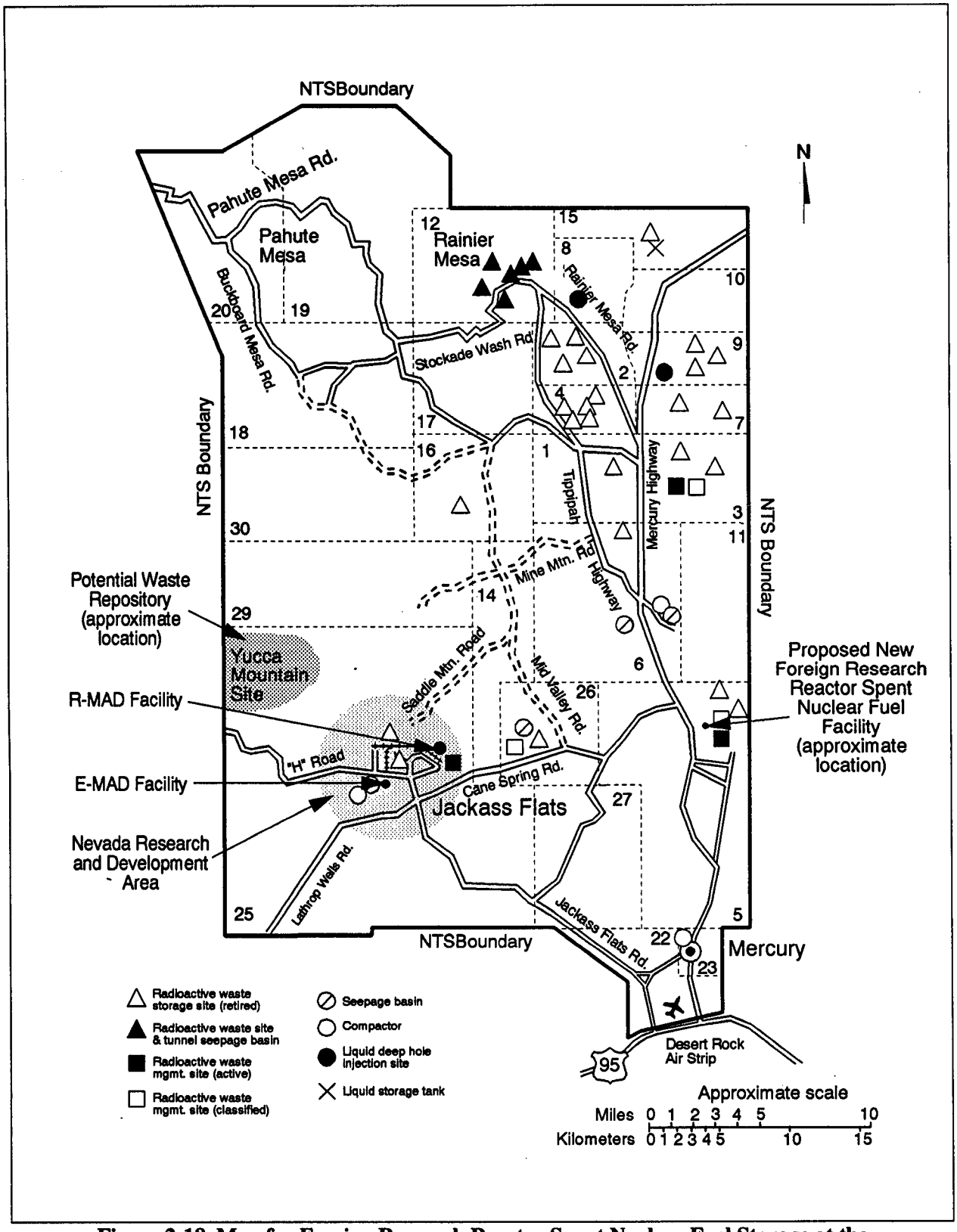


Figure 2-18 Map for Foreign Research Reactor Spent Nuclear Fuel Storage at the Nevada Test Site

Idaho National Engineering Laboratory. The impacts from the management of the decreased amount of spent nuclear fuel at the Nevada Test Site would be bounded by analysis option 5A above.

- Under Implementation Subalternative 2b (Section 2.2.2.2), the acceptance of a small portion of the spent nuclear fuel would be extended over an indefinite period of time, but the amount of spent nuclear fuel to be received and managed would remain constant. The impacts would be the same as in analysis option 5A.

- Under Implementation Alternative 3 (Section 2.2.2.3), DOE and the Department of State would consider alternative financial arrangements. The various arrangements would affect the amount of spent nuclear fuel that would be managed in the United States as the foreign research reactors would consider their own alternatives on whether to send the spent nuclear fuel to the United States. The amount of spent nuclear fuel in this case cannot be quantified; however, the upper limit, considered under analysis option 5A, would be bounding.

- Under Implementation Alternative 4 (Section 2.2.2.4), DOE and the Department of State would consider alternatives for the location where title of foreign research reactor spent nuclear fuel would be taken. The choices do not affect the management options at the Nevada Test Site.

- Under Implementation Alternative 5 (Section 2.2.2.5), DOE would consider construction of a new wet storage facility at the Nevada Test Site for Phase 2 until ultimate disposition. For this implementation alternative an analysis option 5B, which is similar to 5A, is considered as follows:

5B. The spent nuclear fuel managed at the Idaho National Engineering Laboratory and/or the Savannah River Site during Phase 1 would be shipped to the Nevada Test Site where it would be managed at a new wet storage facility. Spent nuclear fuel arriving in the United States after Phase 1 concludes (i.e., during Phase 2) would also be received and managed at the new facility until ultimate disposition. For the purposes of analysis, the total amount of spent nuclear fuel that would be managed in the wet storage facility would be all the foreign research reactor spent nuclear fuel (22,700 elements). If the Nevada Test Site were to receive only TRIGA spent nuclear fuel from the Idaho National Engineering Laboratory or only western spent nuclear fuel, the wet storage facility would be sized accordingly. The impacts from a smaller size facility would be bounded by the option analyzed.

- Under Implementation Alternative 6 (Section 2.2.2.6), DOE and the Department of State would consider chemical separation of foreign research reactor spent nuclear fuel in the United States. Based on the discussion in Section 2.3.6, the Nevada Test Site would not be considered as a site for chemical separation. The Nevada Test Site is also not considered for the Hybrid Alternative discussed in Section 2.4.

Table 2-15 presents an overview of the foreign research reactor spent nuclear fuel management options, quantities of foreign research reactor spent nuclear fuel assumed for the analysis, and facilities considered.

Table 2-15 Proposed Quantities of Foreign Research Reactor Spent Nuclear Fuel and Management Options at the Nevada Test Site

Management Alternative 1		FRR SNF Elements	Percentage of Total FRR SNF Elements	Storage Option/Technology		
				Dry Storage		Wet Storage
				E-MAD[a]	New	New
All FRR SNF	Phase 2[b]	22,700	100%	A	A	A
Western FRR SNF	Phase 2	6,300	28%	A	A	A
TRIGA FRR SNF	Phase 2	4,900	22%	A	A	A

A = Applicable
NA = Not Applicable
FRR = foreign research reactor
SNF = spent nuclear fuel

[a] *E-MAD could be available for use five years after the start of implementation.*

[b] *Phase 2 values represent total number of foreign research reactor spent nuclear fuel elements requiring management at the site.*

2.7 Characteristics of Emergency Management and Response

This section addresses the emergency management and response infrastructure that exists to support the possible implementation of those management alternatives of the proposed action that would have an impact in the United States. This section considers emergency management and response at the ports of entry, along ground transport routes, and at the management sites.

2.7.1 DOE and the National Response System

In the United States, State and local governments are responsible for emergency management and response programs. These programs must be capable of managing all hazards ranging from natural disasters to hazardous material incidents on a day-to-day basis. In order to maintain these programs, various State, Tribal, and local governments receive Federal funding. DOE historically has provided a variety of support to governmental jurisdictions in fulfilling its responsibilities under regulatory and National emergency plan taskings (FEMA, 1994; Rogoff, 1994; and DOE, 1994g).

There are three national emergency response plans (i.e., Federal Response Plan, Federal Radiological Emergency Response Plan, and the National Contingency Plan) under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advice and assistance to State, Tribal, and local agencies involved with a radiological incident (DOE, 1989). For a foreign research reactor spent nuclear fuel incident, DOE actions would be guided by the Federal Radiological Emergency Response Plan (FEMA, 1985) and its own internal emergency management and response system.

DOE maintains an emergency management and response system that is based on regulatory requirements as outlined in various DOE Orders (e.g., DOE Order Series 5500 and 5530). These orders require an emergency management and response system that generally follows the models and practices established by the Federal Emergency Management Agency, National Fire Protection Association, American National Standards Institute, and National Council on Radiation Protection and Measurements.

2.7.2 Foreign Research Reactor Spent Nuclear Fuel Transportation

Foreign research reactor operators, their shipping agents, and commercial carriers would have the primary responsibility to coordinate and arrange all activities associated with foreign research reactor spent nuclear fuel shipments and cask return including emergency management and response. DOE, along with other Federal agencies (e.g., Department of Transportation, NRC, Federal Emergency Management Agency, U.S. Department of Defense, and the U.S. Environmental Protection Agency) would provide support and assistance to State, Tribal, and local government agencies responsible for responding to a foreign research reactor spent nuclear fuel incident.

DOE fulfills its role and responsibilities as the Federal agency tasked with developing and maintaining a capability to safely manage spent nuclear fuel (DOE, 1995c), in part by setting overall spent nuclear fuel program management responsibility and policy for transportation and emergency management and response; resolving policy questions; issuing guidance; providing information; and accomplishing oversight by including regulatory compliance requirements in its spent nuclear fuel related contracts and by monitoring the performance of those involved.

According to DOE records, from 1985 to 1993 there were 102,213 DOE shipments consisting of 1,009,357.6 metric tons (1,112,626 tons) of radioactive material. Of these, 457 shipments, containing 13,176.86 metric tons (14,525 tons) were spent nuclear fuel (these weights include the packaging) (DOE, 1994d). To date, there are no records of radiological fatalities that have occurred in the United States due to transportation accidents. To date, no spent nuclear fuel transportation cask has ever been punctured or released any of its radioactive contents, even in actual highway accidents (NRC, 1993).

2.7.3 External Coordination

Historically, DOE ensures coordination with various organizations and agencies through its interaction with Government, national, and local groups such as the Southern States Energy Board and Western Governors' Association, among others.

The primary responsibility for developing and maintaining a radiological hazardous materials emergency response capability is vested in State, Tribal, and local agencies. DOE, on an "as needed," case-by-case basis, has helped State, Tribal, and local agencies prepare for response to potential accidents involving DOE radioactive material shipments (including spent nuclear fuel). As with the Urgent Relief foreign research reactor spent nuclear fuel transportation effort, DOE has offered various types of technical assistance to the affected jurisdictions (SSEB, 1994).

One example of this partnership with State and local governments occurred in August 1994. In support of Urgent Relief safe transportation, special Radiological Emergency Training for Local Responders and Emergency Response Workshop courses were conducted by DOE for approximately 160 local responders from North Carolina and South Carolina (Analysas Corporation, 1994).

2.7.3.1 Financial and Technical Assistance to States and Tribes

DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. While some of these funding efforts are not directly related to spent nuclear fuel shipments, they do enhance a jurisdiction's emergency management and response capabilities (DOE, 1994g). Financial assistance to States and Tribes for Transportation programs for fiscal year 1994 is shown in Table 2-16 (DOE, 1994g).

Table 2-16 DOE Summary of Financial Assistance to States and Indian Tribes

Total Allocations for Transportation Programs: FY 1994	
Activity	***Amount***
Waste Isolation Pilot Plant	$1,410,848
Cesium Shipment Support	330,000
Spent Fuel Shipment Support	125,000
Transportation External Coordination Working Group[a]	34,921
Urban Energy & Transportation Corporation[b]	150,137
Office of Civilian Radioactive Waste Management	1,332,000
State of Washington Emergency Management Funds	637,570
Total Allocations	**$4,020,476**

[a] *The amount shown reflects the cost to DOE of furnishing travel, food, and lodging for non-DOE participants at two Transportation External Coordination meetings. Participation in Transportation External Coordination meetings is not restricted to States and Tribes; however, it is not possible to break out State and Tribal costs separately.*

[b] *The amount shown reflects the cost to DOE of furnishing travel, food and lodging for non-DOE participants at three Urban Energy & Transportation Corporation meetings. Urban Energy & Transportation Corporation is a non-profit corporation organized primarily to address local government concerns.*

Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials (DOE, 1994g).

2.7.3.2 Training Assistance to States and Tribes

State, Tribal, local personnel, and other Federal agencies participate in training programs developed by DOE for its staff and contractors. State, Tribal, and local personnel pay their own travel and per diem expenses; however, DOE bears the cost of developing and implementing the training. Available training includes:

- Hazardous Waste Transportation and Packaging Workshop which covers regulations governing transportation of radioactive materials;
- Radiological Emergency Response and Operations is offered in conjunction with the Federal Emergency Management Agency, and teaches response to and management of radiological incidents;
- Radiological Emergency Training for Local Responders was piloted during fiscal year 1994 in Wyoming and brings training directly to the states, allowing them to train in their own environment;
- Radioactive Material Response Orientation provides a 1-day introduction for response personnel;
- Advanced Radioactive Materials Transportation Accident Response is a sequel to the previous course for State, Tribal, Regional, and local emergency responders; and

- Transportation Emergency Training for Response Assistance includes several modules. The Public Affairs module, which is specifically designed to include States and Tribes, is scheduled for piloting during Fiscal Year 1995 (DOE, 1994g).

In addition, the DOE-funded Radiation Emergency Assistance Center/Training Site located in Oak Ridge, Tennessee, conducts courses in medical management of radiation emergencies. These courses include:

- Handling of Radiation Accidents by Emergency Personnel;
- Medical Planning and Care in Radiation Accidents;
- Health Physics in Radiation Accidents; and
- Occupational Health in Nuclear Facilities (REACT/TS, n.d.a.).

2.7.3.3 Transportation External Coordination/Working Group

DOE recognizes the need for ongoing partnerships with external organizations: health and safety; emergency management and response; law enforcement; technical; State, Tribal, and local government; and industrial organizations involved in radiological emergency response. This "stakeholder" involvement has been formalized in the Transportation External Coordination/Working Group.

The Transportation External Coordination/Working Group (Table 2-17) is a 35 member body of emergency management and response professional associations (DOE, 1994i). Through this group DOE looks at crosscutting transportation and emergency response issues that all DOE programs either are addressing or will address in the future. In turn, these groups are able to provide input to DOE for its decision-making process involving these issues (Holm, 1994).

2.7.3.4 Transportation Emergency Preparedness Program

The Transportation Emergency Preparedness Program helps integrate DOE's existing emergency management and response capabilities into an effective response system for transportation incidents involving DOE shipments. Through its extensive external coordination program with State, Tribal, and local agencies, DOE develops interfaces for meeting its various national response plan taskings to provide radiological monitoring and assessment technical assistance needed for transportation incidents involving radioactive materials including any possible incidents associated with a foreign research reactor spent nuclear fuel shipment.

Under the Transportation Emergency Preparedness Program Field Assistance Program, DOE provides support for emergency exercises (Table 2-18) that include State, Tribal, and local agencies through the Operations Offices (DOE, 1994g; DOE, 1994n; SSEB, 1994).

2.7.3.5 Radiological Assistance Program

The primary DOE response groups that would assist at a foreign research reactor spent nuclear fuel incident are the Radiological Assistance Program teams that operate from eight strategically located DOE Regional Coordinating Offices (Figure 2-19) around the country. These teams, upon State, Tribal, or local jurisdiction request, provide technical expertise and assistance to monitor and assess radiological hazards. Figure 2-19 displays pertinent information for contacting each regional office.

Table 2-17 Transportation External Coordination/Working Group Membership

Invited Organizations	*Guest Organizations*[c]
American Association of State Highway and Transportation Officials[a]	Emergency Services Representatives
American College of Emergency Physicians	Arizona Division of Emergency Services
AFL-CIO Transportation Trades Department[a]	City of Jacksonville, FL, Fire Department
American Indian Law Center[a]	Louisiana State Police/TESS
American Trucking Association[a]	St. Charles Parish Department of Emergency Management
Association of American Railroads	Ohio Emergency Management Agency
Chemical Manufacturers Association[b]	County Representatives
Columbia River Inter-tribal Fish Commission	Transportation Advisor, Nuclear Waste Project, Carson City, NV
Commercial Vehicle Safety Alliance	Clark County Comprehensive Planning Department, Esmeralda, NV
Conference of Radiation Control Program Directors	Transportation Planner, Nuclear Waste Division, Las Vegas, NV
Cooperative Hazardous Materials Enforcement Development[a]	Mineral County Office of Nuclear Projects, Hawthorne, NV
Council of Energy Resource Tribes	Nye County, NV
Council of State Governments, Midwestern Office	Nye County Nuclear Waste Repository Office, Tonopah, NV
Edison Electric Institute	White Pine County, NV
Emergency Nurses Association	White Pine County Nuclear Waste Project Office, Ely, NV
Hazardous Materials Advisory Council[a]	Tribal Representatives
International Association of Chiefs of Police	Manager, ERWM Program, Nez Perce Tribe, Lapwai, ID
International Association of Fire Chiefs	Industry Representatives
International Association of Fire Fighters	Union Pacific Railroad
International City Management Association[a]	Environmental Evaluation Group
National Association of Counties	PIC
National Association of Emergency Medical Technicians	
National Association of Regulatory Utility Commissioners[a]	
National Conference of State Legislators	
National Conference of State Transportation Specialists[a]	
National Congress of American Indians	
National Coordinating Council on Emergency Management	
National Emergency Management Association	
National Governors' Association[a]	
National Indian Policy Center	
National League of Cities[a]	
Southern States Energy Board	
Urban Energy and Transportation Corporation	
Western Governors' Association	
Western Interstate Energy Board	

[a] *Denotes organizations invited to attend, but have not yet participated.*

[b] *Denotes organizations invited to attend, but do not wish to participate.*

[c] *Denotes organizations who have attended Transportation External Coordination/Working Group meetings, but are not full-time members.*

Table 2-18 Radiological Emergency Response Exercises

Exercise	*Location*	*Date*
TRANSAX 1994	Ontario, OR	August 3, 1994
TRANSAX 1993	Lamy, NM	September 1, 1993
TRANSAX 1992	Fort Hall, ID	September 16, 1992
TRANSAX 1990	Colorado Springs, CO	November 8, 1990
WIPPTREX 93-1	Laramie, WY	April 14, 1993
WIPPTREX 92-1	Raton, NM	October 28, 1992

Radiological Assistance Program teams are composed of a range of technical specialists who volunteer for team membership. The teams are activated on an "as needed" basis and generally can be ready to deploy from their home station within 4 hours of notification. Response times to the scene vary depending on the accident's location and the level of assistance required (Taylor, 1995).

In 1994, Radiological Assistance Program teams responded 37 times to a variety of radiological situations throughout the country. Upon evaluation, a number of these responses were determined to be nonradiological hazards (Taylor and Hauptman, 1994).

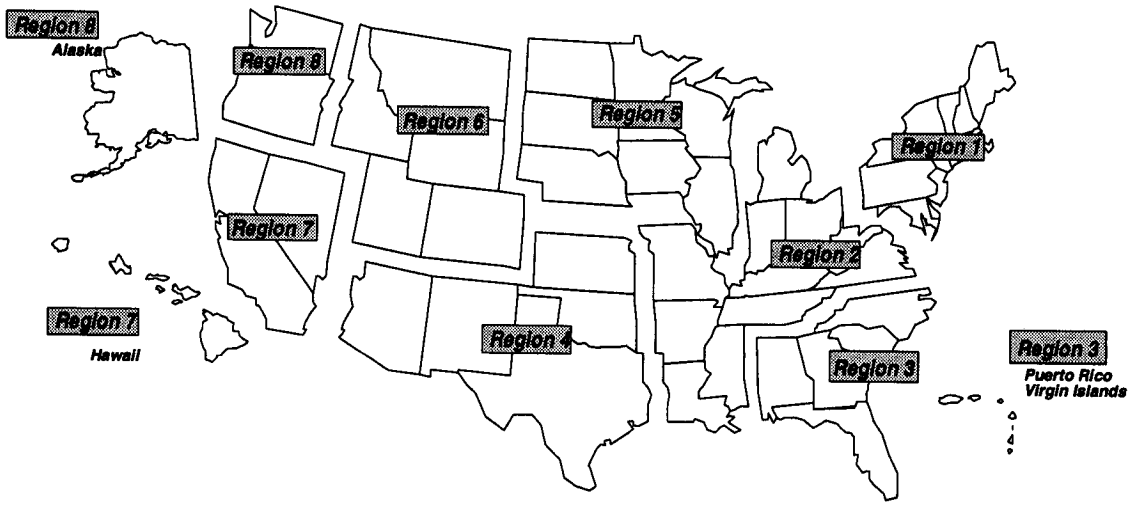
Typically, Radiological Assistance Program teams are involved in identifying personnel, equipment, or property that may be radiologically contaminated, recommending sources of medical advice for the treatment of personal injuries sustained as a result of exposure to radioactivity, and providing advice or assistance in monitoring, decontamination, material recovery, or other post-emergency operations (Gordon-Hagerty, 1993).

2.7.4 Emergency Management and Response at Ports of Entry

From 1979 to 1992, 317 spent nuclear fuel shipments in "Type B" transportation casks were made through various United States ports (NRC, 1993) with no releases of radioactive materials. The "Type B" cask shipments were placed in standard maritime shipping containers the same as any other material being sent to the port. Foreign research reactor spent nuclear fuel shipments are subject to the same types of potential hazards as those of other ships carrying nonradioactive hazardous materials.

Under the Oil Spill Prevention Act of 1990, each port is required to develop an Area Contingency Plan. While the main focus of these plans is an oil spill response, they have been expanded in many cases to address other types of hazardous material responses including radioactive material. These plans outline response capabilities, procedures, and authorities for responding to and recovering from hazardous material incidents.

These ports of entry have a specially designated and prepared terminal or dock area for unloading hazardous materials. They have either a dedicated hazardous material response team or access to a local team through some type of mutual aid agreement. These emergency response teams receive ongoing training and participate in various types of drills and exercises. Also, the dock workers receive varying levels of ongoing hazardous materials response training.



Regional Coordinating Office	Mailing Address	Telephone for Assistance
1. Brookhaven National Laboratory	Upton, Long Island New York 11973	(516) 282-2200 24 Hours
2. Oak Ridge Operations Office	DOE EOC M/S DP 801, P.O. Box 2001 200 Administration Road Oak Ridge, TN 37831-8543	(615) 576-1005 24 Hours
3. Savannah River Operations Office	P.O. Box 616 Aiken, SC 29808	(803) 725-3333 24 Hours
4. Albuquerque Operations Office	P.O. Box 5400 Albuquerque, NM 87185-5400	(505) 845-4667 24 Hours
5. Chicago Operations Office	9800 S. Cass Avenue Argonne, IL 60439	Duty Hours: (708) 252-4800 Off Hours: (708) 252-5731
6. Idaho Operations Office	850 Energy Drive Idaho Falls, ID 83401-1563	(208) 526-1515 24 Hours
7. Oakland Operations Office	1301 Clay Street Oakland, CA 94612	(510) 637-1794 24 Hours
8. Richland Operations Office	825 Jadwin Avenue Richland, WA 99352	(509) 373-3800 24 Hours
9. DOE Headquarters EOC	1000 Independence Avenue Washington, DC 20585	Non-Emergency: (202) 586-8100 Emergency: (202) 586-8500

Figure 2-19 DOE Regional Coordinating Offices for Radiological Assistance and Their Geographical Areas of Responsibility

The U.S. Coast Guard Captain of the Port would have primary On-Scene Coordinator responsibility during a foreign research reactor spent nuclear fuel incident/accident at the port, and would work in conjunction with emergency responders from the Port Authority and local jurisdictions. The On-Scene Coordinator also would be able to call upon a wide range of U.S. Coast Guard resources and the resources of other Federal agencies.

On-Scene Coordinators have at their disposal the resources of the staff of the Marine Safety Office, the resources of the staff at U.S. Coast Guard Headquarters in Washington, DC, assets of any Boat Stations in the Marine Safety Office zone, and any Air Groups. The Marine Safety Office or a Port Authority facility is used as the Emergency Operations Center for many incidents. The On-Scene Coordinator has the authority to call in the Strike Team.

These Strike Teams have limited responsibilities in the course of an incident. Their two main duties are containment and clean-up. They use booms, skimmers, absorbents, and chemicals in their response. The vessels used as platforms for booms and skimmers are usually provided by the Marine Safety Office or Boat Station in the area of the incident. Strike Teams consist of highly trained pollution response and clean-up personnel.

There are three Strike Teams under the command of the National Strike Force Coordination Center in Elizabeth City, NC, that could be called on for a foreign research reactor spent nuclear fuel accident. These teams are located on the three coasts of the United States: the Gulf Strike Team located in Mobile, AL; the Pacific Strike Team located in Novato, CA; and the Atlantic Strike Team located in Fort Dix, NJ.

For a foreign research reactor spent nuclear fuel accident, the U.S. Coast Guard On-Scene Coordinator would request an NRC or DOE representative. DOE Radiological Assistance Program teams would be requested as needed.

2.7.5 Emergency Management and Response Along Ground Transport Routes

During transport of the spent nuclear fuel received as a result of the Urgent Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel Environmental Assessment, the foreign research reactor operator's shipping agents were required to ensure that all activities of the agent's and the commercial carrier's personnel conformed to regulatory requirements, as well as all plans and procedures developed for the foreign research reactor spent nuclear fuel (DOE, 1994m). DOE and other Federal and State government agencies monitored the activities of the shipping agent and the commercial carrier to ensure that the regulatory requirements were met. If foreign research reactor spent nuclear fuel is managed in the United States, DOE will prepare a Transportation Plan before any shipments are undertaken. The Transportation Plan will detail all transportation activities necessary for the safe and secure transport of the foreign research reactor spent nuclear fuel from the point of origin to the management site in the United States. The general provisions for such a plan are included in Appendix H.

Primary responsibility for emergency response to a foreign research reactor spent nuclear fuel incident would reside with local authorities (DOE, 1989). Each corridor State or Tribe would be responsible for augmenting their existing emergency management and response plans and procedures with any foreign research reactor spent nuclear fuel specific information they felt was necessary.

States coordinate with their local jurisdictions on emergency planning and information. States and Tribes would be responsible for notifying DOE of any conditions that could affect the safe and secure transport of foreign research reactor spent nuclear fuel shipments through their jurisdictions. DOE would provide technical advice and assistance to the shippers and affected government jurisdictions to ensure safe transportation.

Spent nuclear fuel shipments transported by rail, barge, or commercial truck carrier would be subject to the same potential problems as any other hazardous materials shipment that travels daily by these means, namely severe weather, mechanical problems, derailments, and collisions.

DOE would seek to mitigate potential highway foreign research reactor spent nuclear fuel accident consequences by ensuring commercial carriers comply with NRC guidelines for shipment security and the Department of Transportation Highway Route Controlled Quantity routing regulations (DOE, 1995c) which are designed to reduce radiological transportation risk impacts.

The rail and barge industries are similar to the trucking industry in the hazardous material transportation regulatory regime. Documentation, manifesting, placarding, labeling, and other communications are controlled by 49 CFR Parts 100-199.

The carriers used for the transportation of foreign research reactor spent nuclear fuel would be required to develop emergency response plans. In developing these plans, the carriers would be required to consider the following responsibilities:

- protect life, health, and the environment;
- notify appropriate railroad officials in a timely manner;
- notify the appropriate Federal, State, and local authorities, and the shipper;
- initiate a prompt and proper response;
- provide appropriate resources and expertise for resolution of the incident;
- perform cleanup functions; and
- establish and maintain a working contact with the responsible Governmental authorities until they declare the incident closed.

As discussed in Section 2.7.2, spent nuclear fuel shipments, like other hazardous material shipments, have been involved in transportation accidents. Those that have occurred have not resulted in a radiological hazard or damage to the public or the environment. This is primarily due to the rigorous packaging.

Each State and Tribe along a shipping route would be notified of the foreign research reactor spent nuclear fuel shipment's itinerary through that jurisdiction to enable the appropriate agencies to notify the necessary response personnel. Also, DOE would maintain continuous communications through its communications and tracking systems (DOE, 1989).

Foreign research reactor spent nuclear fuel shipments would be tracked either by the commercial carrier or by a satellite tracking system similar to DOE's Transportation Tracking and Communications System (Figure 2-20). The satellite tracking system would provide a "real-time" satellite tracking and voice communications system that would link the truck or train and its escorts with a control center. Some commercial carriers have established their own satellite tracking systems. The DOE system would interface with these systems and co-monitor the shipment's progress to ensure maximum accountability and security. The satellite tracking system would also coordinate "SAFE PARKING" requests from the states.

If a situation would arise (e.g., severe weather, mechanical difficulties, protesters, security threat, personnel illness or injury) that presented a hazard or threat to a highway foreign research reactor spent nuclear fuel shipment, DOE would have arranged through Memoranda of Agreement for the commercial carrier to divert to any Federal installation (e.g., a DOE site or military base) and request "SAFE PARKING" at that facility until the situation is resolved. The receiving facility would assist in providing security and logistical support until the shipment was prepared to depart.

State, Tribal, and local agencies, as well as the commercial carriers, maintain various emergency response plans and procedures. During a foreign research reactor spent nuclear fuel highway, barge, or rail accident, the personnel accompanying the shipment would be the immediate contact for information to the local emergency responders having jurisdiction and Incident Commander authority over the situation.

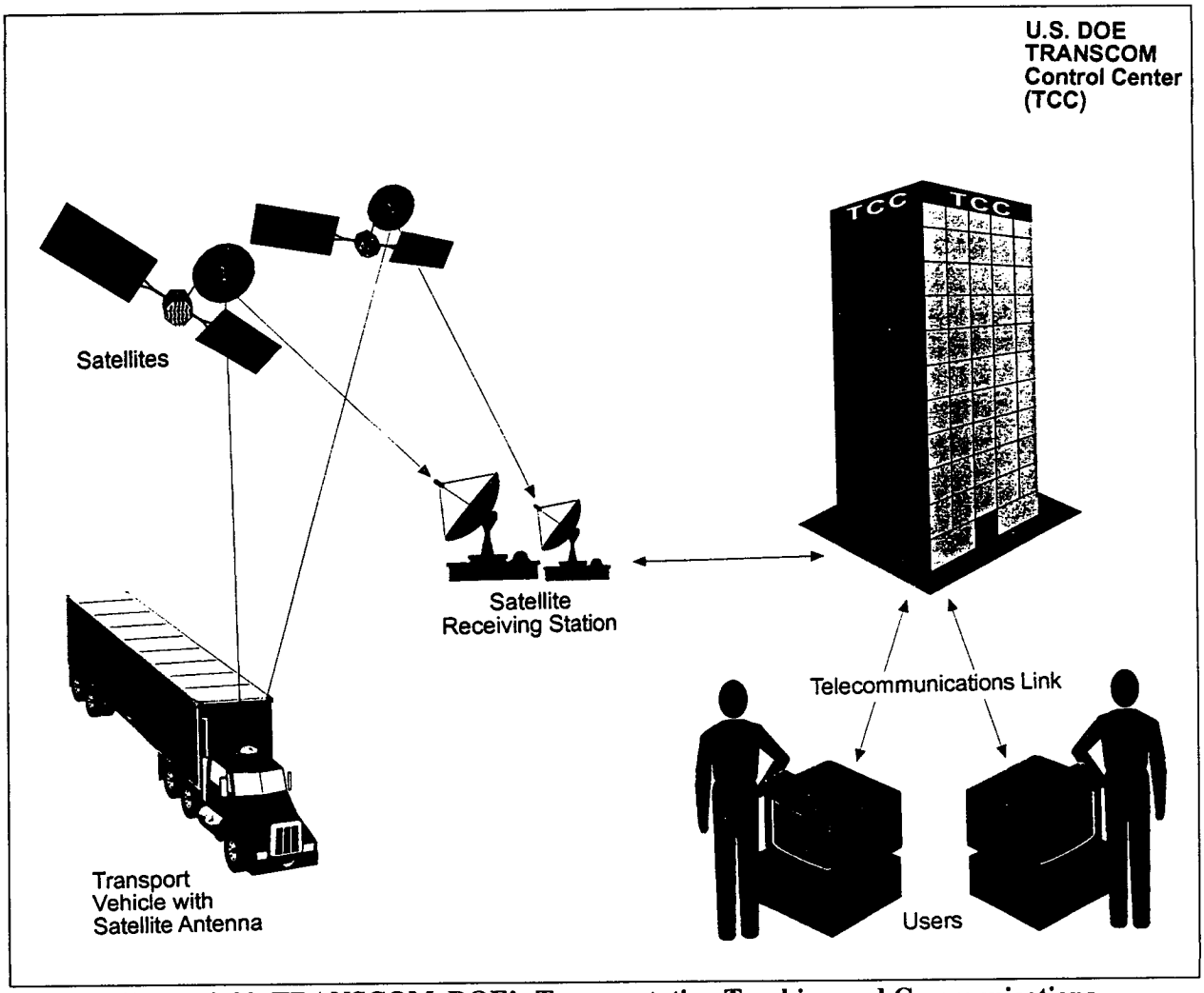


Figure 2-20 TRANSCOM, DOE's Transportation Tracking and Communications System

Additionally, the Hazardous Material Regulations (49 CFR 177.861) advise highway shippers, carriers, and emergency responders to contact DOE if assistance with radioactive materials is required (DOE, 1990b). A DOE Radiological Assistance Program team could respond to the scene if requested.

Incident Commanders have other sources of technical assistance they could call on such as the commercial carrier's technical experts (through a 24-hr contact number), the National Response Center, and the Chemical Transportation Emergency Center, which provides immediate response advice and information from the shipper on a 24-hr basis.

2.7.6 Emergency Management and Response at Management Sites

The DOE 5500 series of Orders incorporates various Federal regulatory requirements and mandates an extensive emergency management and response program at each management site in the same manner as any other industrial facility or local government jurisdiction. State-level specific requirements are addressed by each respective site.

Each of these sites routinely handles hazardous materials that have potential emergency management and response considerations similar to foreign research reactor spent nuclear fuel. These, along with the usual risks posed by any industrial environment, are regularly evaluated through various Safety Analysis Reports and Hazards Assessment studies. These situations are then mitigated to the greatest extent possible.

2.8 Security Measures

Domestic transportation of foreign research reactor spent nuclear fuel would be under the regulatory jurisdiction of the U.S. Department of Transportation and NRC. In the event that foreign research reactor spent nuclear fuel were to be transported through a military port of entry, applicable requirements would be established in advance by the U.S. Department of Defense, DOE and NRC to provide the appropriate level of security.

The objective of the security measures during transportation of spent nuclear fuel are to minimize the possibilities for radiological sabotage of spent nuclear fuel shipments and facilitate the location and recovery of spent nuclear fuel shipments that may have come under control of unauthorized persons. The elements of the security measures would be considered when developing the Transportation Plan to be developed by DOE in consultation with State, local, and Tribal officials prior to any actual spent nuclear fuel shipments. The general provisions of the Transportation Plan, which would include requirements relative to emergency response planning, security considerations, and communications during actual shipments of foreign research reactor spent nuclear fuel, are included in Appendix H.

The security measures provided by the regulations would make the hijacking of a transportation cask a highly unlikely event. In the first place, the large size and weight of these casks (9.1 to 22.7 metric tons, or 10 to 25 tons) and the inherent radioactivity of the spent nuclear fuel make spent fuel in a transportation cask an unlikely hijacking target. For a malicious act of sabotage, there are, in fact, more accessible targets than spent nuclear fuel, that would provide more spectacular detrimental effects; especially considering the fact that, aside from the radioactivity of the spent nuclear fuel, which is a relatively short range effect, the spent nuclear fuel elements are simply pieces of metal (which might be somewhat warm). In the event of a hijack attempt aimed at some long-term use of the contents of the cask, the communications systems required to be used during the shipment would enable timely notification of authorities who would mobilize response forces. Tracking systems would allow the location of the cask to be determined in real time, thereby aiding in the timely interception of the hijackers by response forces.

The successful completion of attempts aimed at short-term destructive acts, such as explosions from within the cask or inducement of criticality, are not considered credible because they would require sufficient time to breach the cask at a great personal risk to the hijackers (probably lethal exposure), special tooling and techniques, and/or the use of specialized materials (for sufficient moderation) that in themselves are safeguarded materials.

Malicious attack scenarios from a distance, such as the explosion of a bomb near a transportation cask, or an attack by an armor-piercing weapon could be within the realm of possibility. The risk to the health and safety of the public associated with such an event cannot be calculated since there is no basis for estimating either the probability of such an event occurring or that damage sufficient to release radioactive material from the cask would occur. Appendix D, Section D.5.9, provides a discussion of the consequences of some sabotage/terrorist initiated events for the purpose of emergency response planning.

2.9 Preferred Alternative

In selecting a preferred alternative for the management of foreign research reactor spent nuclear fuel, DOE and the Department of State took several factors into consideration, including the following:

1. U.S. Government nuclear weapons nonproliferation policies and objectives;
2. DOE responsibilities (e.g., safe handling of hazardous materials, safety/health risks to workers, compatibility with other ongoing missions, etc.);
3. Potential environmental impacts (e.g., public safety, etc.);
4. Public comments received and concerns expressed following issuance of the Draft EIS;
5. Analysis of impacts and alternatives in the Programmatic SNF&INEL Final EIS (DOE, 1995c), as well as the Record of Decision for that EIS;
6. Estimated costs of alternatives for management of foreign research reactor spent nuclear fuel;
7. Public issues/concerns/perceptions (e.g., fairness/equity to affected States and populations, etc.); and
8. Uncertainties (e.g., future budget priorities and continuity of funding, technology development, repository timing and waste form acceptance criteria, regulatory change, etc.).

Based on consideration of these factors, DOE and the Department of State, in consultation with other Government agencies, designate the alternative described below as the preferred alternative. This preferred alternative is the same as Management Alternative 1 (Manage Foreign Research Reactor Spent Nuclear Fuel in the United States, discussed in Section 2.2), with the modifications discussed below. The basic components of Management Alternative 1 have been modified to incorporate various implementation alternatives discussed in Section 2.2.2.

The amount of foreign research reactor spent nuclear fuel that would be accepted and managed, as specified in Section 2.2.1.3, could total approximately 19.2 MTHM, with a volume of approximately 110 m^3 (4,100 ft^3), representing approximately 22,700 individual spent nuclear fuel elements. The target material that would be accepted and managed, as specified in Section 2.2.2.1, contains an additional 0.6 MTHM representing the uranium content of approximately 620 additional typical foreign research reactor spent nuclear fuel elements. The following stipulations on qualifying spent nuclear fuel types would apply:

- Spent nuclear fuel (HEU and/or LEU) would be accepted from research reactors operating on LEU fuel or in the process of converting to LEU fuel when the policy becomes effective.
- Spent nuclear fuel (HEU and/or LEU) would be accepted from research reactors which operate on HEU fuel when the policy becomes effective and which agree to convert to LEU fuel. Spent nuclear fuel would not be accepted from research reactors that could convert to LEU fuel but refuse to do so.

- Spent nuclear fuel (HEU) would be accepted from research reactors having lifetime cores, from research reactors planning to shut down by a specific date while the policy is in effect, and from research reactors for which a suitable LEU fuel is not available.
- Spent nuclear fuel (HEU and/or LEU) would be accepted from research reactors that are already shut down.
- Unirradiated fuel (HEU and/or LEU) from eligible research reactors would be accepted as spent nuclear fuel.
- For research reactors with both HEU and LEU spent nuclear fuel available for shipment, LEU spent nuclear fuel would not be accepted until the HEU spent nuclear fuel is exhausted, unless there are extenuating circumstances (e.g., deterioration of one or more LEU elements sufficient to cause a safety problem).
- Spent nuclear fuel (HEU and/or LEU) would not be accepted from new research reactors starting operation after the date of implementation of the policy.

The policy duration under this preferred alternative would be 10 years, beginning on the date when the management policy would become effective, as discussed in Section 2.2.1.1. Shipments of spent nuclear fuel to the United States could be made for a period of 13 years, starting from the effective date of policy implementation, as long as the spent nuclear fuel had already been discharged prior to the beginning of the policy period or is discharged during the policy period.

The aluminum-based foreign research reactor spent nuclear fuel would be managed at the Savannah River Site and the TRIGA foreign research reactor spent nuclear fuel would be managed at the Idaho National Engineering Laboratory, in accordance with the Record of Decision for the Programmatic SNF&INEL Final EIS (DOE, 1995c) and the settlement agreement reached between DOE and the State of Idaho [Public Service Co. of Colorado v. Batt, No. CV 91-0035-S-EJL (D. Id.) and United States v. Batt, No. CV-91-0054-S-EJL (D. Id.)]. Under this preferred alternative, up to approximately 19 MTHM of aluminum-based foreign research reactor spent nuclear fuel (approximately 17,800 elements), representing up to approximately 675 casks, and target material representing up to approximately 140 additional casks would be accepted and managed at the Savannah River Site. Also, up to approximately 1 MTHM of TRIGA foreign research reactor spent nuclear fuel (approximately 4,900 elements), representing up to approximately 162 casks would be accepted and managed at the Idaho National Engineering Laboratory.

The candidate U.S. ports of entry are listed in Section 2.2.1.6 and are described in detail in Section 3. Although all of the ports are acceptable based on the port selection criteria discussed in Appendix D, DOE would prefer to candidate use the military ports in proximity to the spent nuclear fuel management sites (i.e., Charleston NWS and the Concord NWS). Under this preferred alternative, a maximum of 38 casks of TRIGA foreign research reactor spent nuclear fuel (estimated to require about 5 shipments) could be accepted at a Western port, with 150 to 300 shipments being accepted via an Eastern port.

The foreign research reactor spent nuclear fuel and target material would be shipped by either chartered or regularly scheduled commercial ships from the foreign ports to the United States, as specified in Section 2.2.1.5.

DOE would take title to the foreign research reactor spent nuclear fuel and target material that is shipped by sea after it is offloaded at the port of entry, and to the spent nuclear fuel and target material shipped solely overland (i.e., from Canada) at the border crossing between Canada and the United States.

The foreign research reactor spent nuclear fuel and target material would be transported from the United States ports to the management sites by truck and rail as specified in Section 2.2.1.7.

The financing arrangement under this preferred alternative would be for the United States to bear the full cost for transporting and managing the foreign research reactor spent nuclear fuel and target material accepted from countries with other-than-high-income economies, and to charge high-income economy countries a competitive fee. The fee would be established in a Federal Register Notice (as opposed to being published in this Final EIS), to allow DOE flexibility to adjust the fee to account for inflation, or changes in spent nuclear fuel management practices in the United States.

For the aluminum-based foreign research reactor spent nuclear fuel, a three point strategy is proposed, as follows:

1. DOE would embark immediately on an accelerated program at the Savannah River Site to identify, develop, and demonstrate one or more non-reprocessing, cost-effective treatment and/or packaging technologies to address potential health and safety issues that may develop and to prepare the foreign research reactor spent nuclear fuel for ultimate disposal. The purpose of any new facilities that might be constructed to implement these technologies would be to change the foreign research reactor spent nuclear fuel into a form that is suitable for geologic disposal, without necessarily separating the fissile materials, while meeting or exceeding all applicable safety and environmental requirements. Examples of technologies that would be considered include: *can-in-canister, chop and dilute/poison, melt and dilute/poison, plasma arc treatment, electrometallurgical treatment, glass material oxidation and dissolution, chloride volatility, dissolve and vitrify, direct disposal in small packages*, etc. Functional schematics of these technologies are shown in Figure 2-21. In conjunction with the examination of new technologies, variations of conventional direct disposal methods would also be explored. After treatment and/or packaging, the foreign research reactor spent nuclear fuel would be managed on site in "road ready" dry storage until transported off-site for continued storage or disposal. DOE would select, develop, and implement, if possible, one or more of these treatment and/or packaging technologies by the year 2000. DOE is committed to avoiding indefinite storage of this spent nuclear fuel in a form that is unsuitable for disposal.

2. Despite DOE's best efforts, it is possible that a new treatment and/or packaging technology may not be ready for implementation by the year 2000. It may become necessary, therefore, for DOE to use the F-Canyon to reprocess some foreign research reactor spent nuclear fuel elements, while the F-Canyon is operating to stabilize at-risk materials as recommended by the Defense Nuclear Facilities Safety Board. (For example, under current schedules this activity could take place between the years 2000 and 2002.) In that event, the foreign research reactor spent nuclear fuel would be converted into LEU and wastes generated during reprocessing. Certain wastes would be vitrified in the Defense Waste Processing Facility, while others would be solidified in the Saltstone facility. In order to provide a sound policy basis for making a determination on whether and how to utilize the F-Canyon for processing tasks that are not driven by health and safety considerations, DOE will commission or conduct an independent study of the nonproliferation and other (e.g., cost and timing) implications of reprocessing spent nuclear fuel from foreign research reactors. The study will be initiated in mid-1996 and will be completed in a timely fashion to allow a subsequent decision about possible use of the F-Canyon for foreign research reactor spent nuclear fuel reprocessing to be fully considered by the public, the Congress and the Executive Branch agencies. Pending disposition of the foreign research reactor spent

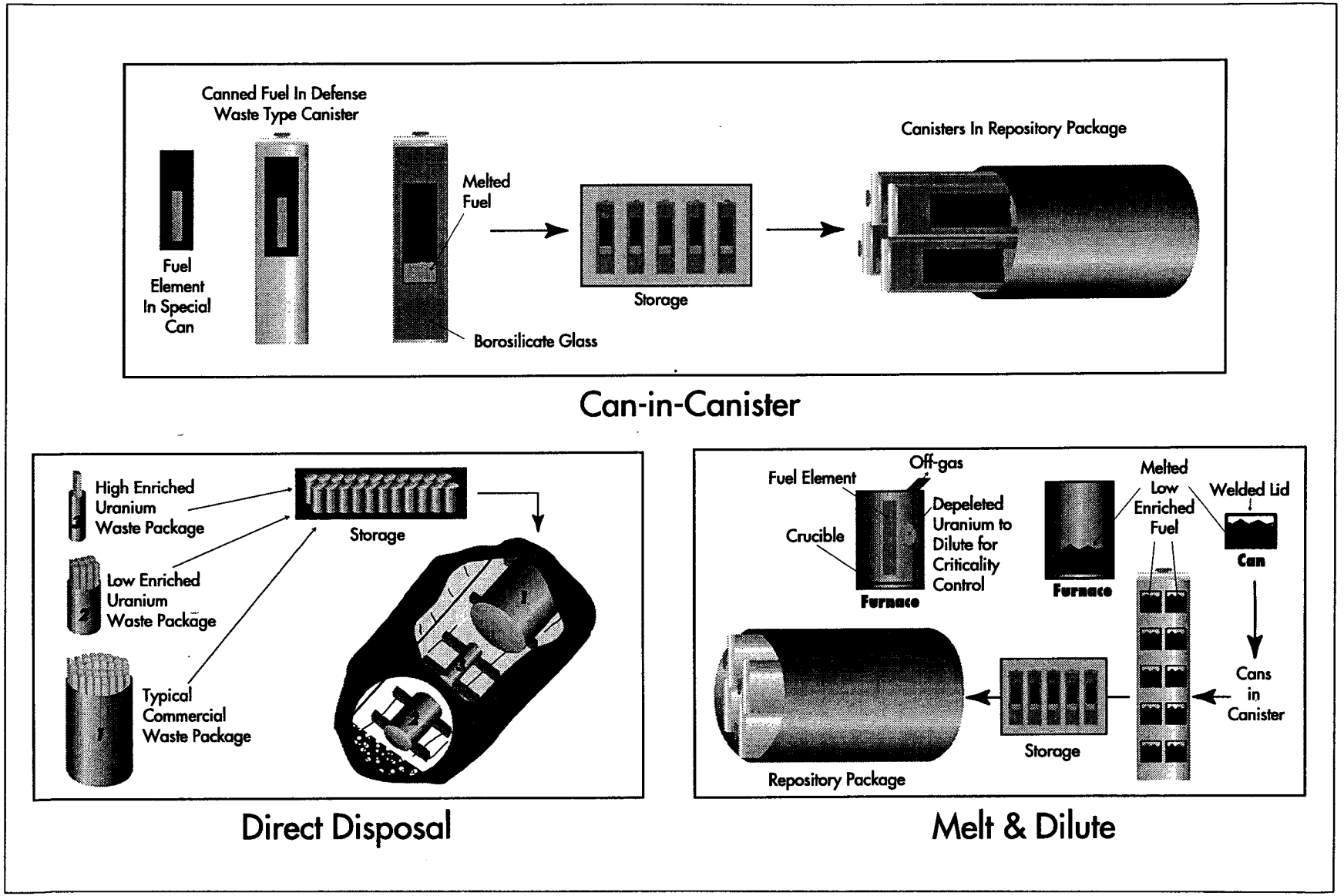
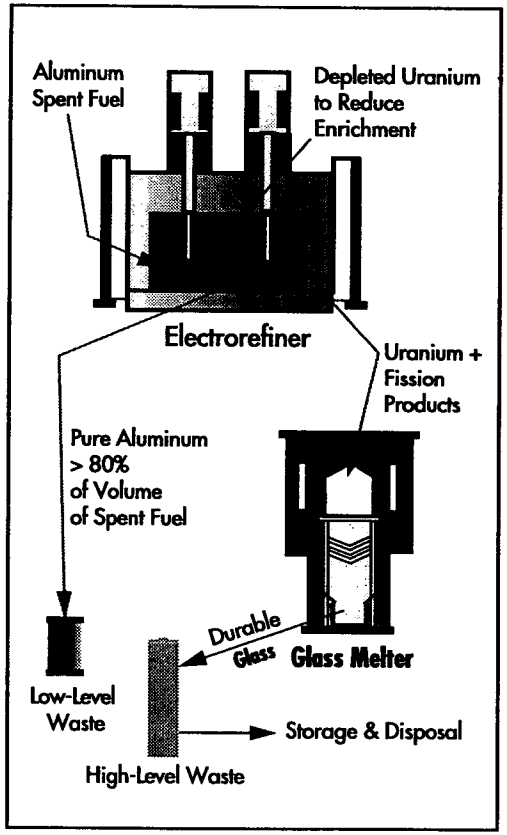
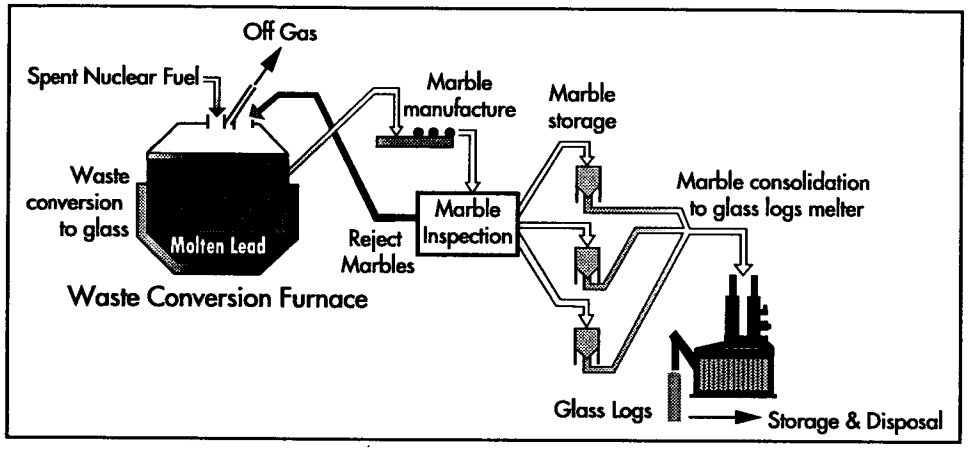


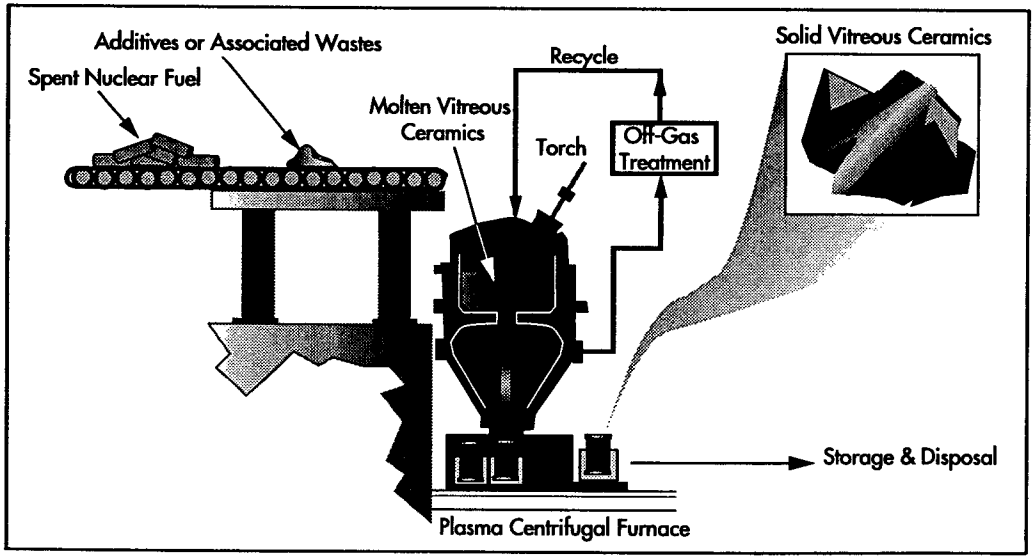
Figure 2-21 New Treatment and Packaging Technologies (Functional Schematic Diagrams)



Electrometallurgical Treatment



Glass Material Oxidation & Dissolution System



Plasma Arc Treatment

Figure 2-21 New Treatment and Packaging Technologies (Functional Schematic Diagrams) (Continued)

nuclear fuel by either a new treatment and/or packaging technology or reprocessing in the F-Canyon, the spent nuclear fuel would be placed in existing wet storage at the Savannah River Site.

3. DOE would conduct a program of close monitoring of any foreign research reactor spent nuclear fuel and target material that would be accepted for storage in existing wet storage facilities. DOE is presently unaware of any technical basis for believing that this spent nuclear fuel cannot be safely stored until one or more of the treatment and/or packaging technologies becomes available. Nevertheless, if health and safety concerns involving any of the foreign research reactor spent nuclear fuel elements are identified prior to development of an appropriate treatment and/or packaging technology, DOE would use the F-Canyon to reprocess the affected spent nuclear fuel elements, if it is still operating to stabilize at-risk materials.

   Because of criticality constraints stemming from the configuration of the F-Canyon, under no circumstances would it be possible to produce separated HEU that is suitable for a nuclear weapon. Instead, depleted uranium would be added to the foreign research reactor spent nuclear fuel near the beginning of the reprocessing process, so that only LEU would be produced when the uranium is separated from the fission products. The trace quantities of plutonium in the spent nuclear fuel would be left in and solidified along with the high-level radioactive reprocessing wastes. This would further the President's policy to discourage the accumulation of excess weapons grade fissile materials, to strengthen controls and constraints on these materials and, over time, to reduce worldwide stocks.

The TRIGA foreign research reactor spent nuclear fuel would be stored at the Idaho National Engineering Laboratory in the Fluorinel Dissolution and Fuel Storage (FAST) facility (wet storage) or preferably the dry storage Irradiated Fuel Storage Facility (IFSF) and the CPP-749 dry storage area. After 2003, all foreign research reactor spent nuclear fuel would be managed in accordance with the provisions of the settlement agreement between DOE and the State of Idaho, until transported off-site for ultimate disposition. Depending on the nature of any new treatment and/or packaging technology that might be developed, the TRIGA spent nuclear fuel would also be processed using such a new technology, if necessary for disposal.

A critical result of implementing this preferred alternative would be the continued viability and vitality of the Reduced Enrichment for Research and Test Reactors (RERTR) Program, whose goal is minimizing and eventually eliminating the use of HEU in civil nuclear programs, by providing foreign research reactor operators with a continued incentive to participate. Similarly, the successful development of alternative fuels for research reactors and the expansion of the program to Russia, the other Newly Independent States, China, South Africa, and other countries, and the establishment of a world-wide norm discouraging the use of HEU, are dependent on the United States' commitment to action such as that embodied in this preferred alternative.

DOE is aware that the inclusion of chemical separation within the preferred alternative could be interpreted by some nations, organizations and persons as a signal of endorsement of the use of reprocessing as a routine method of waste management for spent nuclear fuel or a reversal of U.S. policy on reprocessing. This would not be an accurate interpretation. The U.S. policy regarding reprocessing was established in Presidential Decision Directive 13. DOE and the Department of State have determined that this preferred alternative is not inconsistent with that policy. The draft version of this EIS indicated that reprocessing is a non-preferred technology and would not be used unless one or more of a set of specific conditions occurred (see Draft EIS Section 2.2.2.6). This final preferred alternative, which

includes reprocessing, establishes a prescribed set of circumstances that would have to be met before reprocessing would be used. The independent study discussed above in point 2 of the strategy for management of aluminum-based spent nuclear fuel will review the policy, technology, cost and schedule implications for reprocessing foreign research reactor spent nuclear fuel to determine whether reprocessing of foreign research reactor spent nuclear fuel is justified for other than health and safety reasons.

Policy considerations and environmental impacts associated with implementation of this preferred alternative are presented in Section 4.7. Cost considerations are included in Section 4.9.

Basis for the Preferred Alternative - The elements of the preferred alternative discussed above have been selected based on the following considerations:

1. ***Management Alternative*** - The various management alternatives considered are discussed in Sections 2.2 through 2.4 of the EIS. The analyses in Sections 4.2 through 4.5 of the EIS demonstrate that the impacts on the environment, involved workers, or the citizens of the United States from implementation of any of the management alternatives or implementation alternatives analyzed (other than beneficial impacts associated with support for United States nuclear weapons nonproliferation policy) would be small and completely within the applicable regulatory limits, and would not provide a basis for discrimination among the alternatives. As a result, the process for selection of the elements of the preferred alternative focused on programmatic considerations:

    a. DOE and the Department of State concluded that the No Action Alternative and Management Alternative 2, Implementation Alternative 1a (Overseas Storage) would be unacceptable since these alternatives are not consistent with United States nuclear weapons nonproliferation policy objectives.

    b. DOE and the Department of State believe that the basic implementation of Management Alternative 1 would be undesirable to the extent that it would involve indefinite storage of foreign research reactor spent nuclear fuel in a form that is not suitable for disposal. Management Alternative 1 modified to rely solely on Implementation Alternative 6 (Near Term Conventional Chemical Separation in the United States) would raise nuclear weapons nonproliferation policy questions. Management Alternative 1 modified to rely solely on Implementation Alternative 7 (Developmental Treatment and/or Packaging Technologies) could not be selected at this time because no decision has been made on which technology will be pursued.

    c. DOE and the Department of State also believe that Management Alternative 2, Implementation Alternative 1b (Overseas Reprocessing) would be technically complex and potentially extremely expensive because it would require the United States to accept reprocessing wastes from the overseas reprocessing operations. This is due to the fact that both of the countries in which the overseas reprocessing might be accomplished require the reprocessing wastes to leave their countries, and many of the countries that would be covered by the proposed policy cannot accept the return of such reprocessing wastes. The intermediate-level radioactive wastes produced in Europe during reprocessing of research reactor spent nuclear fuel are often in a concreted waste form, unlike any high-level radioactive waste form in the United States. This concreted waste form has not been evaluated for disposal in a United

States geologic repository. Accordingly, acceptance of such waste in the United States likely could require expensive, currently unproven treatment and/or packaging technologies to transform it into a form that would be acceptable for disposal.

d. The sample hybrid alternative (Management Alternative 3) analyzed in the Draft EIS involved partial reprocessing overseas coupled with partial management in the United States. In order for this alternative to be consistent with United States nuclear weapons nonproliferation policy objectives, certain conditions would have to be met by either the reprocessor (e.g., Dounreay) or the research reactor operators. Staff from both DOE and the Department of State have addressed this issue with representatives of the United Kingdom Department of Trade and Industry and reactor operators, and have determined that it would not be possible to ensure compliance with the United States nuclear weapons nonproliferation policy objectives. The primary concern was the inability to ensure that any separated HEU would be blended down to LEU. Obtaining the reactor operators' agreement to such a policy would likely require significant financial subsidies. The potential cost of achieving agreement to blend down the uranium, plus uncertainties regarding Dounreay's long-term availability, led DOE and the Department of State to conclude that successful implementation of this alternative could not be relied on.

None of the alternatives analyzed in the Draft EIS could be implemented without some degree of difficulty. However, a modification of Management Alternative 1 (Manage Foreign Research Reactor Spent Nuclear Fuel in the United States), incorporating a combination of alternatives to the basic implementation components balances policy, technical, cost and schedule requirements. DOE and the Department of State consider that this approach provides the highest assurance that programmatic requirements could be met. This combination also provides the strongest support for United States nuclear weapons nonproliferation policy objectives as all aspects of the alternative would be under the control of DOE, either directly or through the spent nuclear fuel acceptance contracts with the reactor operators.

2. ***Management Technology*** - The alternative spent nuclear fuel management technologies considered are discussed in Sections 2.2.2.7 and 2.6.5 of the EIS. The approaches fall into four broad categories, as follows:

Wet Storage - Wet storage is a proven technology, the impacts of which would be small, and completely within the applicable regulatory limits, if it were used to implement the proposed action. Furthermore, DOE currently has wet storage facilities in operation at the Savannah River Site and the Idaho National Engineering Laboratory that could be used for storage of foreign research reactor spent nuclear fuel. However, wet storage requires attention to ensure that the storage conditions do not foster slow degradation of the spent nuclear fuel through corrosion.

Dry Storage - Dry storage is also a proven technology, that would also have no more than small impacts, completely within the applicable regulatory limits, if used to implement the proposed action. It is the storage medium that is being selected at all commercial power reactor sites where additional storage capacity is being built. However, it has not been used for research reactor spent nuclear fuel in the United States. Dry storage capacity could be provided at the management sites in time to meet the program's projected needs, if initial spent nuclear fuel receipts were placed into the available wet storage.

Chemical Separation - Chemical separation is also a proven technology, the impacts of which would be small, and completely within the applicable regulatory limits, if used to implement the proposed action. However, DOE is phasing out its chemical separation activities and is currently reprocessing only at the Savannah River Site to stabilize materials for health and safety reasons. Because these chemical separations facilities could be used to treat the foreign research reactor spent nuclear fuel, they provide a contingency to be considered pending availability of an alternate means of treating and/or packaging the spent nuclear fuel prior to ultimate disposition.

New Technologies - Due to concerns regarding geologic disposal of intact spent fuel containing HEU (i.e., the possibility of uncontrolled criticality incidents), some form of treatment of this spent nuclear fuel may be required. While several concepts have been proposed for new treatment and/or packaging technologies, none of them are ready for implementation at this time. Prior to a decision leading to their implementation, additional development work would be required to determine whether and how they could be implemented, based on technical and cost considerations.

In order to effectively implement the preferred alternative of accepting and managing the foreign research reactor spent nuclear fuel in the United States, DOE and the Department of State developed the three point strategy for management of aluminum-based spent nuclear fuel discussed earlier in this Section. This strategy draws on the strengths of each of the spent nuclear fuel management technologies discussed above, while avoiding sole reliance on any of them. Due to the relatively more robust nature of the TRIGA spent nuclear fuel, DOE believes that minimal additional development may be needed to prepare it for storage and final disposition. Accordingly, the preferred alternative specifies that the TRIGA spent nuclear fuel would be placed in existing dry storage facilities at the Idaho National Engineering Laboratory. However, the program to qualify the final geologic disposal form for the TRIGA spent nuclear fuel will continue and the appropriate treatment, if any, would be identified and implemented.

3. ***Policy Duration*** - The alternative policy durations considered are defined in Sections 2.2.2.1 and 2.2.2.2 of the EIS. Analysis of these alternatives concluded that the 5-year option is likely to provide insufficient time for the reactor operators to arrange for alternative spent nuclear fuel disposal mechanisms, and thus might result in some reactor operators refusing to cooperate fully with United States nuclear weapons nonproliferation programs. This, in turn, could undermine international cooperation with other nuclear weapons nonproliferation programs the United States might seek to implement.

   On the other hand, the analysis determined that there was insufficient benefit to be gained from indefinite acceptance of all of the spent nuclear fuel containing HEU because such an approach likely would provide insufficient incentive for other countries to proceed expeditiously with arrangements for alternative disposal mechanisms not involving the United States.

   The approach incorporated into the preferred alternative allows sufficient incentive to the reactor operators to ensure their cooperation, while specifying a definite cut-off point. This alternative provides sufficient lead time to allow the reactor operators to make other arrangements for disposition of their spent nuclear fuel, and provides sufficient time to accept all spent nuclear fuel containing HEU enriched in the United States.

4. ***Amount of Material to Manage*** - The alternative amounts of material that might be covered by the proposed policy are defined in Sections 2.2.1.3 and 2.2.2.1 of the EIS. DOE and the Department of State concluded that management of spent nuclear fuel only from other-than-high-income economy countries would strongly encourage the resurgence of the use of HEU in the high-income economy countries, as well as opening the United States, fairly or unfairly, to charges that we are not living up to our commitments under the *Treaty on the Non-Proliferation of Nuclear Weapons*. Management of only spent nuclear fuel containing HEU would penalize those reactors that have already converted to the use of LEU fuel, and would provide an incentive for reactors to continue to use HEU fuel, or switch back to its use. The impacts that would result from management of any of these different amounts of material would be small, and within the applicable regulatory limits.

   DOE and the Department of State concluded that management of all of the aluminum-based and TRIGA foreign research reactor spent nuclear fuel currently in storage or projected to be discharged during the policy period, and target material containing uranium enriched in the United States, would provide the best support for the objectives of the proposed policy. Implementation of this preferred alternative would provide an opportunity for removal of the maximum amount of HEU from civil commerce and would provide an incentive for the continued conversion to and use of LEU as fuel for foreign research reactors, in place of highly enriched (weapons grade) uranium.

5. ***Marine Transport*** - The alternative approaches to marine transport of foreign research reactor spent nuclear fuel are discussed in Section 2.2.1.5 of the EIS. The analysis in the EIS demonstrates that the impacts to the environment, workers or the public from transport of the spent nuclear fuel using any of these types of ships would be small, and within the regulatory limits. The analyses do not identify any difference in the small impacts that would result from the use of purpose-built vs. general purpose ships. Since "military transports" are in fact the same type of ship as the chartered commercial cargo ships and are crewed by civilians, use of "military transports" would not actually result in any difference in impacts. DOE and the Department of State believe that use of actual warships would be both unnecessary from a security standpoint and could entail additional risk to the environment and the public, since such ships do not routinely carry cargo.

   The approach selected by DOE and the Department of State for the preferred alternative provides maximum flexibility for marine transport.

6. ***Ground Transport*** - The ground transportation alternatives are defined in Section 2.2.1.7 of the EIS. The analyses in the EIS demonstrate that the impacts to the environment, workers or the public, from any of these modes of ground transport (counting barge as a mode of "ground transport") would be small and within the applicable regulatory limits. Furthermore, the differences in potential impacts between the truck, rail and barge alternatives were not significant.

   Both the truck and rail transportation options have been used successfully to transport foreign research reactor spent nuclear fuel in the past. Truck transport was the predominant mode used for over twenty years, until the old "Off-Site Fuels Policy" lapsed in 1988. Rail was the mode used for both shipments under the *Environmental Assessment of Urgent-Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel* (DOE, 1994m). Since neither

without encouraging any of them to resort to reprocessing of their spent nuclear fuel, and would provide a mechanism through which to account for inflation and future definition of program details.

2.10 Additional Alternatives Considered But Dismissed

Besides ocean transport by vessel, carriage by air is the only other mode of transportation from overseas nations to the United States. There are two distinct reasons why the air mode is not a feasible alternative to the sea mode for transportation of foreign research reactor spent nuclear fuel.

First, with the possible exception of small sample quantities, spent nuclear fuel is required to be transported in packagings (casks) weighing several tons. As a general rule, casks would have to be shipped singly by air (i.e., one per airplane) because of their weight. This has made the air alternative so costly as to be prohibitive. As a result, there is no commercial operational experience in the United States with air transport of spent nuclear fuel. No "Standard Operating Procedures" have been written and no intermodal transfer procedures (air-truck or air-rail) have been developed. No agreements have been negotiated regarding airspace overflight of other nations or states. Because the United States has no experience with this type of transportation, no meaningful comparison can be made between air transport and ship transport regarding either incident-free doses to workers and the public or accident risks.

Second, plutonium air transport packaging standards clearly apply to movement by air of any non-exceptional package containing more than 0.005 curies of plutonium (10 CFR 71.88a). The foreign research reactor spent nuclear fuel considered in this EIS is non-excepted and could contain more than 0.005 curies of plutonium per cask. Therefore, the spent nuclear fuel would have to be transported in a cask meeting plutonium air transport packaging standards. Because no spent nuclear fuel transportation cask has been certified to meet plutonium air transport packaging standards, transporting foreign research reactor spent nuclear fuel by air to the United States could not be accomplished in the near term.

The following additional considerations contributed to the dismissal of air transport as an alternative transportation mode of foreign research reactor spent nuclear fuel: 1) Most United States airports lack rail connections; therefore ground transportation would be limited to the use of trucks; 2) airports have no experience in handling spent nuclear fuel and the capabilities of the available handling equipment are marginal and; 3) worker exposure associated with handling activities would be higher because a lack of automation in handling equipment.

The alternative of accepting of foreign research reactor spent nuclear fuel only from countries that present a potential nuclear weapons proliferation risk was considered but dismissed. A major drawback inherent in this alternative is that potential proliferant countries might well object to being publicly identified as such and, on one pretext or another, refuse to cooperate with the United States in the program. Further, this alternative would not address the potential that some countries that are not currently identified as nuclear weapons proliferation threats might become such a threat in the future. To account for acceptance of foreign research reactor spent nuclear fuel from such countries, DOE would have to assume and analyze one or more "hypothetical reactors" to estimate the potential environmental impacts. The public noted its objection to such an approach when DOE proposed to accept 150 foreign research reactor spent nuclear fuel elements from one or more unnamed "hypothetical reactors" in the first draft of the *Environmental Assessment of Urgent-Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel* (DOE, 1994m). Finally, implementation of such an alternative would leave unresolved the spent nuclear fuel disposition concerns of the majority of the countries in which foreign research reactors are operating. These countries would be likely to argue, rightly or wrongly, that the United States was not living up to its obligations under the *Treaty on the Non-Proliferation of Nuclear Weapons* to assist nonnuclear weapon states with the

peaceful application of nuclear energy. This would damage the credibility of the United States as a reliable partner in the implementation of international nuclear materials management. In consideration of the above summarized flaws, DOE dismissed this alternative from consideration in this EIS.

As a result of public comments, the possibility of managing foreign research reactor spent nuclear fuel on an isolated island was considered, and dismissed. A new facility on an island could not be ready to receive foreign research reactor spent nuclear fuel for at least five years, necessitating temporary management at another location (Savannah River site or Idaho National Engineering Laboratory) for at least the first half of the policy period. Furthermore, management of spent nuclear fuel on such an island is undesirable from the standpoint of security and safety. Provision of physical security would be much more difficult on a remote island than at a mainland site, due to isolation and the greater challenges of protecting open coastlines. Small isolated islands are subject to a greater frequency of severe weather than occurs in the mainland, and after a severe storm it can be more difficult to restore services than it would be in a mainland area.

3. The Affected Environment

This chapter describes the marine, port, and site environments. Marine environments (Section 3.1) would be potentially impacted by the ocean transport of spent nuclear fuel, and port environments (Section 3.2) would be potentially impacted by the transfer of the casks that would contain the foreign research reactor spent nuclear fuel. The affected environment of the potential DOE management sites for storage is addressed in Section 3.3.

3.1 Marine Environment

The ocean is the principal marine environment potentially impacted by foreign research reactor spent nuclear fuel transport. The scientific study of the ocean is commonly referred to as "oceanography." The discipline of oceanography has been subdivided in terms of the basic physical sciences into geological, chemical, physical, and biological oceanography. The purpose of this section is to provide a basic description of the marine environment. It describes those relevant features that have an influence on the general circulation of the world ocean.

3.1.1 Geological Oceanography

Marine geology or geological oceanography is the study of the character and history of that portion of the earth's surface covered by seawater. The world ocean is geographically divided into five major regions: (1) the Southern Ocean, (2) the Atlantic Ocean, (3) the Pacific Ocean, (4) the Indian Ocean, and (5) the Arctic Ocean. The Pacific Ocean occupies roughly 46 percent of the total world ocean area, the Atlantic Ocean approximately 23 percent, the Indian Ocean nearly 20 percent, and the remaining oceans, 11 percent.

The structural features of the ocean basin surface (Figure 3-1) can be divided into five major entities: (1) shore, (2) continental shelf, (3) continental slope and rise, (4) basin (or abyssal plain), and (5) mid-oceanic ridges. The shore region is commonly referred to as that portion of the land mass that has been modified by oceanic processes. The beach is the seaward limit of the shore, and represents a region that is in dynamic equilibrium between the high and low water marks. Extending seaward from the beach face is the continental shelf. It is characterized by a gentle slope of approximately 1:500. The shelf region has an average width of approximately 65 km (40.4 mi), and a water depth of roughly 130 m (426 ft) at the seaward end of the shelf. The continental shelves provide some of the richest fisheries known. At the end of the shelf, the slope drastically steepens (1:20), giving rise to the continental slope, and eventually the continental rise regions. This region averages approximately 4,000 m (13,120 ft) in vertical extent from the shelf to the abyssal plain. The ocean basin constitutes the most extensive area of the ocean bottom surface. Depths in this region range from 3,000 m to 6,000 m (9,840 to 19,680 ft). About 75 percent of the ocean floor is classified as basin area. The deepest areas of the ocean basins are the deep sea trenches, contrasted by the mid-oceanic ridges, which provide relative high points in the ocean bottom surface topography (Pickard and Emery, 1982).

Marine ports are generally located at the confluence of major rivers and the ocean. These regions are commonly referred to as estuaries, and provide a fragile habitat for much of the marine life found in the oceans. An estuary is defined as a semi-enclosed body of water with a free connection to the open ocean,

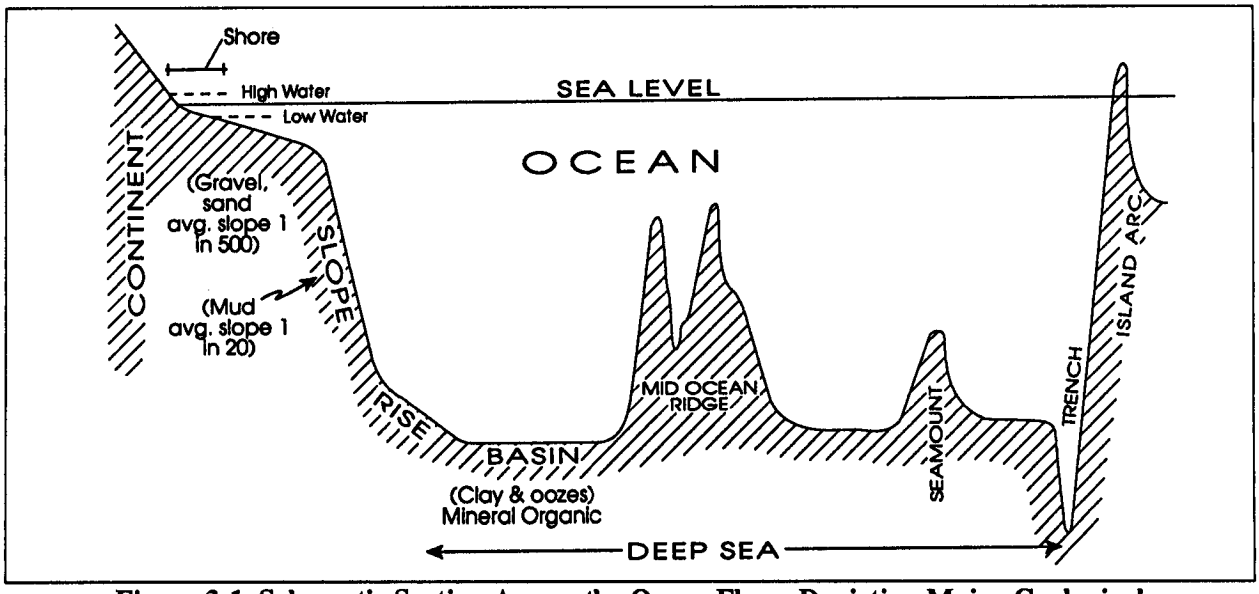


Figure 3-1 Schematic Section Across the Ocean Floor, Depicting Major Geological Features (Pickard and Emery, 1982)

where the saltwater is considerably diluted with freshwater. In general, the freshwater flowing into the estuary eventually exits the system in the upper (water) layer of the estuary, while the denser seawater enters the estuary through lower subsurface layers.

3.1.2 Chemical Oceanography

Seawater is a complex solution of minerals, salts, and elements, containing approximately 80 of the 92 naturally occurring elements. Hydrogen and oxygen, as water, constitute the largest elemental percent of seawater, with sodium chloride (NaCl) being the most abundant salt (78 percent) in the solution. Magnesium, calcium, and potassium chlorides and carbonates provide the bulk of the remaining constituents of the seawater solution. The ratio of these elements within the solution is relatively constant from ocean to ocean. However, in coastal areas where freshwater river influences are significant, the water chemistry can be substantially different. In addition to the major and minor constituents described above, trace metals, nutrient elements, dissolved atmospheric gases, and other organic matter also form important components of seawater. While trace metals are essential to the growth and development of certain organisms at low concentrations, these elements can become toxic when concentrated at high levels. Table 3-1 summarizes the concentration of major elements and trace elements, expressed in milligram per liter (mg/L), in seawater. The major nutrients (phosphates, silicates, and nitrates) provide the chief limiting agent for oceanic phytoplankton production. Atmospheric gases (e.g., oxygen and carbon dioxide) absorbed by the ocean play important roles in the overall global climate of the earth.

Naturally occurring radionuclides of uranium (such as ^{234}U, ^{235}U, ^{238}U), and polonium-210 (^{210}Po), are present in seawater, and in marine organisms, at concentrations generally greater than those found in terrestrial ecosystems. The ocean water concentrations of uranium isotopes are: ^{234}U, 1.30 picocuries per liter (pCi/l); ^{235}U, 0.05 pCi/l; and ^{238}U, 1.2 pCi/l (IAEA, 1976). For comparison, other major radioisotopes found in ocean water are: potassium-40 (40K), 486 pCi/l; thorium-232 (232Th), 540 pCi/; tritium (3H), 3 pCi/l; rubidium-87 (87Rb), 3 pCi/l; and Carbon-14 (14C), 1.8 pCi/l (IAEA, 1988).

Table 3-1 Concentration of Major Elements and Trace Elements in Seawater (CRC, 1991)

Element	*mg/L*	*Trace Element*	*mg/L*
Chlorine	19,000	Strontium	8.1
Sodium	10,500	Arsenic	0.003
Magnesium	1,350	Iron	0.01
Sulphur	885	Copper	0.003
Calcium	400	Zinc	0.01
Potassium	380	Cesium	0.0005
Bromine	65	Uranium	0.003
Fluorine	1.3	Lead	0.00003
Iodine	0.06	Zirconium	0.000022

The relationship between environmental concentrations of radionuclides and the concentration found in organisms is important in the study of food chain effects. Bioamplification, the increase in concentration of radionuclides in organisms progressively further up the food chain (as with organic pesticides in terrestrial environments), is observed in marine food chains. In the marine environment, uranium has not been found to bioamplify in fish, and there is only slight bioamplification in crustaceans and mollusks (IAEA, 1976). The readiness with which other radionuclide constituents of spent nuclear fuel may enter the food chain is variable, but generally low.

3.1.3 Physical Oceanography

The science of physical oceanography involves the development of a systematic quantitative description of ocean characteristics and circulations. Ocean circulations include not only the major, permanent ocean features (e.g., the Gulf Stream) that circulate continuously with fluctuating velocity and position dynamics, but also the smaller-scale circulation features (e.g., tides, waves, coastal currents, etc.). Gradients in temperature, salinity, and seawater density give rise to vertical and lateral circulations.

The primary forces behind the generation and maintenance of surface currents in the world ocean are the winds in the lower portions of the atmosphere. Low-level winds generate stresses on the ocean surface that give rise to the surface currents. However, these currents only affect the uppermost layers of the ocean. Thus, the global wind patterns establish the direction and magnitude of the surface currents. Figure 3-2 depicts the major components of the wind-induced surface circulation of the world ocean.

Northern hemisphere ocean basins are characterized by strong western basin boundary currents that transport warmer, less dense water poleward, and are balanced by weaker, colder return flows along the eastern basin boundaries. Examples of these flows in the northern hemisphere are the Gulf Stream and Kuroshio currents, and the Canary and Californian currents, respectively. These permanent circulation features are the result of the strong mid-latitude westerly winds and the easterlies in the tropics. Due to the strength of these oceanic and atmospheric circulations, North Atlantic and North Pacific shipping routes tend to follow these flows.

Also of interest are the deep water convective circulations, which are linked with the surface system circulation. In general, these circulations are generated in high latitudes by air-sea interaction processes producing relatively cold and dense surface waters that sink and flow into the central ocean basins. This loss of water in the high latitudes is replaced by warmer surface waters migrating poleward at intermediate depths. Thus, in considering the overall environmental impact of the proposed and alternative actions, the intermediate and bottom water masses/circulations cannot be ignored, due to their surface origin.

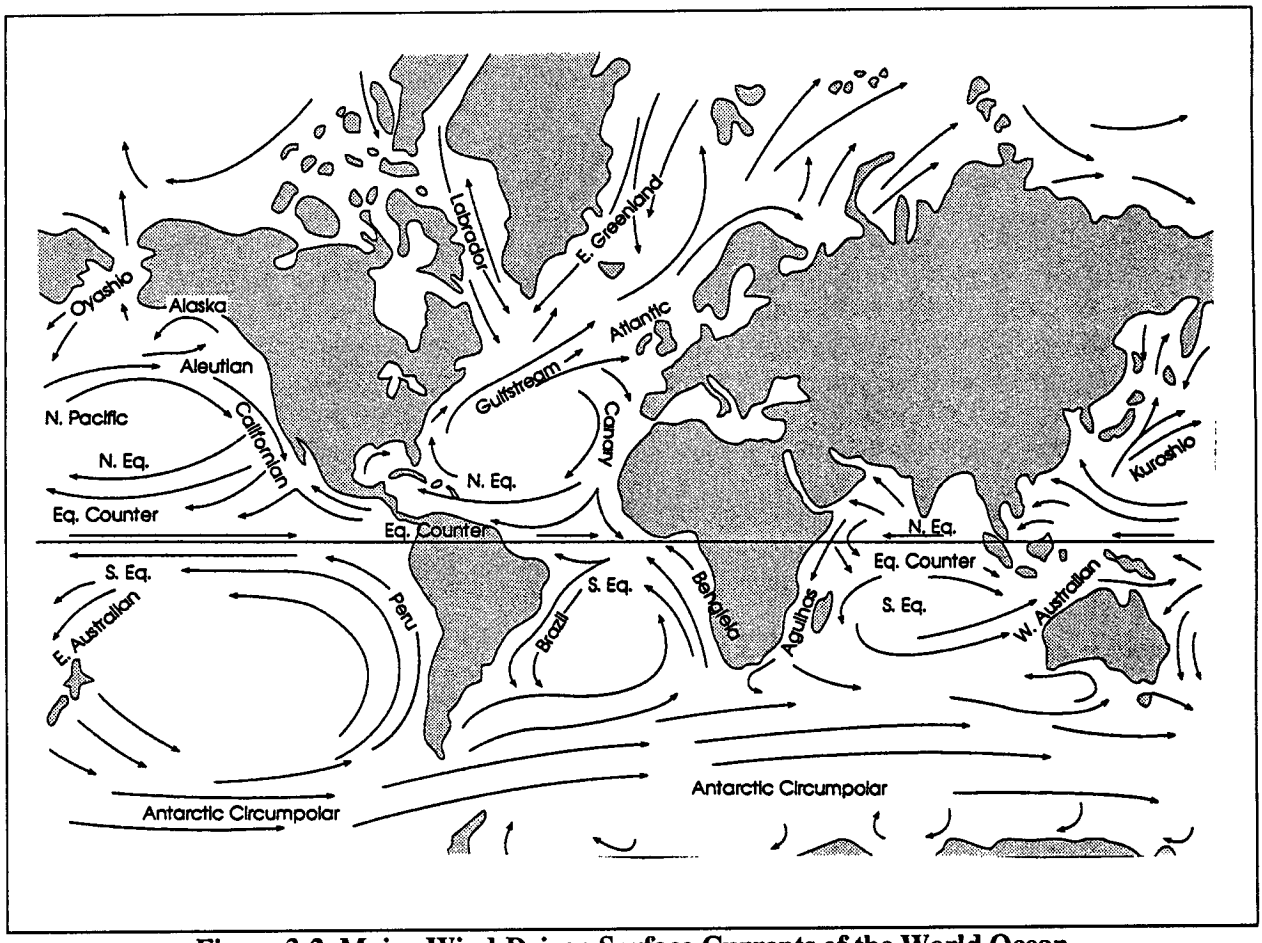


Figure 3-2 Major Wind-Driven Surface Currents of the World Ocean (Kennett, 1982)

3.1.4 Biological Oceanography

Biologically, the characteristics of ocean organisms dramatically change with ocean depth. Changes in organisms can be correlated with the decrease in the amount of light and the wavelength of the light that penetrate to a given depth. This variation in light is also influenced by the turbidity of the oceanic waters, and has a great influence on the biological productivity of a given region. Upper water layers are rich in nutrients and more productive than water layers found at depths greater than 200 m (660 ft). Abundant plant life supports the many animal species found at depths less than 200 m (660 ft). The estuarine areas found at the margins of the shelf region and the continents provide rich, productive breeding and spawning grounds for many marine organisms. In contrast, the deep ocean bottoms are limited in productivity because of the absence of light and the scarcity of nutrients (Friedrich, 1969).

The deep sea bottom dwellers are highly diverse, with many biological groups represented by more species than in most shallow-water communities (Hessler and Sanders, 1967). However, the number of individual organisms in a given volume does decrease in the deep sea and this, together with a general tendency toward decrease in the average size of the organisms, results in a dramatic reduction in standing stock or biomass on the deep ocean floor. In round figures, the total wet weight of bottom-living organisms in and on each square meter (m) of seabed decreases from 10-100 grams (g) on the continental shelf, to 1-10 g on the continental slope, and to only 0.1-1.0 g on the abyssal plain (Rice, 1978).

3.2 Individual Port Marine Environments

This section presents general environmental information for ten U.S. ports that have been identified as potential ports of entry. The ten ports are:

> Charleston, SC [includes the Naval Weapons Station (NWS) at Charleston and the Wando Terminal]; Galveston, TX; Hampton Roads (includes terminals at Newport News, Norfolk, and Portsmouth), VA; Jacksonville, FL; the Military Ocean Terminal at Sunny Point (MOTSU), NC; the NWS at Concord, CA; Portland, OR; Savannah, GA; Tacoma, WA; and Wilmington, NC.

These ports are more fully described in Appendix D of this Environmental Impact Statement (EIS). Appendix D identifies the ports that were considered as potential ports of entry for foreign research reactor spent nuclear fuel, the criteria used in the port evaluation process, the method of evaluation, and the results of the evaluation process. Appendix D also presents population data for ports and transportation routes considered in the evaluation. Potential overland and barge transportation routes are described in Appendix E, and Appendix C presents information on the environmental impacts of marine transport.

The various policy, management, and implementation alternatives being considered in this EIS do not involve any construction or modification of port facilities, nor would the use of one or more ports for the receipt of foreign research reactor spent nuclear fuel be expected to noticeably increase the number of vessel calls to the port or interfere with existing port operations. Once at the port of destination, the spent nuclear fuel would be transferred from the vessel to a waiting truck or train and shipped to the destination as expeditiously as possible.

3.2.1 Environmental Information for the Potential Ports of Entry

This section presents summary environmental information for the potential ports of entry for foreign research reactor spent nuclear fuel.

3.2.1.1 Charleston, SC (Includes Terminals at the Naval Weapons Station and the Wando Terminal)

Charleston is the largest port city in South Carolina, and the greater Charleston area is one of the major seaports on the East Coast of the United States. The city of Charleston is located at the confluence of the Cooper and Ashley Rivers, approximately 11 km (7 mi) west of the Atlantic Ocean. The principal wharves are along the west bank of the Cooper River, except for the Wando Terminal, which is along the east bank of the Wando River near the city of Mount Pleasant, about 20 km (12 mi) from the Atlantic Ocean. The city of Charleston is on a peninsula, bounded on the west and south by the Ashley River and on the east by the Cooper River. In general, the elevation of the area ranges from sea level to approximately 6 m (20 ft) on the peninsula.

Environmental Conditions: The State of South Carolina has classified the water quality of the lower portion of the Wando River as both SFH and SA (SFH waters are shellfish harvesting waters, and SA waters are suitable for primary and secondary recreation and for other water uses requiring lower water quality). According to the U.S. Fish and Wildlife Service's Ecological Inventory Map for James Island, SC, the Wando Terminal and the NWS Charleston are located in a mid-salinity estuarine habitat (generally 5 to 16.5 ppt). The Charleston harbor which is traversed enroute to either terminal, is located in a high-salinity estuarine habitat (generally 16.5 to 30 ppt) (FWS, 1980a).

The State of South Carolina has classified the water quality of the portion of the Cooper River above the confluence with the Ashley River as SB (SB waters are tidal saltwaters suitable for secondary contact recreation, crabbing, and fishing, except the harvesting of clams, mussels, or oysters for market purposes and human consumption). The waters of Goose Creek, upstream of the confluence with the Cooper River to the dam at the Charleston Waterworks, are also Class SB (Department of the Navy, 1994).

State or Federally protected endangered or threatened aquatic species in the vicinity of the Charleston harbor include the shortnose sturgeon, Atlantic sturgeon, and the American shad. Bachman's warbler is a Federally protected bird species also found in the vicinity (FWS, 1980a). While there are some wetlands in the vicinity of Wando Terminal and on the property of NWS Charleston (Department of the Navy, 1990 and 1994), there are no known special wildlife sanctuaries or habitats of concern in the general area. Bald eagles have been observed on the NWS Charleston property and are believed to be nesting in the far northern areas of the Station. Red-cockaded woodpeckers are known to inhabit NWS Charleston. Although, the hurricane Hugo (September 1989) destroyed much of their habitat (mature pine trees with red heart disease), several colonies are surviving with the assistance of artificial nest bates (Lewis, 1995). The Charleston harbor area and the west bank of the Cooper River are commercially well developed.

The lower Wando and Cooper Rivers and the Charleston harbor support a large number of aquatic and terrestrial species. Aquatic species commonly found in the vicinity include crabs, oysters, clams, shrimp, sturgeon, herring, shad, seabass, kingfish, drum, flounder, and mackerel. Marine mammals, including dolphins and whales, have been sighted in the harbor. According to the South Carolina Heritage Trust, no rare, threatened, or endangered species or communities have been recorded in the area near the Wando Terminal (McBee, 1994).

Climatic Conditions: The climate of this region is temperate, primarily due to its close proximity to the Atlantic Ocean. The prevailing winds are generally northerly in the fall and winter months, becoming more southerly during the summer months. This type of circulation serves to "warm" the region during winter and "cool" it during the summer. Summer is the rainy season in Charleston, with the city receiving 41 percent of the annual total rainfall during the summer months. Except for the occasional tropical storm or hurricane, the majority of this rain occurs during afternoon and evening thunderstorms. The late summer and early fall brings the highest probability of tropical storm activity to the Charleston area. The fall season is a transitional period, where temperature extremes are rare and sunshine is abundant. The winters in this area are mild with periods of rain. However, in contrast to the summer, winter rains tend to be steady and uniform, and last for several days. The most unstable period in this region is spring, when the confluence of warm moist tropical air and cool dry continental air increase the occurrence of severe weather in this region. The average earliest freeze is in early December, and the average last frost is in late February (NOAA, 1992c).

The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Charleston, the Uniform Building Code provides a basic wind speed of about 160 km per hour (100 m per hour). The greater Charleston area is located in a moderate seismic zone with an acceleration of 0.15 g. The effective peak velocity-related acceleration represents the back-and-forth horizontal motion of the ground due to a seismic event at a period of 1.0 sec. This acceleration is expressed in relation to g, where g equals acceleration due to gravity.

Naval Weapons Station - Charleston: The NWS is located on the west bank of the Cooper River, north of the city of North Charleston. The NWS is approximately 7080 hectares (17,500 acres) in size and is located in southeastern Berkely County, South Carolina, about 30 km (19 mi) from the Atlantic Ocean. The NWS has two useful wharves and two useful piers. Wharf Alpha and Pier Bravo have cranes and are

capable of loading trucks or trains directly from the ships. Pier Charlie and the Military Traffic Management Command Terminal would have to use shipboard or mobile cranes to load trucks. Several facilities on the NWS could be used to transfer spent fuel casks or containers from trucks to rail cars. A map of the port is shown in Figure 3-3.

The 1990 population within 16 km (10 mi) of the Wharf Alpha was 209,188. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five U.S. Department of Energy (DOE) management sites are: the Savannah River Site, 46,200; the Oak Ridge Reservation, 108,000; the Idaho National Engineering Laboratory, 498,000; the Hanford Site, 550,000; and the Nevada Test Site, 540,000. Populations along rail routes to these sites are slightly larger. The distances to the five potential sites on interstate routes are: the Savannah River Site, 303 km (188 mi), the Oak Ridge Reservation, 647 km (402 mi), the Idaho National Engineering Laboratory, 3,930 km (2,442 mi), the Hanford Site, 4,601 km (2,859 mi), and the Nevada Test Site, 4,094 km (2,544 mi). Distances along rail routes are slightly longer.

Ethnic and Income Characteristics: Figure 3-4 shows the ethnic composition for the area surrounding the port at the NWS Charleston. This figure shows the population residing within 16 km (10 mi) of the port according to 1990 data published by the U.S. Bureau of the Census. At the time of the 1990 census, African Americans constituted about 31 percent of the total population, and approximately 88 percent of the minority population for the area surrounding the port. Figure 3-5 shows analogous information for low-income households residing within 16 km (10 mi) of the port. As discussed in Appendix A, the percentage of low-income households near the port is nearly the same as that for counties surrounding the port.

Wando Terminal: This South Carolina State Port Authority terminal is located at the confluence of the Wando and Cooper rivers, on the east bank of the Wando River, near the incorporated city of Mount Pleasant. The facility has three modern container berths, with a fourth under construction, and a large paved container storage yard. The Wando terminal is about 8.1 km (5 mi) from the nearest Interstate highway and 15 km (9 mi) from the nearest intermodal rail yard. A map of the port is shown in Figure 3-6.

The 1990 population within 16 km (10 mi) of the Wando Terminal was 233,424. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five U.S. Department of Energy (DOE) management sites are: the Savannah River Site, 65,700; the Oak Ridge Reservation, 127,000; the Idaho National Engineering Laboratory, 518,000; the Hanford Site, 569,000; and the Nevada Test Site, 559,000. Populations along rail routes to these sites are slightly larger. The distances to the five potential sites on interstate routes are: the Savannah River Site, 327 km (203 mi), the Oak Ridge Reservation, 671 km (417 mi), the Idaho National Engineering Laboratory, 3,954 km (2,457 mi), the Hanford Site, 4,625 km (2,879 mi), and the Nevada Test Site, 4,118 km (2,559 mi). Distances along rail routes are slightly longer.

Ethnic and Income Characteristics: Figure 3-7 shows the ethnic composition for the area surrounding the Wando Terminal. This figure shows the population residing within 16 km (10 mi) of the port according to 1990 data published by the U.S. Bureau of the Census. At the time of the 1990 census, African Americans constituted about 33 percent of the total population, and approximately 93 percent of the minority population for the area surrounding the port. Figure 3-8 shows analogous information for low-income households residing within 16 km (10 mi) of the port. As discussed in Appendix A, the percentage of low-income households near the port is nearly the same as that for counties surrounding the port.

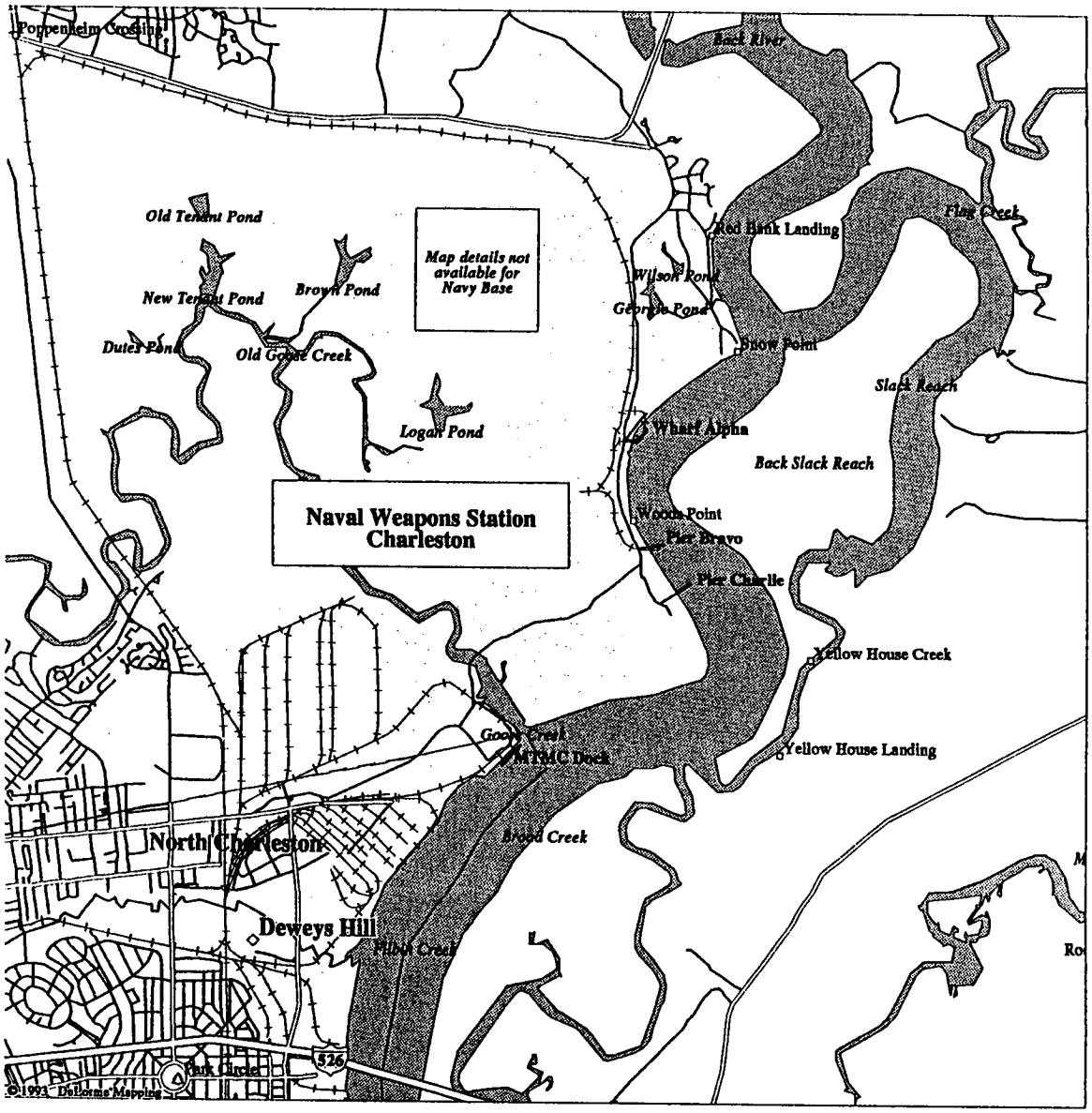


Figure 3-3 Naval Weapons Station, Charleston, SC

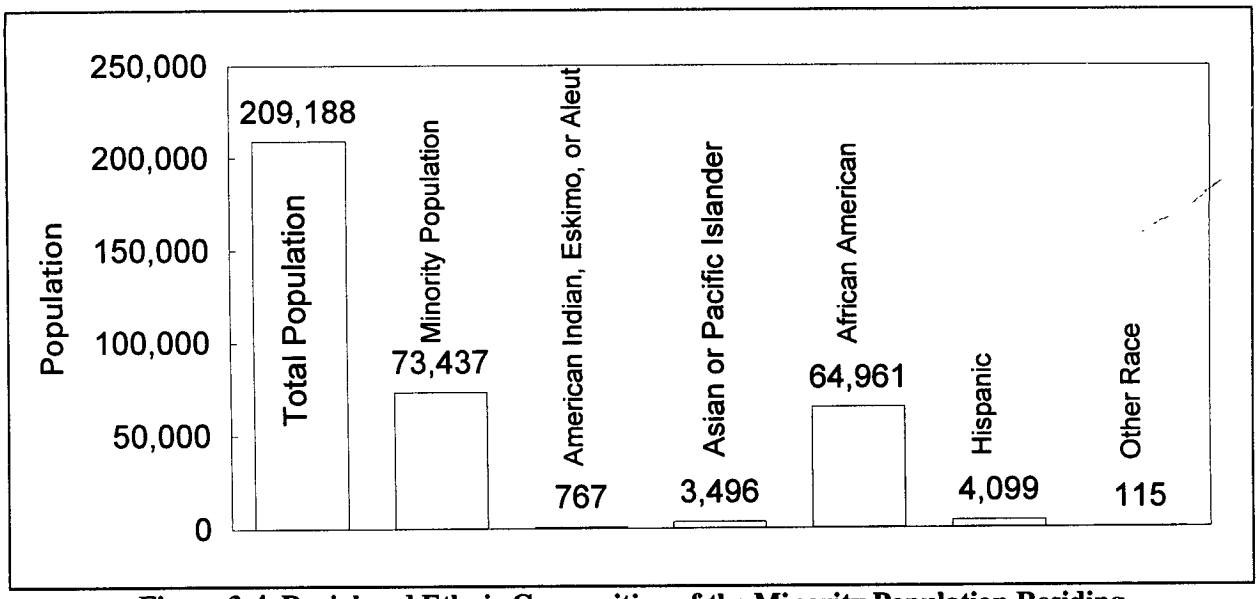


Figure 3-4 Racial and Ethnic Composition of the Minority Population Residing within 16 km (10 mi) of the Naval Weapons Station, Charleston

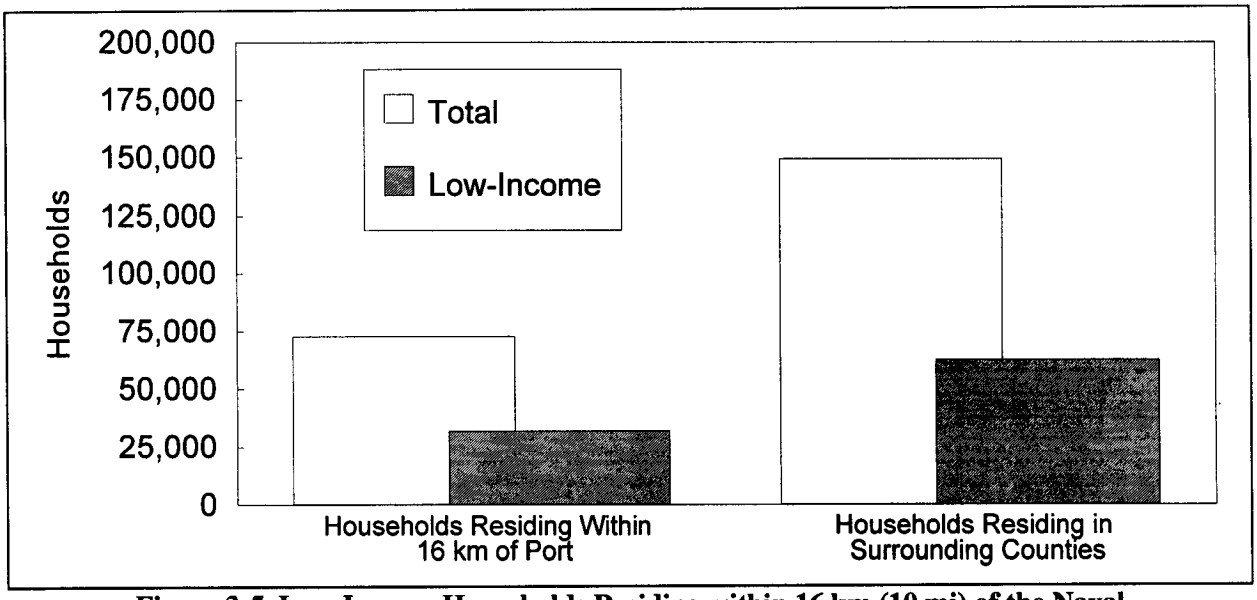


Figure 3-5 Low-Income Households Residing within 16 km (10 mi) of the Naval Weapons Station, Charleston

3.2.1.2 Galveston, TX

Galveston, TX is situated within 16 km (10 mi) of the entrance to the Gulf of Mexico. The city of Galveston occupies the entire width of the east end of Galveston Island. The shipping wharves are on the north side of the island and the Gulf of Mexico is on the south. The Port of Galveston is located in the heart of the city. A map of the port is shown in Figure 3-9.

Galveston is a major resort and tourist center for the Southwest. There is a waterfront tourist attraction at "Pier 21" close to the port area. A public park on Pelican Island, reached by causeway, is located across the Intracoastal Waterway from the Port of Galveston. A cruise ship terminal is located at Pier 25 in the

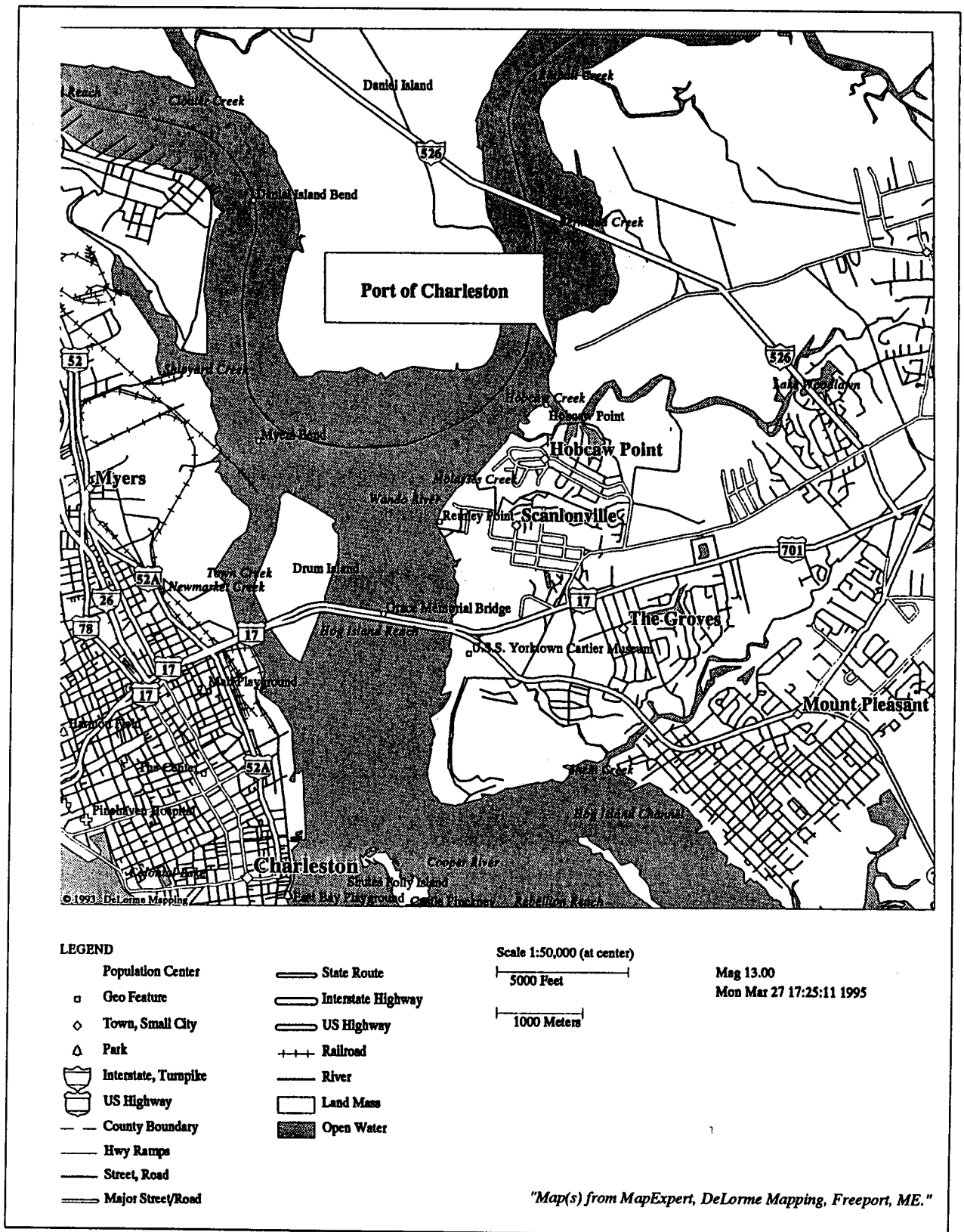


Figure 3-6 Wando Terminal, Charleston, SC

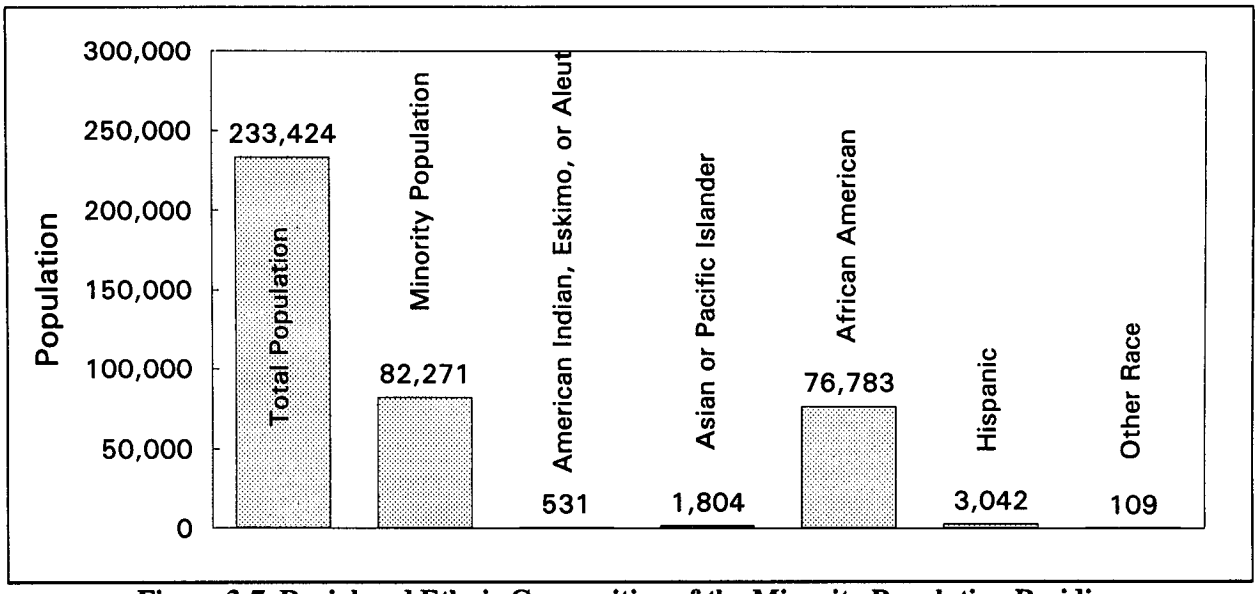


Figure 3-7 Racial and Ethnic Composition of the Minority Population Residing within 16 km (10 mi) of the Wando Terminal, Charleston

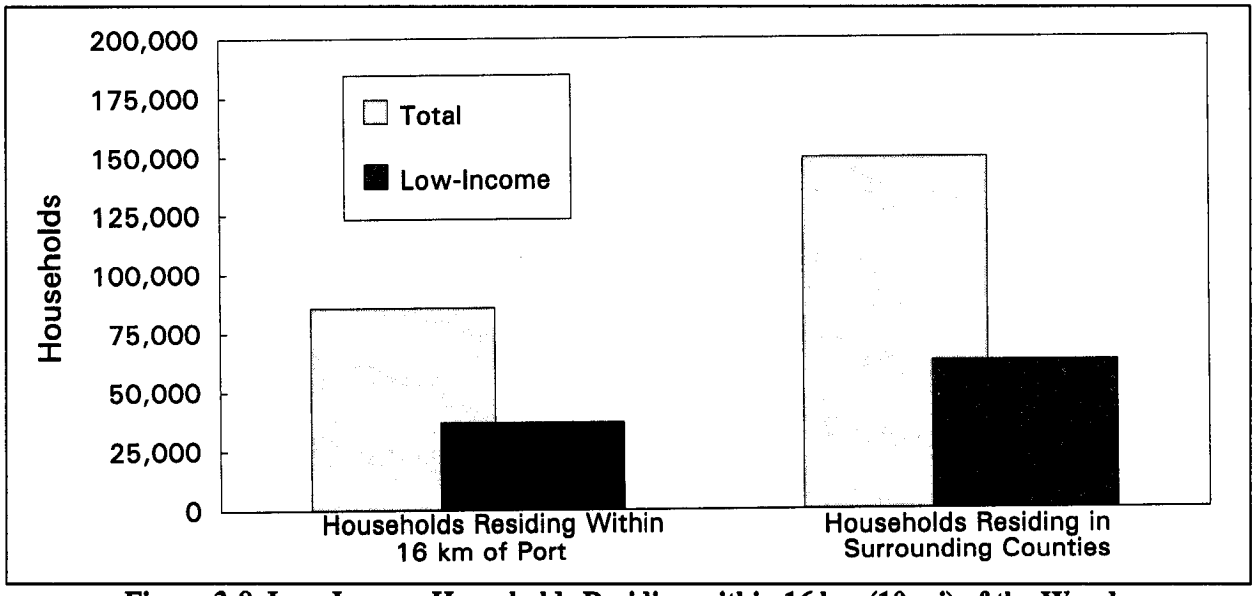
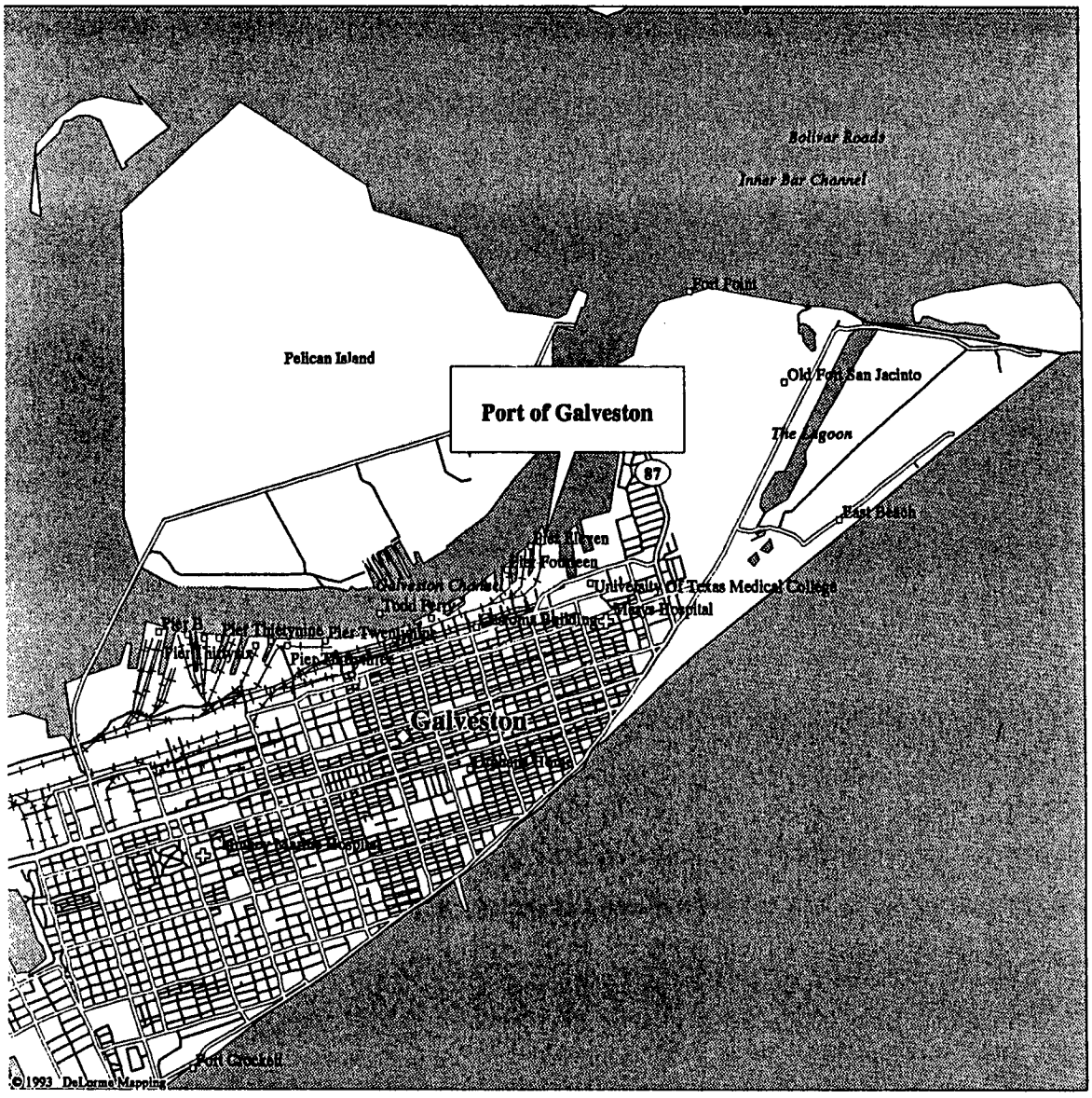


Figure 3-8 Low-Income Households Residing within 16 km (10 mi) of the Wando Terminal, Charleston

heart of the Port of Galveston complex, and there is a tanker terminal on Pelican Island across from the Port of Galveston at its southern end. A Federal project provides for an entrance channel, and an outer bar channel both dredged to 12.8 m (42 ft).

The Port of Galveston's principal container handling facility is the container terminal at Pier 10. This facility has a controlled all-weather truck entrance and interchange area. The terminal is connected to Interstate Highway 45 on the mainland by a 9.3 km (5.8 mi) four-lane State highway and two 2.8 km (1.75 mi) causeways that cross the southwest end of Galveston Bay. The container handling facility is served by four major railroads, the Burlington Northern, Santa Fe, Southern Pacific, and Union Pacific



LEGEND

- Population Center
- State Route
- Geo Feature
- Large City
- Street, Road
- Major Street/Road
- State Route
- Railroad
- River
- Open Water

Scale 1:50,000 (at center)

5000 Feet

1000 Meters

Mag 13.00
Mon Mar 27 08:46:03 1995

"Map(s) from MapExpert, DeLorme Mapping, Freeport, ME."

Figure 3-9 Port of Galveston, TX

Lines. Galveston Railway, Inc., provides terminal connections and performs switching of all port rail traffic. An intermodal container transfer terminal is located within the container terminal, and trackage extends to within 30.5 m (100 ft) of ship berths.

The 1990 census population within 16 km (10 mi) of the port terminals was 73,322. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: the Savannah River Site, 403,000; the Oak Ridge Reservation, 337,000; the Idaho National Engineering Laboratory, 526,000; the Hanford Site, 575,000; and the Nevada Test Site, 595,000. Populations along rail routes to these sites are slightly larger for the Savannah River Site and the Oak Ridge Reservation, but slightly less for the Idaho National Engineering Laboratory, the Hanford Site, and the Nevada Test Site. The distances to the five potential sites on interstate routes are: the Savannah River Site, 1,600 km (1,000 mi); the Oak Ridge Reservation, 1,550 km (963 mi), the Idaho National Engineering Laboratory, 3,070 km (1,908 mi); the Hanford Site, 3,740 km (2,324 mi); and the Nevada Test Site, 3,000 km (1,864 mi). Distances along rail routes are slightly longer.

Environmental Conditions: A large number of aquatic and terrestrial species frequent the Galveston Bay area. A variety of birds migrate, winter, and breed along the Texas Coast including shorebirds, songbirds, waterfowl and raptors (Breslin, 1993; FWS, 1992). These endangered/threatened bird species include the brown pelican, peregrine falcon, bald eagle, Atwater's greater prairie-chicken, piping plover, and the Eskimo curlew (State-threatened only). Endangered/threatened marine mammals and sea turtles also are found in the coastal bay systems and the Gulf of Mexico. Galveston Bay is within the range of the green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles. While no protected species are known to be located within the Port of Galveston, significant populations of the endangered brown pelican and the threatened piping plover exist nearby (Werner, 1994). The U.S. Fish and Wildlife Service reported that as many as 600 brown pelicans have been sighted loafing on the north end of Little Pelican Island, which is approximately 5.6 km (3.5 mi) northwest of the port. In addition, approximately 125 pairs nested and produced 90 young ones at this site in 1994. This was the first time that brown pelicans had successfully nested in Galveston Bay in over 40 years. Wintering populations of the threatened piping plover use the northeastern end of Galveston Island and the southeastern end of Bolivar Peninsula. Of the 3,187 birds observed during the first Gulf Coast count of wintering piping plovers, 1,904 were observed on the Texas coastline (Werner, 1994).

A great amount of commercial and recreational fishing occurs in Galveston Bay and the Gulf of Mexico. Shellfish are the most important commercial species, particularly shrimp followed by eastern oysters and blue crabs (TPWD, 1989a). The most valuable finfish landed from the Galveston Bay system are black drum and mullet. In 1988, a total of 507,7169 kg (11,169,773 lb) of shellfish valued at $13,489,146 was landed from the Galveston Bay System; a total of 224,536 kg (493,980 lb) of finfish valued at $226,140 was also landed. The major recreational species of fish that were caught in the Galveston Bay system in 1987-1988 were: Atlantic croaker, sand seatrout, spotted seatrout, southern flounder, black drum, and red drum (TPWD, 1989b). Galveston Bay has been named as an "estuary of national significance" by the U.S. Congress. The implementation of the proposed action would pose no significant radiological or non-radiological risks to the environment in the Galveston area, including estuaries.

Climatic Conditions: The climate of the Galveston area is predominantly marine, with periods of modified continental influence during winter. The port is subject to hurricanes and tropical storms (NOAA, 1993a). The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. For the Port of Galveston, the Uniform Building Code provides a basic wind speed of about 160 km per hour (100 mph) (UBC, 1991). The port is located in a very low seismic zone with an acceleration of less than 0.075 g.

Ethnic and Income Characteristics: Figure 3-10 shows the ethnic composition for the area surrounding the Port of Galveston. This figure shows the population residing within 16 km (10 mi) of the port, according to 1990 data published by the U.S. Bureau of the Census. At the time of the 1990 census, African Americans made up about 27 percent of the total population, and approximately 54 percent of the minority population for the area surrounding the port. Hispanics made up about 20 percent of the total population, and approximately 40 percent of the minority population around the port. Figure 3-11 shows analogous information for low-income households residing within 16 km (10 mi) of the port. As discussed in Appendix A, the percentage of low-income households near the port is nearly the same as that for counties surrounding the port.

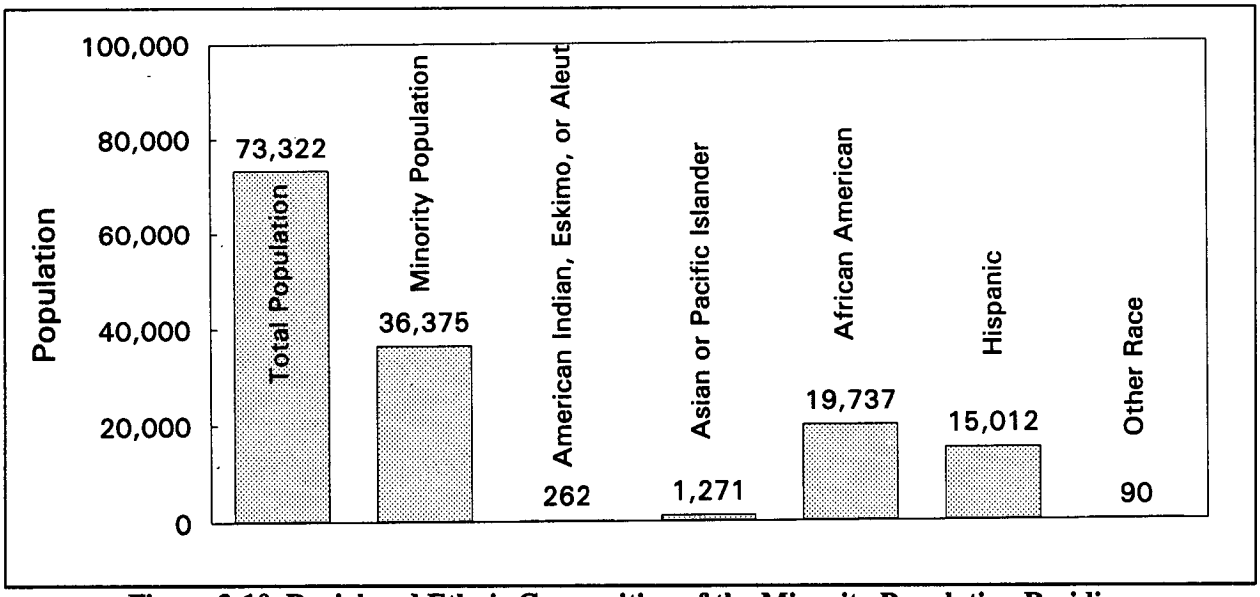


Figure 3-10 Racial and Ethnic Composition of the Minority Population Residing within 16 km (10 mi) of the Port of Galveston

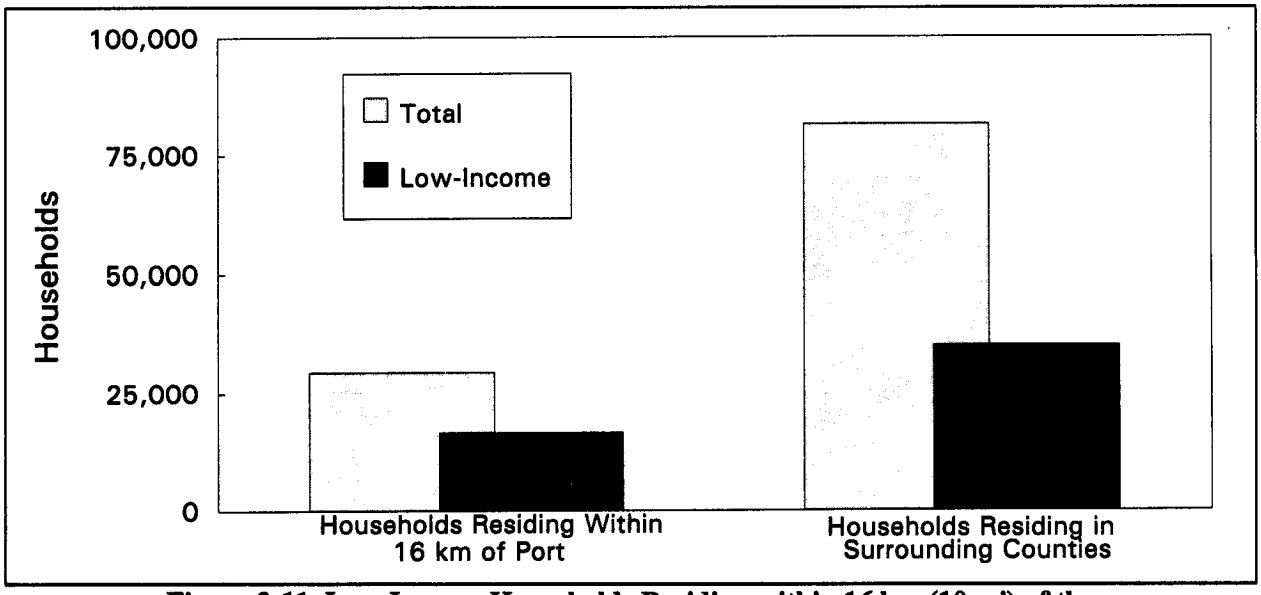


Figure 3-11 Low-Income Households Residing within 16 km (10 mi) of the Port of Galveston

3.2.1.3 Hampton Roads, VA (Includes Terminals at Newport News, VA; Norfolk, VA; and Portsmouth, VA)

Hampton Roads is one of the world's foremost bulk cargo harbors, and has more collective experience handling spent nuclear fuel than any other port in the United States. It is a multi-terminal port with privately and publicly owned marine cargo handling facilities, and is located at the southwest corner of the Chesapeake Bay at the confluence of the James and the Elizabeth Rivers. The port is about 26 km (16 mi) from the Virginia Capes and the entrance from the Atlantic Ocean. The major terminals located on the Elizabeth and James Rivers are approximately another 10 to 13 km (6 to 8 mi) from the Chesapeake Bay. The port includes the port terminals at Norfolk, Portsmouth, and Newport News. All three terminals are located in commercial port districts of their respective cities, somewhat separated from other community activities, in areas dedicated primarily to port industrial usage. Adjacent communities include the cities of Chesapeake and Virginia Beach.

Environmental Conditions: The Port of Hampton Roads is located at the confluence of the James River and the Chesapeake Bay, approximately 29 km (18 mi) west of the Atlantic Ocean. The average elevation of this region is approximately 4 m (13 ft) above sea level. There are no known areas of special environmental concern other than the growing interest in preservation of the Chesapeake Bay and its tributary rivers. The Dismal Swamp National Wildlife Refuge is located about 16 km (10 mi) from the two terminals on the Elizabeth River, but water drainage from the swamps is toward the port area. The swamp refuge is far enough from the terminals that potential negative impacts of low-probability, severe accidents in the ports on wildlife populations would be negligible. The three port terminals at Hampton Roads are described separately below.

Climatic Conditions: The geographic location of this region is especially favorable, tending to be located south of the predominant winter extratropical cyclone tracks which originate at higher latitudes and north of the usual tropical cyclone (e.g., tropical storms and hurricanes) paths. In general, the winters are mild with slightly warmer temperatures during the spring and fall seasons. The summer season is warm and long, but is characterized by frequent cool periods, generated by cool northeasterly winds off of the North Atlantic. Extreme cold waves are infrequent, and temperatures below -18°C (0°F) are almost nonexistent. In general, winters pass without measurable snowfall and most snowfall melts within 24 hours. The average first sub-freezing day in the fall is November 17th and the last occurrence in the spring is March 23rd. The predominant wind directions since 1984 are from the south-southwest and north-northeast and vary seasonally (NOAA, 1992c).

The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Hampton Roads, the Uniform Building Code provides a basic wind speed of about 140 km per hour (90 mph). The port is located in a low seismic zone with an acceleration of 0.075 g.

Newport News Marine Terminal: This terminal is located on the north shore of the Port of Hampton Roads on the James River. It is a combination container, roll-on/roll-off, and breakbulk terminal. The facility has two piers, two container vessel berths, and four container cranes. There is covered storage on both piers. A map of the Newport News Marine Terminal is shown in Figure 3-12.

The 1990 population within 16 km (10 mi) of the port terminal was 430,757. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: the Savannah River Site, 181,000; the Oak Ridge Reservation, 209,000; the Idaho National Engineering Laboratory, 628,000; the Hanford Site, 677,000; and the Nevada Test Site, 691,000. Populations along rail

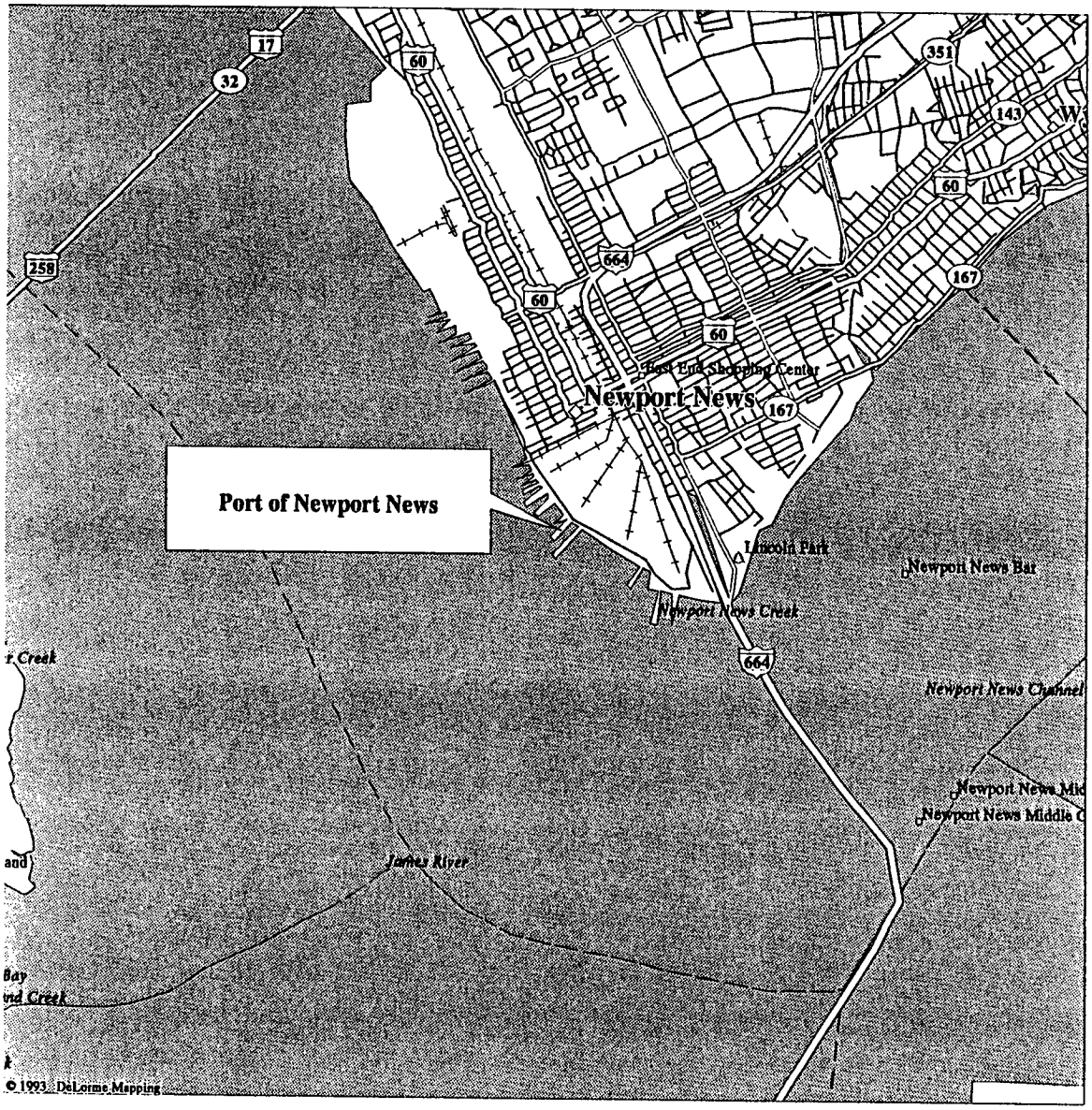


Figure 3-12 Port of Newport News, VA

routes to these sites are slightly larger. The distances to the five potential sites on interstate routes are: the Savannah River Site, 840 km (522 mi); the Oak Ridge Reservation, 890 km (553 mi); the Idaho National Engineering Laboratory, 4,010 km (2,492 mi); the Hanford Site, 4,680 km (2,908 mi); and the Nevada Test Site, 4,172 km (2,592 mi). Distances along rail routes are slightly longer.

Ethnic and Income Characteristics: Figure 3-13 shows the ethnic composition for the area surrounding the port at Newport News. This figure shows the population residing within 16 km (10 mi) of the port according to 1990 data published by the U.S. Bureau of the Census. At the time of the 1990 census, African Americans made up about 32 percent of the total population, and approximately 86 percent of the minority population for the area surrounding the port. Figure 3-14 shows analogous information for low-income households residing within 16 km (10 mi) of the port. As discussed in Appendix A, the percentage of low-income households near the port is nearly the same as that for counties surrounding the port.

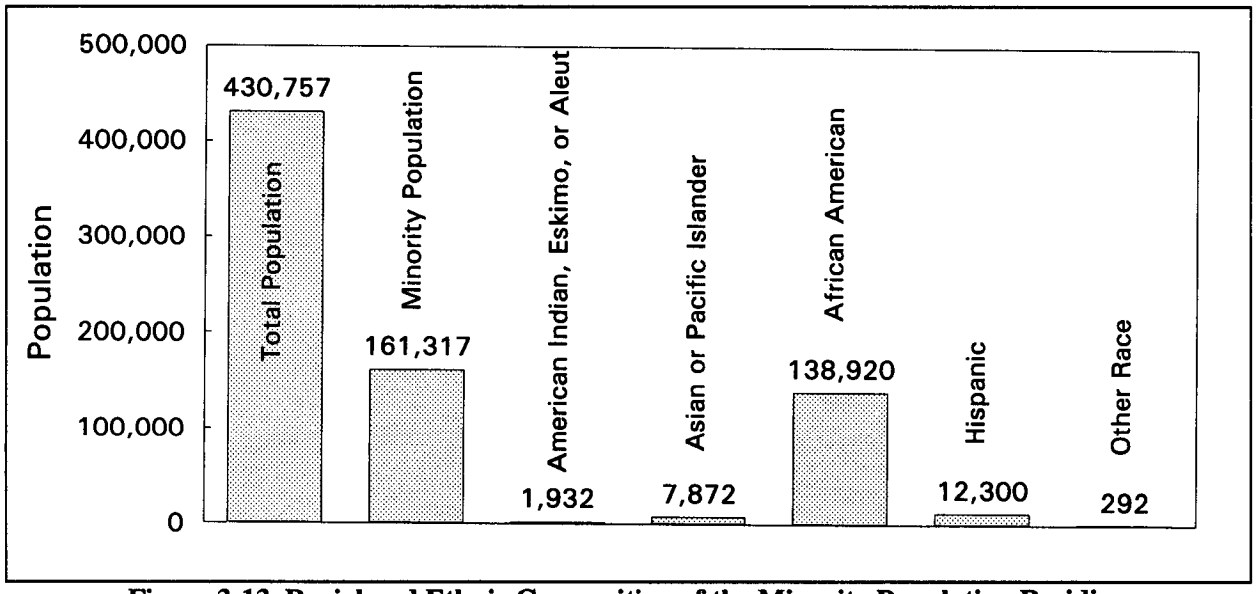


Figure 3-13 Racial and Ethnic Composition of the Minority Population Residing within 16 km (10 mi) of the Port of Newport News

Norfolk International Terminal: This terminal is located on the south side of the Port in Norfolk, adjacent to the Navy Base on the Elizabeth River Channel. Norfolk International Terminal has 4 container vessel berths, 7 container cranes, a roll-on/roll-off berth, and covered pier storage. Sewell's Point Terminal, located at the north end (seaward) of Norfolk International Terminal's container berths has two piers, and covered storage for breakbulk cargoes. A map of Norfolk International Terminal is shown in Figure 3-15.

The 1990 population within 16 km (10 mi) of the port terminals was 681,864. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: the Savannah River Site, 131,000; the Oak Ridge Reservation, 174,000; the Idaho National Engineering Laboratory, 631,000; the Hanford Site, 694,000; and the Nevada Test Site, 694,000. Populations along rail routes to these sites are slightly larger. The distances to the five potential sites on interstate routes are: the Savannah River Site, 800 km (497 mi); the Oak Ridge Reservation, 880 km (547 mi); the Idaho National Engineering Laboratory, 4,070 km (2,529 mi); the Hanford Site, 4,740 km (2,945 mi); and the Nevada Test Site, 4,240 km (2,635 mi). Distances along rail routes are slightly longer.

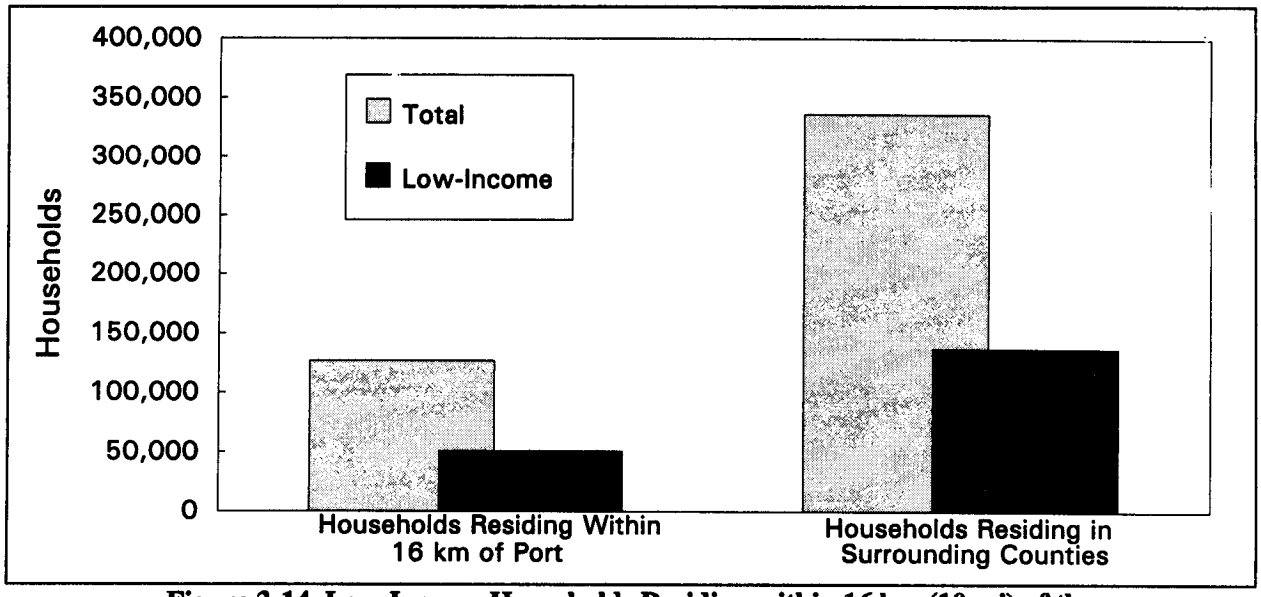


Figure 3-14 Low-Income Households Residing within 16 km (10 mi) of the Port of Newport News

Ethnic and Income Characteristics: Figure 3-16 shows the ethnic composition for the area surrounding the port at Norfolk, VA. This figure shows the population residing within 16 km (10 mi) of the port according to 1990 data published by the U.S. Bureau of the Census. At the time of the 1990 census, African Americans made up about 33 percent of the total population, and approximately 93 percent of the minority population for the area surrounding the port. Figure 3-17 shows analogous information for low-income households residing within 16 km (10 mi) of the port. As discussed in Appendix A, the percentage of low-income households near the port is nearly the same as that for counties surrounding the port.

Portsmouth Marine Terminals: Portsmouth Marine Terminals are located at the confluence of the Elizabeth River and its western branch in the city of Portsmouth. The terminals have 3 berths that handle container, breakbulk and roll-on/roll-off cargoes. The terminals have 3 container cranes, and more than 14,000 m^2 (150,000 ft^2) of warehouse space. A map of the Portsmouth Marine Terminals is shown in Figure 3-18.

The 1990 population within 16 km (10 mi) of the Portsmouth Marine Terminals was 665,700. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: the Savannah River Site, 135,000; the Oak Ridge Reservation, 257,000; the Idaho National Engineering Laboratory, 670,000; the Hanford Site, 718,000; and the Nevada Test Site, 732,000. Populations along rail routes to these sites are about the same for eastern sites and slightly larger for western sites. The distances to the five potential sites on interstate routes are: the Savannah River Site, 810 km (503 mi); the Oak Ridge Reservation, 780 km (485 mi); the Idaho National Engineering Laboratory, 4,040 km (2,510 mi); the Hanford Site, 4,710 km (2,927 mi); and the Nevada Test Site, 4,210 km (2,616 mi). Distances along rail routes are slightly longer.

Ethnic and Income Characteristics: Figure 3-19 shows the ethnic composition for the area surrounding the port at Portsmouth. This figure shows the population residing within 16 km (10 mi) of the port according to 1990 data published by the U.S. Bureau of the Census. At the time of the 1990 census, African Americans made up about 33 percent of the total population, and approximately 89 percent of the minority population for the area surrounding the port. Figure 3-20 shows analogous information for

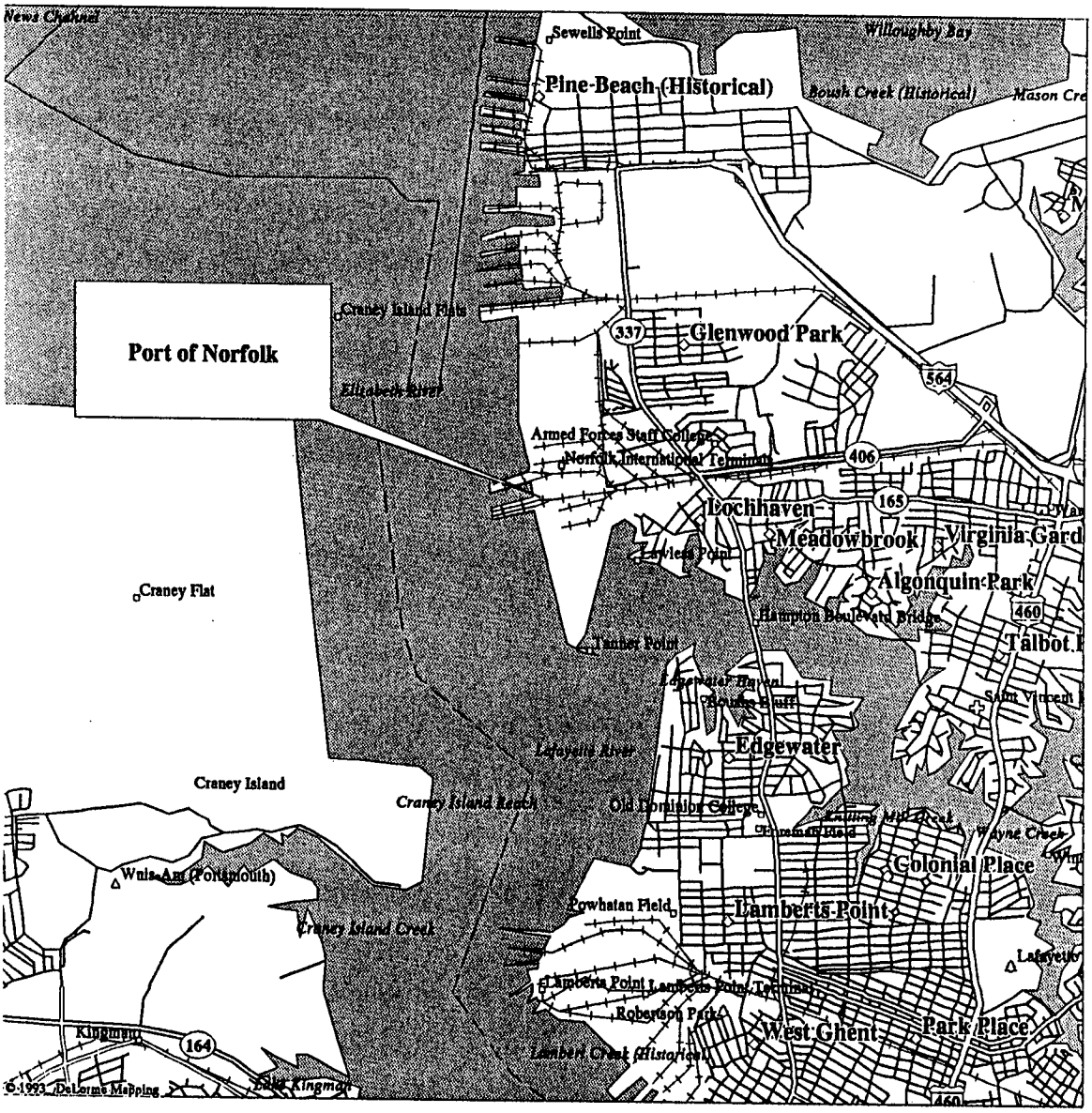


Figure 3-15 Port of Norfolk, VA

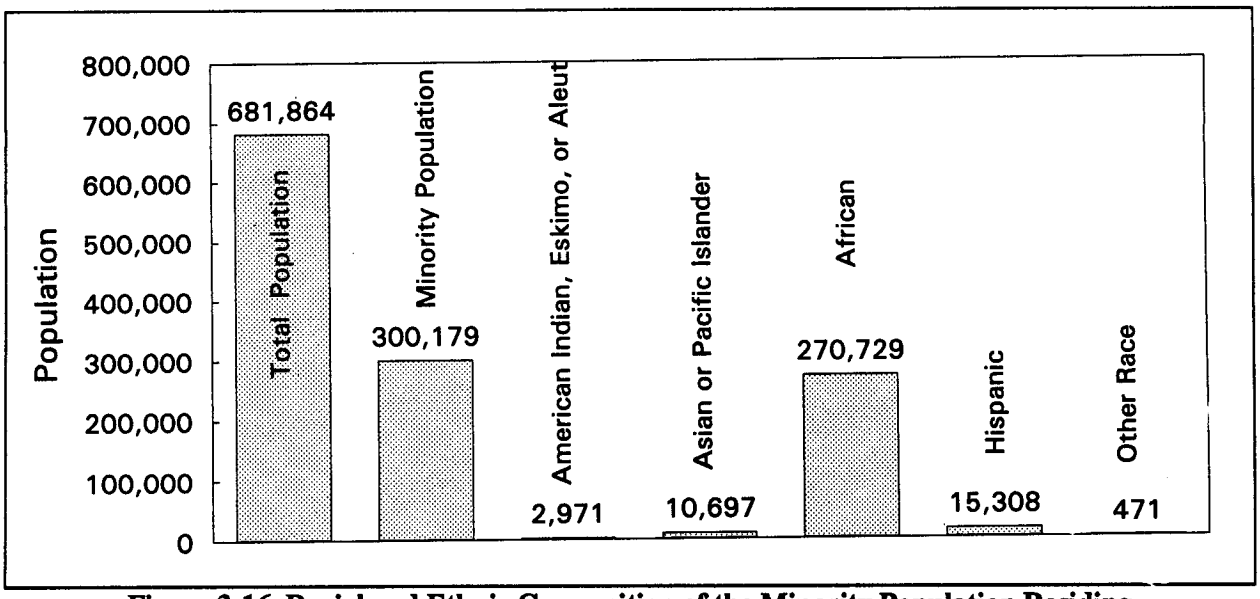


Figure 3-16 Racial and Ethnic Composition of the Minority Population Residing within 16 km (10 mi) of the Port of Norfolk

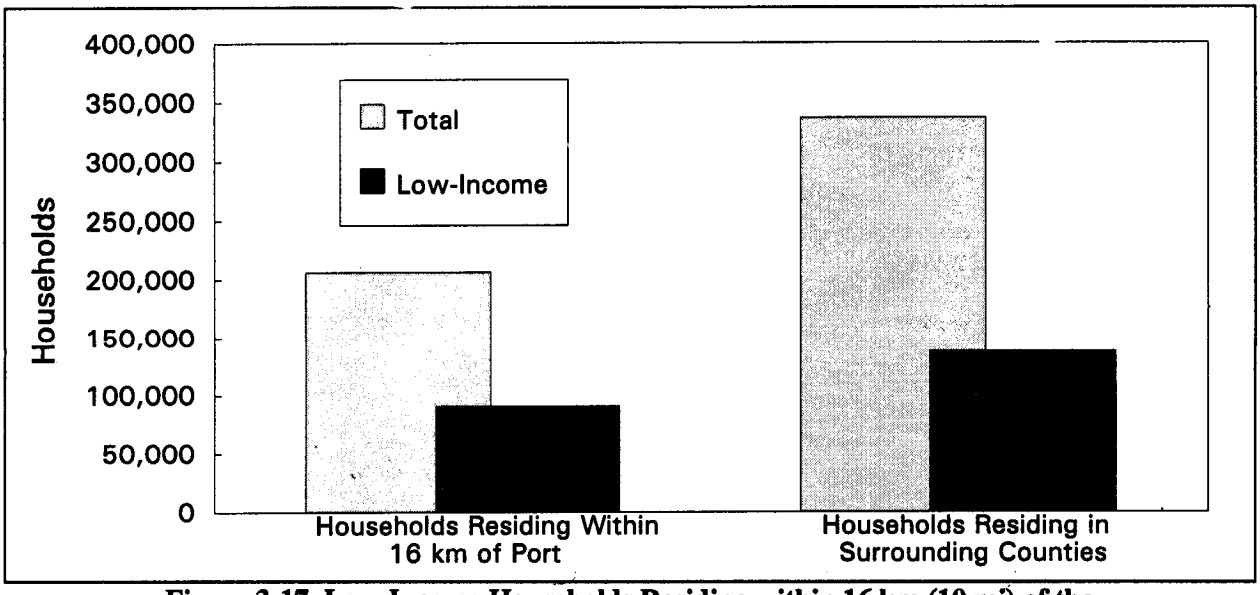
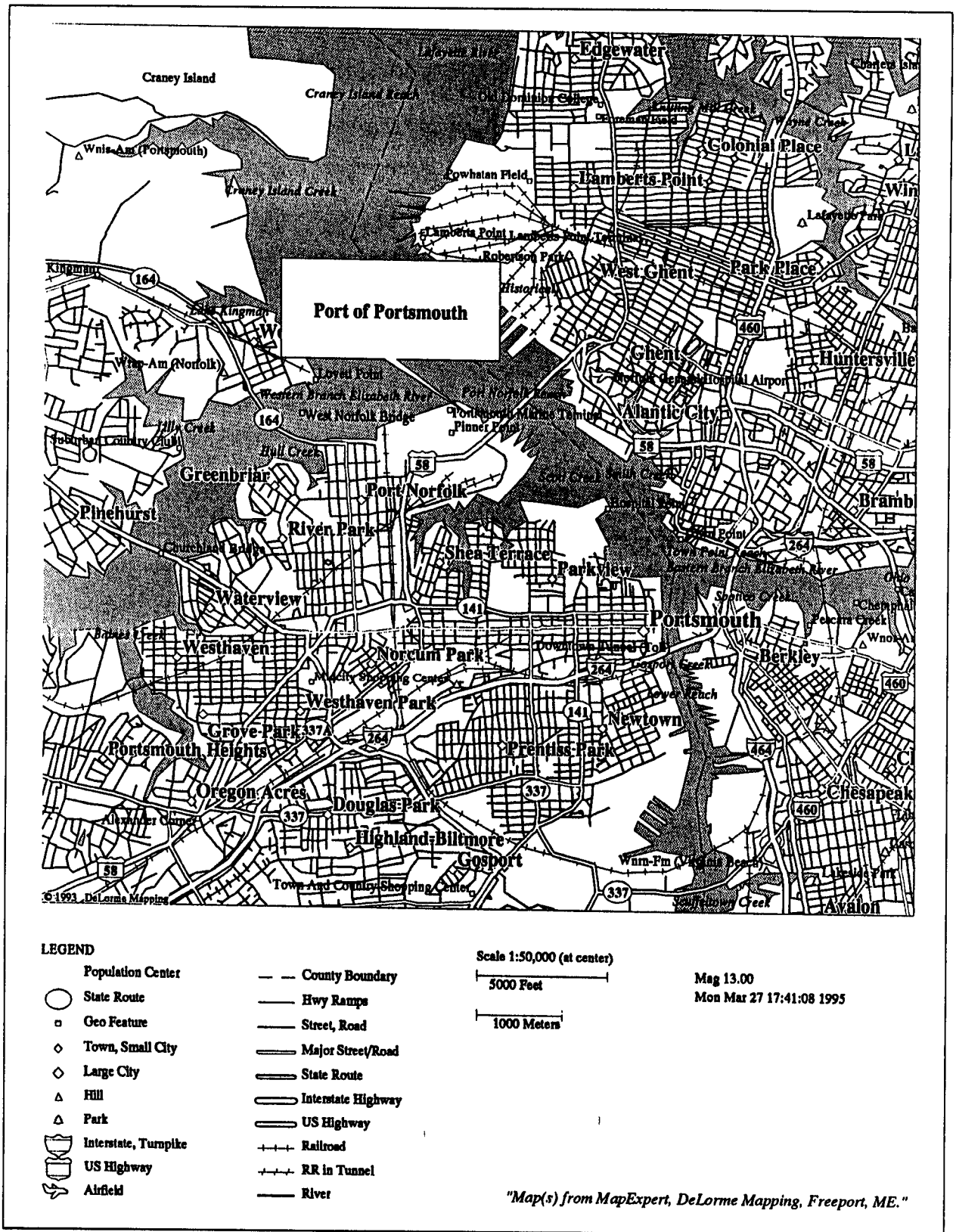


Figure 3-17 Low-Income Households Residing within 16 km (10 mi) of the Port of Norfolk

low-income households residing within 16 km (10 mi) of the port. As discussed in Appendix A, the percentage of low-income households near the port is nearly the same as that for counties surrounding the port.

3.2.1.4 Jacksonville, FL

The Port of Jacksonville is located on the Atlantic Coast of northern Florida, along the St. Johns River. It is a geographically large city (1,967 km^2 or 760 mi^2) ranging from the town of Orange on the east side of the river to Julington Creek on the west side. Most of the marine terminals are on the west side of the river, about 34 km (21 mi) from the ocean entrance. However, the Blount Island container terminal is well



LEGEND

- Population Center
- State Route
- Geo Feature
- Town, Small City
- Large City
- Hill
- Park
- Interstate, Turnpike
- US Highway
- Airfield
- County Boundary
- Hwy Ramps
- Street, Road
- Major Street/Road
- State Route
- Interstate Highway
- US Highway
- Railroad
- RR in Tunnel
- River

Scale 1:50,000 (at center)
5000 Feet
1000 Meters

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"Map(s) from MapExpert, DeLorme Mapping, Freeport, ME."

Figure 3-18 Port of Portsmouth, VA

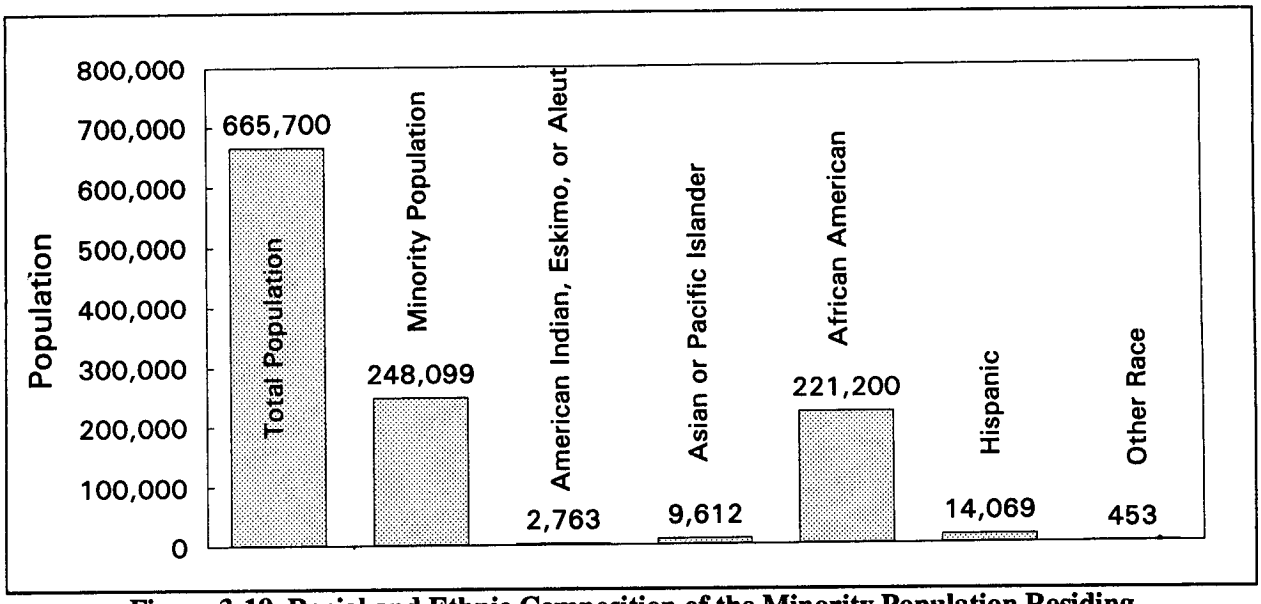


Figure 3-19 Racial and Ethnic Composition of the Minority Population Residing within 16 km (10 mi) of the Port of Portsmouth

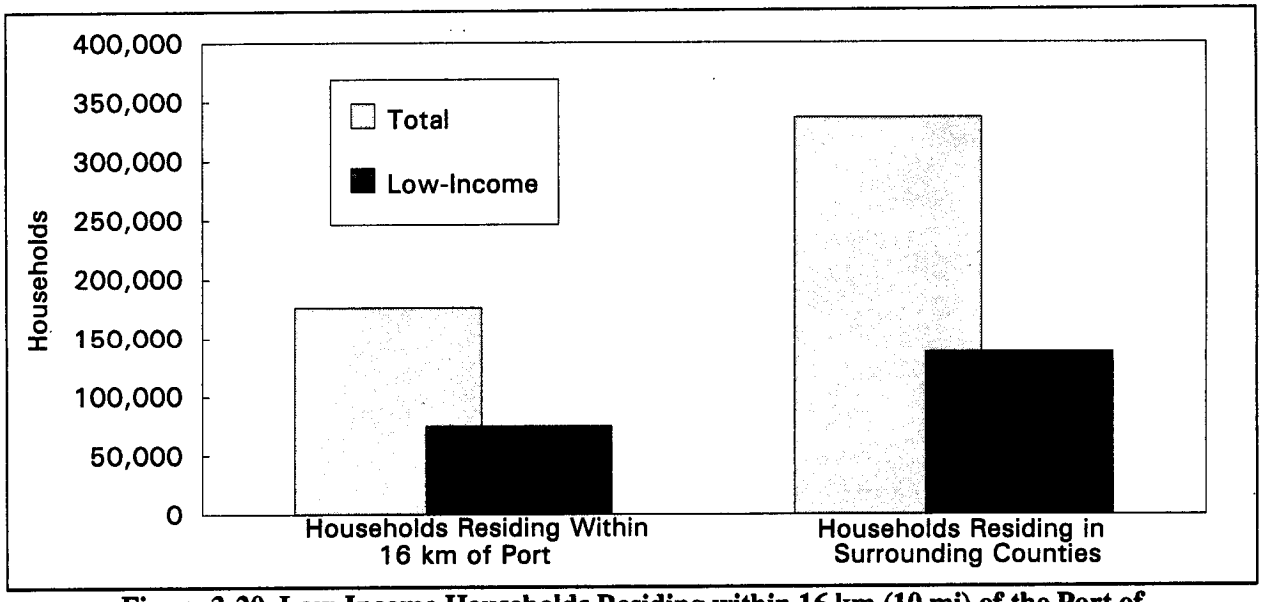


Figure 3-20 Low-Income Households Residing within 16 km (10 mi) of the Port of Portsmouth

separated from the city, and is only about 11 km (7 mi) from the harbor entrance. A map of the port is shown in Figure 3-21. A Federal project maintains a channel depth of 12.2 m (40 ft) to 12.8 m (42 ft) at the entrance to the river.

The St. Johns River has a deep, steep-sided channel cut through rock in some areas. Tidal currents are strong in the river as far as Jacksonville, approaching 3 knots in several places.

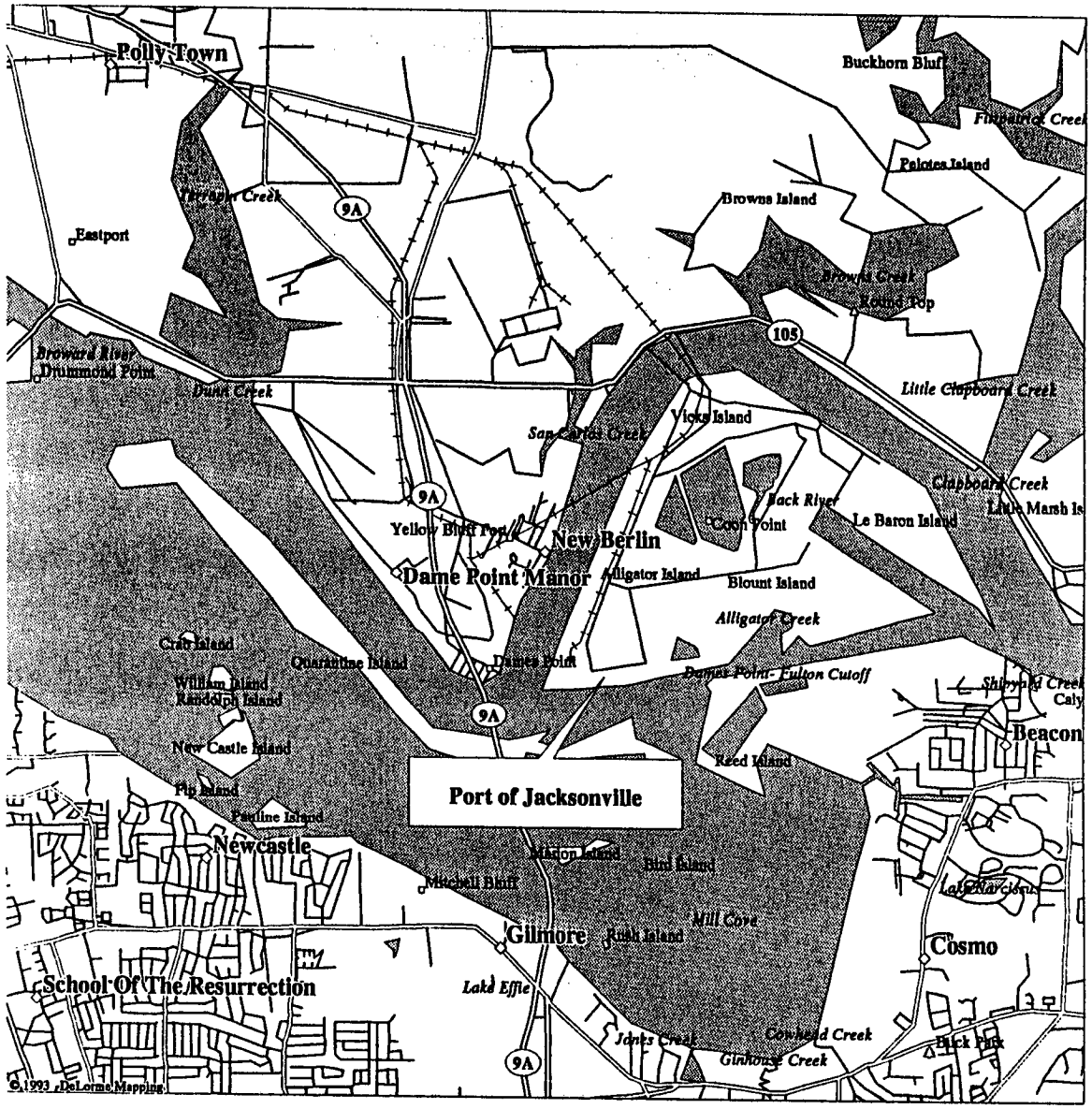


Figure 3-21 Port of Jacksonville, FL

There are two deepwater container/general cargo terminals: Blount Island, located approximately 11 km (7 mi) from the harbor entrance, and Talleyrand Docks and Terminals located about 34 km (21 mi) from the entrance. Both terminals are equipped with modern cranes, handle breakbulk and other types of cargo, and have warehouse as well as open storage areas. Of the two, Blount Island would be preferred because of its separation from the high-density downtown area and closer proximity to the sea.

Blount Island Terminal: Blount Island is a 356 ha (880 acre) facility with 1,920 m (6,336 ft) of berthing space. Blount Island berths 7-13 have 11.6 m (38 ft) of water alongside at mean low water, and five container cranes. This terminal is connected to the mainland via a fixed highway bridge which joins State Highway 105 (Necksher Drive) and connects with I-95 and Route 17 about five miles north of the city of Jacksonville. Blount Island has pierside service by the CSX Railroad, which connects with the Norfolk Southern Railroad.

Talleyrand Terminal: Talleyrand Docks is a 70 ha (173 acre) facility with 1,250 m (4,100 ft) of wharf on deep water (11.6 m or 38 ft at mean low water). It has two container cranes and two large gantry cranes. Talleyrand Terminal is located in downtown Jacksonville's shopping and commercial zone, about 2.9 km (1.8 mi) downstream of the John R. Matthews Bridge (alternate U.S. Route 90), and less than 1.0 km (0.6 mi) via city streets from the city Expressway system.

The 1990 population within 16 km (10 mi) of the port terminals was 334,212. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: the Savannah River Site, 46,900; the Oak Ridge Reservation, 175,000; the Idaho National Engineering Laboratory, 576,000; the Hanford Site, 643,000; and the Nevada Test Site, 639,000. Populations along rail routes to these sites are slightly larger. The distances to the five potential sites on interstate routes are: the Savannah River Site, 607 km (377 mi); the Oak Ridge Reservation, 912 km (567 mi); the Idaho National Engineering Laboratory, 4,030 km (2,504 mi); the Hanford Site, 4,700 km (2,920 mi); and the Nevada Test Site, 4,190 km (2,604 mi). Distances along rail routes are about the same.

Environmental Conditions: The area between the mouth of the St. Johns River and Blount Island is characteristic of typical coastal lowlands found along the southeastern United States. Numerous creeks meander through large expanses of marshes and swamps. With the exception of the U.S. Naval Station Mayport and the village of Mayport, which occupy the first several miles along the southern bank of the river, the land bordering the lower portion of the river is largely undeveloped with the exception of riverfront residences, mainly along the northern bank. Most of the land to the north of the river between Blount Island and the coast is part of the Nassau River - St. Johns River Marshes Aquatic Preserve. The Fort Caroline National Memorial is located southeast of Blount Island on the southern bank of the river. The Little Talbot Island State Park is located approximately 1.6 km (1 mi) north of the channel entrance.

The lower 24.2 km (15 mi) of the St. Johns River has been designated as critical habitat for the manatee, a listed endangered species. The river is also used as a migratory area for the shortnose sturgeon, a listed endangered species (FWS, 1980b). According to the Florida Natural Areas Inventory, the following rare species have been reported within 3.2 km (2 mi) of the Blount Island Terminal: West Indian manatee (State and Federally Listed Endangered Species), shortnose sturgeon (State and Federally Listed Endangered Species), Atlantic sturgeon (State-Listed Species of Special Concern and Federally Listed Threatened Species), sea lamprey, and the opossum pipefish (Murray, 1994).

A variety of wading birds is also found in the vicinity of the Fort Caroline National Memorial. Several species of birds, including shorebirds, waterfowl, and gannets frequent the area around the jetties at the channel entrance. In particular, the brown pelican, a State Species of Special Concern, is found in this

area. A variety of birds inhabits the Little Talbot Island State Park, including the American oystercatcher, a State Species of Special Concern. Loggerhead sea turtles, a listed endangered species, use the beaches along this portion of Florida as a nesting area (FWS, 1980b).

While environmental awareness is high throughout the state of Florida, there are no known sensitive wildlife sanctuaries in the immediate area of the Port of Jacksonville. Blount Island is surrounded by extensive marsh and wetlands.

Climatic Conditions: The Port of Jacksonville is located along the upper 39.4 km (24.5 mi) of the St. Johns River. The terrain in this area is relatively level, providing very little change in relief proceeding inland from the coastal region. The National Weather Service has been archiving meteorological information for this area since 1880.

The climate of this area is modified by the influence of the Atlantic Ocean. Easterly winds occur roughly 40 percent of the time, producing a true maritime climate for the Jacksonville area. The greatest rainfall occurs during summer, usually associated with afternoon and evening thunderstorms. During summer, measurable precipitation can be recorded nearly every two days. The prevailing winds are northeasterly in the fall and winter months, becoming more southwesterly during spring and summer. Although Jacksonville is along the eastern U.S. coast, it has been very fortunate in escaping hurricane-force winds. The majority of systems in recent years which have reached this latitude have moved parallel to the coastline, keeping well offshore. Others have weakened significantly moving overland prior to reaching metropolitan Jacksonville. The combination of these two factors has spared the area from any major devastation due to tropical systems in recent years (NOAA, 1992b). The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Jacksonville, the Uniform Building Code provides a basic wind speed of about 160 km per hour (100 mph). The port is located in a very low seismic zone with an acceleration of less than 0.075 g.

Ethnic and Income Characteristics: Figure 3-22 shows the ethnic composition for the area surrounding the port at Jacksonville. This figure shows the population residing within 16 km (10 mi) of the port according to 1990 data published by the U.S. Bureau of the Census. At the time of the 1990 census, African Americans were the largest minority group. Figure 3-23 shows analogous information for low-income households residing within 16 km (10 mi) of the port. As discussed in Appendix A, the percentage of low-income households near the port is nearly the same as that for counties surrounding the port.

3.2.1.5 Military Ocean Terminal Sunny Point, NC

The Military Ocean Terminal at Sunny Point (MOTSU) is a U.S. Department of Defense transportation facility located north of Southport, NC. The facility is located on the Cape Fear River, approximately 16 km (10 mi) upstream (north) from the mouth of the river, and 26 km (16.1 mi) south of the Port of Wilmington, NC. A map of MOTSU is shown in Figure 3-24. The port is easily accessed from the ocean, and all commercial vessels bound for Wilmington, NC must pass by MOTSU. It is served by a 12.1 m- (40 ft-) deep by 152 m- (500 ft-) wide channel from the ocean.

The water depth (channel and alongside the wharves) of 10.3 m (34 ft) at mean low water is adequate for most commercial breakbulk, roll-on/roll-off, and container ships. The terminal has three 600 m (2,000 ft) wharves, each with three berths. All wharves have three parallel sets of rail tracks. Berth 1, on the south

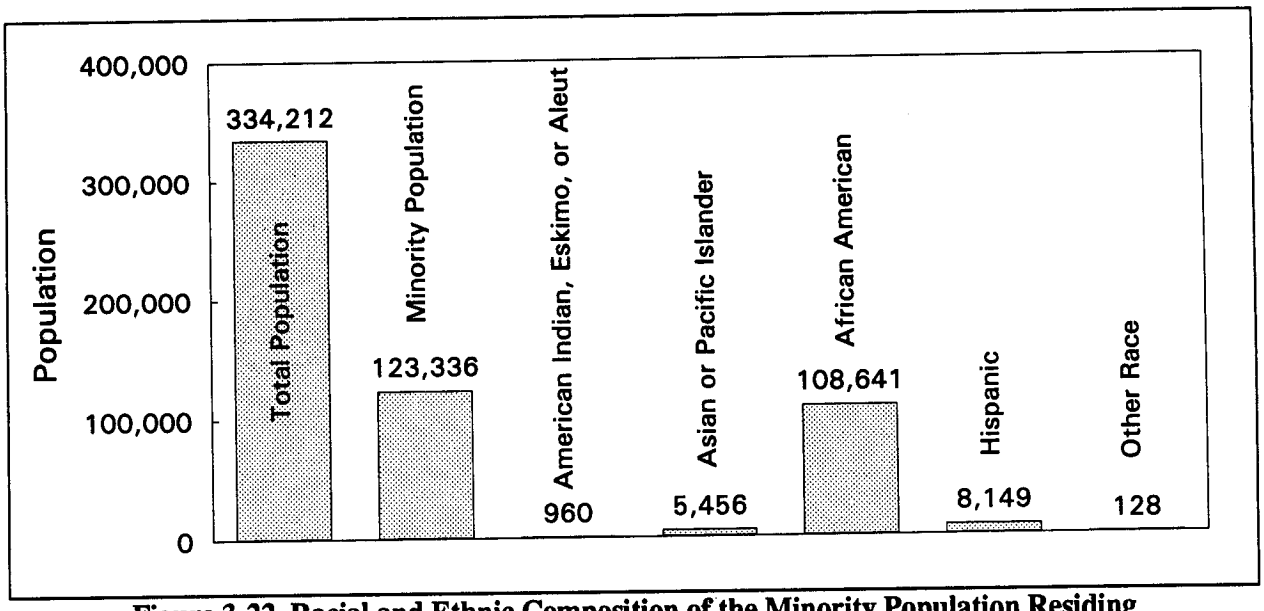


Figure 3-22 Racial and Ethnic Composition of the Minority Population Residing within 16 km (10 mi) of the Port of Jacksonville

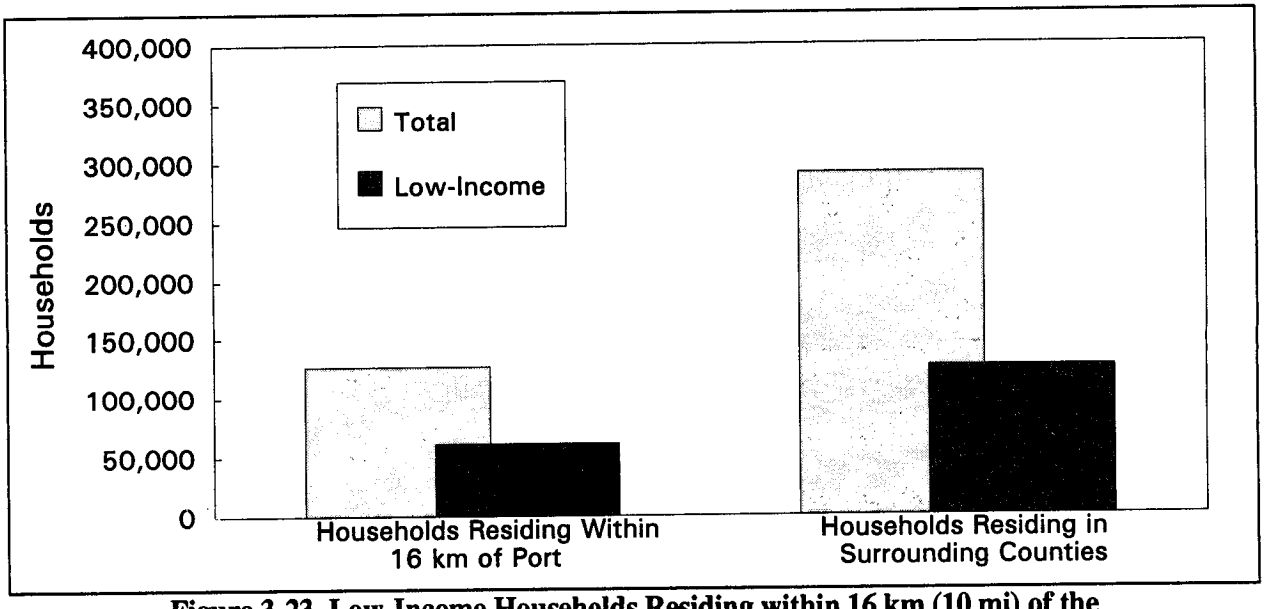


Figure 3-23 Low-Income Households Residing within 16 km (10 mi) of the Port of Jacksonville

wharf, has two 50 metric ton (55 ton) container cranes capable of off-loading container or container/breakbulk vessels. Berth 3 has been modified with a 30 m (100 ft) wide, reinforced concrete apron that permits breakbulk and roll-on/roll-off operations, in addition to containerized cargoes.

MOTSU is serviced by well-maintained roads, and has a dedicated 157 km (98 mi) U.S. Army rail line that connects the CSX network directly to the terminal. Truck access is provided by State Route 87 from the northwest and State Route 133 from the north. Route 87 provides access to U.S. 17, which runs southwest or northeast. The distance from the terminal gate to Route 133 is about 3.7 km (2.2 mi). Route 133 runs directly to U.S. 17 just outside Wilmington. From Wilmington, U.S. 74 runs west 120 km (75 mi) to Interstate 95, the nearest major north-south highway.

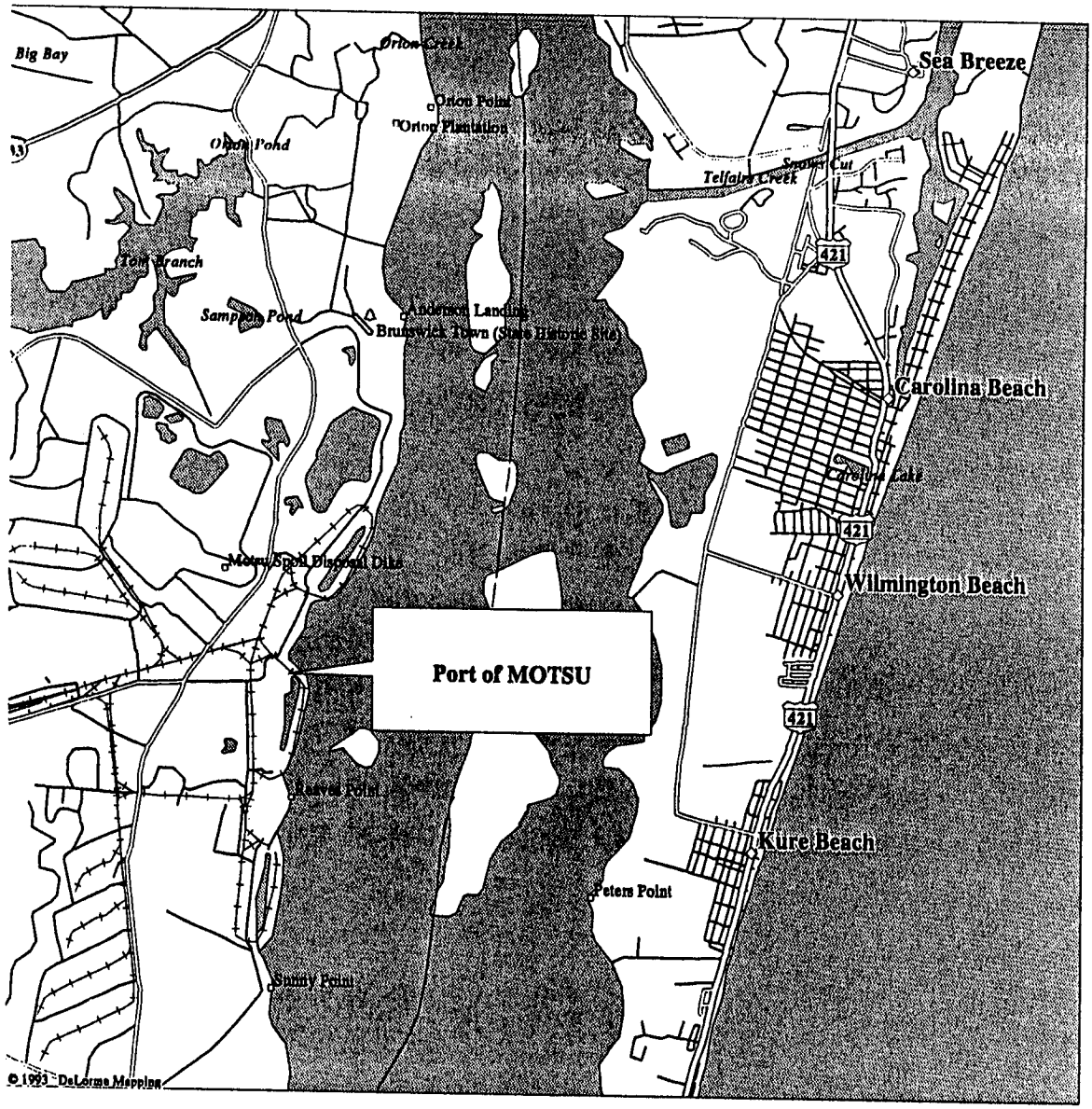


Figure 3-24 Military Ocean Terminal Sunny Point, NC

The 1990 population within 16 km (10 mi) of the port terminals was 7,995. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: the Savannah River Site, 34,200; the Oak Ridge Reservation, 128,000; the Idaho National Engineering Laboratory, 463,000; the Hanford Site, 548,000; and the Nevada Test Site, 619,000. Populations along rail routes to these sites are slightly larger. The distances to the five potential sites on interstate routes are: the Savannah River Site, 402 km (250 mi); the Oak Ridge Reservation, 798 km (496 mi); the Idaho National Engineering Laboratory, 3,873 km (2,407 mi); the Hanford Site, 4,615 km (2,868 mi); and the Nevada Test Site, 3,953 km (2,456 mi). Distances along rail routes are slightly longer.

Environmental Conditions: The environmental conditions at MOTSU are similar to those at the Port of Wilmington, NC, and are described in Section 3.2.1.10. MOTSU has been identified as an area with sinkhole activities (Koch, 1984). Sinkholes can occur naturally or as a result of human activity. Occurrences of sinkholes are closely tied to the drainage pattern in areas where geologic formations provide a collapse mechanism. Human activities which modify the natural drainage pattern in such an area can increase the rate of sinkhole formation. Sinkholes pose a potential hazard to truck and rail traffic in the Sunny Point area. Due to the robust casks which would be used to transport spent nuclear fuel from foreign research reactors (see Appendix B for a description of the casks), sinkholes would not be expected to cause a radiological accident.

Climatic Conditions: The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. For MOTSU, the Uniform Building Code provides a basic wind speed of about 160 km per hour (100 mph) (UBC, 1991). The port is located in a low seismic zone with an acceleration of 0.075 g.

Other climatic conditions at MOTSU are similar to those at the Port of Wilmington, NC, and are described in Section 3.2.1.10.

Ethnic and Income Characteristics: Figure 3-25 shows the ethnic composition for the area surrounding MOTSU. This figure shows the population residing within 16 km (10 mi) of the port according to 1990 data published by the U.S. Bureau of the Census. At the time of the 1990 census, African Americans made up about 17 percent of the total population, and approximately 91 percent of the minority population for the area surrounding the port. Figure 3-26 shows analogous information for low-income households residing within 16 km (10 mi) of the port. As discussed in Appendix A, the percentage of low-income households near the port is nearly the same as that for counties surrounding the port.

3.2.1.6 Naval Weapons Station, Concord, CA

Naval Weapons Station (NWS) Concord is located on the southern edge of Suison Bay, an estuarine area immediately west of the junction of the Sacramento and San Joaquin Rivers. By water, the NWS is approximately 58 km (36 mi) northeast of the Golden Gate Bridge. The city of Concord, CA, is about 8 km (5 mi) south of the NWS. A map of the NWS military port is shown in Figure 3-27.

The 1990 population within 16 km (10 mi) of the port terminal was 381,070. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: the Savannah River Site, 1,040,000; the Oak Ridge Reservation, 742,000; the Idaho National Engineering Laboratory, 271,000; the Hanford Site, 263,000; and the Nevada Test Site, 437,000. Populations along rail routes to these sites are slightly smaller for the Oak Ridge Reservation, the Idaho National Engineering Laboratory and the Nevada Test Site, and slightly larger for the Savannah River Site and the Hanford Site. The distances to the five potential sites on interstate routes are: the Savannah River Site, 4,476 km (2,781 mi); the Oak Ridge Reservation, 4,111 km (2,554 mi); the Idaho National Engineering Laboratory,

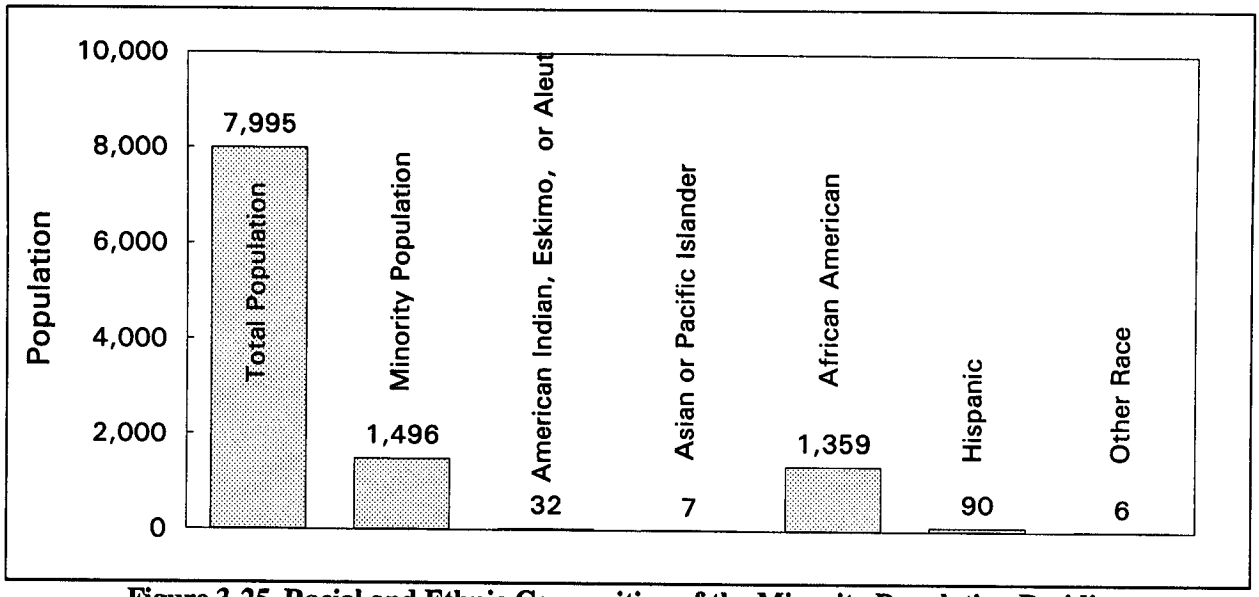


Figure 3-25 Racial and Ethnic Composition of the Minority Population Residing within 16 km (10 mi) of MOTSU

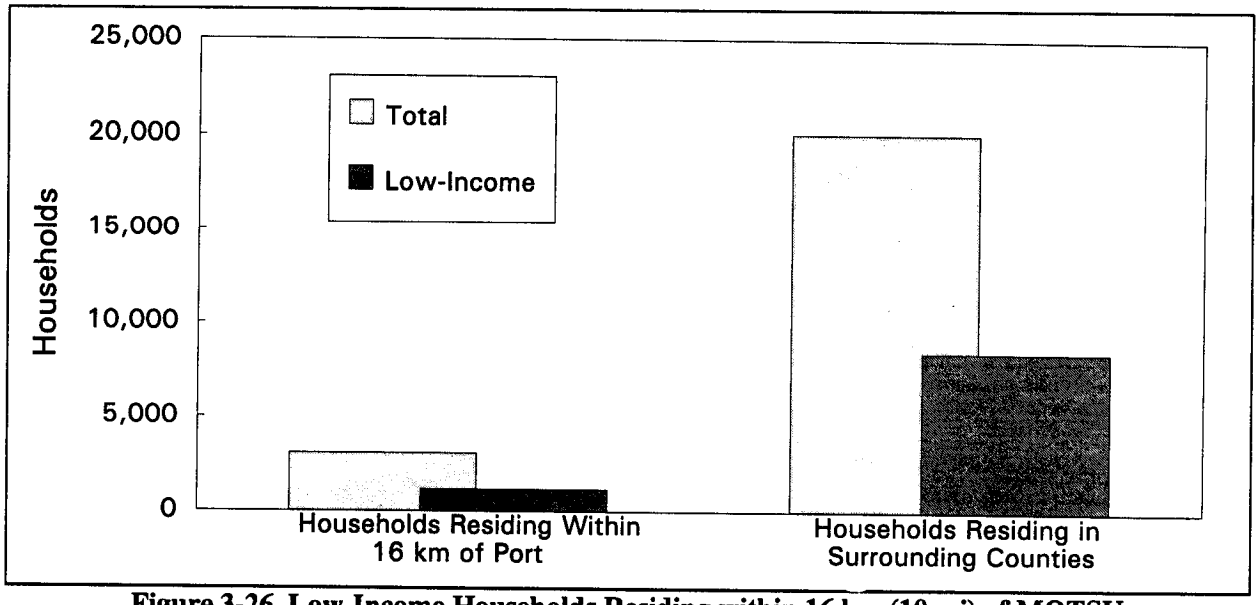


Figure 3-26 Low-Income Households Residing within 16 km (10 mi) of MOTSU

1,516 km (942 mi); the Hanford Site, 1,376 km (855 mi); and the Nevada Test Site, 1,145 km (711 mi). Distances along rail routes are about the same for the Idaho National Engineering Laboratory, and slightly longer for the Savannah River Site, the Oak Ridge Reservation, the Hanford Site, and the Nevada Test Site.

Environmental Conditions: NWS Concord occupies 5,233 ha (12,931 acres) of land adjoining south Suison Bay. Of this total acreage, 2,135 ha (5,276 acres) are inland, while 3,097 ha (7,653 acres) are more tidal in nature. Wetlands comprise approximately 1,215 ha (3,002 acres) of the tidal area (Yocum, 1994). Wetlands occupy large areas of land bordering all sides of Suison Bay and Grizzly Bay, which is located

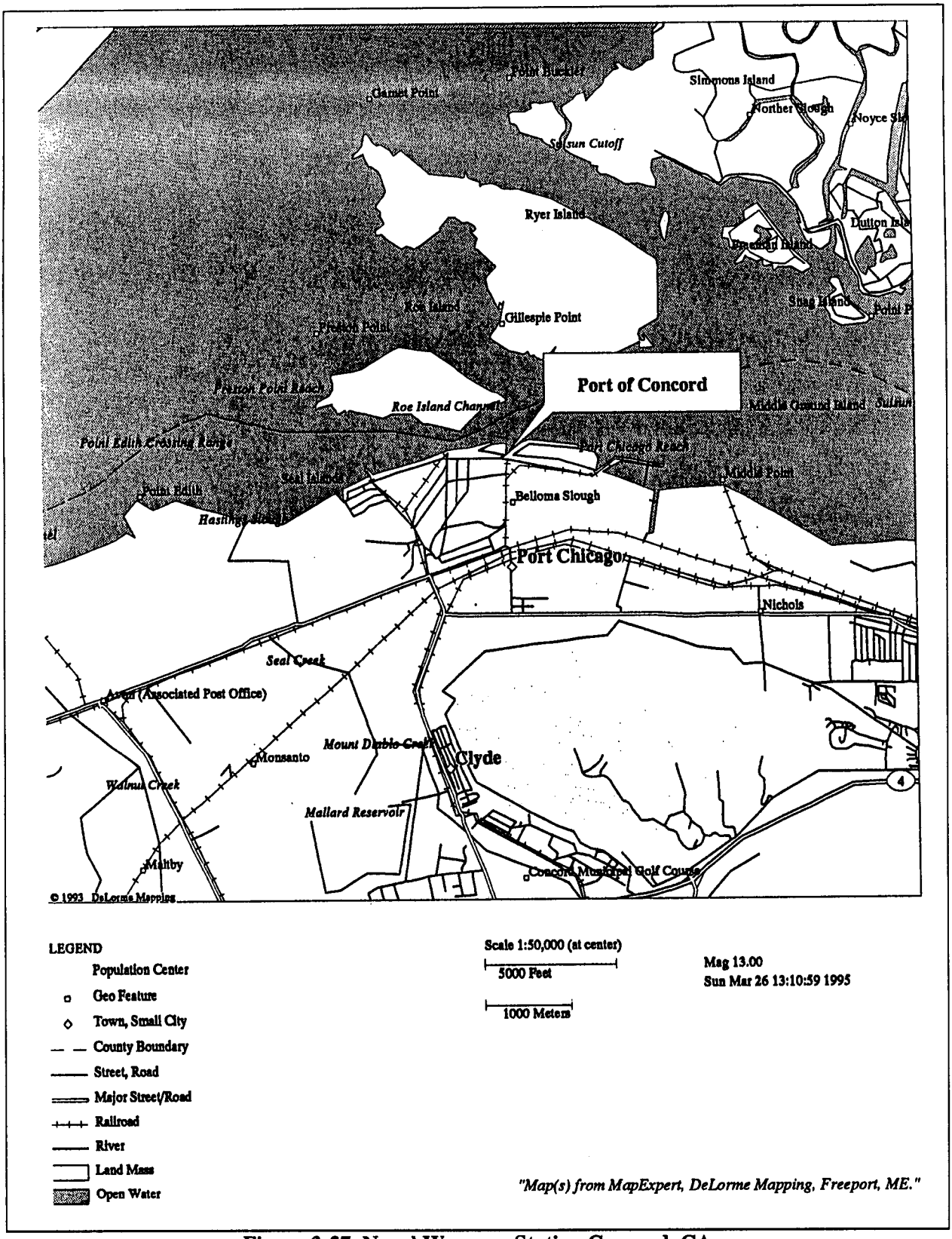


Figure 3-27 Naval Weapons Station Concord, CA

directly north of Suison Bay. The waters of Suison Bay are characterized as a mid-salinity estuarine habitat (generally 5 to 16.5 ppt). Chinook salmon, steelhead trout, striped bass, sturgeon, and American shad are typically found in this area (FWS, 1981a; FWS, 1981b).

Portions of the inland area at NWS Concord serve as a sanctuary for Tule elk, a formerly endangered species (Yocum, 1994). Other terrestrial species found in the area include the river otter, the salt-marsh harvest mouse (a Federally protected species), and the white-tailed kite. Adult concentrations and nesting areas of the California clapper rail (a Federally protected bird species) and the California black rail (a State protected species) are also found in this area. The Federally and State protected figwort plant family is also found in the vicinity of NWS Concord. In general, the greater San Francisco Bay area annually supports large numbers of shorebirds, wintering waterfowl, raptors, seabirds, and passerlings. In addition, shorebirds, wading birds, waterfowl, seabirds, and songbirds migrate through this coastal area.

Climatic Conditions: The climate is mild, with plenty of sunshine year round. Cloudless skies prevail during the spring, summer, and fall. Winter is the rainy season. Snow is rare, as are freezing temperatures. Sometimes torrential rains on the slopes can cause flooding along the Sacramento River (NOAA, 1993b).

The likelihood of severe natural phenomena, such as high winds and earthquakes, is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Concord NWS, the Uniform Building Code provides a basic wind speed of about 110 km per hour (70 mi per hour). The port is located on the edge of a very high seismic zone with an acceleration of 0.45 g.

Ethnic and Income Characteristics: Figure 3-28 shows the ethnic composition for the area surrounding NWS Concord. This figure shows the population residing within 16 km (10 mi) of the port according to 1990 data published by the U.S. Bureau of the Census. At the time of the 1990 census, African Americans made up about 7 percent of the total population, and approximately 24 percent of the minority population for the area surrounding the port. Other minorities include Asian or Pacific Islanders (11 percent of total population), and Hispanics (10 percent of total population). These groups constitute 38 percent and 35 percent of the minority population, respectively. Figure 3-29 shows analogous information for low-income households residing within 16 km (10 mi) of the port. As discussed in Appendix A, the percentage of low-income households near the port is nearly the same as that for counties surrounding the port.

3.2.1.7 Portland, OR

The Port of Portland is located about 160 km (100 mi) above the mouth of the Columbia River on the Willamette River tributary. Portland is the principal city of the Columbia River system, and one of the major ports on the Pacific Coast. The container terminal that would be used for potential receipt of foreign research reactor spent nuclear fuel is located approximately 170 km (106 mi) from the entrance of the Columbia River. Federal project depths in the Columbia River are 14.6 m (48 ft) at the mouth of the river, and 12 m (40 ft) at Portland. A map of the port is shown in Figure 3-30.

The 1990 census population within 16 km (10 mi) of the port was 356,064. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: the Savannah River Site, 686,000; the Oak Ridge Reservation, 519,000; the Idaho National Engineering Laboratory, 143,000; the Hanford Site, 85,700; and the Nevada Test Site, 375,000. Populations along rail routes to these sites are slightly smaller for the Nevada Test Site and the Idaho National Engineering Laboratory, but slightly larger for the Savannah River Site, the Oak Ridge Reservation, and the Hanford

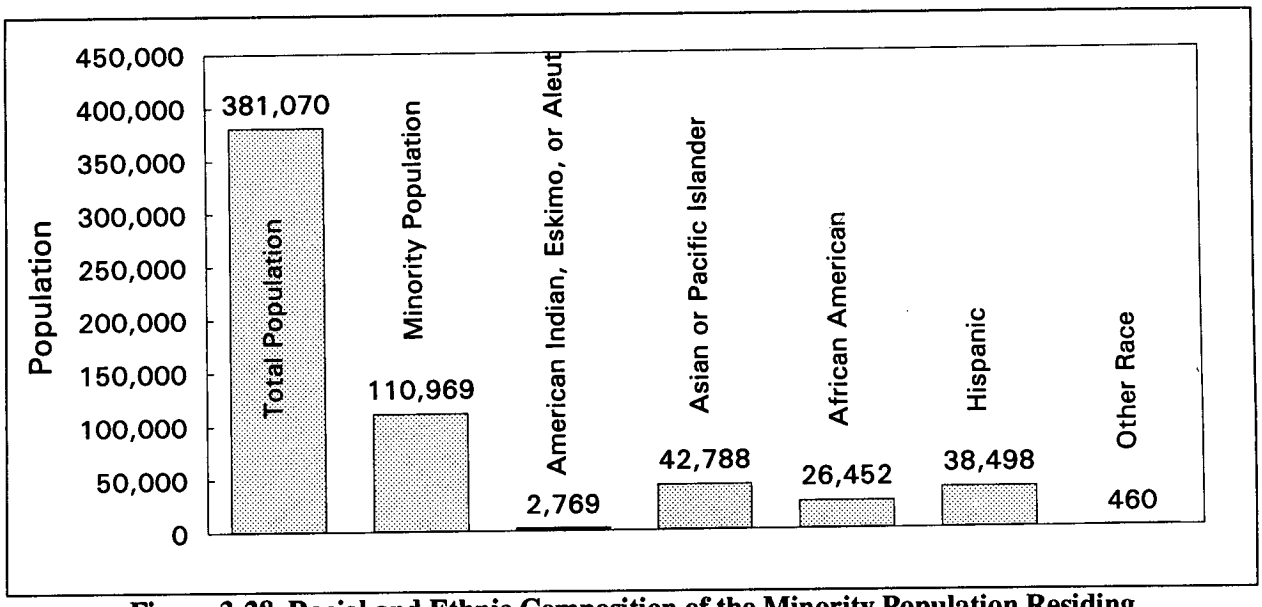


Figure 3-28 Racial and Ethnic Composition of the Minority Population Residing within 16 km (10 mi) of NWS Concord

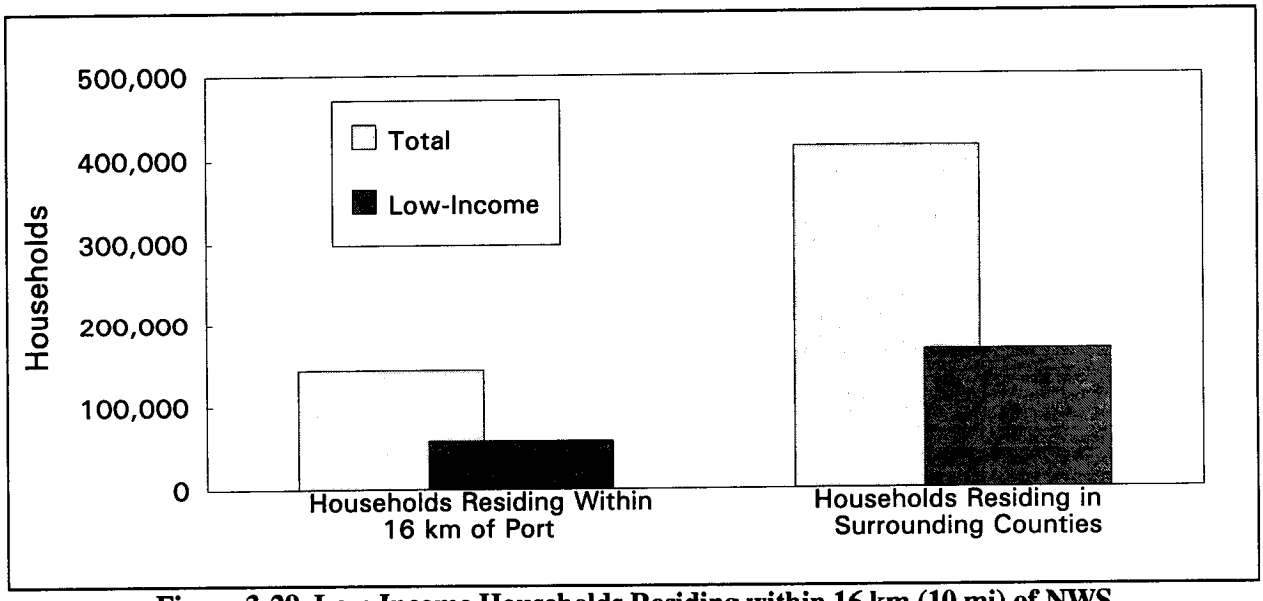


Figure 3-29 Low-Income Households Residing within 16 km (10 mi) of NWS Concord

Site. The distances to the five potential sites on interstate routes are: the Savannah River Site, 4,630 km (2,877 mi); the Oak Ridge Reservation, 4,200 km (2,610 mi); the Idaho National Engineering Laboratory, 1,190 km (739 mi); the Hanford Site, 407 km (253 mi); and the Nevada Test Site, 2,040 km (1,268 mi). Distances along rail routes are slightly longer, with the exception of the Hanford Site, which is slightly shorter.

Environmental Conditions: There are no known areas of special environmental concern in the immediate vicinity of the port, although concern for the environment runs high throughout the Pacific Northwest. The areas surrounding the Terminal are in river-oriented industrial land use. Wildlife habitat along the

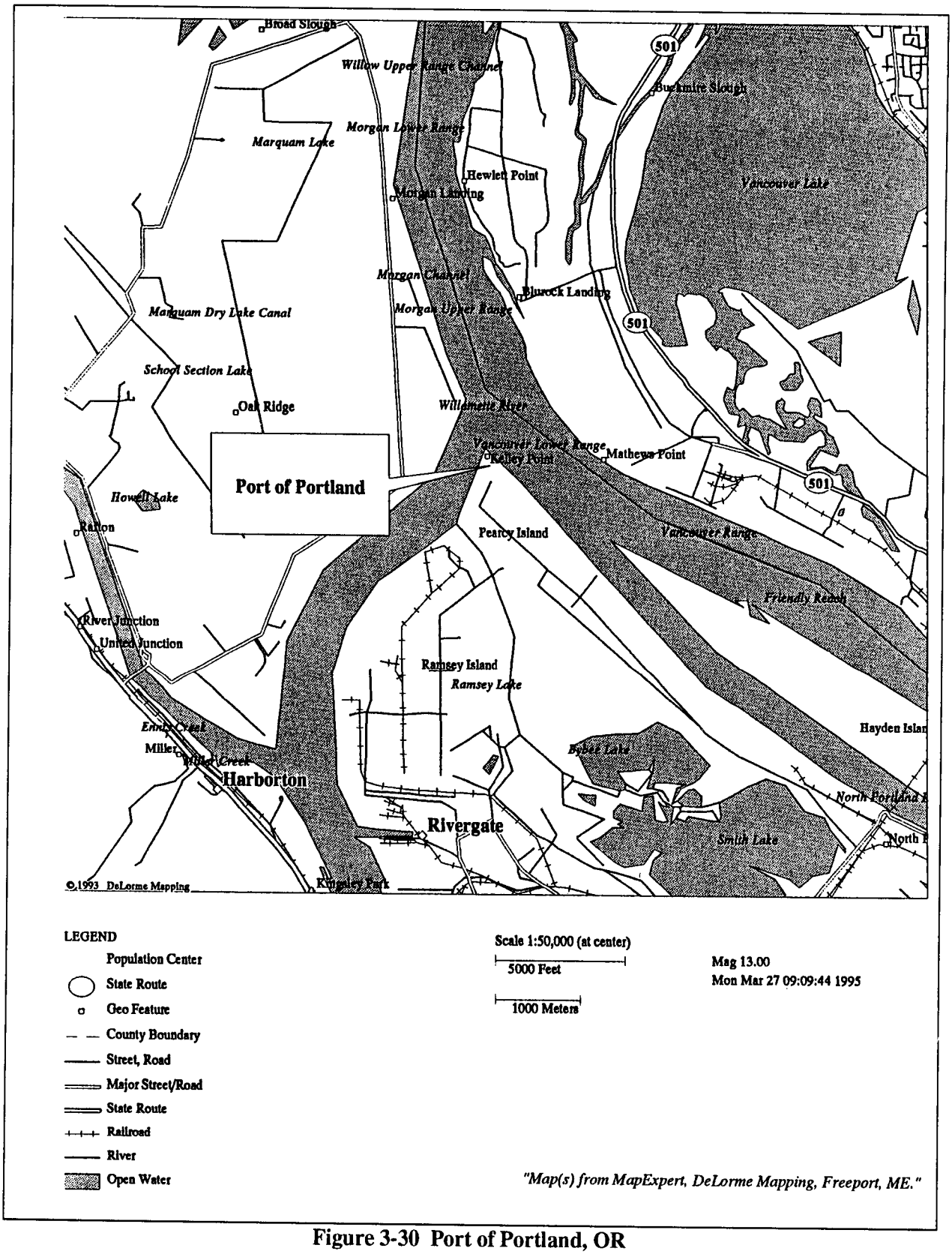


Figure 3-30 Port of Portland, OR

Oregon Slough is limited because of the industrial development, although some waterfowl use the area. While the primary uses in the Terminal area are commercial navigation and industry, some recreational fishing and boating occurs in Oregon Slough and the Columbia River.

The U.S. Fish and Wildlife Service's Ecological Inventory for the Vancouver, Washington-Oregon area indicates that the Columbia River generally includes the following fish species: salmonids, chinook salmon, coho salmon, chum salmon, pink salmon, sockeye salmon, steelhead trout, Dolly Varden, smelts, river lamprey, white sturgeon, American shad, eulachon and cutthroat trout (FWS, 1981c). South of Portland, the various islands and wetlands along the Columbia River provide habitat for a wide variety of terrestrial organisms. Areas of special interest include the Sauvie Island Game Management Area, which is located approximately 8 km (5 mi) downriver of Terminal 6, and the Ridgefield National Wildlife Refuge, which is approximately 16 km (10 mi) downriver.

The U.S. Army Corps of Engineers reports that raptors such as the red-tail hawk, bald eagle, and peregrine falcon are occasional visitors to this area and the U.S. Fish and Wildlife Service has indicated that the endangered American peregrine falcon and threatened bald eagle may winter in this area. In addition, the National Marine Fisheries Service has listed the Snake River sockeye salmon as endangered, and two Snake River chinooks stocks as threatened (Kurkoski, 1994). The State of Oregon's Natural Heritage Program reports that there are at least two rare species that occur in the vicinity of Terminal No. 6 (Gaines, 1994). These species are the painted turtle (a State-Sensitive-Critical species) and the Columbia water-meal.

Climatic Conditions: The port area is subject to earthquakes and volcanism (NOAA, 1992d). The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. For the Port of Portland, the Uniform Building Code provides a basic wind speed of about 140 km per hour (90 mph) (UBC, 1991). The port is located in a moderate seismic zone with an acceleration of 0.20 g. There have been two major earthquakes in the Puget Sound area this century (Bolt, 1978). On May 18, 1980, nearby Mount St. Helens suffered a major volcanic eruption. All the mountains along the Cascade Range are volcanic in origin and have some potential for eruption.

Ethnic and Income Characteristics: Figure 3-31 shows the ethnic composition for the area surrounding the port at Portland. This figure shows the population residing within 16 km (10 mi) of the port according to 1990 data published by the U.S. Bureau of the Census. At the time of the 1990 census, African Americans made up about 8 percent of the total population, and approximately 50 percent of the minority population for the area surrounding the port. Hispanics and Asian or Pacific Islanders each accounted for about 20 percent of the minority population. Figure 3-32 shows analogous information for low-income households residing within 16 km (10 mi) of the port. As discussed in Appendix A, the percentage of low-income households near the port is nearly the same as that for counties surrounding the port.

3.2.1.8 Savannah, GA

The Port of Savannah is located on the south bank of the Savannah River, about 35 km (22 mi) above the entrance from the Atlantic Ocean. Savannah is the third largest city in Georgia, and is the chief port of the State of Georgia. The Savannah River serves as the boundary between Georgia and South Carolina. There are three large cargo terminals at the port. One of these terminals, Containerport, is a dedicated container handling terminal. It is located about 45.6 km (28.3 mi) up the Savannah River from the Atlantic Ocean. A map of the port is shown in Figure 3-33.

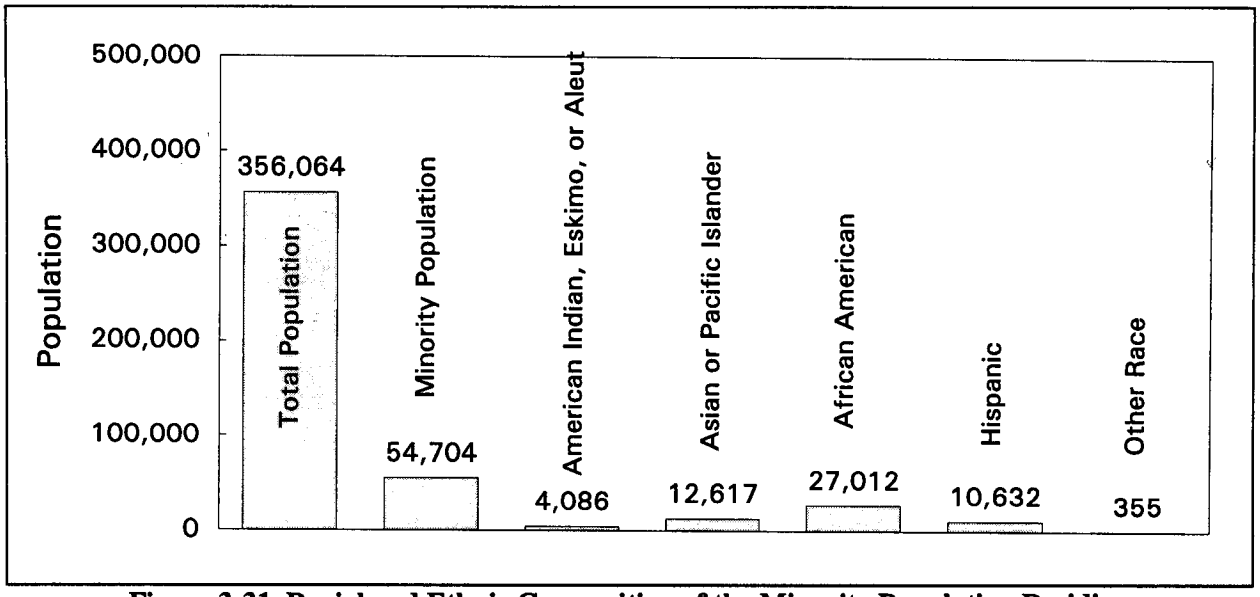


Figure 3-31 Racial and Ethnic Composition of the Minority Population Residing within 16 km (10 mi) of the Port of Portland

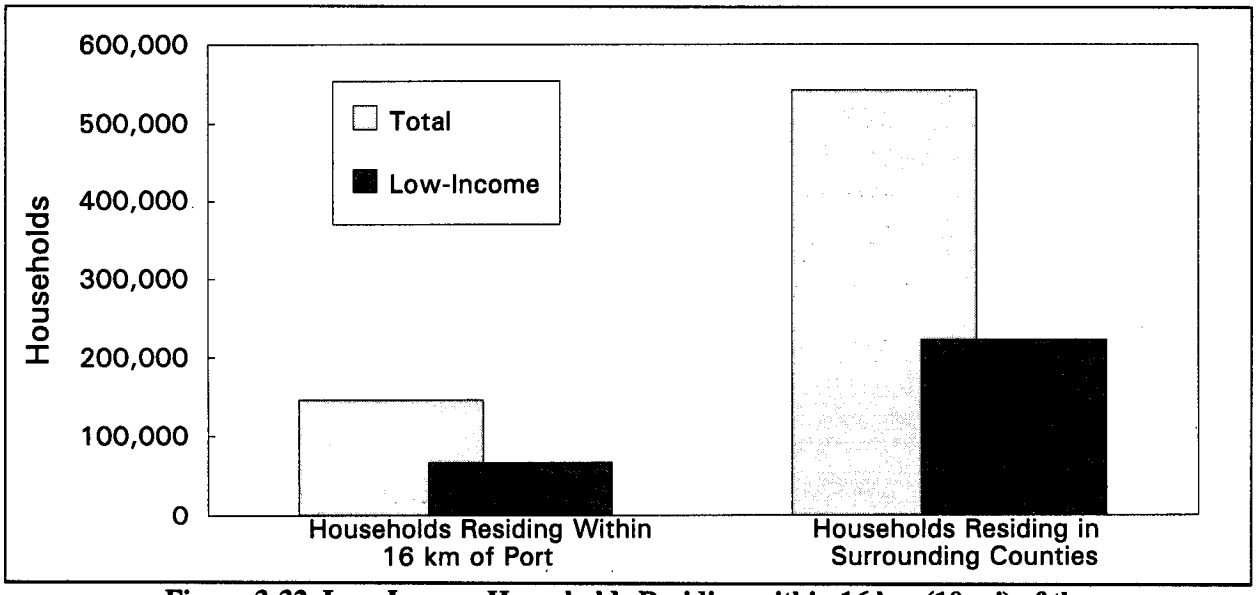


Figure 3-32 Low-Income Households Residing within 16 km (10 mi) of the Port of Portland

The 1990 population within 16 km (10 mi) of the port terminals was 155,166. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: the Savannah River Site, 37,300; the Oak Ridge Reservation, 101,000; the Idaho National Engineering Laboratory, 553,000; the Hanford Site, 602,000; and the Nevada Test Site, 616,000. Populations along rail routes to these sites are slightly larger. The distances to the five potential sites on interstate routes are: the Savannah River Site, 400 km (249 mi); the Oak Ridge Reservation, 720 km (447 mi); the Idaho National Engineering Laboratory, 3,860 km (2,398 mi); the Hanford Site, 4,530 km (2,815 mi); and the Nevada Test Site, 4,020 km (2,498 mi). Distances along rail routes are slightly longer.

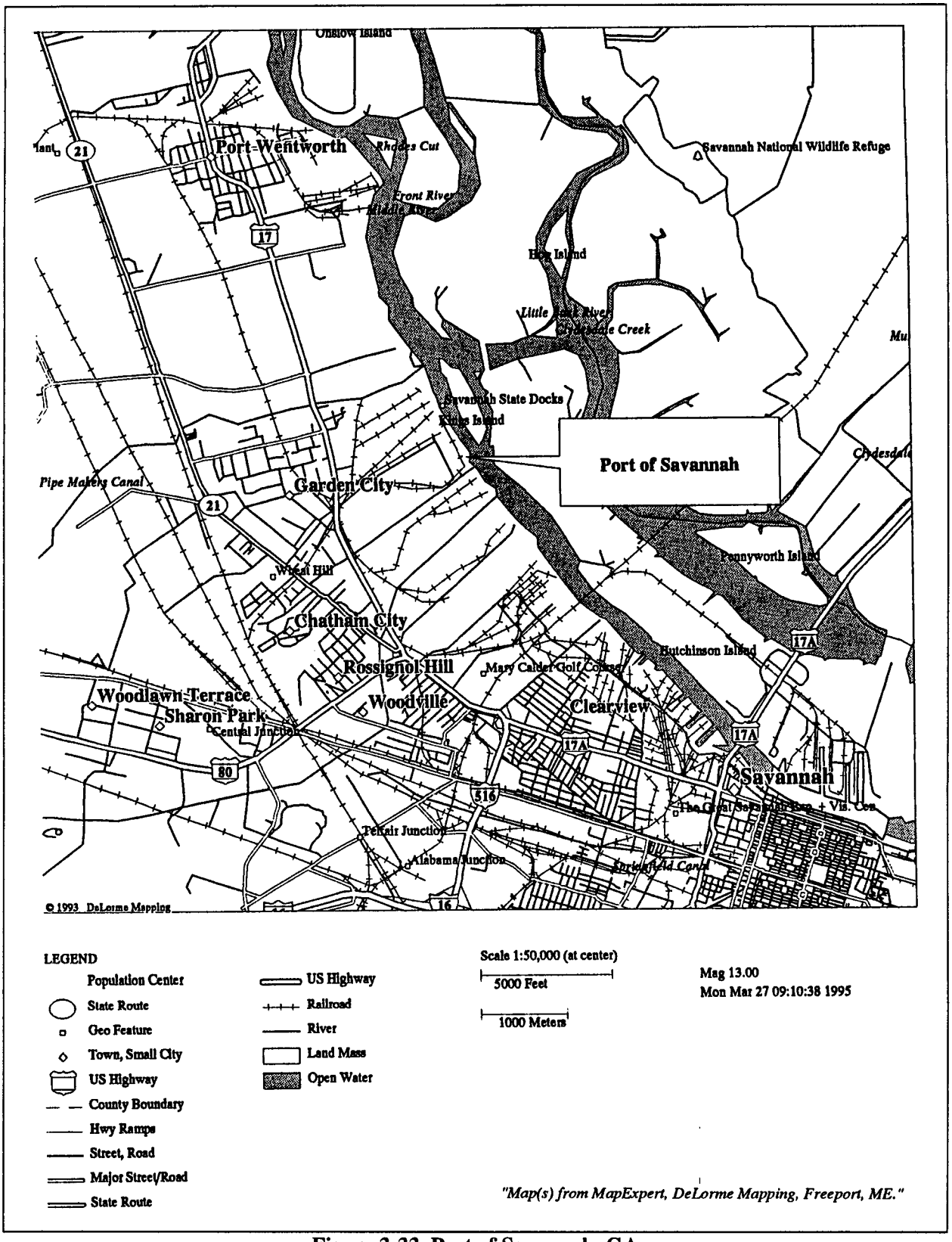


Figure 3-33 Port of Savannah, GA

Environmental Conditions: The lower Savannah River has multiple branches that meander through a variety of coastal lowlands including salt marshes, tidal creeks, freshwater marshes, and freshwater impoundments. South Carolina has classified its portion of the Savannah harbor upstream from Fort Pulaski (located at the mouth of the Savannah River) as Class B, and the portion oceanward as Class SA. Class B waters are freshwaters suitable for secondary contact recreation, use as a drinking water source following conventional treatment, fishing, industrial, and agricultural use. Class SA waters are defined as tidal salt waters suitable for primary contact recreation, and for all the uses listed in Class B. The State of Georgia has classified the Savannah River from mile 0 at Fort Pulaski north to mile 5 at Field's Cut as recreation waters. North of Field's Cut, the waters are classified as Coastal Fishing (U.S. Army, 1991). The river in the vicinity of Containerport is characterized as a transitional estuarine habitat, where the salinity ranges from low (generally 0.5 to 5 ppt) to mid-salinity (generally 5 to 16.5 ppt) (FWS 1980c).

A large number of aquatic and terrestrial species are found in and around the Savannah River near Containerport. State or Federally protected, endangered, or threatened aquatic species in the vicinity of Containerport include the Shortnose sturgeon and the Florida manatee, both identified as State and Federally endangered species. The Shortnose sturgeon uses the Savannah River as a migratory area. In addition, the Loggerhead turtle, the Bald eagle, and the American alligator are found along the lower reaches of the Savannah River (FWS, 1980c).

Both invertebrate and fish species of commercial and recreational value are found in the Savannah River. Commercial fishing is primarily for the American shad, sturgeon, shrimp, and blue crab. Public shellfishing is allowed in some areas near the mouth of the Savannah River, in the vicinity of Fort Pulaski. The Savannah River hosts the migration of several important commercial and game fishes, including the American shad, the hickory shad, and the blueback herring. Game species include the spotted seatrout, red drum, croaker, spot, striped bass, flounder, silver perch, white catfish, channel catfish, largemouth bass, sunfish, and crappies. The State of Georgia has closed the striped bass fishery for population recovery purposes (Schmitt, 1993).

There are several wildlife refuges and/or game management areas located along the lower portion of the Savannah River. Tybee National Wildlife Refuge is located at the mouth of the Savannah River at the confluence with the Atlantic Ocean. Just north of Tybee National Wildlife refuge is the Turtle Island Game Management Area. Containerport itself is located across the river from the southern end of the 10,371 ha (25,627 acre) Savannah National Wildlife Refuge. The Savannah National Wildlife Refuge and the Tybee National Wildlife Refuge are managed by the U.S. Fish and Wildlife Service.

Climatic Conditions: The area has a temperate climate, which is greatly influenced by winds coming into the area off the ocean. Nominally, 50 percent of the rainfall occurs during thunderstorms, with the remainder being equally distributed over the year and generally related to weather front passages. Severe tropical systems affect the Savannah area roughly once every 10 years and cause heavy, sustained precipitation, high winds, and extreme, but usually localized, coastal flooding. Rainfall measurements in excess of 51 cm (20 in) have been observed as a result of tropical systems impacting the area. Based on the 1951-1980 climatology, the first freeze occurs on average around November 15, and the last near March 10 (NOAA, 1992e).

The Port is subject to severe hurricanes and tropical storms, and given its proximity to Charleston, SC may have a slightly higher risk of earthquakes than the rest of the State of Georgia. The likelihood of severe natural phenomena, such as high winds and earthquakes, is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Savannah, the Uniform Building code provides a basic wind speed of about 130 km per hour (80 mi per hour). The port is located in a low seismic zone with an acceleration of 0.075 g.

Ethnic and Income Characteristics: Figure 3-34 shows the ethnic composition for the area surrounding the port at Savannah. This figure shows the population residing within 16 km (10 mi) of the port according to 1990 data published by the U.S. Bureau of the Census. At the time of the 1990 census, African Americans made up about 49 percent of the total population, and approximately 95 percent of the minority population for the area surrounding the port. Figure 3-35 shows analogous information for low-income households residing within 16 km of the port. As discussed in Appendix A, the percentage of low-income households near the port is nearly the same as that for counties surrounding the port.

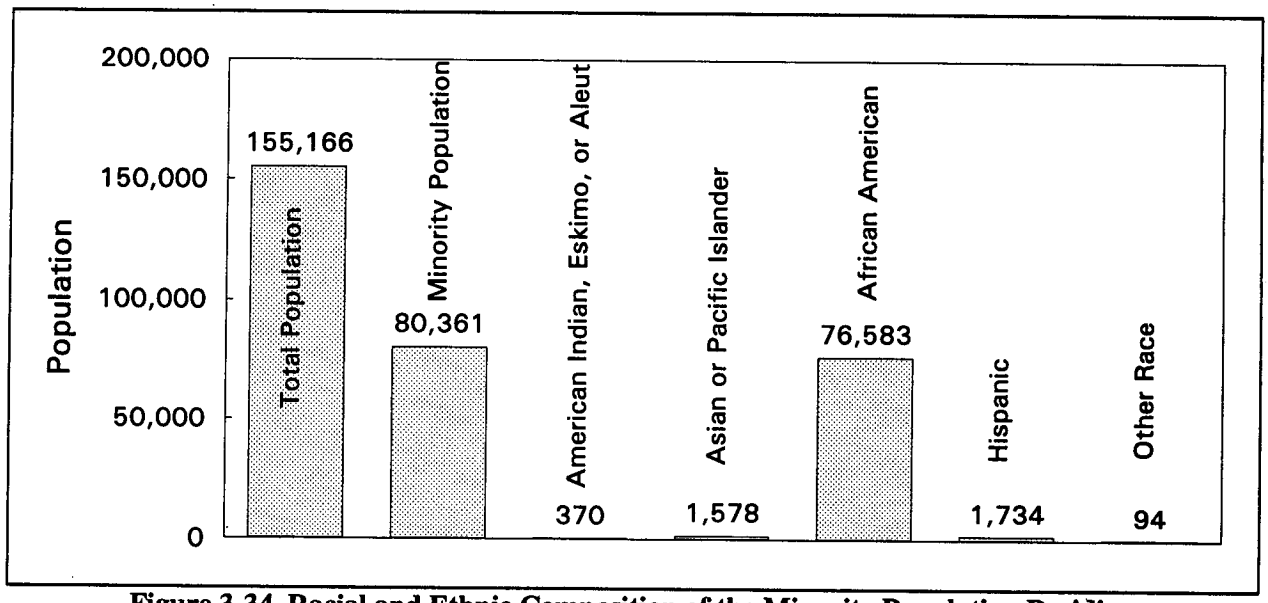


Figure 3-34 Racial and Ethnic Composition of the Minority Population Residing within 16 km (10 mi) of the Port of Savannah

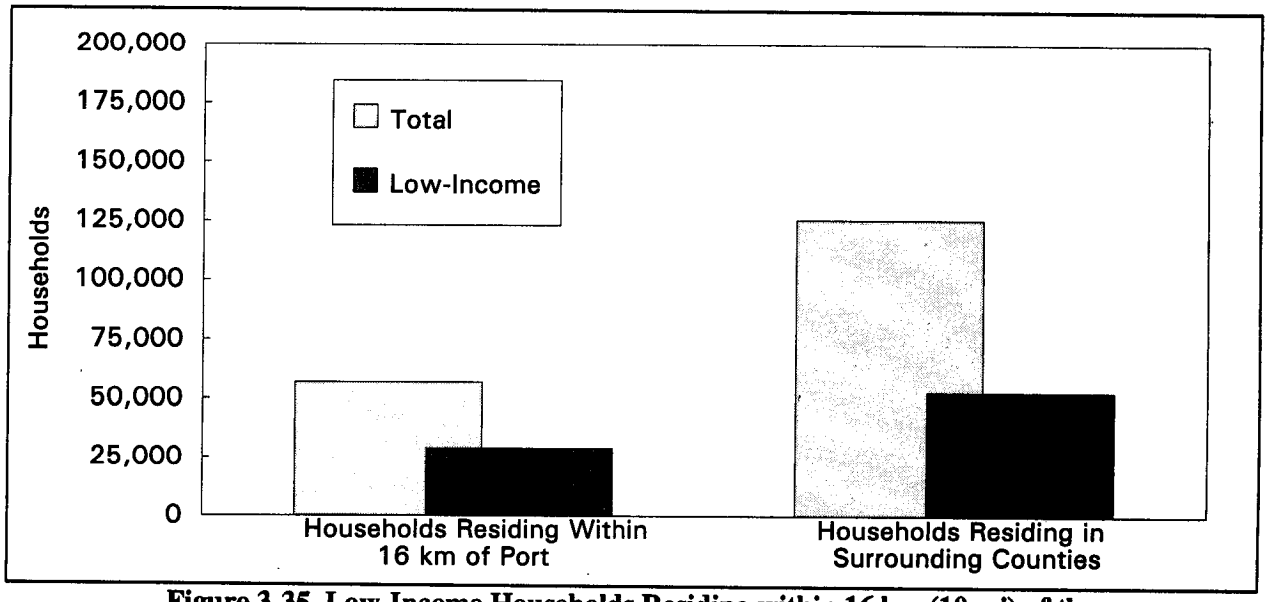


Figure 3-35 Low-Income Households Residing within 16 km (10 mi) of the Port of Savannah

3.2.1.9 Tacoma, WA

The Port of Tacoma is located in the southeastern corner of Puget Sound on the deep waters of Commencement Bay about 5 km (3 mi) from the Sound. It is a rapidly expanding major port second only to Seattle in maritime importance on Puget Sound. The distance from the entrance into Puget Sound is approximately 130 km (80 mi). A map of the port is shown in Figure 3-36.

Terminal 7, Berth D is the primary container terminal. It has one 274 m (904 ft) long container berth, 3 container cranes, and 15.2 m (50 ft) of depth alongside at mean low water.

The terminal is about 4.8 km (3 mi) from the Port of Tacoma road access to Interstate 5 immediately outside the port complex. A somewhat longer route, Interstate 5 South, connects with I-84 East near Portland, OR. Ship berths are served by the Port Belt Line Railroad, and the port is served by the Burlington Northern and Union Pacific Railroads, which interline with eastern and southern railroads.

The 1990 population within 16 km (10 mi) of the port was 511,575. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: the Savannah River Site, 601,000; the Oak Ridge Reservation, 431,000; the Idaho National Engineering Laboratory, 157,000; the Hanford Site, 98,600; and the Nevada Test Site, 379,000. Populations along rail routes to four of these sites are slightly larger, but the population along the rail route to the Nevada Test Site is slightly smaller (this is largely due to primary use of interstate highways through Salt Lake City, UT and Las Vegas, NV). The distances to the five potential sites on interstate routes are: the Savannah River Site, 4,720 km (2,933 mi); the Oak Ridge Reservation, 4,280 km (2,659 mi); the Idaho National Engineering Laboratory, 1,310 km (814 mi); the Hanford Site, 399 km (248 mi); and the Nevada Test Site, 2,160 km (1,342 mi). Distances along rail routes are much longer.

Environmental Conditions: A variety of marine mammals can be found in central Puget Sound including the Pacific harbor seal, California sea lion, killer whale, Dall porpoise, and harbor porpoise. In 1991, the U.S. National Marine Fisheries Services reported that the following endangered and/or threatened species may occur in the Puget Sound: the gray whale, the humpback whale, the Stellar sea lion, and the endangered leatherback sea turtle (DOE, 1995c), although these species are not reported at the port. Bald eagles can be found throughout this coastal zone, and American peregrine falcons are uncommon winter visitors (FWS, 1981a). The U.S. Fish and Wildlife Services' Ecological Inventory for the Puget Sound area indicates that the habitat of Commencement Bay is used by a variety of birds including shorebirds, gulls, sandpipers, turnstones, yellowlegs, herons, rails, great blue herons, waterfowl, loons, grebes, swans, geese, dabbling ducks, diving ducks, mergansers, American wigeons, pintails, mallards, seabirds, cormorants, alcids, common murres, and pigeon guillemots. Adult concentrations of all of these species may be found in the Bay. Some of these species may also use this area as an overwintering area, a migratory area, and/or a nesting area (FWS, 1981a). It is also indicated that adult concentrations of chinook salmon, coho salmon, chum salmon, and pink salmon are found in the Puyallup Waterway/River and use this water body and upstream segments as migratory and nursery areas.

According to the State of Washington's Department of Wildlife, a number of seabird colonies exist along the shoreline of Commencement Bay. Areas of the Puget Sound, north of Commencement Bay, are also used as haulouts by the California Sea Lion. Areas of estuarine wetlands are located along the northern shore of Commencement Bay (WDW, 1994).

Climatic Conditions: The mild climate of the Pacific Coast is modified by the Cascade Mountains and to a lesser extent by the Olympic Mountains. The climate is characterized by mild temperatures, a well-defined rainy season and prolonged cloud cover, especially during the winter months. The Cascades act as a very effective barrier in both winter and summer, shielding the region from both extreme cold and

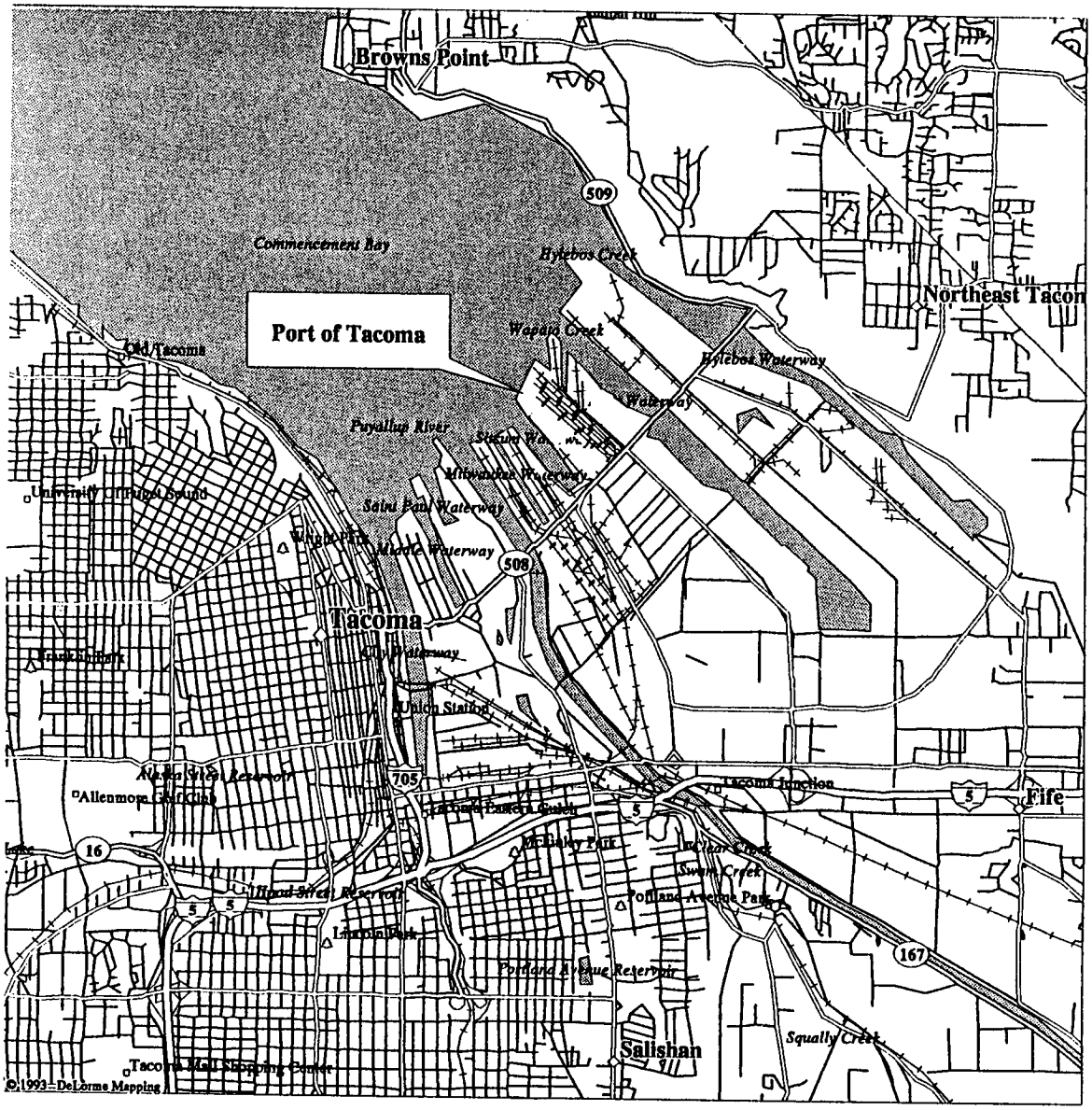


Figure 3-36 Port of Tacoma, WA

heat, respectively. The rainy season extends from October through March, with December accounting for the most rainfall. Approximately 75 percent of the annual total precipitation occurs during the winter rainy season. The dry season is centered around July and August. The majority of Seattle's precipitation is associated with normal, mid-latitude disturbances, which are most vigorous during the winter months. During summer, the dominant storm track (e.g., the polar jet) shifts northward into southern Canada, reducing the precipitation in the area. Summer thunderstorms do occur but do not contribute measurably to the annual rainfall budget. Prevailing winds are from the southwest, but occasional severe winter storms will produce strong northerly winds. Summer winds are generally rather light, with the occasional evidence of land-sea breeze effects creating northerly flows. Fog and low-level stratocumulus clouds form over the southern Puget Sound area in the late summer, fall, and early winter months, and often dominate the weather conditions of the early morning hours, reducing surface visibility. Based on 1951-1980 climatology, the first occurrence of freezing temperatures should occur around November 11, and the last incidence in spring around March 24 (NOAA, 1992f).

The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code. For the Port of Tacoma, the Uniform Building Code provides a basic wind speed of about 130 km per hour (80 mph) (UBC, 1991). The port is located in a high seismic zone with an acceleration of 0.30 g. There have been two major earthquakes in the Puget Sound area this century (Bolt, 1978). On May 18, 1980, Mount St. Helens suffered a major volcanic eruption (IPA, 1993). All the mountains along the Cascade Range from Canada to Northern California are volcanic in origin and are potentially active.

Ethnic and Income Characteristics: Figure 3-37 shows the ethnic composition for the area surrounding the port at Tacoma, WA. This figure shows the population residing within 16 km (10 mi) of the port according to 1990 data published by the U.S. Bureau of the Census. At the time of the 1990 census, African Americans constituted the largest minority group at about 6 percent of the total population, and approximately 38 percent of the minority population for the area surrounding the port. Asian and Hispanic minorities make up approximately 33 percent and 20 percent, respectively, of the minority population. Native Americans make up about 8 percent of the minority population near the port of Tacoma. Figure 3-38 shows analogous information for low-income households residing within 16 km (10 mi) of the port. As discussed in Appendix A, the percentage of low-income households near the port is nearly the same as that for counties surrounding the port.

3.2.1.10 Wilmington, NC

The Port of Wilmington, NC, is located on the east bank of the Cape Fear River, about 42 km (26 mi) above its mouth. It is the leading port of North Carolina, and its major export is wood pulp. The major terminals are down river from the city. A Federal project maintains a 12.2 m (40 ft) channel at the mouth of the Cape Fear River, 11.6 m (38 ft) to the port. A new dredging program will deepen the approach channel to 12.2 m (40 ft). A map of the port is shown in Figure 3-39.

The Wilmington wharves are of concrete pile construction, rubber fendered, with a total frontage of about 2,000 m (6,600 ft). Berths 6 to 9 are dedicated containership berths, with the remaining berths used for various kinds of general cargo. All of the main cargo berths have a depth alongside of 11.6 m (38 ft) at mean low water. The terminal has five container cranes, plus three gantry cranes (Jane's, 1992; AAPA, 1993; FHI, 1993).

Truck shipments from the port to southern destinations are along U.S. Routes 17, 74, 76, and 421 to Interstates 95 and 40 (POW, 1994). Northern and western long-distance routes are via Interstate 40, which connects with State Highway 132 about 16 km (10 mi) north of the city. The 1990 population within

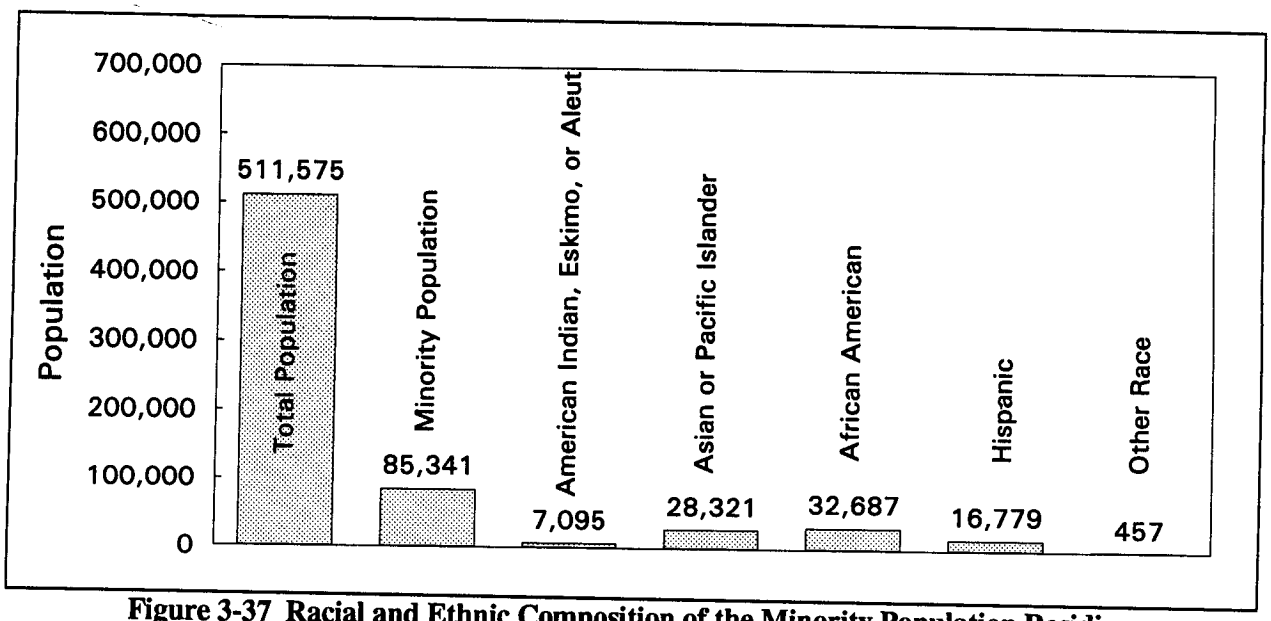


Figure 3-37 Racial and Ethnic Composition of the Minority Population Residing within 16 km (10 mi) of the Port of Tacoma

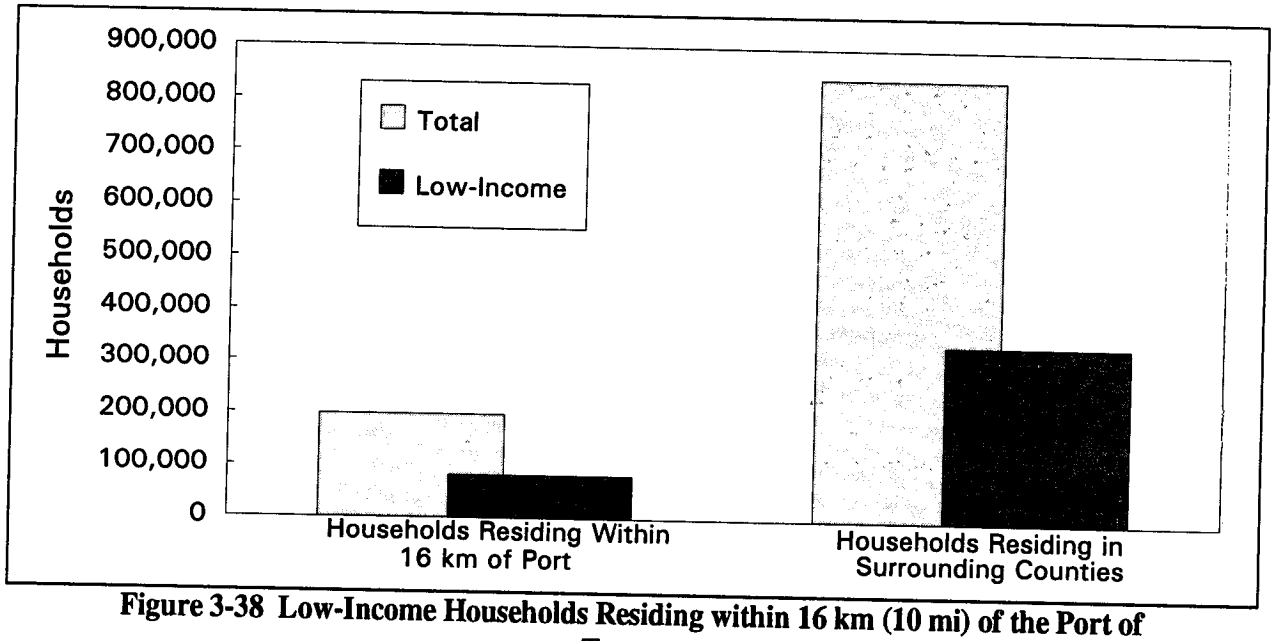


Figure 3-38 Low-Income Households Residing within 16 km (10 mi) of the Port of Tacoma

16 km (10 mi) of the port terminals was 115,057. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: the Savannah River Site, 64,700; the Oak Ridge Reservation, 128,000; the Idaho National Engineering Laboratory, 507,000; the Hanford Site, 556,000; and the Nevada Test Site, 570,000. Populations along rail routes to these sites are slightly larger. The distances to the five potential sites on interstate routes are: the Savannah River Site, 500 km (311 mi); the Oak Ridge Reservation, 820 km (510 mi); the Idaho National Engineering Laboratory, 4,100 km (2,548 mi); the Hanford Site, 4,770 km (2,964 mi); and the Nevada Test Site, 4,260 km (2,647 mi). Distances along rail routes are slightly longer for western sites, but about the same for eastern sites.

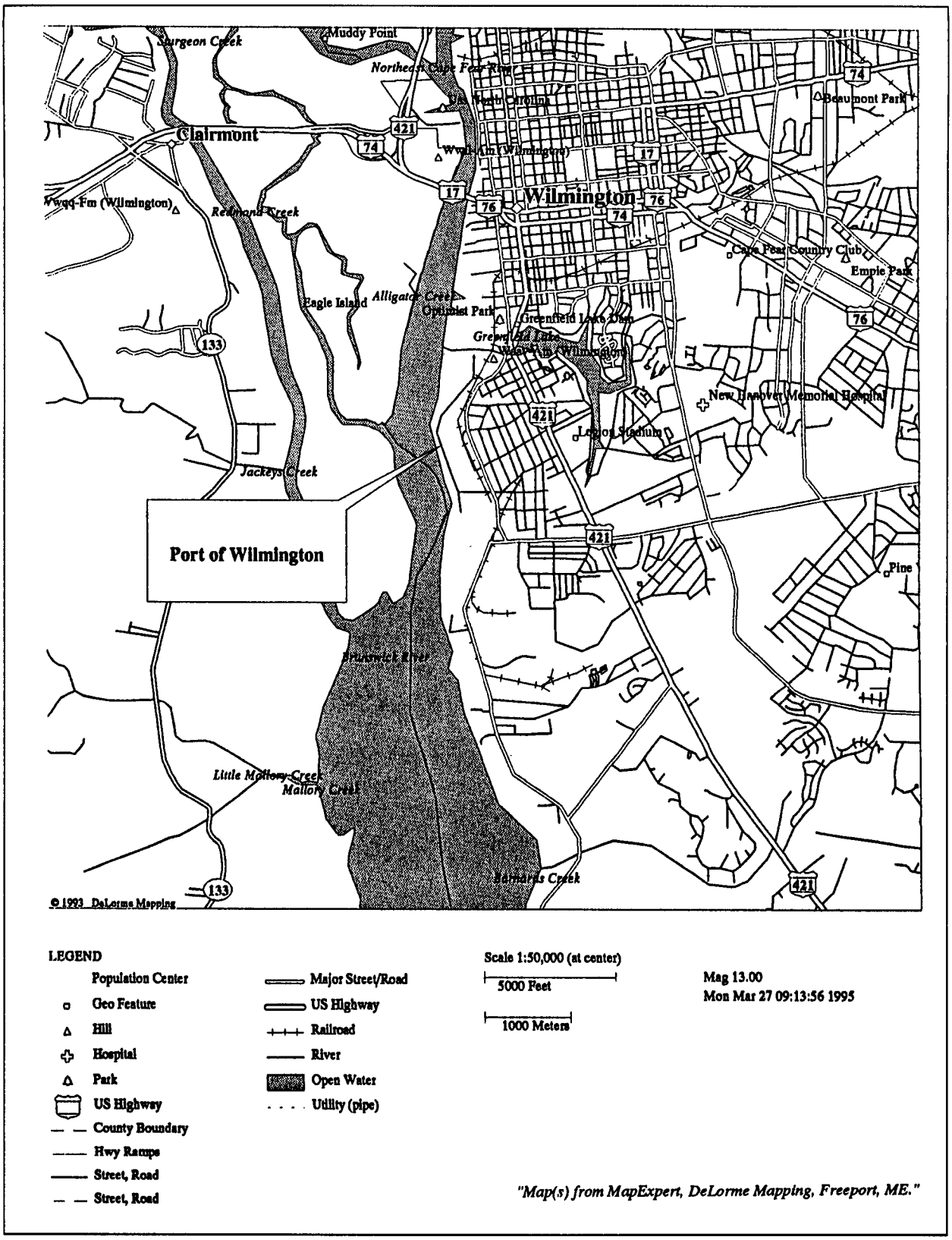


Figure 3-39 Port of Wilmington, NC

Environmental Conditions: There are no known environmentally sensitive areas in the immediate vicinity of the terminal, but due to resorts and recreational activity, there is heightened environmental awareness.

North Carolina has given the lower portion of the Cape Fear River three different stream classifications. From the Northeast Cape Fear River to the confluence with the Cape Fear River the waters are classified as SC-swamp. From the mouth of the Northeast Cape Fear to a point between Snow and Federal Points, the waters are classified as SC, and from Snow and Federal Points oceanward the waters are classified as SA. SC waters are tidal waters suitable for fishing, fish and wildlife propagation, secondary recreation, and other water uses requiring lower quality. The term "swamp" denotes waters with slow velocity. Class SA waters are suitable for shellfishing and primary recreation, as well as all of the activities approved for Class SC waters. According to the U.S. Fish and Wildlife Service's Ecological Inventory Map for Beaufort, NC, the Port of Wilmington is located in a low salinity estuarine habitat (generally 0.5 to 5 ppt) and tidal freshwater habitat. Below Wilmington at Campbell Island, the river changes to a mid-salinity estuarine habitat (generally 5 to 16.5 ppt). The Cape Fear River near MOTSU changes once again to a high-salinity estuarine habitat (generally 16.5 to 30 ppt).

The lower Cape Fear River supports a large number of aquatic and terrestrial species. There are both invertebrate and fish species of commercial and recreational value found in the Cape Fear River near the Port of Wilmington. Species sought by commercial and recreational fishermen include flounder, trout, spot, croaker, bluefish, Spanish mackerel, and king mackerel. Shellfish sought include penaeid shrimp and blue crabs.

The Natural Heritage Program of the North Carolina Department of Environment, Health and Natural Resources reports that the area around the port has not been systematically inventoried for rare species. However, they also report that the lower Cape Fear River, from Wilmington to the mouth of the river at Smith Island, is brackish and contains numerous rare animals. The shortnose sturgeon (State and Federal Endangered Species) rarely occurs in the river, whereas manatees (State and Federal Endangered Species) occasionally occur, especially in the summer. American alligators (a designated threatened species) can be found in tributary streams. The freckled blenny, spinycheek sleeper, opossum pipefish, and marked goby are other rare marine fishes that inhabit the river.

There are many animals with special status in this area including various types of whales, sea turtles, and birds. State or Federally protected, endangered, or threatened aquatic species in this area include the shortnose sturgeon (fish), finback whale, Florida manatee, humpback whale, right whale, sei whale, and sperm whale (mammals), Arctic peregrine falcon, bald eagle, piping plover, red-cockaded woodpecker, wood stork (birds), and the American alligator, green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and the loggerhead sea turtle (reptiles and amphibians).

Climatic Conditions: The Port of Wilmington is located on the Cape Fear River, 42 km (26 mi) from the open Atlantic Ocean. This general area also includes MOTSU, which is also located on the Cape Fear River, north of Southport, NC, and south of Wilmington, NC. The elevation of this region is approximately 12 m (40 ft) above sea level, and is more variable than the coastal plain surrounding the Norfolk, VA area. The National Weather Service has been archiving meteorological information for this area since 1871.

The port is subject to hurricanes and tropical storms. The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code. For the Port of Wilmington, the Uniform Building Code provides a basic wind speed of about 160 km per hour (100 mph) (UBC, 1991). The port is located in a low seismic zone with an acceleration of 0.075 g.

The maritime location of the Wilmington area makes the climate unusually mild for its northern latitude. All wind directions from the east-northeast through the southwest have some moderating effect on the local climate, due to the relatively warm and cool ocean in the winter and summer seasons, respectively. The area rarely experiences cold episodes where the temperature falls below -18°C (0°F). However, cold air outbreaks do occur, causing sharp fluctuations in winter temperatures. Rainfall in the area is generally considered ample and evenly distributed throughout the year, with the bulk of the precipitation occurring during the summer months. The bulk of this rainfall is generally associated with afternoon and evening thunderstorms. In contrast, the winter rains tend to be of the slow, steady type, generally lasting one to two days. As is common at Atlantic coastal localities at this latitude, the late summer and early fall months bring the possibility of hurricanes and tropical storms to the Wilmington area. These storms are capable of generating high winds, above normal tides and torrential rains. The latter two are also capable of creating widespread local flooding of low-lying coastal areas (NOAA, 1992g).

Ethnic and Income Characteristics: Figure 3-40 shows the ethnic composition for the area surrounding the port at Wilmington. This figure shows the population residing within 16 km (10 mi) of the port according to 1990 data published by the U.S. Bureau of the Census. At the time of the 1990 census, African Americans made up about 33 percent of the total population, and approximately 93 percent of the minority population for the area surrounding the port. Figure 3-41 shows analogous information for low-income households residing within 16 km (10 mi) of the port. As discussed in Appendix A, the percentage of low-income households near the port is nearly the same as that for counties surrounding the port.

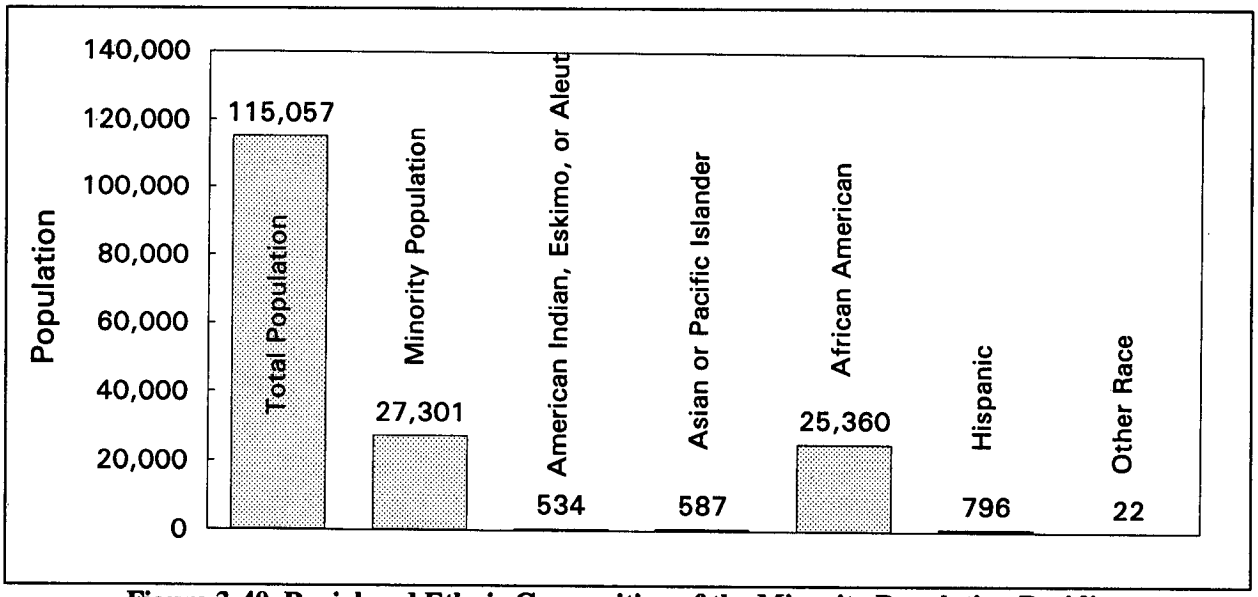


Figure 3-40 Racial and Ethnic Composition of the Minority Population Residing within 16 km (10 mi) of the Port of Wilmington

3.3 Management Site(s) Environments

This section describes the affected environment of the five potential DOE management sites for the foreign research reactor spent nuclear fuel. The five management sites are the Savannah River Site, the Idaho National Engineering Laboratory, the Hanford Site, the Oak Ridge Reservation, and the Nevada Test Site.

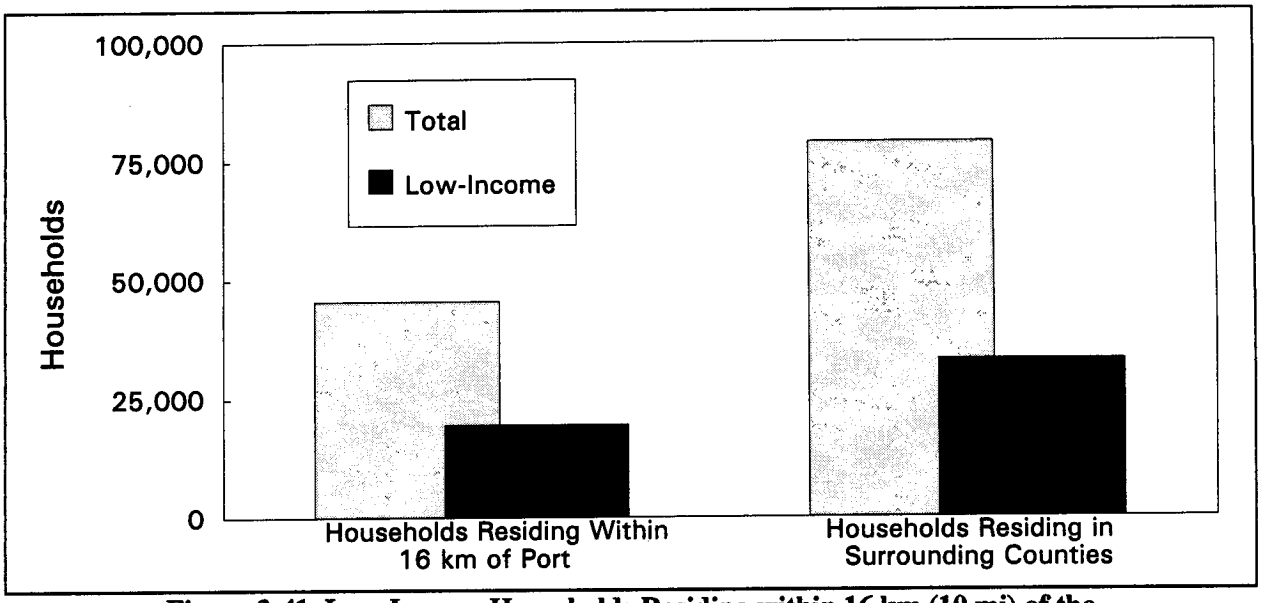


Figure 3-41 Low-Income Households Residing within 16 km (10 mi) of the Port of Wilmington

3.3.1 Description of the Affected Environment at the Savannah River Site

The Savannah River Site is a key DOE facility for research and production of special nuclear materials. The site was built in the early 1950's to produce the basic materials used in the fabrication of nuclear weapons. The DOE Savannah River Operations Office manages the Savannah River Site, and the Westinghouse Savannah River Company operates the site under contract to DOE. This section describes the potentially affected environment of the Savannah River Site. The location of the site is shown in Figure 3-42.

3.3.1.1 Geology

The Savannah River Site is located in the Upper Atlantic Coastal Plain physiographic province of western South Carolina, approximately 32 km (20 mi) southeast of the Fall Line, which separates the Piedmont and Coastal Plain provinces (Figure 3-42). The Coastal Plain in South Carolina is subdivided to include the Aiken Plateau, the Congaree Sand Hills, and the Coastal Terraces. The Coastal Plain consists of 213 to 366 m (700 to 1,200 ft) of gently seaward (southeast) dipping sands, clays, and limestones of Cretaceous and Tertiary age. These sediments are underlain by sandstones of Triassic age and older dense metamorphic and igneous basement rocks (Arnett et al., 1993). Coastal Plain sediments form a wedge of seaward-dipping and thickening unconsolidated and semi-consolidated sediments that begin at zero at the Fall Line and increase to more than 1,212 m (4000 ft) at the Continental Shelf. The Coastal Plain sediments underlying the Savannah River Site consist of sandy clays and clayey sands, with occasional beds of clean sand, gravel, clay, or carbonate. Two bioclastic limestone zones ranging from 0.6 m (2 ft) to 24 m (80 ft) occur within the Tertiary sequence. Most of the clastic sediments are unconsolidated, but thin semi-consolidated beds also occur (DOE, 1991a). The Triassic formations and older igneous and metamorphic rocks are hydrologically separated from the overlying Coastal Plain sediments by a regional aquitard (Arnett et al., 1993) (Figure 3-43).

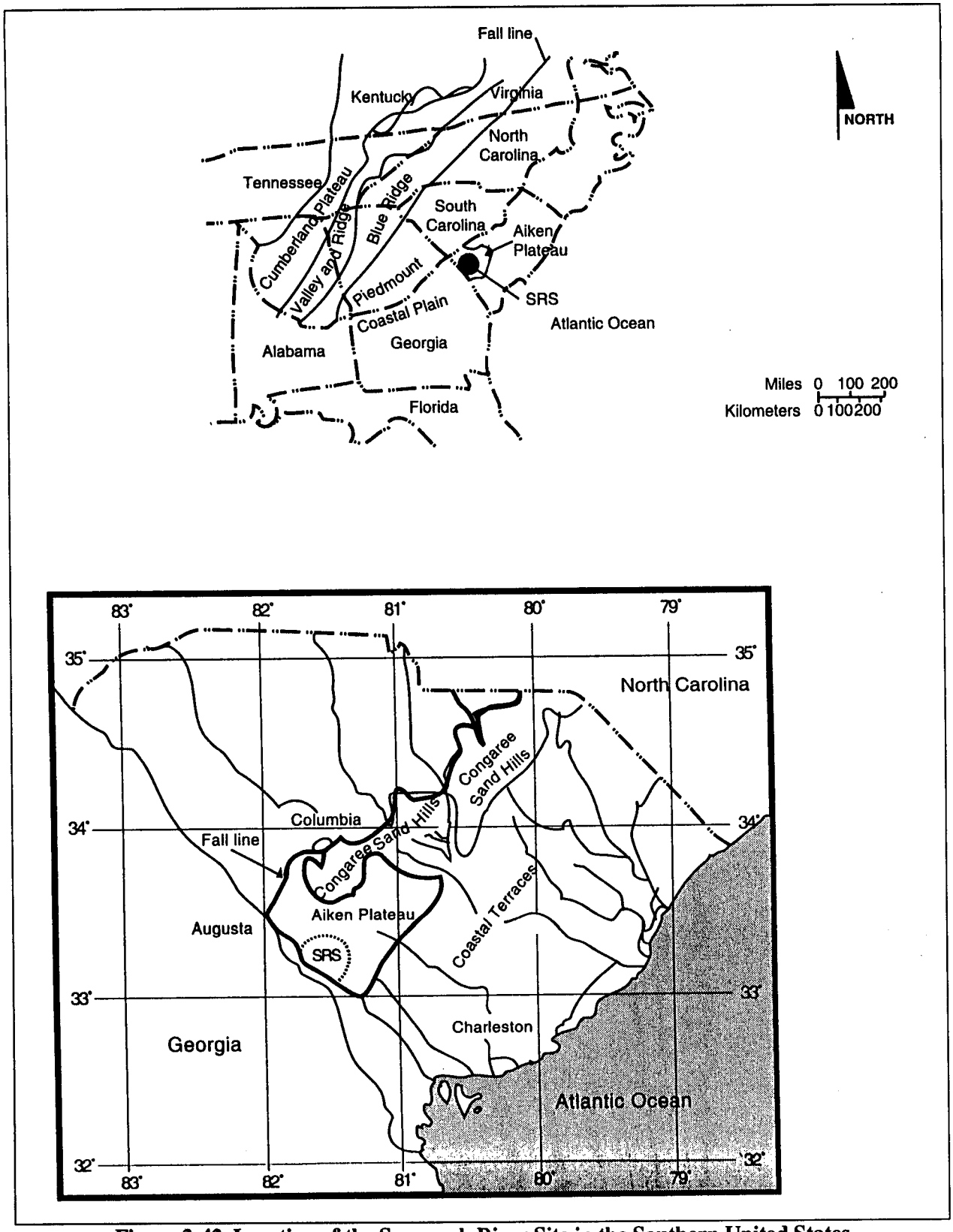


Figure 3-42 Location of the Savannah River Site in the Southern United States

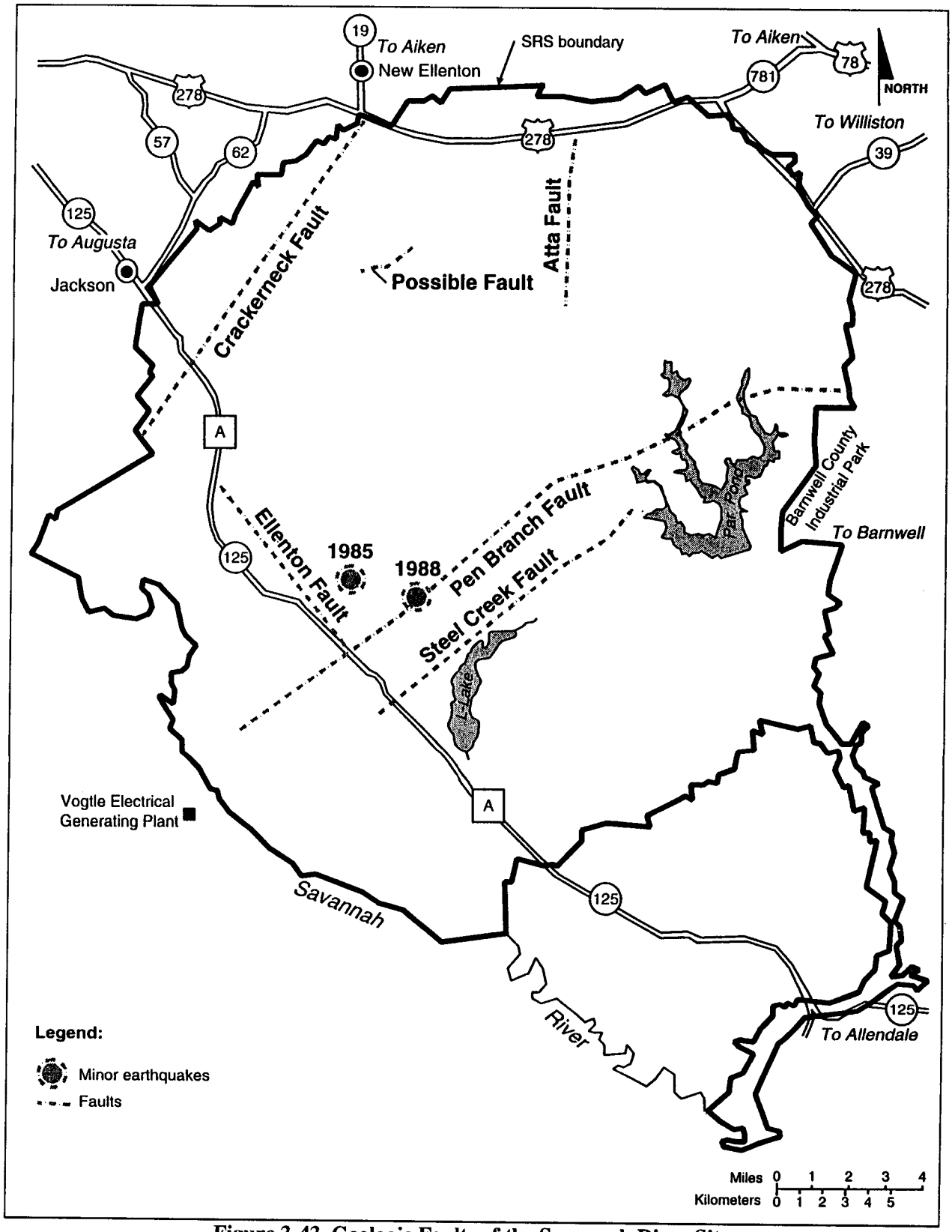


Figure 3-43 Geologic Faults of the Savannah River Site

3.3.1.2 Seismology and Volcanology

Seismicity in the Coastal Plain of South Carolina occurs in three distinct seismic zones near the Charleston area: Middleton Place Summerville, about 19 km (12 mi) northwest of Charleston; Bowman, about 59 km (37 mi) northwest of the Middleton Place-Summerville; and Adams Run, about 30 km (19 mi) southwest of the Middleton Place-Summerville (WSRC, 1993a). Of the three seismic zones within the Coastal Plain province, the Charleston area has been and remains the most seismically active. The Charleston area is also the most significant source of seismicity affecting the Savannah River Site, both in terms of maximum historic site intensity and the number of earthquakes felt in the area (WSRC, 1993a).

The closest offsite fault system is the Augusta Fault Zone, approximately 40 km (25 mi) from the Savannah River Site. In this fault zone, the Belair Fault has experienced the most recent movement, but is not considered capable of generating major earthquakes (DOE, 1987). There is no conclusive evidence of recent displacement along any fault within 320 km (200 mi) of the Savannah River Site, with the possible exception of the buried faults in the epicentral area of the 1886 Charleston, SC earthquake, approximately 144 km (90 mi) away (DOE, 1991a).

Two notable earthquakes have occurred within 320 km (200 mi) of the Savannah River Site. The first was a major earthquake in 1886 centered in the Charleston area, which had an estimated Richter magnitude of 6.8. The second earthquake was the Union County, SC earthquake of 1913, which had an estimated Richter magnitude of 6.0, and occurred about 160 km (100 mi) from the Savannah River Site (WSRC, 1993a).

Two earthquakes have occurred at the Savannah River Site during recent years. In June 1985, onsite instruments recorded an earthquake with a magnitude of 2.6 and a focal depth of about 1.0 km (0.6 mi) (DOE, 1995c). The epicenter was just west of the C- and K-areas. In August 1988, an earthquake of magnitude 2.0 and a focal depth of approximately 2.7 km (1.7 mi) occurred (Stephenson, 1988).

3.3.1.3 Hydrology

3.3.1.3.1 Surface Water

The Savannah River bounds the Savannah River Site on its southwestern border for about 32 km (20 mi), approximately 260 river km (160 river mi) from the Atlantic Ocean. At the Savannah River Site, the Savannah River flow averages about 283 m^3 per sec (74,760 gal per sec). Five principal tributaries to the Savannah River are found on the Savannah River Site: Upper Three Runs Creek, Fourmile Branch, Pen Branch, Steel Creek, and Lower Three Runs Creek (Figure 3-44). These tributaries drain almost all of the Savannah River Site. Each of these streams originates on the Aiken Plateau in the Coastal Plain, and descends 15 to 60 m (50 to 200 ft) before discharging into the river. The streams, which historically have received varying amounts of discharge from the Savannah River Site operations, are not commercial sources of water. The natural flow of the Savannah River Site streams ranges from less than 1 m^3 per sec (264 gal per sec) in smaller streams such as Pen Branch to 6.8 m^3 per sec (1,795 gal per sec) in Upper Three Runs. Three large upstream reservoirs - Hartwell, Richard B. Russell, and Strom Thurmond - minimize the effects of droughts and the impacts of low flow on downstream water quality and fish and wildlife resources in the Savannah River.

Surface Water Quality: The Savannah River, which forms the boundary between the States of Georgia and South Carolina, supplies potable water to several users. Upstream of the Savannah River Site, the river supplies domestic and industrial water needs for Augusta, GA, and North Augusta, SC. Downstream

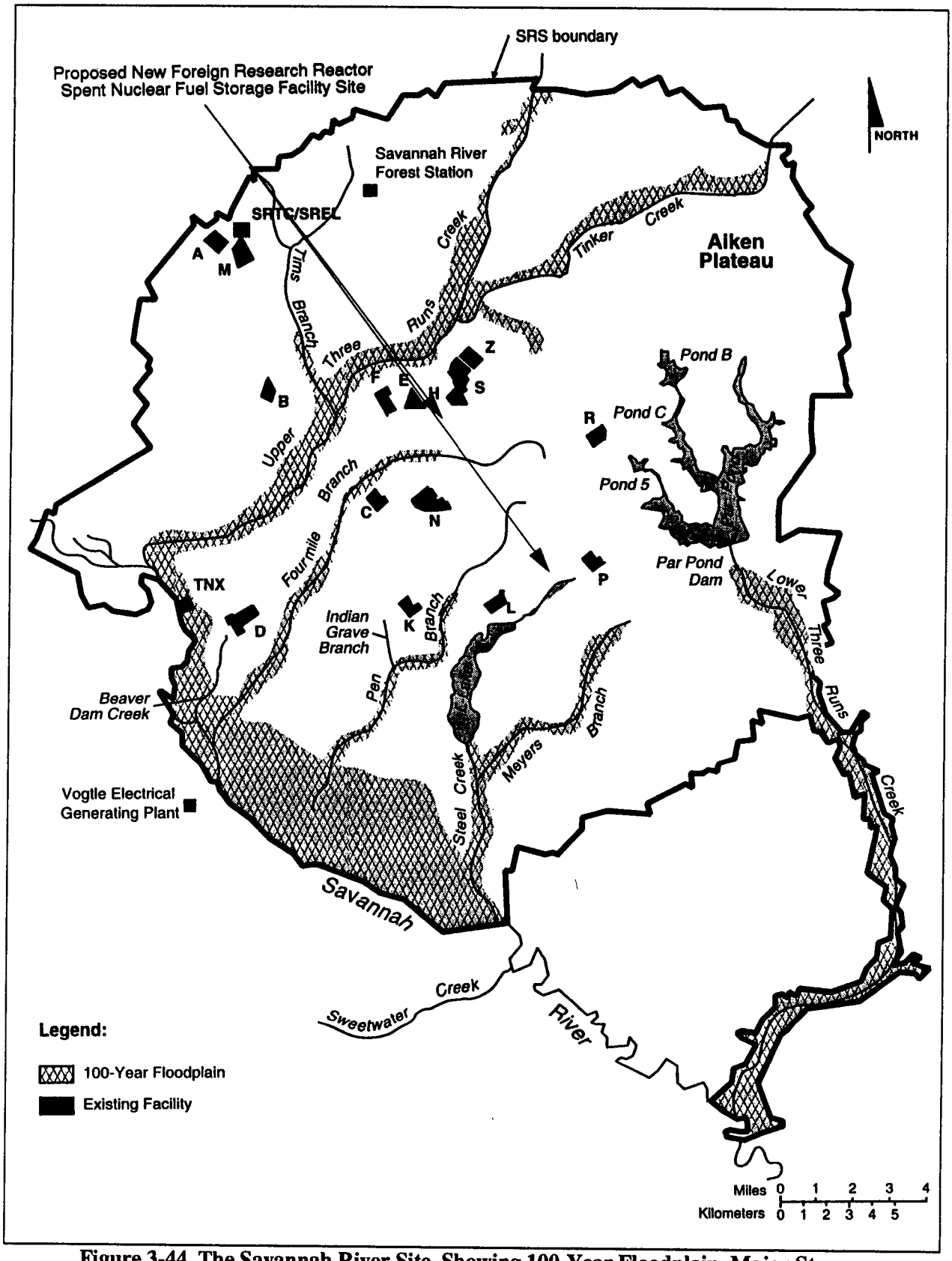


Figure 3-44 The Savannah River Site, Showing 100-Year Floodplain, Major Stream Systems and Facilities

of the Savannah River Site, the river supplies domestic and industrial water needs for Savannah, GA, and Beaufort and Jasper Counties in South Carolina. The South Carolina Department of Health and Environmental Control regulates the physical properties and concentrations of chemicals and metals in the Savannah River Site effluent under the National Pollutant Discharge Elimination System. This department also regulates chemical and biological water quality standards for the Savannah River Site waters. On April 24, 1992, the department changed the classification of the Savannah River and the Savannah River Site streams from "Class B waters" to "Freshwaters." The definitions of "Class B" waters and "Freshwaters" are the same, but the Freshwaters classification imposes a more stringent set of water quality standards (Arnett et al., 1993). Tables 4-10 and 4-11 of Appendix C, Volume 1 of the Programmatic SNF&INEL Final EIS list the characteristics of the Savannah River Site surface water quality (DOE, 1995c).

3.3.1.3.2 Groundwater

There are two hydrogeologic provinces in the subsurface beneath the Savannah River Site. The deepest Piedmont hydrogeologic province includes Paleozoic metamorphic and igneous basement rocks, and Triassic-aged lithified mudstone and sandstone. The Southeastern Coastal Plain hydrogeologic province lies above the Piedmont province and consists of a seaward thickening wedge of unconsolidated sediments of Late Cretaceous and Tertiary age. The Southeastern Coastal Plain hydrogeologic province is more important from a resource point of view because it holds an abundant supply of high-quality groundwater.

The sediments that make up the Southeastern Coastal Plain hydrogeologic province in west-central South Carolina are grouped into three major aquifer systems divided by two major confining systems, all of which are underlain by the Appleton confining system. The Appleton system separates the Southeastern Plain hydrogeologic province from the underlying Piedmont hydrogeologic province. Locally, individual aquifer and confining units are delineated. The complexly interbedded strata that form the three aquifer systems primarily consist of fine-to-coarse-grained sand and local gravel and limestone deposited under relatively high energy conditions in fluvial to shallow marine environments.

The water table receives water through rainfall percolating through the vadose zone. The deeper semi-confined aquifers receive water from groundwater flow into the Savannah River Site from offsite or from water flowing from aquifers above or below. The direction of groundwater flow in the vadose zone is predominantly downward, but some lateral flow occurs because of clay lenses in the soil. The flow of groundwater in the water table and deeper semi-confined aquifers is controlled by the hydraulic properties of the sediments (e.g., conductivity) and the proximity to streams. Savannah River ultimately receives all groundwater that flows beneath the Savannah River Site, and no contaminated groundwater is flowing off of the Savannah River Site.

Groundwater Quality: The quality of groundwater in the principal hydrologic systems beneath the Savannah River Site depends on both the source of the water and the inorganic and biochemical reactions that take place along its flowpath. Quality is strongly influenced by the chemical composition and mineralogy of the enclosing geologic materials (WSRC, 1993b). In general, the quality of the groundwater in the Coastal Plain sediments at the Savannah River Site and the surrounding areas is suitable for most domestic and industrial purposes. The waters are dilute with respect to total dissolved solids concentrations, which range from less than 10 mg per L to about 150 to 200 mg per L. The pH values range from as low as 4.9 to a maximum value of 7.7 (where the groundwater is in contact with limestone). Due to the low solids content of the waters and the frequently low pH values, many of the waters are corrosive to metal surfaces. High dissolved iron concentrations can also be of concern in some units. An onsite degasification and filtration process raises the pH and removes iron in domestic water

supplies where necessary (WSRC, 1993b). Table 4-12 of Appendix C, Volume 1 of the Programmatic SNF&INEL Final EIS summarizes the Savannah River Site groundwater quality data, and Table 4-13 lists data for radiological constituents (DOE, 1995c).

The groundwater beneath 5 to 10 percent of the Savannah River Site has been contaminated by industrial solvents, metals, tritium, or other constituents used or generated on the site. Figure 3-45 shows the locations of facilities monitored by the Savannah River Site and areas with constituents that exceeded drinking water standards in 1992. In general, contaminated groundwater at the Savannah River Site is beneath a few facilities, and the contaminants reflect operations and chemical processes at those facilities. For example, contaminants in the groundwater beneath A- and M-Areas include chlorinated volatile organics, radionuclides, metals, and nitrate. At F- and H-Areas, contaminants in the groundwater include tritium and other radionuclides, metals, nitrate, chlorinated volatile organics (at values much smaller than found at A- and M-Areas), and sulfate. The groundwater beneath the Sanitary Landfill contains chlorinated volatile organics, radionuclides, and metals. The groundwater beneath all the reactor areas except R-Area contains tritium, other nuclides, metals, and chlorinated volatile organics, and at R-Area, groundwater contaminants include radionuclides and cadmium. The groundwater beneath D-Area contains metals, radionuclides, sulfate, and chlorinated volatile organics. At TNX-Area, the groundwater contains chlorinated volatile organics, radionuclides, and nitrate (Arnett et al., 1993).

The McQueen Branch aquifer, which becomes shallower toward the Fall Line, forms the base for most municipal and industrial water supplies in Aiken County. Toward the coast, in Allendale and Barnwell Counties, this aquifer exists at increasingly greater depths. As a consequence, the shallower Gordan aquifer supplies some municipal, industrial, and agricultural users. The Gordan and Upper Three Runs Creek aquifers are the primary sources of domestic water supplies in the vicinity of the Savannah River Site for rural non-municipal water. DOE has identified 56 major municipal, industrial, and agricultural groundwater users within 32 km (20 mi) of the center of the Savannah River Site (DOE, 1987). The total pumpage for these users is about 136,260 m^3 per day (36 million gal per day).

Excellent quality groundwater is abundant in this region of South Carolina from many local aquifer units. As a result, the South Carolina Department of Health and Environmental Control has classified all aquifers in the State as Class GB (DOE, 1995c), or U.S. Environmental Protection Agency Class II, meaning that the aquifers can provide resource-quality water, but are not the sole source of supply (as are South Carolina Class GA or U.S. Environmental Protection Agency Class 1 aquifers) (DOE, 1991a).

3.3.1.4 Meteorology

Wind: Figure 3-46 shows annual wind direction frequencies and wind speeds for the Savannah River Site from 1987 through 1991. The maximum wind directional frequencies are from the northeast and west-southwest. The average wind speed for this 5-yr period was 3.8 m per sec (8.5 mph). Calm winds (less than 2 m per sec or 4.5 mph) occurred less than 10 percent of the time during the 5-yr period. Seasonally, wind speeds were greatest during the winter at 4.1 m per sec (9.2 mph), and lowest during the summer at 3.4 m per sec (7.6 mph) (Shedrow, 1993). Winter snow storms in the Savannah River Site area occasionally bring strong and gusty surface winds with speeds as high as 32 m per sec (72 mph). Thunderstorms can generate winds with speeds as high as 18 m per sec (40 mph) and even stronger gusts. The fastest wind speed recorded at Augusta between 1950 and 1986 was 37 m per sec (83 mph) (DOE, 1995c).

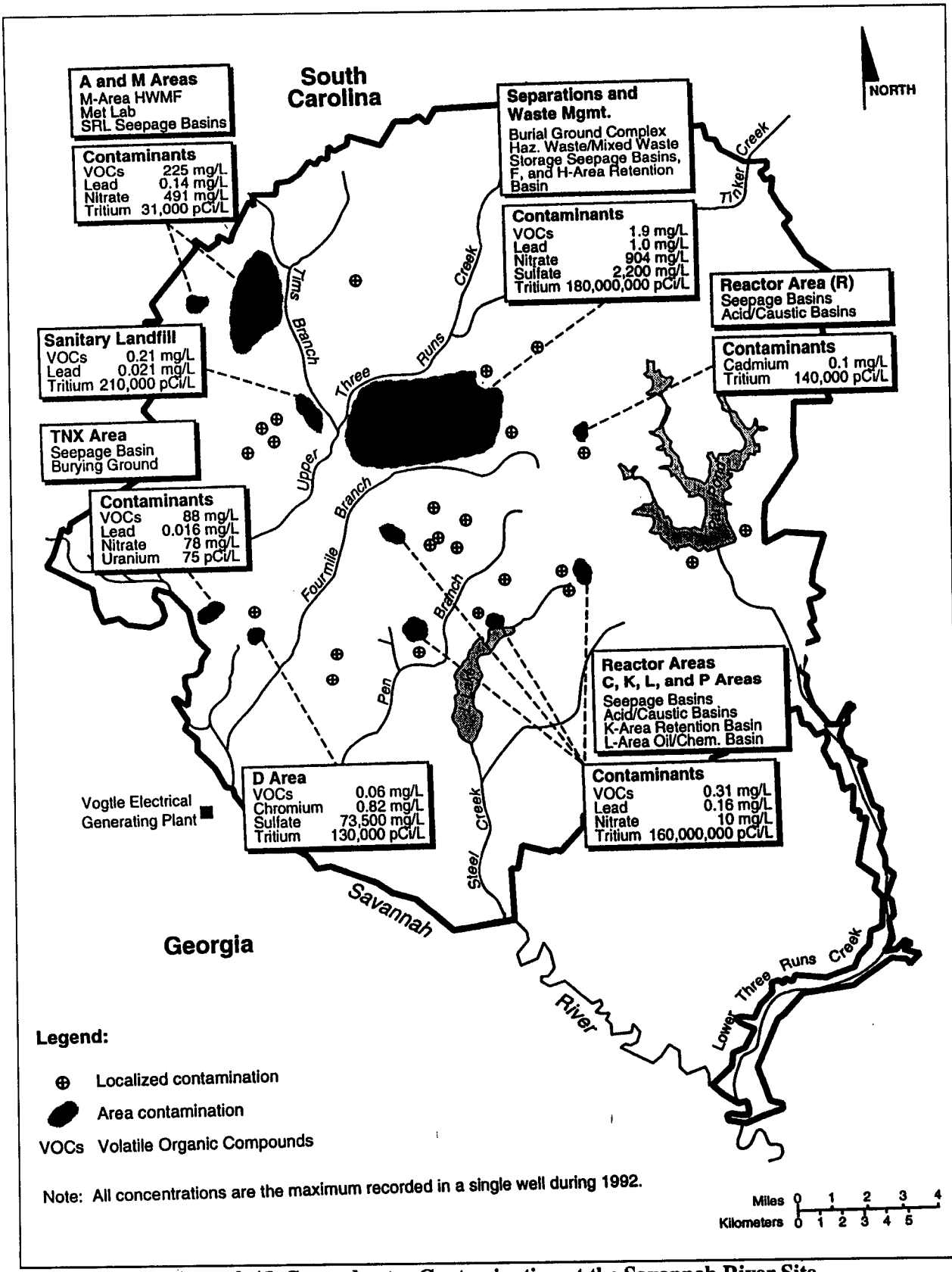


Figure 3-45 Groundwater Contamination at the Savannah River Site

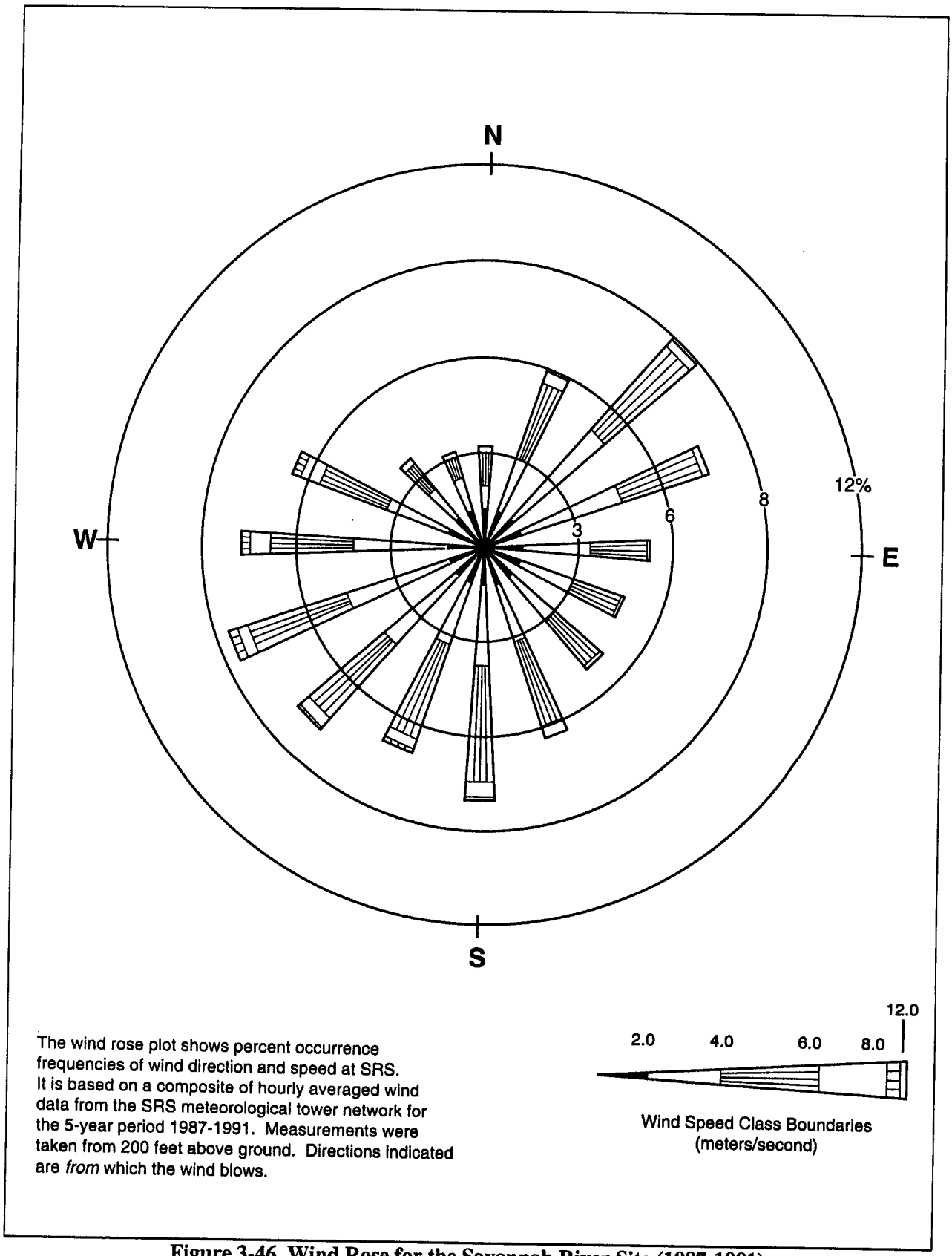


Figure 3-46 Wind Rose for the Savannah River Site (1987-1991)

Temperature and Humidity: The annual average temperature at the Savannah River Site is 17.8°C (64°F), and monthly averages range from a low of 7.22°C (45°F) in January to a high of 27.2°C (81°F) in July. Average daily relative humidity ranges from a maximum of 90 percent in the morning to a minimum of 43 percent in the afternoon on an annual basis.

Precipitation: The average annual precipitation at the Savannah River Site is approximately 121.9 cm (48 in). Precipitation distribution is fairly even throughout the year, with the highest precipitation in the summer [36.1 cm (14.2 in)] and the lowest in autumn [22.5 cm (8.8 in)] (Arnett et al., 1993). Snowfall has occurred in the months of October through March, with the average annual snowfall at 3.0 cm (1.2 in). Large snowfalls are rare (DOE, 1995c).

The area encompassing the Savannah River Site experiences an average of 56 thunderstorm days per year. From 1954 to 1983, 37 tornadoes were reported for a one-degree square of latitude and longitude that includes the Savannah River Site. This frequency of occurrence is equivalent to an average of about one tornado per year. The estimated probability of a tornado striking a point on the Savannah River Site is 0.00007 per year, which is less than one in ten thousand (DOE, 1995c). Since operations began at the Savannah River Site in 1953, nine tornadoes have been confirmed on or near the site. Winds exceeding hurricane force have been observed only once at the Savannah River Site (Hurricane Gracie in 1959) (Shedrow, 1993).

Atmospheric Dispersion: Based on measurements at onsite meteorological stations, dispersion conditions in the Savannah River Site region were classified unstable approximately 56 percent of the time, neutral 23 percent of the time, and stable about 21 percent of the time. On an annual basis, inversion conditions occur 21 percent of the time at the Savannah River Site (Shedrow, 1993).

Air Quality: The local air quality management region which includes the Savannah River Site is in attainment with National Ambient Air Quality Standards for criteria pollutants, which include sulfur dioxide, nitrogen oxides, particulate matter, lead, ozone (as volatile organic compounds), and carbon monoxide (EPA, 1993a). This region has a Class II designation under Prevention of Significant Deterioration regulations (EPA, 1993b), which allows moderate industrial growth to occur. No areas within an 80 km (50 mi) radius of the site are designated as Prevention of Significant Deterioration Class I (e.g., national parks, wildlife refuge). Class I areas place severe restrictions on new sources that might affect ambient air quality. The States of South Carolina and Georgia perform ambient air monitoring near the Savannah River Site, and have reported no significant exceedances of National Ambient Air Quality Standards.

In the Savannah River Site region, airborne radionuclides originate from natural resources (terrestrial or cosmic), worldwide fallout, and the Savannah River Site operations. The Savannah River Site maintains a network of air monitoring stations on and around the site to determine the concentrations of radioactive particulates and aerosols in the air (Arnett et al., 1993). Table 4-6 of Appendix C, Volume 1 of the Programmatic SNF&INEL Final EIS lists average and maximum atmospheric radionuclide particulate concentrations at the Savannah River Site boundary, and background [160 km (100 mi)] monitoring locations in 1991 (DOE, 1995c). Tritium is the only radionuclide of the Savannah River Site origin that can be detected routinely in offsite air samples above background.

3.3.1.5 Ecology

When the U.S. Government acquired the Savannah River Site in 1951, the site was approximately two-thirds forested and one-third cropland and pasture (Dukes, 1984). At present, more than 90 percent of the Savannah River Site is forested. With the exception of the Savannah River Site production and support

areas, natural succession has reclaimed other previously disturbed areas. Satellite imagery of the site shows a circle of wooded habitat within a matrix of cleared uplands and narrow forested riparian corridors. The Savannah River Site provides nearly 73,250 ha (181,000 acres) of contiguous forested cover broken only by unpaved secondary roads, transmission line corridors, and a few paved primary roads. Carolina bays, the Savannah River swamp, and several relatively intact longleaf pine-wiregrass communities make important contributions to the biodiversity of the region.

The Savannah River Site is near the transition area between the oak-hickory-pine forest and the southern mixed forest. As a consequence, species typical of both associations occur (Dukes, 1984). A variety of vascular plant communities occur in the upland areas. Typically, scrub oak communities occur on the drier, sandier areas. Longleaf pine, turkey oak, bluejack oak, blackjack oak, and dwarf post oak dominate these communities, which typically have understories of wire grass and huckleberry. Oak-hickory hardwood communities occur on more fertile, dry uplands, and characteristic species are white oak, post oak, southern red oak, mockernut hickory, pignut hickory, and loblolly pine, with an understory of sparkleberry, holly, greenbriar, and poison ivy (DOE, 1995c).

The Savannah River Site has provided excellent habitat to wildlife associated with the wetlands of the Savannah River and the pine-dominated sandhills of coastal South Carolina. Furbearers such as gray fox, raccoon, opossum and beaver are relatively common throughout the Savannah River Site. Game species such as gray and fox squirrel, cottontail rabbit, and wild turkey are also common. The Savannah River Site contains suitable habitat for white-tailed deer and feral hogs, as well as other faunal species common to the mixed pine/hardwood forests of South Carolina.

The Savannah River Site has extensive, widely distributed wetlands, most of which are associated with floodplains, creeks, and impoundments. The southwestern Savannah River Site boundary adjoins the Savannah River for approximately 32 km (20 mi). The river floodplain supports an extensive swamp, covering about 4,916 ha (12,148 acres) of the site. At present, the swamp forest consists of second-growth bald cypress, black gum, and other hardwood species (USDA, 1991). Five major streams drain the Savannah River Site, and eventually flow into the Savannah River. Each stream has floodplains characterized by bottomland hardwood forests or scrub-shrub wetlands in varying stages of succession. Dominant species include the red maple, box elder, bald cypress, water tupelo, sweetgum, and black willow (DOE, 1995c). Carolina bays, unique wetland features of the southeastern United States, are islands of wetland habitat dispersed throughout the uplands of the Savannah River Site. The more than 200 bays on the site exhibit extremely variable hydrology and a range of plant communities from herbaceous marsh to forested wetland (Shields et al., 1982; Schalles et al., 1989).

Threatened, Endangered, and Candidate Plant and Animal Species: Threatened, endangered, and candidate plant and animal species on the Savannah River Site include 5 bird species, 1 mammal species, 5 amphibian species, 5 reptile species, 1 fish species, 2 invertebrate species, and 19 plant species. The following Federally listed endangered animals are known to occur on the Savannah River Site or in the Savannah River adjacent to the site: the red-cockaded woodpecker, the southern bald eagle, the wood stork, and the shortnose sturgeon (DOE, 1995c). Researchers have found one Federally listed endangered plant species, the smooth coneflower, on the Savannah River Site, along with several Federally listed Category 2 species, and several listed species (Knox and Sharitz, 1990).

3.3.1.6 Land Use

The Savannah River Site occupies an area of approximately 800 km^2 (310 mi^2) in western South Carolina, in a generally rural area about 40 km (25 mi) southeast of Augusta, GA. The Savannah River Site, which is bordered by the Savannah River to the southwest, includes portions of Aiken, Barnwell, and Allendale

Counties. Land use on the Savannah River Site can be grouped into three major categories: forest/undeveloped, water/wetlands, and developed facilities. Ninety-six percent of the Savannah River Site area, about 73,450 ha (181,500 acres), is undeveloped (USDA, 1991). Approximately 90 percent of this area is forested (Cummins et al., 1990). In 1972, DOE designated the Savannah River Site as a National Environmental Research Park. At present, approximately 57 km^2 (22 mi^2), or 7 percent of the Savannah River Site area is designated as "Set-Asides," which are areas specifically protected for environmental research activities that are coordinated either through the University of Georgia Savannah River Ecological Laboratory or the Savannah River Technology Center (Cummins et al., 1990). At present, administrative production and support facilities occupy approximately 5 percent of the total the Savannah River Site land area.

Land bordering the Savannah River Site is primarily forest and agricultural. There is also a significant amount of open water and forested wetlands along the Savannah River Valley. Urbanized and industrial areas are the only other significant use of land in the vicinity (Figure 3-47). None of the three counties in which the Savannah River Site is located has zoned any of the site land. The only adjacent area with any zoning is the Town of New Ellenton, which has two zoning categories for lands that bound the Savannah River Site, urban development and residential development. The closest residences to the Savannah River Site boundary include several within 61 m (200 ft) of the site perimeter to the west, north, and northeast.

The Savannah River Site is a controlled area, with public access limited to through traffic on South Carolina Highway 125 (the Savannah River Site Road A), U.S. Highway 278, the Savannah River Site Road 1, and the CSX railway. The Savannah River Site does not contain any public recreation facilities. However, the Savannah River Site conducts controlled deer and feral hog hunts each fall, from mid-October through mid-December. The intent of the hunts is to control the resident populations of these animals and to reduce animal-vehicle accidents on the Savannah River Site roads.

3.3.1.7 Noise

The major noise sources at the Savannah River Site are found primarily in developed operational areas, and include various facilities, equipment, and machines (e.g., cooling towers, transformers, engines, pumps, boilers, steam vents, paging systems, construction and materials-handling equipment, and vehicles). Major noise sources outside the operational areas consist primarily of vehicles and railroad operations. Previous studies have analyzed noise impacts of existing the Savannah River Site operational activities (DOE, 1995c; DOE, 1991a; DOE, 1990a; DOE, 1993d). These studies concluded that, because of the remote locations of the Savannah River Site operational areas, there are no known conditions associated with existing onsite noise sources that adversely affect individuals at offsite locations. Some disturbance of wildlife activities might occur on the Savannah River Site as a result of hunting activities and construction activities. Noise limits are established for the workplace to protect workers' hearing in accordance with Occupational Health and Safety Administration standards. Existing Savannah River Site-related noise sources of importance to the public are those associated with the transportation of people and materials to and from the site. These sources include trucks, private vehicles, and freight trains. In addition, a portion of the air cargo and business travel using commercial air transport through the airports at Augusta, GA, and Columbia, SC, is attributable to the Savannah River Site operations. The States of Georgia and South Carolina, and the counties in which the Savannah River Site is located, have not established regulations that specify acceptable community noise levels, with the exception of a provision of the Aiken County Nuisance Ordinance, which limits daytime and nighttime noise by frequency band (Aiken County, 1991).

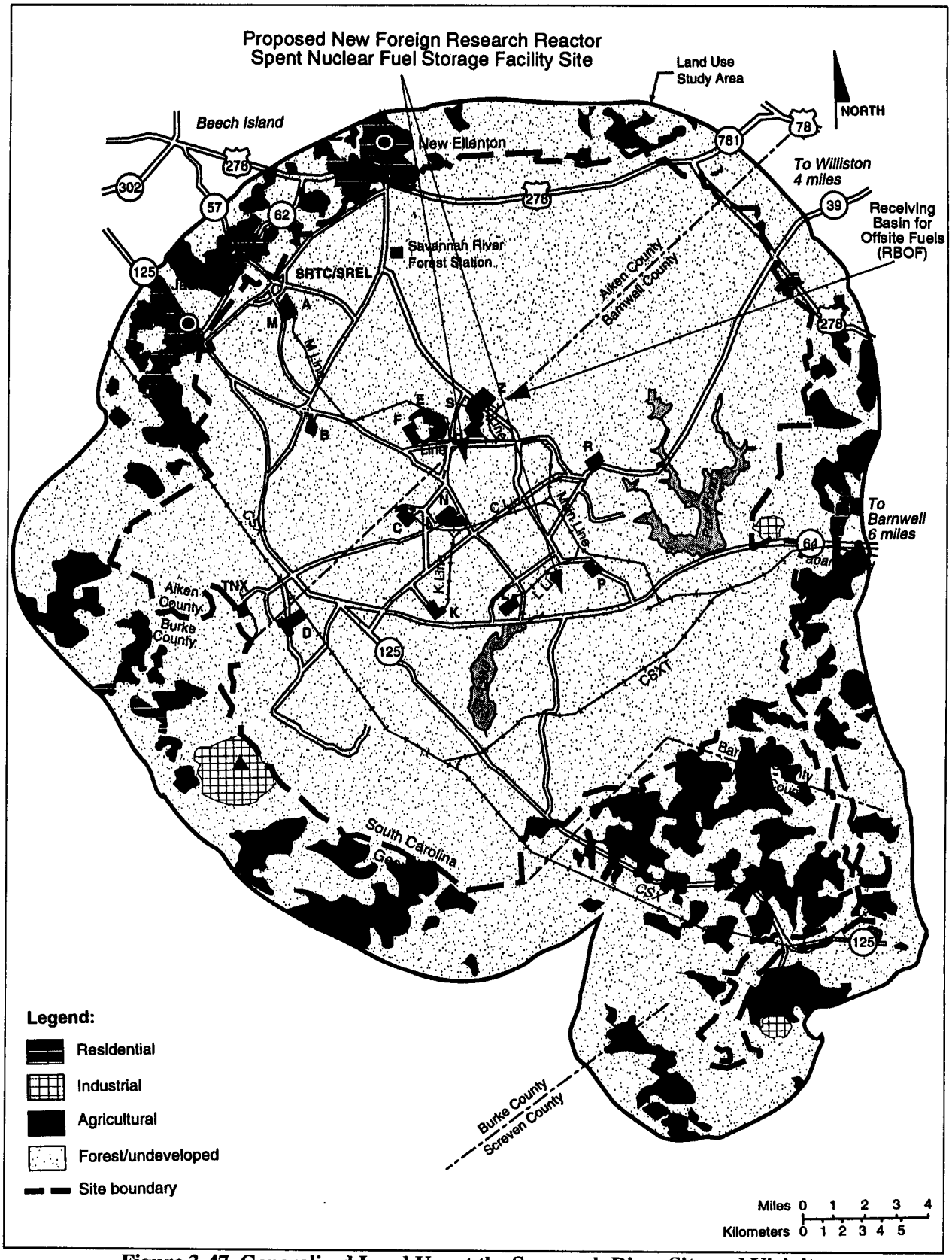


Figure 3-47 Generalized Land Use at the Savannah River Site and Vicinity

Noise from the Savannah River Site Traffic: During a normal week, about 20,000 employees travel to the Savannah River Site each day in private vehicles from surrounding communities. Both Government-owned and private trucks pick up and deliver materials at the site. The contribution of the Savannah River Site operations to traffic volumes along SC 125 and SC 19, especially during peak traffic periods, affects noise levels in the towns of New Ellenton and Jackson and the city of Aiken. Noise measurements taken during 1989 and 1990 along SC 125 in the town of Jackson (at a point about 15 m or 50 ft from the roadway) indicate that the one-hour equivalent sound level from traffic ranged from 48 to 72 decibels. The estimated day/night average sound level along this route was 66 decibels for summer and 69 decibels for winter. Similarly, noise measurements along SC 19 in the town of New Ellenton indicate that the one-hour equivalent sound level from traffic ranged from 53 to 71 decibels. The estimated day/night average sound level along this route was 66 decibels for both summer and winter (HNUS, 1990). Employment at the Savannah River Site has increased by about 17 percent since 1989, potentially causing increases in traffic noise, especially during peak traffic periods (approximately between 6:30 and 8:30 a.m., and between 3:30 and 5:30 p.m. corresponding to major shift changes). Since some residences and at least two schools are within 30 to 60 m (100 to 200 ft) of these routes, some annoyance to members of the public residing along these highways can occur based on the relationship between the day/night average sound level (Schultz 1978; FICON, 1992).

Noise from Railroad Traffic: Approximately 18 trains per day pass through the Savannah River Site on the CSX line, with five trains delivering shipments to the Savannah River Site. Noise sources from rail transport include diesel engines, wheel-track contact, and whistle-warnings at rail crossings.

3.3.1.8 Transportation

The Savannah River Site is surrounded by a system of Interstate highways, U.S. highways, State highways, and railroads. The regional transportation networks service the four South Carolina counties (Aiken, Allendale, Bamberg, and Barnwell), and two Georgia counties (Columbia and Richmond) that generate about 90 percent of the Savannah River Site commuter traffic (DOE, 1995c). Two major railroads—CSX Transportation and Norfolk Southern Corporation—also serve the Savannah River Site vicinity. Norfolk Southern serves Augusta and Savannah, GA, as well as Columbia and Charleston, SC. CSX serves the same locations and the Savannah River Site. Figure 3-48 shows the regional transportation infrastructure.

Two Interstate highways serve the Savannah River Site area. Interstate 20 (I-20) provides a primary east-west corridor and I-520 links I-20 with Augusta, GA. U.S. Highways 1 and 25 are principal north-south routes, and U.S. 78 provides east-west connections. Several other highways (U.S. 221, U.S. 301, U.S. 321, and U.S. 601) provide additional transport routes in the region. Several State routes provide direct access to the Savannah River Site. From the northwest and north, access is provided by SC 125 and SC 19, respectively, and SC 125 is open to through traffic. Access to the site is provided from the northeast by SC 39, from the east by SC 64, and from the southeast by SC 125. These are all two-lane roads. The public has access to U.S. 278 and SC 125, but only the Savannah River Site employees are permitted access to the site on the other routes.

The Savannah River Site transportation infrastructure consists of more than 230 km (143 mi) of primary roads, 1,931 km (1,200 mi) of unpaved secondary roads, and 103 km (64 mi) of railroad track (DOE, 1995c). These roads and railroads provide connections among the various Savannah River Site facilities and offsite transportation linkages. Figure 3-49 shows the Savannah River Site network of primary roadways and access points, and the Savannah River Site railway system.

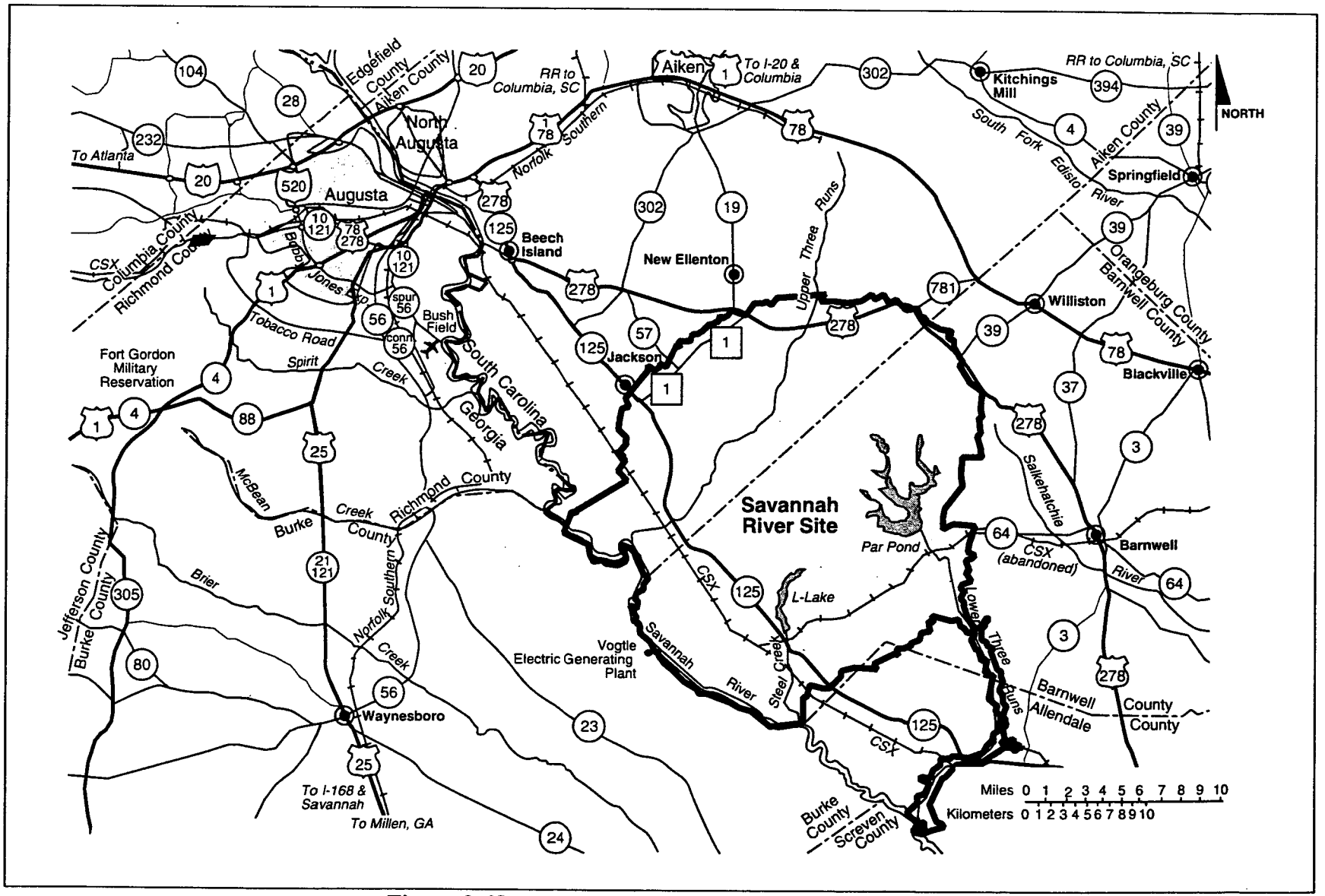


Figure 3-48 Regional Transportation Infrastructure

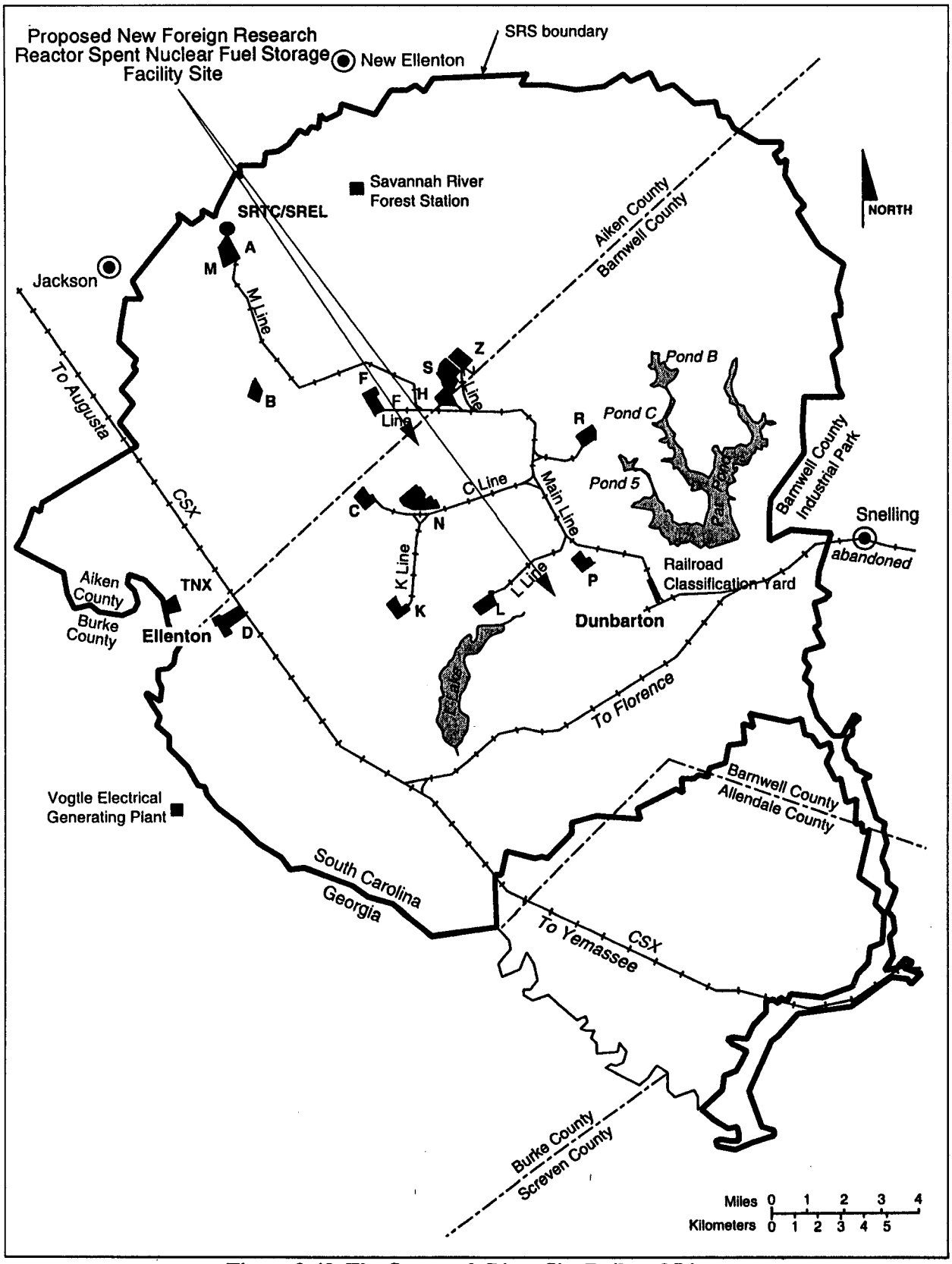


Figure 3-49 The Savannah River Site Railroad Lines

Two major public highways traverse the Savannah River Site: SC 125 and U.S. 278. SC 125 connects Allendale, SC, to Augusta, GA, by crossing the site in a northwest-to-southeast direction. U.S. 278 also connects Augusta and Allendale, but its route generally follows the northern and eastern Savannah River Site boundaries. In general, the primary Savannah River Site roadways are in good condition, and are smooth and free from potholes. Typically, wide, firm shoulders border roads that are either straight or have wide gradual turns. Intersections are well marked for both traffic and safety identification, and are sufficiently cleared of trees and brush that might obstruct a driver's view of oncoming traffic. Railings along the side of the roadways offer protection at appropriate locations from dropoffs or other hazards. In general, the roadways are lighted only at gate areas and near major facilities.

In general, heavy traffic occurs early in the morning and late in the afternoon when workers from surrounding communities commute to and from the Savannah River Site. During working hours, official vehicles and logging trucks constitute most of the traffic. At any time, as many as 60 logging trucks, which can impede traffic, might be operating on the Savannah River Site, with an annual average of about 25 trucks per day. Table 4-16 of Appendix C, Volume 1 of the Programmatic SNF&INEL Final EIS provides data on traffic counts for various roads and access points around the Savannah River Site (DOE, 1995c).

Railroads on the Savannah River Site include both CSX tracks and the Savannah River Site rolling stock and tracks. Two routes of the CSX distribution system run through the Savannah River Site: a line between Florence, SC, and Augusta, GA, and a line between Yemassee, SC, and Augusta. The two lines join on the site near the L-Lake dam (Figure 3-49). Early in 1989, CSX discontinued service on the line from the Savannah River Site junction to Florence. The 103 km (64 mi) of the Savannah River Site railroad tracks are well maintained. The rails and crosslines are in good condition, and the track lines are clear of vegetation and debris. Significant clear areas border the tracks on both sides. Intersections of railroads and roadways are marked by railroad crossing signs with lights where appropriate. The Savannah River Site rail classification yard is east of P-Reactor. This eight-track facility sorts and redirects railcars. Deliveries of the Savannah River Site shipments occur at two onsite rail stations at the former towns of Ellenton and Dunbarton. From these stations, a Savannah River Site engine moves the railcars to the appropriate receiving facility. The Ellenton station, which is on the main Augusta-Yemassee line, is the preferred delivery point. The Dunbarton station, which is on the discontinued portion of the Augusta-Florence line, receives less use.

3.3.1.9 Socioeconomics

The Savannah River Site region of influence includes Aiken, Allendale, Bamberg, and Barnwell Counties in South Carolina, and Columbia and Richmond Counties in Georgia. Between 1980 and 1990, total employment in the region of influence increased from 139,504 to 199,161, an average annual growth rate of approximately 5 percent. Table 4-1 of Appendix C, Volume 1 of the Programmatic SNF&INEL Final EIS lists projected employment data for the six-county region of influence. As shown, by the year 2000, employment levels should increase 27 percent to approximately 253,000. The unemployment rates for 1980 and 1990 were 7.3 percent and 4.7 percent, respectively (DOE, 1995c).

In 1990, employment at the Savannah River Site was 20,230, representing 10 percent of the region of influence employment (DOE, 1993d). In Fiscal Year 1992, employment at the Savannah River Site increased approximately 15 percent to 23,351, with an associated payroll of more than $1.1 billion. From 1980 to 1990, the labor force in the six-county region of influence grew 39 percent, from 150,551 to 208,984. In 1990, 75.3 percent of the region of influence labor force lived in Richmond and Aiken Counties, SC. Current projections call for the region's labor force to increase to approximately 257,000 workers by 1995 (DOE, 1995c).

Between 1980 and 1990, population in the region of influence increased 13 percent, from 376,058 to 425,607. More than 88 percent of the 1990 population lived in Aiken (28.4 percent), Columbia (15.5 percent), and Richmond (44.6 percent) Counties. According to 1990 census data, the estimated average number of persons per household in the six-county region was 2.72, and the median age of the population was 31.2 years (DOE, 1995c). Based on 1990 census population data, the general ethnic composition of the immediate area of influence, which is within an 80 km (50 mi) radius of the site, is shown in Figure 3-50. Low-income households are presented in Figure 3-51. Low-income households are those with incomes of 80 percent or less than the median income of the counties. As indicated in this figure, approximately 42 percent of the total households are low-income households.

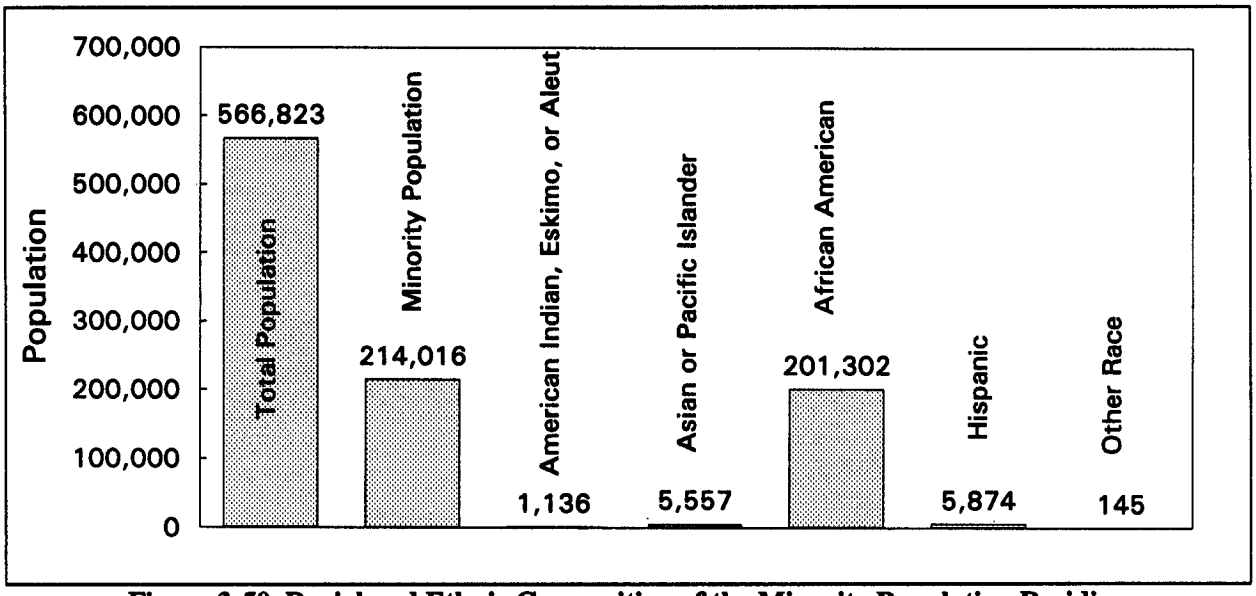


Figure 3-50 Racial and Ethnic Composition of the Minority Population Residing within 80 km (50 mi) of the Savannah River Site

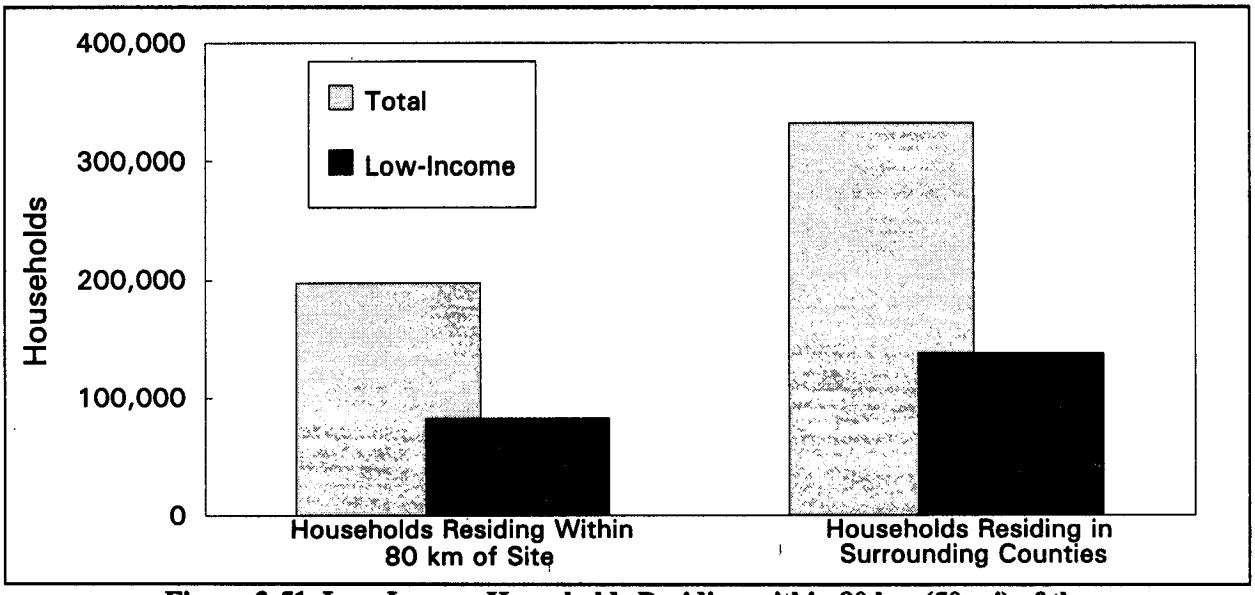


Figure 3-51 Low-Income Households Residing within 80 km (50 mi) of the Savannah River Site

3.3.1.10 Historical, Archaeological and Cultural Resources

By the end of Fiscal Year 1992, approximately 60 percent of the 800 km^2 (310 m^2) of the Savannah River Site had been examined, and 858 archaeological sites had been identified. Of these, 53 have been determined to be eligible for the National Register of Historic Places, and 650 have not been evaluated (DOE, 1995c).

Three Native American groups, the Yuchi Tribal Organization, the National Council of Muskogee Creek, and the Indian People's Muskogee Tribal Town Confederacy, have expressed concerns over sites and items of religious significance on the Savannah River Site.

Archaeologists have divided areas of the Savannah River Site into three sensitivity zones related to their potential for containing sites with multiple archaeological components or dense or diverse artifacts, and their potential for eligibility to the National Register of Historic Places (DOE, 1995c).

Zone One is the zone of highest archaeological site density, with a high probability of encountering large archaeological sites with dense and diverse artifacts, and high potential for nomination to the National Register of Historic Places. Zone Two covers areas of moderate archaeological site density that should contain sites of similar composition. Activities in this zone have a moderate probability of encountering archaeological sites, but a low probability of encountering large sites with more than three prehistoric components. All areas within the zone are conducive to site preservation. The zone has moderate potential for encountering sites that would be eligible for nomination to the National Register of Historic Places. Zone Three covers areas of low archaeological site density. Activities in this zone have a low probability of encountering archaeological sites and virtually no chance of encountering large sites with more than three prehistoric components. Therefore, potential for site preservation is low. Some exceptions to this definition have been discovered in Zone 3, so some sites in the zone could be considered eligible for nomination to the National Register of Historic Places.

3.3.2 Description of the Affected Environment at the Idaho National Engineering Laboratory

This section describes the potentially affected environment of the Idaho National Engineering Laboratory. The location of the site is shown in Figure 3-52.

3.3.2.1 Geology

The Idaho National Engineering Laboratory is located within a broad low-relief basin floored with basaltic lava flows and terrestrial sediments in the Eastern Snake River Plain physiographic province. The Snake River Plain extends in a broad arc from the Idaho-Oregon border in the west to the Yellowstone Plateau in the east, and contrasts sharply with the surrounding mountainous country of the Northern Basin and Range Province and the Idaho Batholith.

The Snake River Plain was formed in response to the movement of the North American Continent over a deep seated plume of hot mantle rocks. Movement of the continent and a northeast directed extension of the crust caused development of both the Eastern Snake River Plain and the northern Basin and Range Province over the past 17 million years. This movement has produced northwest trending normal faults in the Basin and Range Province and volcanic activity, including the formation of calderas, rhyolite domes, and volcanic rifts or vents.

Surface rocks on and near the Idaho National Engineering Laboratory are mostly an interlayered sequence of basalt flows and poorly consolidated sedimentary interbeds to a depth of 1 to 2 km (0.6 to 1.2 mi). Interbedded sediments are composed mostly of fine-grained silts and clays. A wide band of Quaternary

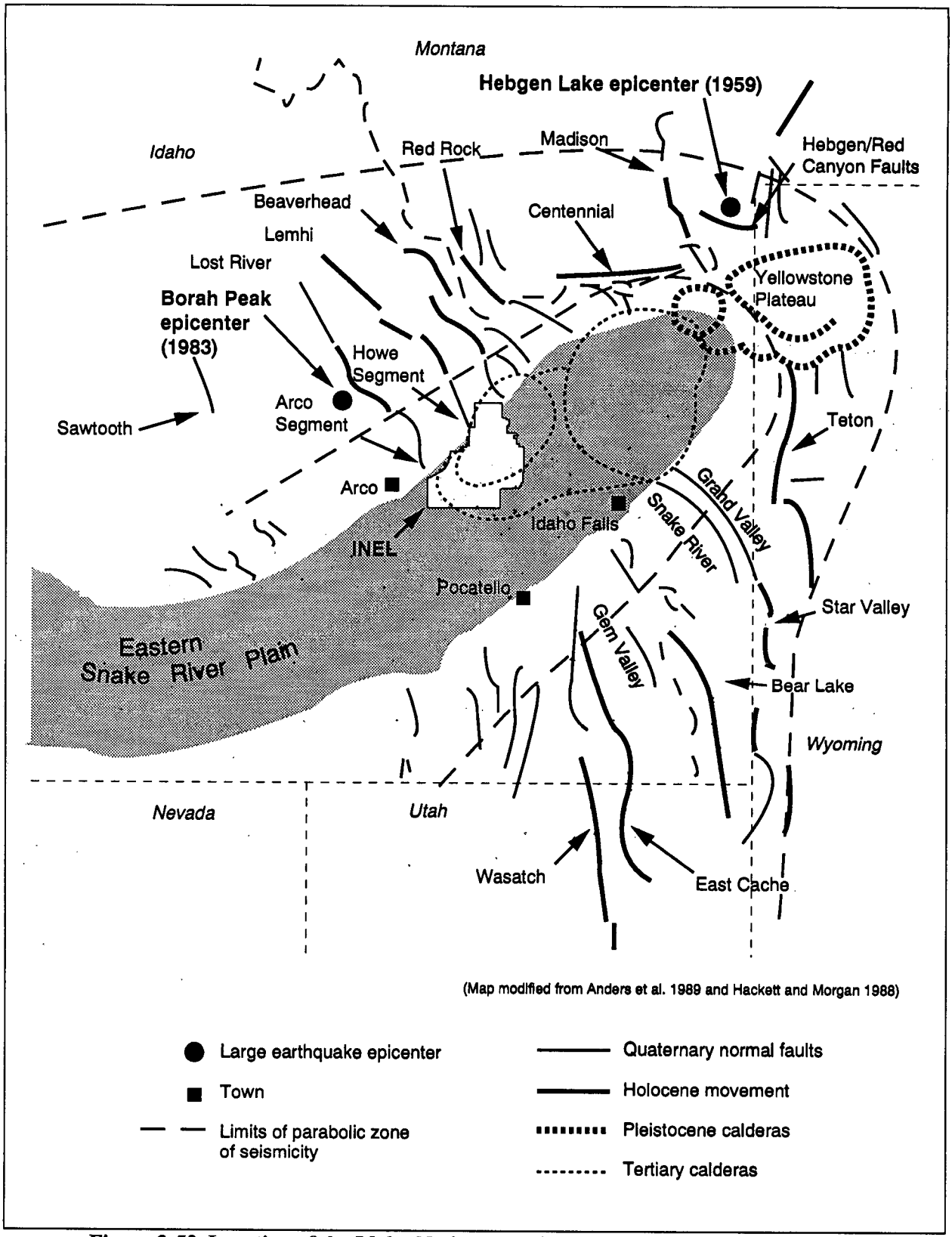


Figure 3-52 Location of the Idaho National Engineering Laboratory in Context of Regional Geologic Features

mainstream alluvium extends along the course of the Big Lost River (southwestern corner of the Idaho National Engineering Laboratory) to the Lost River Sinks area in the north-central portion of the Idaho National Engineering Laboratory. Lacustrine clay and sand deposits from the Ice Age Lake Terreton occur in the northern part of the site. Some of these beach sands were reworked by winds in late Pleistocene and Holocene times to form large dune fields in the northeastern part of the Idaho National Engineering Laboratory (Scott, 1982). Several Quaternary rhyolite domes occur along the Axial Volcanic Zone near the south and southeast borders of the Idaho National Engineering Laboratory. Paleozoic limestones, late-Tertiary rhyolitic volcanic rocks, and large alluvial fans occur in limited areas along the northwest margin of the site.

3.3.2.2 Seismology and Volcanology

The effusion of basaltic-lava flows from volcanic rift zones has been the predominant style of volcanism on the Eastern Snake River Plain, including the Idaho National Engineering Laboratory area, during the past 4 million years. Broad uplift of the ground surface, together with the opening of fissures and faults, accompany the ascending magma before eruptions. Vents for the basaltic volcanism are concentrated in northwest-trending volcanic rift zones and along the Axial Volcanic Zone (Kuntz, 1992).

Volcanic vents on the Eastern Snake River Plain are concentrated in several linear belts that trend northwest and northeast. These northwest-trending belts are associated with ground deformation features referred to as volcanic rift zones with fissures, faults, grabens, and monoclines. Volcanic vents are also concentrated in a northeast-trending zone along the axis of the Eastern Snake River Plain, called the Axial Volcanic Zone to distinguish it from volcanic rift zones (Hackett and Smith, 1992). Basaltic-lava eruptions appear to have been most frequent and most recent (approximately 5,200 years ago at Hell's Half Acre) along this zone, and at intersections of that zone with northwest-trending volcanic rift zones in the site area. Volcanic vents in this area are fed by northwest-trending dikes with seismicity associated with volcanism.

The Eastern Snake River Plain is surrounded by the seismically active Intermountain Seismic and Centennial Tectonic Belts (Smith and Arabasz, 1991). The Snake River Plain is devoid of earthquakes relative to the active areas surrounding it. The Eastern Snake River Plain has exhibited infrequently-occurring small magnitude (M 1.5) earthquakes.

3.3.2.3 Hydrology

3.3.2.3.1 Surface Water

Surface water at the Idaho National Engineering Laboratory accumulates into streams from local rainfall, snowmelt, and runoff originating in the mountain ranges located directly north and west of the Idaho National Engineering Laboratory. Surface water also includes water contained in man-made infiltration and evaporation ponds. Except for standing water in man-made ponds, there is little surface water at the Idaho National Engineering Laboratory. However, during wet years, when runoff from drainage basins or snowmelt is heavy, surface water bodies are formed.

The Idaho National Engineering Laboratory is located in Pioneer Basin, a closed drainage basin that includes three main surface water bodies: The Big Lost River, the Little Lost River, and Birch Creek. These sources of water drain mountain watersheds located north and west of the Idaho National Engineering Laboratory. However, most of the surface water flow is diverted for irrigation before it

reaches site boundaries (Barraclough et al., 1981). This has resulted in little or no flow in these surface water bodies for several years within the boundaries of the Idaho National Engineering Laboratory (Pittman et al., 1988).

The Big Lost River is the major surface water body at the Idaho National Engineering Laboratory. The river flows between the Lost River Range and the Pioneer Mountains, draining approximately 3,755 km^2 (1,450 mi^2) of land before reaching the site. Approximately 48 km (30 mi) upstream of Arco, ID, Mackay Dam controls and regulates the flow of the river. During heavy runoff events, surface water from the Big Lost River is diverted to four spreading areas located south of the Idaho National Engineering Laboratory Diversion Dam. North of the diversion dam, the Big Lost River continues northward across the site to an area of natural infiltration basins (playas or sinks) near Test Area North. Flow within the Big Lost River channel may only reach a few kilometers southeast of Arco during drought years.

Birch Creek flows through an elongated, southeast-trending valley located between the Lemhi and Beaverhead Mountain Ranges, which cross the northwest corner of the Idaho National Engineering Laboratory to Playa 4 near Test Area North. Birch Creek drains an area of approximately 1,943 km^2 (750 mi^2). In the summer, upstream of the Idaho National Engineering Laboratory, surface water from Birch Creek is diverted for irrigation and to produce hydropower. In the winter, water flows in a man-made channel constructed 6.4 km (4 mi) north of Test Area North, where it infiltrates into channel gravel.

The Little Lost River drains the slopes of the Lemhi and Lost River Ranges, an area of approximately 1,826 km^2 (705 mi^2). Surface water from the Little Lost River has not reached the Idaho National Engineering Laboratory in recent times; during high streamflow years, however, water will reach the site and infiltrate into the subsurface (EG&G Idaho Inc., 1984).

Surface water generated from local precipitation will flow into topographic depressions (lower elevations than the surrounding terrain). Surface water within the depressions either evaporates or infiltrates into the ground. Localized flooding can occur at the Idaho National Engineering Laboratory when the ground is frozen and melting snow is combined with heavy spring rains. Other facility areas have been threatened by flooding because of ice jams in the Big Lost River and its diversion channel (McKinney, 1985).

Intermittent surface flow and the Idaho National Engineering Laboratory Diversion Dam have effectively prevented the Big Lost River from flooding onto the site. Flood plains in existence before the diversion dam and channels were built are not active. Based on historical data from past storm events, if heavy runoff occurs and surface water flow from the Big Lost River is diverted to the four spreading areas, water will not overflow the banks of the existing Big Lost River channel onsite during 100- and 500-yr floods (floods that occur on an average of every 100 or 500 years).

Onsite flooding from the Big Lost River may occur if high water in the MacKay Dam or the Big Lost River is coupled with a dam failure. Assuming the Mackay Dam fails, significantly higher flows and greater flooding would be associated with the probable maximum flood than either the 100- or 500-year floods (Figure 3-53).

Surface Water Quality: Water quality in the Big Lost River, Little Lost River, and Birch Creek is similar, and has not varied significantly over the period of record. The chemical composition of these water bodies is determined primarily by the mineral composition of the rocks in surrounding mountain ranges northwest of the site, and by the chemical composition of irrigation water in contact with the surface water

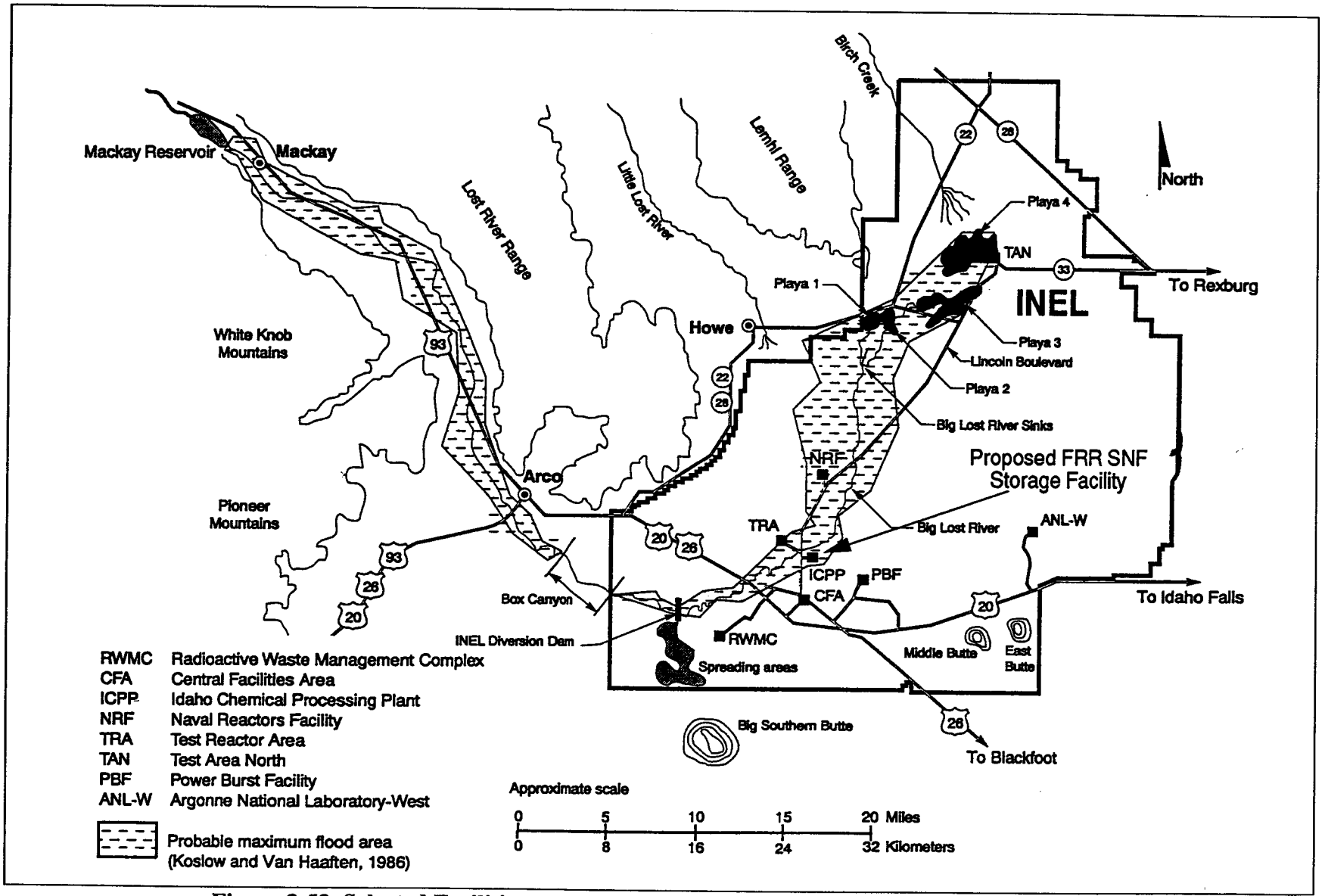


Figure 3-53 Selected Facilities and Predicted Inundation Map for Probable Maximum Flood-Induced Overtopping Failure of Mackay Dam at the Idaho National Engineering Laboratory

(Robertson et al., 1974; Bennett, 1990). Chemical and physical parameters measured in the Big Lost River, Little Lost River, and Birch Creek do not exceed drinking water quality standards for the parameter analyzed (DOE, 1995c).

The Idaho National Engineering Laboratory activities do not directly affect the quality of surface water outside the site, because discharges from the Idaho National Engineering Laboratory facilities are made to man-made seepage and evaporation basins or stormwater injection wells. Surface water is not withdrawn by humans for use at the Idaho National Engineering Laboratory, and discharge of effluents to natural surface waters does not occur. In addition, surface water does not flow directly offsite (Hoff et al., 1990). However, water from the Big Lost River, as well as from seepage of evaporation basins and stormwater injection wells, does infiltrate into the Snake River Plain Aquifer, and will eventually reach the Snake River (Robertson et al., 1974; Wood and Law, 1988; Bennett, 1990).

3.3.2.3.2 Groundwater

Groundwater at the site occurs in the Snake River Plain Aquifer and the vadose zone. The Idaho National Engineering Laboratory overlies the Snake River Plain Aquifer, which covers an area of approximately 24,900 km^2 (9,614 mi^2). Groundwater in the aquifer generally flows south and southwestward across the Snake River Plain, discharging into the Snake River at the Thousand Springs Area near Twin Falls, ID.

The Snake River Plain Aquifer is recharged by seepage of irrigation water, stream channel and canal leakage, tributary drainage basin underflow, and direct infiltration from precipitation (Garabedian, 1989). The drainage basin recharging the aquifer covers an area of approximately 90,643 km^2 (35,000 mi^2). Most recharge occurs in surface water-irrigated areas and along the northeastern margins of the plain. A majority of the groundwater discharged from the aquifer is through springs that flow into the Snake River, and through pumping for irrigation purposes. Major springs and seepages that flow from the aquifer are located near the American Falls Reservoir (southwest of Pocatello) and the Thousand Springs area between Milner Dam and King Hill (near Twin Falls, ID).

Water storage in the Snake River Plain Aquifer is estimated at 2.5 x $10^{+12} m^3$ (8.8 x $10^{+13} ft^3$) (Robertson et al., 1974). Irrigation wells yield as much as 26.5 m^3 per min (7,000 gal per min) of water (Garabedian, 1989). Groundwater discharges primarily from the aquifer through springs that flow into the Snake River and from pumping for irrigation purposes. Major springs and seepages that flow from the aquifer are localized near the American Falls Reservoir (southwest of Pocatello) and the Thousand Springs area between Milner Dam and King Hill.

The Idaho National Engineering Laboratory covers 2,305 km^2 (890 mi^2) of the north-central portion of the Snake River Plain Aquifer. Most of the aquifer is composed of a thick sequence of relatively thin basaltic lava flows with sedimentary interbeds extending to depths greater than 1,067 m (3,500 ft) below the land surface (Irving, 1993). The basalt flows are interbedded with sedimentary layers formed during periods between volcanic eruptions when the basalt was exposed and sediments collected on the land surface. A majority of the groundwater moves horizontally through fractured, basaltic interflow zones (broken and rubble zones) that occur at various depths. Water also moves vertically along joints and the interfingering edges of interflow zones (Garabedian, 1986). Sedimentary interbeds restrict the vertical movement of groundwater.

Depths to the water table from the land surface at the Idaho National Engineering Laboratory range from approximately 61 m (200 ft) in the north, to more than 274 m (900 ft) in the south (Pittman et al., 1988). The upper surface of the aquifer is unconfined over most of its extent. However, the aquifer generally behaves as if it were partially confined, because water moves through dense basalt with interbedded

sediments and water-bearing basaltic fracture zones at different rates. The base of the aquifer coincides with the tip of a thick, widespread sequence of clay, silt, sand, and basalt that occurs at depths ranging from 244 to 457 m (800 to 1,500 ft) below the land surface. The thickness of the aquifer is primarily controlled by the geologic setting, and therefore varies across the Idaho National Engineering Laboratory (Anderson, 1991).

The rate water moves through the aquifer depends on the gradient (change in elevation with distance) of the water table, the porosity of the soil and bedrock (void spaces in aquifer materials), and the hydraulic conductivity of the soil and bedrock (capacity of a porous media to transport water). Across the Idaho National Engineering Laboratory, the horizontal gradient of the water table ranges from 0.19 to 2.9 m/km (1 to 15 ft/mi) (Ackerman, 1991). Vertical hydraulic gradients (change in elevation, pressure, and velocity with distance in a given direction) are usually less than 0.01 m/m (0.01 ft/ft) in the first 61 m (200 ft) below the land surface, and less than 0.02 m/m (0.02 ft/ft) in the first 168 m (550 ft) of the saturated thickness. Groundwater flows horizontally at velocities ranging from 1.5 to 7.6 m/day (5 to 25 ft/day). However, most of the water flows from 1.5 to 3 m/day (5 to 10 ft/day) (Robertson et al., 1974).

Transmissivity values vary widely across the Idaho National Engineering Laboratory. Data from 183 single-well tests at 94 wells provide estimates of transmissivity ranging from 0.1 to 70,604 m^2 per day (1.1 to 760,000 ft^2 per day) (Ackerman, 1991). The lowest transmissivity rates are generally at the northern end of the Idaho National Engineering Laboratory, and the highest rates are near the Test Reactor Area in the south-central part of the Idaho National Engineering Laboratory. Aquifer storativity is estimated using results from multiple-well aquifer tests. Values of storativity (or storage coefficients) range from 0.01 to 0.06, indicating generally unconfined aquifer conditions at the site. The aquifer behaves as an unconfined system, which increases well yields. However, clay layers and dense, unfractured basalts in the aquifer are locally confining.

Since aquifer porosity and hydraulic conductivity decrease with depth, most of the water in the aquifer moves through the upper 61 to 152 m (200 to 500 ft) of the Quaternary basalts. Estimated flow rates within the aquifer range from 1.5 to 6.1 m (5 to 20 ft) per day. Recharge to the aquifer near the Idaho National Engineering Laboratory originates from precipitation in the mountains to the north and west. Lesser amounts of recharge occur from local precipitation and snowmelt (Barraclough et al., 1981).

The vadose zone at the Idaho National Engineering Laboratory extends from the land surface down to the water table, with a thickness ranging from 61 m (200 ft) in the north, to greater than 274 m (900 ft) in the south. The vadose zone consists of surface sediments and relatively thin, basaltic lava flows with occasional interbedded sediments. The surface sediments are composed of clay, silt, sand, and gravel. Thick surficial deposits of (primarily) clay and silt are found in the northern portion of the Idaho National Engineering Laboratory, and thin deposits are found southward, where basalt is exposed at the surface.

Perched water at the site generally occurs under presence of disposal ponds or other surface water features. Perched water bodies have been detected at the Idaho Chemical Processing Plant, Test Reactor Area, Test Area North, and Radioactive Waste Management Complex facility areas.

Groundwater Quality: Previous waste discharges to unlined ponds and deep wells have introduced radionuclides, nonradioactive metals, inorganic salts, and organic compounds to the subsurface (DOE, 1995c).

Radionuclide concentrations in the Snake River Plain Aquifer beneath the Idaho National Engineering Laboratory have decreased since the mid-1980's because of changes in disposal practices, radioactive decay, adhesion of radionuclides to rocks and minerals, and dilution by natural surface water and

groundwater entering the aquifer (Pittman et al., 1988; Orr and Cecil, 1991). Radionuclides released and observed in the soil and groundwater include tritium, strontium-90, iodine-129, cobalt-60, cesium-137, plutonium-238, plutonium-239/240, and americium-241 (Golder Associates, 1993).

The Idaho National Engineering Laboratory has released sodium, chromium, lead, and mercury on the site and into the subsurface through unlined ponds and deep wells. Sodium is the greatest quantity of material released from the waste treatment processes. However, sodium is not toxic. In 1988, chromium concentrations exceeding the maximum allowable contaminant level were measured near the Test Reactor Area. Lead and mercury have occurred at concentrations below the maximum contaminant level near the Idaho Chemical Processing Plant (Orr and Cecil, 1991).

Concentrations of volatile organic compounds have been detected in the aquifer beneath the Idaho National Engineering Laboratory. Concentrations of the following compounds exceeding the maximum contaminant levels have occurred in and near the Test Area North disposal well: Carbon tetrachloride; chloroform; 1,2-cis-dichloroethylene; 1,1-dichloroethylene; 1,2-trans-dichloroethylene; trichloroethylene; tetrachloroethylene; and vinyl chloride (Leenheer and Bagby, 1982; Mann and Knobel, 1987; Liszewski and Mann, 1993).

Groundwater uses on the Snake River Plain include irrigation, food processing and agriculture, and domestic, rural, public, and livestock supply. Water use for the upper Snake River drainage basin and Snake River Plain Aquifer was 16.4 x 10^{+10} cubic m (4.3 x 10^{+12} gal) per year during 1985, which was more than 50 percent of the water used in Idaho, and approximately 7 percent of agricultural withdrawals in the nation. Site activities withdraw water at an average rate of 7,400,000 m^3 (1.9 x 10^{+9} gal) per year. This rate is equal to approximately 0.4 percent of the water consumed in the Eastern Snake River Plain Aquifer (DOE, 1995c).

Since groundwater supplies 100 percent of the drinking water consumed within the Eastern Snake River Plain (Gaia Northwest, 1988), and an alternative drinking water source or combination of sources is not available, the U.S. Environmental Protection Agency designated the Snake River Plain Aquifer a sole-source aquifer in 1991 (EPA, 1991b).

The Idaho Department of Water Resources manages groundwater resources to meet the State's water needs. Idaho operates under the system of appropriation rights — the senior appropriation has priority in times of shortage, or "first in time, first in right."

DOE holds a Federal Reserved Water Right for the Idaho National Engineering Laboratory, which permits a water pumping capacity of 2.3 m^3 per sec (80 ft^3 per sec), and a maximum water consumption of 43 million m^3 per year (11.4 billion gal per year) for drinking, process water, and noncontact cooling. Because it is a Federal Reserved Water Right, the Idaho National Engineering Laboratory's priority on water rights dates back to the establishment of the Idaho National Engineering Laboratory.

3.3.2.4 Meteorology

The Eastern Snake River Plain climate exhibits low relative humidity, wide daily temperature swings, and large variations in annual precipitation. Several topographic characteristics of the area (including altitude, latitude, and intermountain setting) influence the climate of the site area.

Wind: The terrain impacts the regional wind flow. The Idaho National Engineering Laboratory is in the belt of prevailing westerlies. Nighttime winds are common at the Idaho National Engineering Laboratory on clear or partly cloudy nights. These winds blow from the northeast and are formed by the rapid

rotational cooling of the near-ground air layer on mountain slopes. Wind directions with the highest frequency of occurrence as measured onsite, are from south to west-southwest and from northwest to northeast (Clawson et al., 1989).

The highest hourly average near-ground (6.1 m, 20 ft level) windspeed measured onsite is 22.8 m per sec (51 mph) from the west-southwest. The maximum instantaneous gust at this level was 34.9 m per sec (78 mph). Some of the highest windspeeds occur in the spring, which coincides with strong prevailing westerlies at higher altitudes (Clawson et al., 1989). Apart from thunderstorms, severe weather is uncommon. Visibility in the region is good due to the low moisture content of the air and minimal sources of visibility-reducing pollutants. The background visibility is estimated at 60 km (37.5 mi).

Temperature and Humidity: Average seasonal temperatures measured onsite range from -7.3°C (18.8°F) in winter to 18.2°C (64.8°F) in summer, with an annual average temperature of about 5.6°C (42°F). Temperature extremes measured at the Idaho National Engineering Laboratory range from a summertime maximum of 39.4°C (103°F), to a wintertime minimum of -45°C (-49°F). Temperature differences in excess of 13.9°C (25°F) have been observed onsite (Clawson et al., 1989).

The annual average relative humidity at the Idaho National Engineering Laboratory is 50 percent, with monthly average maximum values ranging from 59 percent in July to 89 percent in February and December, and with monthly average minimum values ranging from 16 percent in June and July to 47 percent in January (Clawson et al., 1989).

Precipitation: Annual precipitation is light, averaging 22.12 cm (8.71 in). The monthly average precipitation peaks in May and June. For the rest of the year, precipitation is uniformly distributed, averaging 1.27 to 1.78 cm (0.5 to 0.7 in) monthly. The highest monthly average snowfall of 16.26 cm (6.4 in) occurs in December, with similar amounts during January. The average annual snowfall is 70.1 cm (27.6 in). Maximum annual snowfall is 151.6 cm (59.7 in), and minimum annual snowfall is 17.3 cm (6.8 in) (Clawson et al., 1989).

Atmospheric Dispersion: Vertical diffusion of pollutants may be restricted or enhanced by the vertical temperature gradient of the atmosphere (that is, lapse or inversion conditions). These inversions are often ground-based, meaning that the temperature increases with height from the ground (Clawson et al., 1989).

Air Quality: The population of the Eastern Snake River Plain is exposed to environmental radiation from both natural and man-made sources.

Background radiation includes sources such as cosmic rays, radioactivity naturally present in soil, rocks, and the human body, and airborne radionuclides of natural origin (such as radon). Radioactivity still remaining in the environment as a result of atmospheric testing of nuclear weapons also contributes to the background radiation level, although in very small amounts.

The Programmatic SNF&INEL Final EIS presents a summary of the estimated natural background dose by exposure source for residents of the Eastern Snake River Plain (DOE, 1995c). The cumulative annual dose, 351 mrem, is caused largely by the inhalation of radioactive particles formed by the decay of naturally occurring radon.

Sources of radiological emissions at the Idaho National Engineering Laboratory result from operation of research and training reactors, spent nuclear fuel testing and processing, irradiated material and fuel examination, nuclear waste treatment and storage, and depleted uranium armor production. These operations can result in the release of radioactivity to air, either directly (e.g., through stacks or vents) or indirectly (e.g., by re-suspension of radioactivity on contaminated grounds). Concentrations of

radionuclides in direct releases are monitored or estimated based on knowledge of the materials used and activities performed. Indirect releases are estimated using engineering calculations that relate surface contamination levels to expected airborne concentrations.

Table 4.7-2 of Appendix B, Volume 1 of the Programmatic SNF&INEL Final EIS provides a summary of the principal types of airborne radioactivity emitted from the Idaho National Engineering Laboratory operations during 1991 (DOE, 1995c). The information summarized provides a perspective on the general nature and magnitude of airborne radiological emissions from current the Idaho National Engineering Laboratory operations. These emissions include the noble gases (argon, krypton, and xenon) and iodine; particulate fission products such as rubidium, strontium, and cesium; radionuclides formed by neutron activation such as tritium (hydrogen-3), carbon-14, and cobalt-60; and very small quantities of heavy elements such as uranium, thorium, plutonium, and their decay products. The emissions listed are considered representative of a maximum baseline year. The radionuclide with the highest emission rate is the noble gas, krypton-85. Most of the krypton-85 emissions result from the chemical reprocessing of spent nuclear fuel at the Idaho Chemical Processing Plant.

3.3.2.5 Ecology

The Idaho National Engineering Laboratory vegetation consists primarily of shrub-steppe vegetation, and is a small fraction of the 45 million ha (112.5 million acres) of this vegetation type found in the Intermountain West. Vegetation communities range from shadscale-steppe vegetation at lower altitudes, through sagebrush and grass-dominated communities, to juniper woodlands along the foothills of the nearby mountains and buttes. Big sagebrush and rabbitbrush are the most common and noticeable shrub species on the Idaho National Engineering Laboratory. Other common shrubs include winterfat, perennial broomweed, black sage, and saltbrush species. Grass species common to the Idaho National Engineering Laboratory include Indian ricegrass, Great Basin wildrye, needle-and-threadgrass, wheatgrasses, bottlebrush squirreltail, and cheatgrass. Common flora species include mustards, summer cypress, and Russian thistle. Fifteen vegetation classes have been identified at the Idaho National Engineering Laboratory. The classes can be grouped into six major types: juniper woodland, native grassland, shrub-steppe, lava, modified, and wetland vegetation types.

The Idaho National Engineering Laboratory supports animal communities typical of Great Basin high desert vegetation and habitats. About 270 vertebrate species have been observed, including 46 mammal, 204 bird, 10 reptile, 2 amphibian, and 9 fish species (Arthur et al., 1984; DOE, 1995c). Thirty-seven mammal species or their signs have been observed at the site. Included are 14 rodents, 4 lagomorphs (rabbits and hares), 6 bats, 6 carnivores, 4 ungulates (hoofed animals), and 1 shrew. A total of 185 bird species were recorded on the site (DOE, 1995c). Other species may be present on the Idaho National Engineering Laboratory since more than 216 bird species have been reported in southeastern Idaho in similar habitats. Of these species, 32 are game birds, 26 are waterfowl, 82 are passerines, and 22 are raptors (for example, hawks, eagles, and owls). Waterfowl use man-made ponds and lagoons at the Idaho National Engineering Laboratory, and the Idaho National Engineering Laboratory is a nesting and wintering area for raptors. Sage grouse and their habitat are found throughout the site. Ten reptile and one amphibian species have been observed on the Idaho National Engineering Laboratory, but only five are common or abundant (DOE, 1995c). These species include western rattlesnake, short-horned lizard, sagebrush lizard, Great Basin spadefoot toad, and western garter snake.

Two Federal endangered and six Federal Category 2 Candidate animal species were identified by the U.S. Fish and Wildlife Service as potentially existing on the Idaho National Engineering Laboratory (DOE, 1995c). Seven additional animal species listed by the State as species-of-special-concern were identified. No Federal-or State-listed plant species were identified as potentially existing on the Idaho National

Engineering Laboratory. The bald eagle and peregrine falcon are Federally listed endangered species. The bald eagle is a winter resident and is locally common in the far north end of the Idaho National Engineering Laboratory, and on the western edge of the site near Howe. Peregrine falcons have been rarely observed in the winter. Neither species is known to nest on the site, and neither species is commonly observed near facilities (Reynolds, 1993).

The Candidate Category 2 species identified by the U.S. Fish and Wildlife Service as potentially existing at the Idaho National Engineering Laboratory include four birds and two mammals. Both the long-billed curlew and the white-faced ibis are uncommon migrants at the Idaho National Engineering Laboratory, associated with aquatic and riparian habitats. Swainson's hawk and ferruginous hawk nest on and migrate through the site. These species are found throughout the site, but are observed more frequently in the juniper woodlands and riparian areas where they nest. The loggerhead shrike, which uses shrub-steppe vegetation to nest, is also found on the Idaho National Engineering Laboratory. Breeding and hibernation caves for Townsend's big-eared bat have been observed on the Idaho National Engineering Laboratory. About six caves are used, the nearest being in excess of 7 km (3 mi) from the nearest facility. The pygmy rabbit is common on the Idaho National Engineering Laboratory (DOE, 1995c). The habitat for this species is grass and shrub communities found throughout much of the Idaho National Engineering Laboratory.

State species-of-special-concern include three aquatic, one raptor, and three bat species. The aquatic bird species are rare migrants (DOE, 1995c). The gray falcon has only been observed a few times. Of the bats, only the California myotis has been observed, and it is rare. Ten plant species identified by other Federal agencies (U.S. Bureau of Land Management and U.S. Forest Service) and the Idaho Native Plant Society as sensitive, rare, or unique are known to occur on the Idaho National Engineering Laboratory (Chowlewa and Henderson, 1984). These species are not, however, protected under State or Federal laws. Most of these species are not found near any the Idaho National Engineering Laboratory facilities, and are uncommon on the Idaho National Engineering Laboratory because they require unique microhabitat conditions.

Potential wetlands are found throughout the Idaho National Engineering Laboratory and cover about 0.25 percent (3,322 ha or 8,206 acres) of the site. The wetlands are associated primarily with drainages, although some wetlands are associated with natural playas, man-made ponds, and drainage ditches. More than 70 percent of the potential wetlands are identified as palustrine (marsh lands). These wetlands are found mainly near the Big Lost River and its spreading areas and playas, the Birch Creek Playa, and an area to the north and in the general vicinity of Argonne National Laboratory-West. Potential lacustrine wetlands are found in the central and south central portions of the site. Potential riverine wetlands were mapped by the U.S. Fish and Wildlife Service near the Big Lost River, Birch Creek, and Big Lost River Playas. Man-made wetlands include industrial waste and sewage treatment ponds, borrow pits, and gravel pits associated with site facilities. Limited riparian communities with large trees are found along the drainages of the Big Lost River, and very limited riparian habitat is located on Birch Creek.

3.3.2.6 Land Use

The Idaho National Engineering Laboratory encompasses 231,049 ha (570,934 acres). Only about two percent of the land (4,614 ha or 11,400 acres) is used for facilities and operations supporting energy research and development and waste management. In addition to industrial and support land uses associated with each of the facility areas at the Idaho National Engineering Laboratory, other land uses exist within the Idaho National Engineering Laboratory site boundaries.

Approximately five percent of the total the Idaho National Engineering Laboratory site area, or 13,349 ha (33,000 acres), is devoted to public road, utility, and railway rights-of-way crossing the site (DOE, 1995c). Rights-of-way at the Idaho National Engineering Laboratory are granted and administered by the U.S. Department of the Interior and the Bureau of Land Management.

More than half of the Idaho National Engineering Laboratory is used for grazing. The actual amount of the Idaho National Engineering Laboratory land used for grazing varies from year to year, but is usually between 121,410 and 141,645 ha (300,000 and 350,000 acres). In 1992 for example, 121,853 ha (301,094 acres) were grazed (DOE, 1995c). Grazing is not allowed within 3.2 km (2 mi) of any nuclear facility, and dairy cattle are not permitted on the site to avoid the possibility of milk contamination by long-lived radionuclides. The U.S. Sheep Experiment Station, located approximately 42.6 km (26.5 mi) northeast of the site, uses a 364 ha (900 acre) portion of the Idaho National Engineering Laboratory for a winter feed lot for approximately 5,000 sheep.

The Idaho National Engineering Laboratory also supports periodic uses associated with onsite resources. Two sites within the Idaho National Engineering Laboratory site boundary are listed in the National Register of Historic Places: Experimental Breeder Reactor-I, designated in 1966, and Goodale's Cutoff, a portion of the Oregon Trail that crosses the southwest corner of the Idaho National Engineering Laboratory, designated in 1974. In addition to public tours, the Idaho National Engineering Laboratory occasionally supports controlled hunting within the site boundaries. Each year the Idaho Department of Fish and Game and DOE jointly determine whether or not to allow controlled hunts of wild game populations living on the Idaho National Engineering Laboratory property (DOE, 1995c).

Several uses associated with the National Environmental Research Park designation occur at the Idaho National Engineering Laboratory. The Idaho National Engineering Laboratory's cool desert ecosystem provides a controlled outdoor laboratory where scientists can study changes to the natural environment caused by human activities.

3.3.2.7 Noise

Sources of man-made noise at the Idaho National Engineering Laboratory include noise from operation and construction activities; bus, car, and truck traffic; aircraft; security force training exercises; and the Idaho National Engineering Laboratory railroad. Previous studies have assessed noise impacts of existing the Idaho National Engineering Laboratory operational activities (Abbott et al., 1990). These studies concluded that because of the remote location of the Idaho National Engineering Laboratory, there are no known noise conditions associated with existing onsite operations that adversely affect individuals at offsite locations. Studies of the noise effects on wildlife at the Kennedy Space Center show that even very high noise levels have little significance on wildlife productivity (Leonard, 1993).

3.3.2.8 Transportation

Roads are the primary access to and from the site, and workers are transported primarily by bus and private vehicles. Commercial shipments are transported by road and air, and some bulk materials are transported by rail. Waste is transported by road and rail. The existing regional highway system and site roadways are shown in Figure 3-54. To maintain a supply of goods and services and to transport workers to the Idaho National Engineering Laboratory, an onsite road system of approximately 145 km (90 mi) of paved surface has been developed. About 29 km (18 mi) of this network are considered service roads and are closed to the public. In addition to the site facilities, DOE owns or leases office and technical buildings throughout Idaho Falls for approximately 4,000 DOE and DOE contractor personnel to administer and support work at the Idaho National Engineering Laboratory. DOE shuttle vans provide

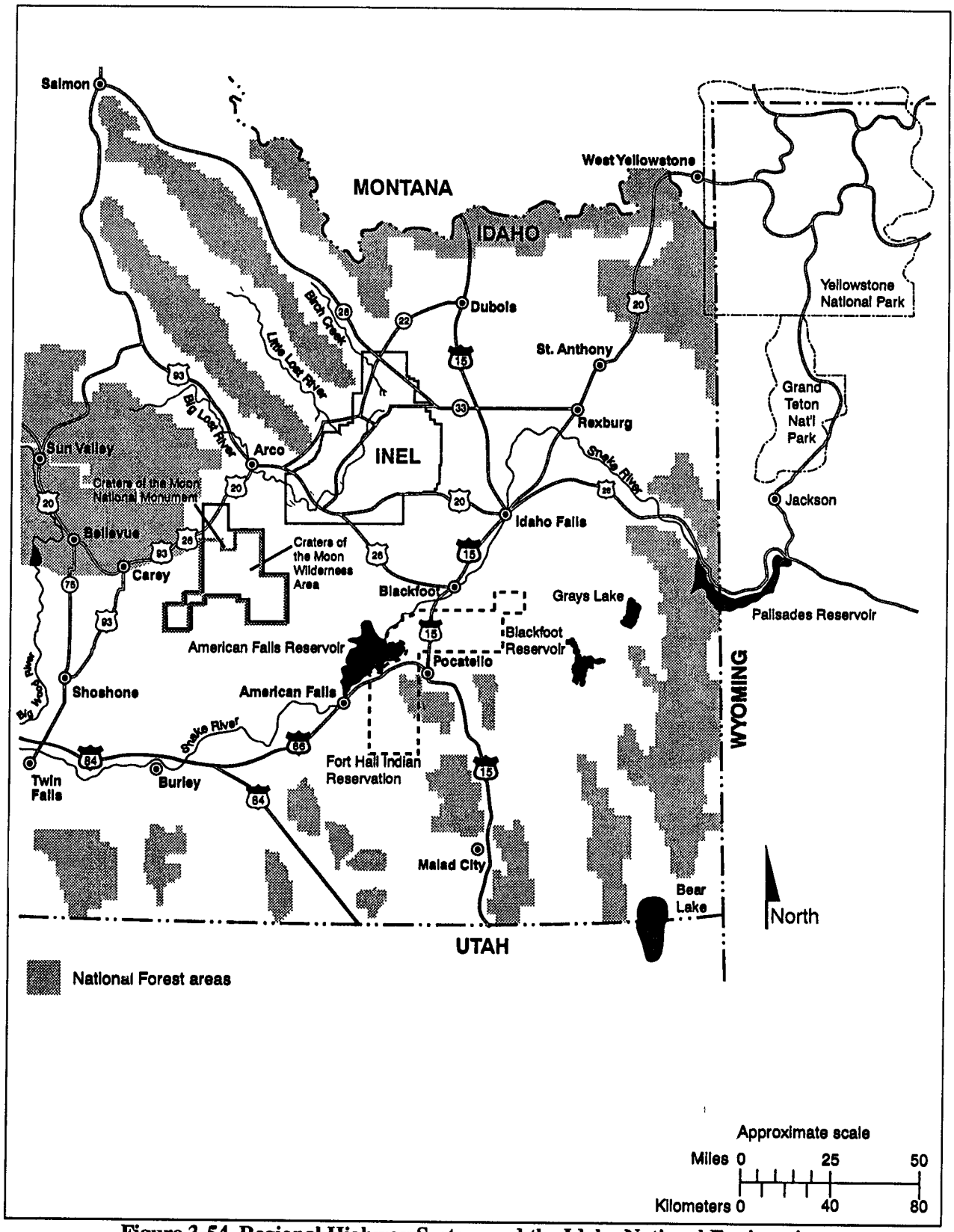


Figure 3-54 Regional Highway System and the Idaho National Engineering Laboratory Site Roadways

hourly transport between in-town facilities. Four major modes of transit use the regional highways, community streets, and site roads to transport people and commodities: DOE buses and shuttle vans, DOE motor pool vehicles, commercial trucks, and private automobiles.

Idaho Falls receives railroad freight service from Butte, Montana to the north, and from Pocatello, and Salt Lake City, Utah to the south via Union Pacific. The Union Pacific Railroad's Mackay Branch, which crosses the southern portion of the Idaho National Engineering Laboratory, provides rail service to the Idaho National Engineering Laboratory. This branch connects with a DOE-owned spur line at Scoville Siding, and then links with developed areas within the Idaho National Engineering Laboratory. Rail shipments to and from the Idaho National Engineering Laboratory are usually limited to bulk commodities, spent nuclear fuel, and radioactive materials.

One major airline carrier, Delta Airlines, provides Idaho Falls with jet aircraft passenger and cargo service. Two other air carriers, Horizon and Skywest, provide commuter service. Daily service includes flights to and from Boise and Salt Lake City. Landings in Idaho Falls for 1991 and 1992 totalled 5,367 and 5,578, respectively. The combined number of passengers leaving and arriving at Idaho Falls and Pocatello for 1991 and 1992 was 282,185 and 285,047, respectively. Non-DOE air traffic over the Idaho National Engineering Laboratory is restricted, and non-DOE aircraft are not permitted to use the site.

From 1987 through 1992, the average motor vehicle accident rate was 0.94 accident per million km (1.5 accidents per million mi) for Idaho National Engineering Laboratory vehicles, which compares with an accident rate of 1.5 accidents per million km (2.4 accidents per million mi) for all DOE complex vehicles and 8 accidents per million km (12.8 accidents per million mi) nationwide for all motor vehicles. There are no recorded rail or air accidents associated with the Idaho National Engineering Laboratory and, to date, no fatal air traffic accidents have involved flights through either the Idaho Falls or Pocatello airports (DOE, 1995c). Spent nuclear fuel and radioactive, hazardous, industrial, municipal, and recyclable wastes are transported at the Idaho National Engineering Laboratory.

3.3.2.9 Socioeconomics

In general, population growth in the region has mirrored population growth in Idaho as a whole over the past 30 years (Figure 3-55). Although growth was not evenly distributed among the counties, total regional population increased by 47 percent between the years 1960 to 1990, which is comparable to a Statewide growth rate of 51 percent. During this period, Madison County experienced the most rapid growth in the region, its population increasing by more than 150 percent. By contrast, the two smallest counties in the region, Butte and Clark, actually lost population between the years 1960 and 1990. The largest increases in the population of Idaho Falls occurred during the 1950's, which can be partially explained by the formation and the development of the National Reactor Testing Station, which evolved into the Idaho National Engineering Laboratory. By contrast, Pocatello grew primarily in the 1940's and the 1960's. Idaho Falls has continued to grow, increasing in population by 11 percent from the years 1980 to 1990. During the same period, however, Pocatello's population declined by 0.7 percent.

Historically, the economy of the seven-county region relied predominantly on natural resource use and extraction. To this day, farming, ranching, and mining remain important components of the regional economy. Almost all manufacturing in the region is a form of food processing, and mining or mineral processing. Idaho Falls is a regional retail and service center for southeastern Idaho. Similarly, Pocatello has evolved into an important processing and distribution center for the surrounding agricultural areas, and is a regional center for higher education. Retail trade and educational services are the two largest regional employment categories, providing 17.6 and 11.4 percent of the total employment in the region. Tourism is also considered to be an important component of the regional economy. The economy of the seven-county

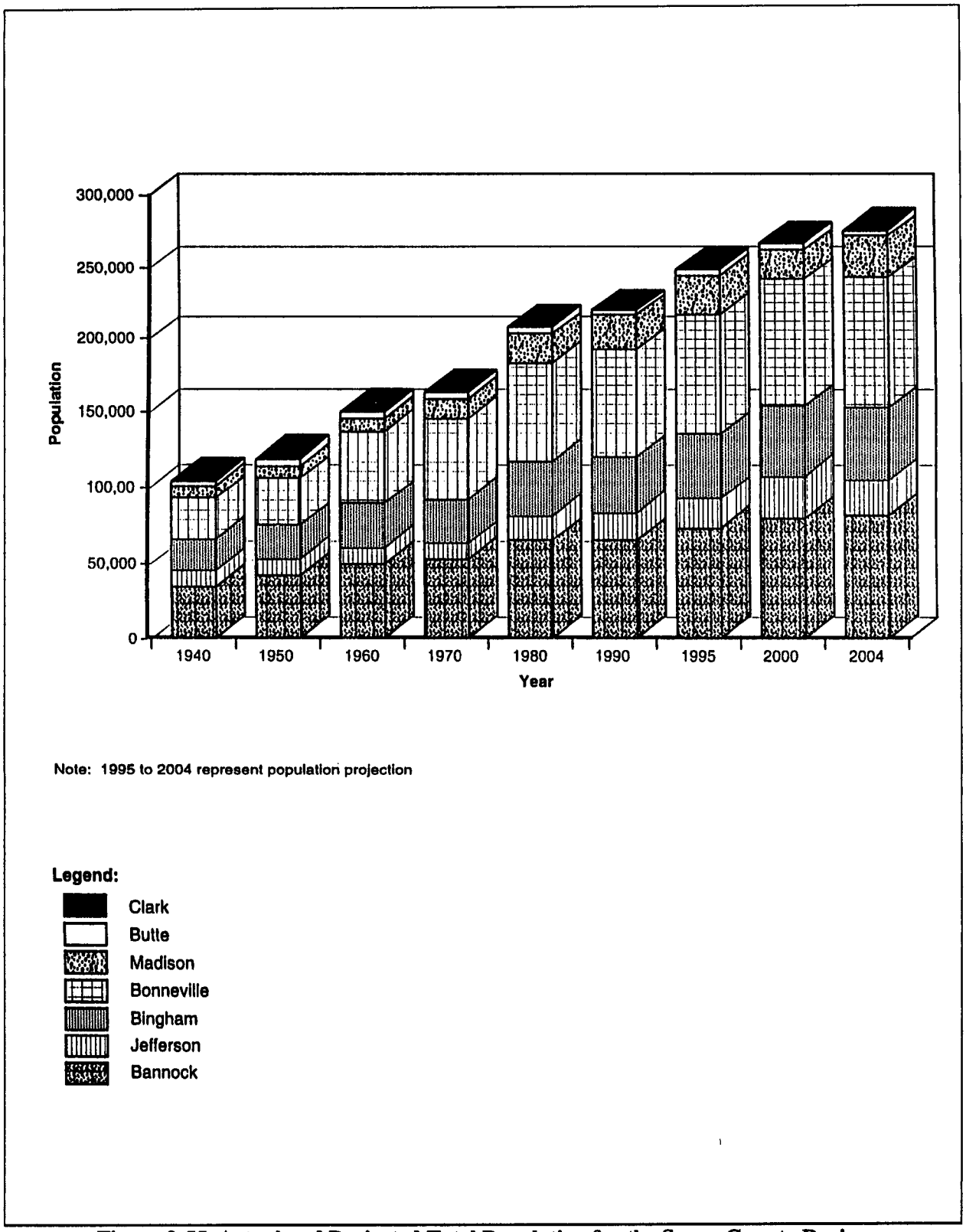


Figure 3-55 Actual and Projected Total Population for the Seven-County Region Surrounding the Idaho National Engineering Laboratory for the Years 1940 through 2004

region, however, currently revolves around agriculture and the Idaho National Engineering Laboratory (the single largest employer in the seven-county region). As of January 1991, DOE and its contractors employed more than 12,425 persons, with an estimated annual payroll of $440 million. Annual funding for the Idaho National Engineering Laboratory in 1991 was more than $1.1 billion.

As of January 1992, 12,803 contractor and Government personnel were employed at the Idaho National Engineering Laboratory, representing about 12 percent of the total available jobs in the seven-county region. Total employment at the Idaho National Engineering Laboratory has increased by more than 23 percent in the past 4 years. The Idaho National Engineering Laboratory has a large influence on both the regional economy and the economy of Idaho. During Fiscal Year 1992, total expenditures at the Idaho National Engineering Laboratory directly and indirectly supported 36,395 jobs, and generated an estimated $945 million in total earnings within the seven-county region.

Bonneville and Bannock Counties are the focal points of the housing market. These two counties provide 67 percent of the total housing in the region. A shortage of single-family housing presently exists near Idaho Falls because construction has not kept up with increasing demand. Total population living within the 80 km (50 mi) radius around the site is about 176,311. The ethnic composition of this population is presented in Figure 3-56. The number of low-income households within the same area of influence is presented in Figure 3-57. Approximately 40 percent of these households are low income families.

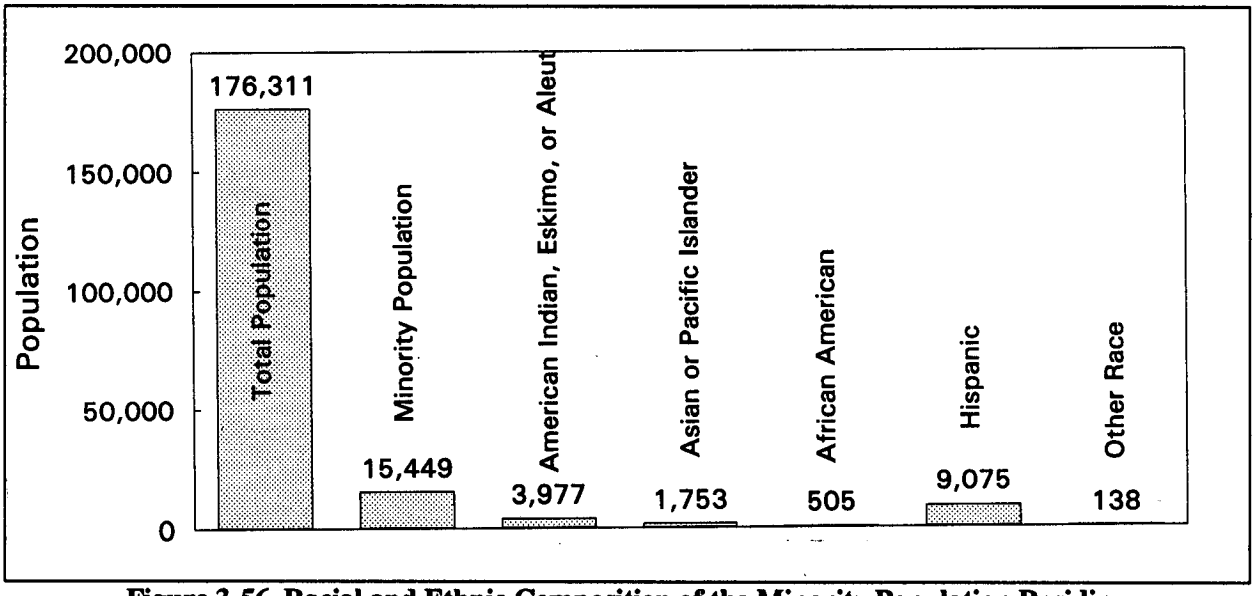


Figure 3-56 Racial and Ethnic Composition of the Minority Population Residing within 80 km (50 mi) of the Idaho National Engineering Laboratory

Seventeen public school districts provide educational services for 56,899 school-aged children within the seven-county region. Most of the public schools in the seven-county region operate at levels at or above the design capacity of their classroom facilities.

There are 18 fire districts in the seven-county area surrounding the Idaho National Engineering Laboratory. These 18 districts operate a total of 30 fire stations staffed by 179 paid and 313 volunteer firefighters. Bingham, Bonneville, Butte, Clark, and Jefferson counties, which surround the Idaho National Engineering Laboratory, have developed emergency plans to be implemented in the event of a radiological or hazardous materials emergency. Eight hospitals serve the seven-county region. The Eastern Idaho Regional Medical Center in Idaho Falls, with 311 beds, is the largest hospital in the region. Occupancy rates range from 22.0 to 89.2 percent in the region. Law enforcement services in the

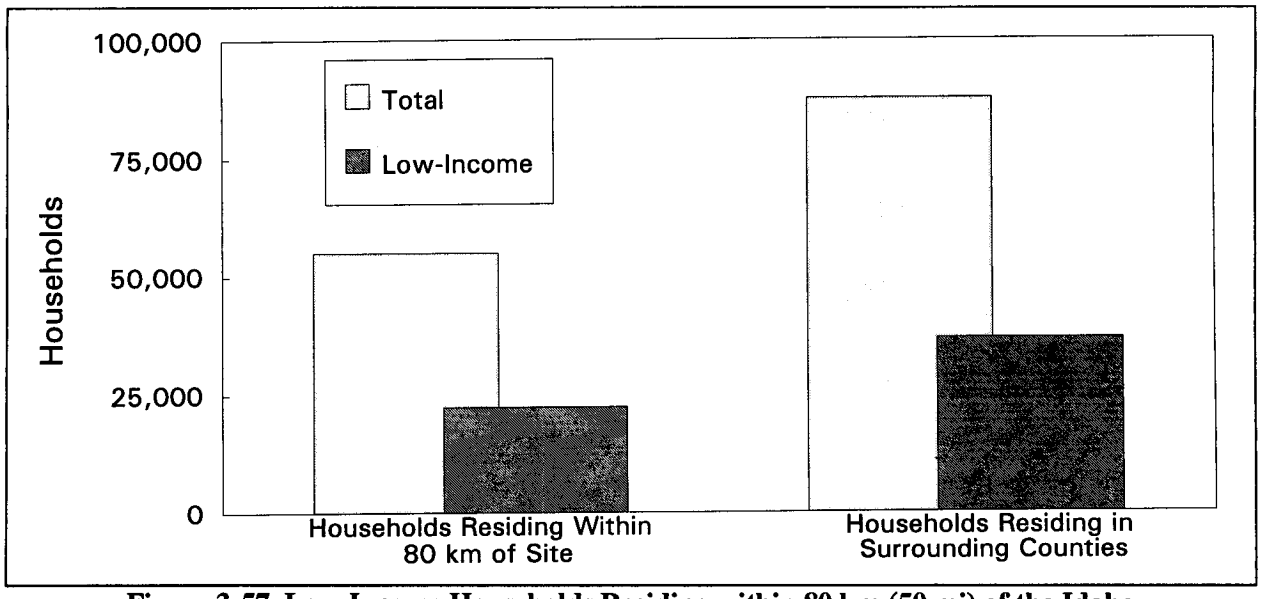


Figure 3-57 Low-Income Households Residing within 80 km (50 mi) of the Idaho National Engineering Laboratory

seven-county area are provided by sheriff's offices in each county, 12 city police departments, and the Idaho State Police. Clark County has the highest ratio of law enforcement personnel per 1,000 people (6.3 per 1,000), and Butte County has the lowest ratio (1.3 per 1,000).

3.3.2.10 Historical, Archaeological, and Cultural Resources

In the course of more than 100 cultural resource surveys, 1,506 cultural resources have been discovered and recorded within the Idaho National Engineering Laboratory boundaries (DOE, 1995c), not including architectural properties directly associated with the creation and operation of the Idaho National Engineering Laboratory. Only four percent of the Idaho National Engineering Laboratory has been surveyed, however, and most surveys were conducted near major facility areas. The 1,506 resources recorded at the Idaho National Engineering Laboratory through 1992 include 688 prehistoric sites, 38 historic sites, 753 prehistoric isolated finds, and 27 historic isolated finds (DOE, 1995c; Gilbert and Ringe, 1993). Until formal evaluations can be performed, all of the cultural sites are considered to be potentially eligible for the National Register of Historic Places. Only Goodale's Cutoff, part of the Northern Alternate of the Oregon Trail, is listed on the National Register of Historic Places. All of the isolated find artifacts have been categorized as unlikely to meet eligibility requirements (Yohe, 1993).

Most of the 688 prehistoric archaeological sites located to date at the Idaho National Engineering Laboratory are classified as lithic scatters. These sites consist of more than 10 stone artifacts, but lack evidence of other categories of cultural materials or features. At 12 percent of these sites, limited subsurface excavations have been conducted. Prehistoric cultural resources vary in density and type across the Idaho National Engineering Laboratory, but appear to be associated with definable physical features of the land. Areas classified as having very high sensitivity have been identified along the Big Lost River, atop buttes, and within craters and caves. The southernmost part of the Lemhi Mountains, the Lake Terreton basin, and a 2,800 m (9,200 ft) wide zone along the edge of lava fields are classified as high-sensitivity areas. With the exception of the Central Facilities Area and Experimental Breeder Reactor-I, which are located in high-sensitivity zones, all developed Idaho National Engineering Laboratory facility areas are located in or on the edge of low or medium sensitivity areas.

As of March, 1993, 38 historic sites and 27 historic isolated finds had been recorded on the Idaho National Engineering Laboratory (Gilbert and Ringe, 1993). These resources include small homesteads and irrigation canals, temporary campsites of sheep and cattle drivers, stage and wagon roads, and some mining-related features.

In most instances, a property must be at least 50 years old to be considered for inclusion in the National Register of Historic Places, unless it meets certain criteria. The unique nature of existing DOE site facilities at the Idaho National Engineering Laboratory and their historic role in nuclear research and development make them eligible for special consideration regardless of their age. Two buildings dating from 1942 appear on a partial inventory of potentially significant historic the Idaho National Engineering Laboratory facilities (Braun et al., 1993). The Experimental Breeder Reactor-I is listed in the National Register of Historic Places, and is designated as a National Historic Landmark. Although the Experimental Breeder Reactor-I is the only nuclear property less than 50 years old that has been formally listed in the National Register, other DOE facilities eligible for listing have been identified, including the Auxiliary Reactor Areas I, II, III; Boiling Water Reactor Experiment V; Materials Test Reactor; Engineering Test Reactor; and the Test Area North hangar (Braun et al., 1993). The Idaho State Historic Preservation Office believes that most major structures related to nuclear research at the Idaho National Engineering Laboratory are probably eligible for the National Register (Yohe, 1993).

As of July 1993, several specific types of locations have been identified as associated with traditional religious practices. The most significant of these locations are the East and Middle Buttes located in the southern section of the Idaho National Engineering Laboratory, and more than 20 lava tube and blister cave sites, which are considered sacred by the Shoshone-Bannock Tribes. The Tribes also consider archaeological sites to be sensitive resources, especially rock art sites. The entire the Idaho National Engineering Laboratory falls within the traditional territory of the Shoshone-Bannock Tribes. These areas of concern are likely to be located within very high sensitivity zones identified for presence of prehistoric archaeological resources, such as the Big Lost River, Birch Creek, buttes, craters, caves, lava edge zones, Lemhi Mountains, and the Lake Terreton basin

3.3.3 Description of the Affected Environment at the Hanford Site

This section describes the potentially affected environment of the Hanford Site. The location of the Hanford Site is shown in Figure 3-58.

3.3.3.1 Geology

The region of the Pacific Northwest that contains the Hanford Site lies within the Columbia Intermontane physiographic province, which is bordered on the north and east by the Rocky Mountains, and on the west by the Cascade Range (Figure 3-58). The province has been a topographic and structural depression since the early Miocene period, and is subdivided into smaller physiographic units. The dominant geologic characteristics of this province are the thick accumulations of basaltic lava flows extending laterally from central Washington eastward into Idaho, and southward into Oregon (Tallman et al., 1979). The ancient basalt surface has been subsequently modified by tectonism, volcanism, weathering, and erosion.

The Columbia Intermontane Province is divided into four subprovinces. The Hanford Site is contained within the Columbia Basin subprovince, which contains most of the Columbia River Basalt Group. The Columbia Basin subprovince is further divided into six physiographic sections, with the Hanford Site located in parts of the Yakima Folds and the Central Plains sections. Much of the Columbia Basin subprovince was affected by preglacial cataclysmic flooding associated with the sudden release of water from glacial Lake Missoula. Cataclysmic floods were responsible for much of the present morphology of

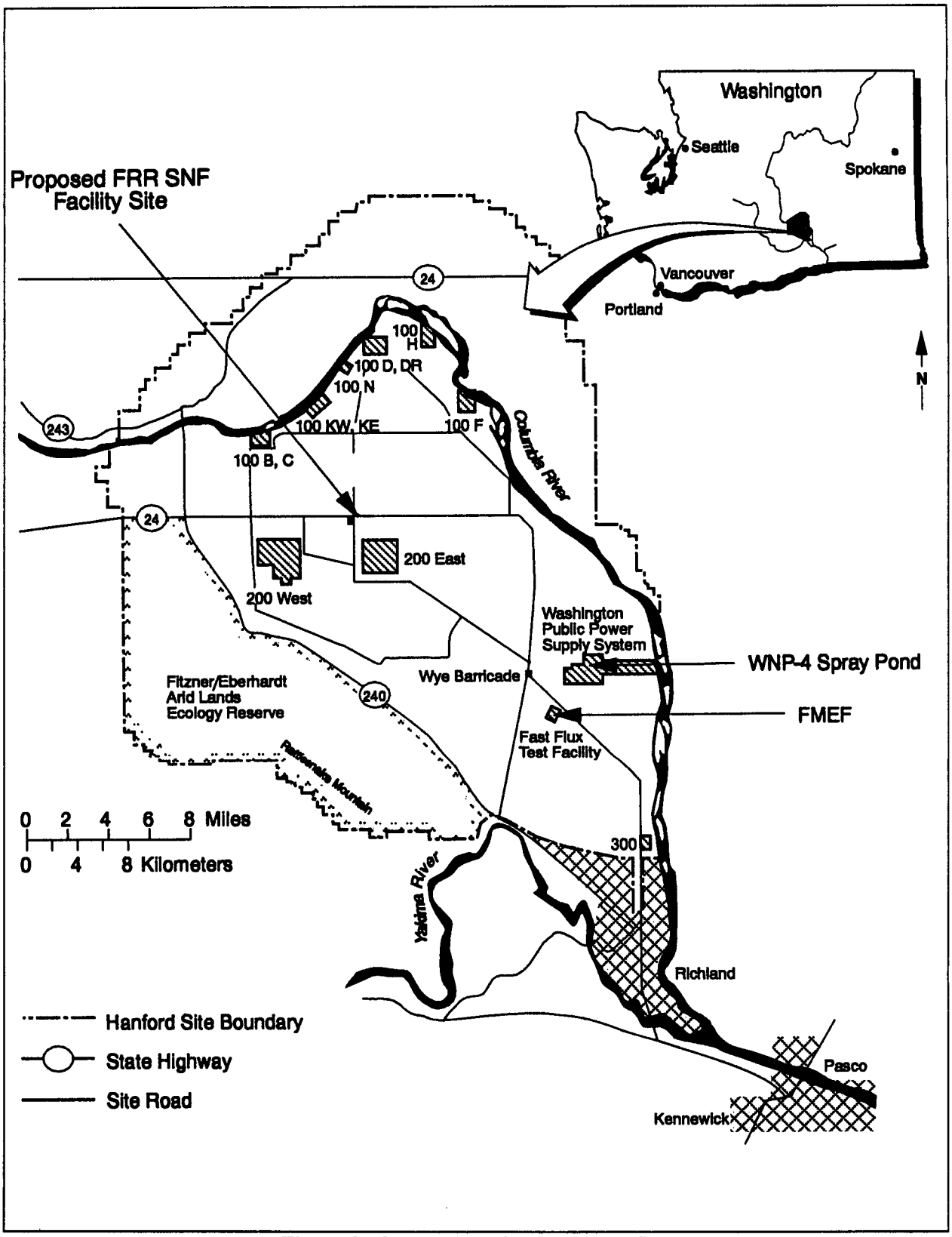


Figure 3-58 Location of the Hanford Site

the Channeled Scabland and Central Plains section. Fluvial and lacustrine processes associated with the ancestral Columbia River system have been active since the late Miocene. Sedimentary deposits indicate that deposition was continuous from about 10.5 million years ago until about 3.5 million years ago (DOE, 1988c). Quaternary volcanism has been limited to the extreme western margin of the Columbia Basin subprovince, and is associated with the Cascade Range Province.

The Hanford Site is located within the Pasco Basin, which was formed by the deformation of the lava flows into broad structural and topographic basins. The Pasco Basin is defined by anticlinal structures of basaltic rock known as the Saddle Mountains to the north, the Umtanum Ridge, Yakima Ridge, and Rattlesnake Hills to the west, and a series of doubly plunging anticlines merging with the Horse Heaven Hills to the south.

Most known faults within the region are associated with anticlinal fold axes, and were probably formed concurrently with the folding (DOE, 1986a). Existing known faults within the Hanford Site area include tear faults with lengths of up to 3 km (1.9 mi) on Gable Mountain, and the Rattlesnake-Wallula alignment. Strike-slip faults have not been observed crosscutting the Pasco Basin. Structures within the Hanford Site have shown the greatest deformation along the hinge area of the anticlinal ridges, decreasing with distance from that area (i.e., the greatest amount of tectonic jointing and faulting occurs in the hinge zone and decreases toward the gently dipping limbs). The faults usually exhibit low dips with small displacements, may be confined to the layer in which they occur, and die out to no recognizable displacement in short lateral distances (DOE, 1986a).

Fifteen different soil types present on the Hanford Site have been listed and described (Hajek, 1966). The soil types vary from sand to silty and sandy loam.

3.3.3.2 Seismology and Volcanology

Seismicity of the Columbia Plateau, as determined by the rate of earthquakes per area and the historical magnitude of these events, is relatively low compared to other regions of the Pacific Northwest, the Puget Sound area, and western Montana/eastern Idaho. Figure 3-59 shows the locations of all earthquakes that occurred in the Columbia Plateau from 1850 to 1969 with Modified Mercalli Intensity of 5 or greater. Swarms of small, shallow earthquakes lasting from several weeks to months, and clustered in an area 5 to 10 km (3 to 6 mi) in lateral dimension are the predominant seismic events. Earthquake swarms may contain from four to more than 100 earthquakes of magnitude 1.0 to 3.5. Detailed locations of swarm earthquakes indicate that the events occur on fault planes of variable orientation and not on a single throughgoing fault plane (DOE, 1995c).

Shallow earthquake swarm activity in the central Columbia Plateau is concentrated principally north and east of the Hanford Site. Here, earthquakes of magnitude greater than 3.0 occur, with the largest recorded (in 1973) having magnitude 4.4 north of the Hanford Site. Deeper earthquakes occur in the central Columbia Plateau, although at much lower frequencies than the shallower swarm events. Deep seismic activity generally occurs randomly, and is not associated with known geologic structures or with patterns of shallow seismicity. Earthquake focal mechanisms in the central Columbia Plateau generally indicate reverse faulting on east-west planes, consistent with a north-south directed maximum compressive stress, and with the formation of the east-west oriented anticlinal fold of the Yakima Fold Belt (Rohay, 1987). The earthquake focal mechanisms in the western margin of the Columbia Plateau also indicate north-south compression, but here the minimum compressive stress is oriented east-west, resulting in strike-slip faulting (Rohay, 1987).

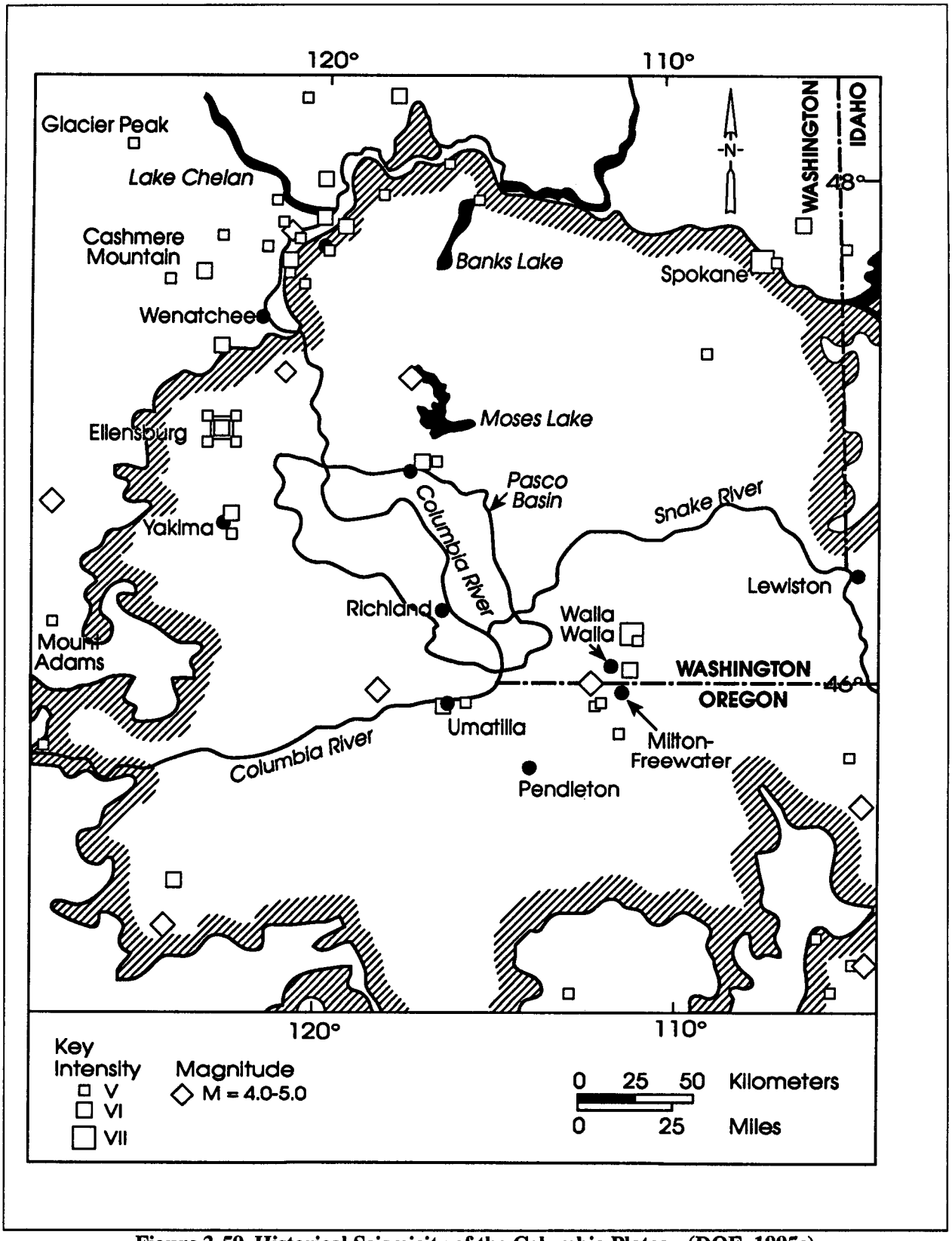


Figure 3-59 Historical Seismicity of the Columbia Plateau (DOE, 1995c)

There are several major volcanoes in the Cascade Range west of the Hanford Site. The nearest volcano is Mount Adams, about 165 km (103 mi) from the Hanford Site, and the most active is Mount St. Helens, approximately 220 km (137 mi) west-southwest from the Hanford Site.

3.3.3.3 Hydrology

The major geologic units of the Hanford Site are, in ascending order: basement rocks of unknown origin and composition, the Columbia River Basalt Group with interbedded sediments of the Ellensburg Formation, the Ringold Formation, the Plio-Pleistocene unit, and the Hanford formation.

3.3.3.3.1 Surface Water

The Hanford Site occupies approximately 33 percent of the land area within the Pasco Basin. Primary surface-water features associated with the Hanford Site are the Columbia and Yakima Rivers. Several surface ponds and ditches are present, and are generally associated with fuel and waste processing activities (Figure 3-60). There is no significant surface water flow from the Hanford Site to nearby rivers.

Cold Creek and its tributary, Dry Creek, are ephemeral streams within the Yakima River drainage system along the southern boundary of the Hanford Site. Rattlesnake Springs, located on the western part of the Hanford Site, forms a small surface stream that flows for about 3 km (1.9 mi) before disappearing into the ground.

Normal river elevations within the Hanford Site range from 120 m (396 ft) above mean sea level when the river enters the Hanford Site near Vernita, to 104 m (343 ft) where it leaves the Hanford Site near the 300 Area.

Large Columbia River floods have occurred in the past (DOE, 1986a), but the likelihood of recurrence of large-scale flooding has been reduced by the construction of several flood control/water storage dams upstream from the Hanford Site. The maximum historical flood on record occurred June 7, 1894, with a peak discharge at the Hanford Site of 21,000 m^3 per sec (741,600 ft^3 per sec) (Figure 3-61). The largest recent flood took place in 1948, with an observed peak discharge of 20,000 m^3 per sec (706,300 ft^3 per sec) at the Hanford Site. The probability of flooding at the magnitude of the 1894 and 1948 floods has been greatly lowered because of upstream regulation by dams (Figure 3-60). There have been fewer than 20 major floods on the Yakima River since 1862 (DOE, 1986a).

The probable maximum flood for the Columbia River below Priest Rapids Dam has been calculated to be 40,000 m^3 per sec (1,412,600 ft^3 per sec). This flood would inundate the 100 Areas located adjacent to the Columbia River, but the central portion of the Hanford Site would remain unaffected (DOE, 1986a).

The U.S. Army Corps of Engineers evaluated a number of scenarios on the effects of failures of Grand Coulee Dam, assuming flow conditions on the order of 11,000 m^3 per sec (388,500 ft^3 per sec). The discharge resulting from a 50 percent breach at the outfall of Grand Coulee Dam was determined to be 600,000 m^3 per sec (21,188,800 ft^3 per sec). In addition to the areas inundated by the probable maximum flood, the remainder of the 100 Areas, the 300 Area, and nearly all of Richland, WA, would be flooded (DOE, 1986a).

Surface Water Quality: The Washington State Department of Ecology classifies the Columbia River as Class A (excellent) between Grand Coulee Dam and the mouth of the river near Astoria, OR (DOE, 1986a). The Class A designation requires that industrial uses of this water be compatible with other uses, including drinking water, wildlife, and recreation.

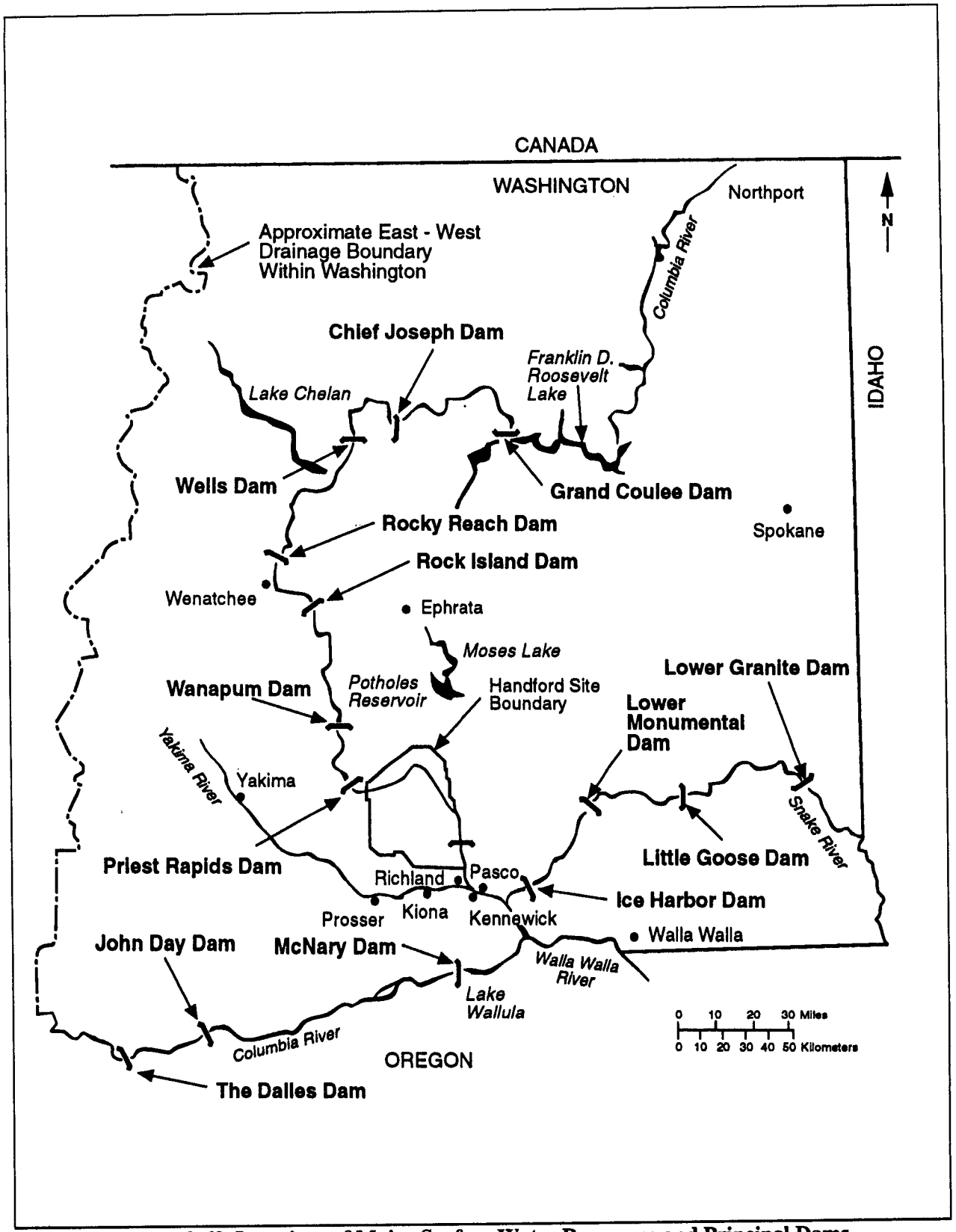


Figure 3-60 Locations of Major Surface Water Resources and Principal Dams within the Columbia Plateau

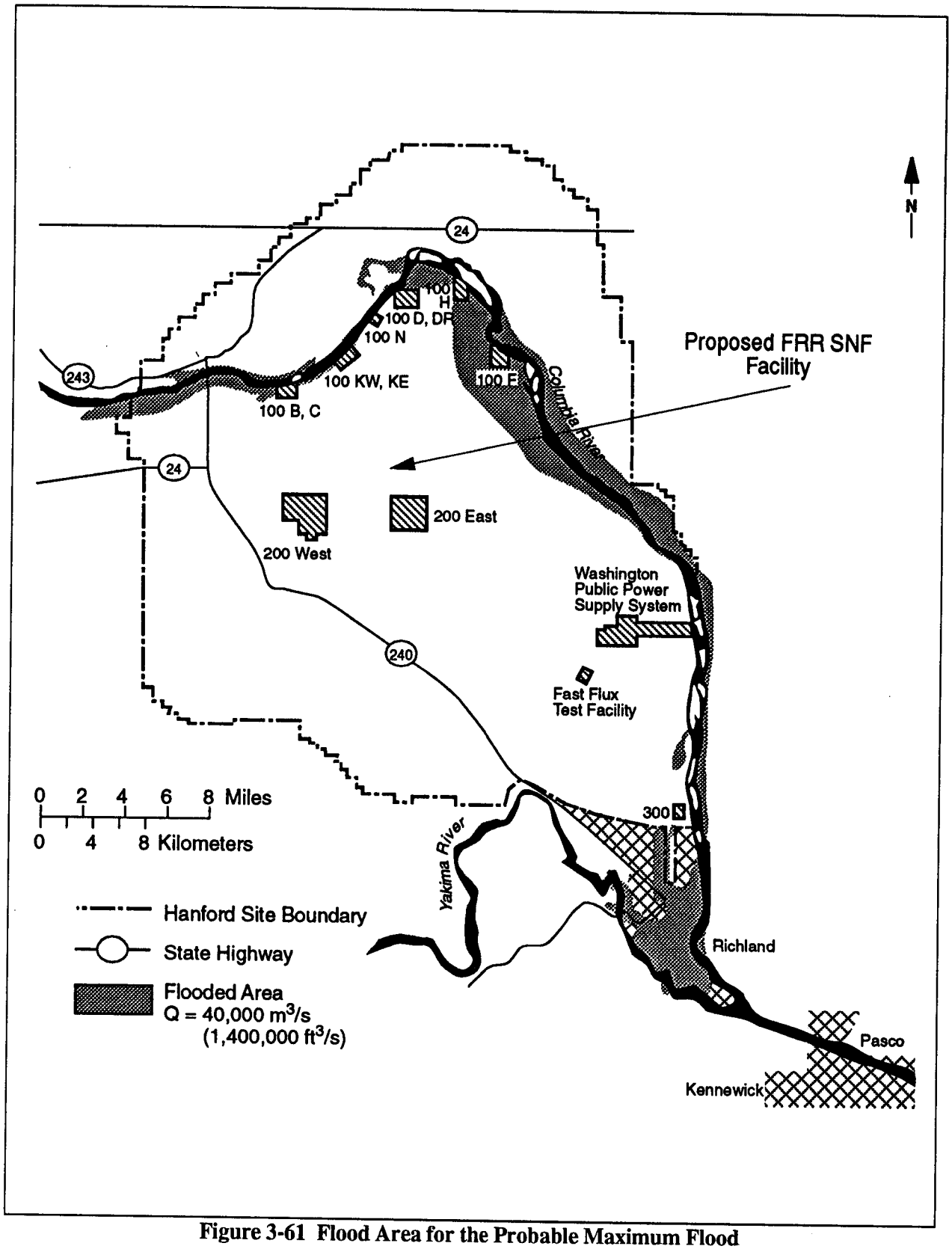


Figure 3-61 Flood Area for the Probable Maximum Flood

Radiological monitoring shows low levels of radionuclides in samples of Columbia River water. Hydrogen-3 (tritium), iodine-129, and uranium are found in slightly higher concentrations downstream from the Hanford Site than upstream (DOE, 1995c), but were well below concentration guidelines established by DOE and U.S. Environmental Protection Agency drinking water standards. Cobalt-60 and iodine-131 were not consistently found in measurable quantities during 1987 samples of Columbia River water from Priest Rapids Dam, the 300-Area water intake, or the Richland City pumphouse. The average annual strontium-90 concentrations were essentially the same at Priest Rapids Dam and the Richland Pumphouse for 1987, and were well below the State of Washington and U.S. Environmental Protection Agency drinking water standards.

3.3.3.3.2 Groundwater

Groundwater under the Hanford Site occurs in unconfined and confined conditions. The unconfined aquifer is contained within the glaciofluvial sands and gravel and within the Ringold Formation. The bottom of the aquifer is the basalt surface or, in some areas, the clay zones of the lower member of the Ringold Formation. The confined aquifers consist of sedimentary interbeds and/or interflow zones that occur between dense basalt flows in the Columbia River Basalt Group. The main water-bearing portions of the interflow zones occur within a network of interconnecting vesicles and fractures of the flow tops or flow bottoms.

Sources of natural recharge to the unconfined aquifer are rainfall and runoff from the higher bordering elevations, water infiltrating from small ephemeral streams, and river water along influent reaches of the Yakima River and Columbia River.

From the recharge areas to the west, the groundwater flows downgradient to the discharge areas, primarily along the Columbia River. This general west-to-east flow pattern is interrupted locally by the groundwater mounds in the 200 Areas. From the 200 Areas, there is also a component of groundwater flow to the north between Gable Mountain and Gable Butte. These flow directions represent current conditions; the aquifer is dynamic and responds to changes in natural and artificial recharge.

Local recharge to the shallow basalts is believed to result from infiltration of precipitation and runoff along the margins of the Pasco Basin. Regional recharge of the deep basalts is thought to result from interbasin groundwater movement originating northeast and northwest of the Pasco Basin in areas where the Wanapum and Grande Ronde Basalts crop out extensively. Groundwater discharge from the shallow basalt is probably to the overlying unconfined aquifer and the Columbia River. The discharge area(s) for the deep groundwater is currently uncertain, but flow is believed to be generally southeastward with discharge speculated to be south of the Hanford Site (DOE, 1986a).

Groundwater Quality: The groundwater composition is that of a dilute (less than or approximately 350 mg per L total dissolved solids) calcium-bicarbonate chemical type. Other principal chemical constituents include sulfate, silica, magnesium, and nitrate (the latter contributed through the disposal of chemical reprocessing waters).

Contamination of the groundwater is caused by releases from various liquid-waste disposal facilities. Nitrate and tritium contamination has migrated away from these sites in a general west-to-east direction. Some longer-lived radionuclides such as strontium-90 and cesium-137 have reached the groundwater, primarily through liquid-waste disposal cribs. Small quantities of longer-lived radionuclides have reached the water table via a failed groundwater monitoring well casing and through reverse well injection, a disposal practice which was discontinued at the Hanford Site in 1947 (DOE, 1995c).

Areal and stratigraphic changes in groundwater chemistry characterize basalt groundwaters beneath the Hanford Site (Graham et al., 1981). The stratigraphic position of these changes is believed to delineate flow system boundaries, and to identify chemical evolution taking place along groundwater flow paths. Overall, waters of the shallow basalts are of a sodium-bicarbonate chemical type, while those of the deep basalts are of a sodium-chloride chemical type (DOE, 1986a). Iodine-129 and tritium have been detected in confined groundwater in the Saddle Mountains Basalt beneath the Hanford Site (DOE, 1986a).

3.3.3.4 Meteorology

The Hanford Site is located in a semi-arid region of southeastern Washington State. A summary of the following data (through 1980) has been published (Stone et al., 1983).

Wind: Prevailing wind directions on the 200-Area Plateau are from the northwest in all months of the year. Monthly and annual joint frequency distributions of wind direction versus wind speed for the Hanford Meteorological Station have been recorded (Stone et al., 1983). Monthly average wind speeds are lowest during the winter months, averaging 10 to 11 km per hr (6.2 to 6.8 mph), and highest during the summer, averaging 14 to 16 km per hr (8.7 to 9.9 mph). High winds are also associated with thunderstorms. The average occurrence of thunderstorms is 10 per year. Although thunderstorms are most frequent during the summer, they have occurred in each month (DOE, 1995c). It is estimated that the probability of a tornado striking a point at the Hanford Site is 0.0000096 per year, or less than one in one-hundred thousand.

Temperature and Humidity: Diurnal and monthly averages and extremes of temperature, dew point, and humidity have been recorded (Stone et al., 1983). Ranges of daily maximum and minimum temperatures vary from normal maxima of 2°C (35.6°F) in early January to 35°C (95°F) in late July. The record maximum temperature is 46°C (114.8F), and the record minimum temperature is -32.8°C (-27.0°F). The annual average relative humidity at the Hanford Meteorological Station is 54 percent. It is highest during the winter months, averaging about 75 percent, and lowest during the summer, averaging about 35 percent.

Precipitation: Average annual precipitation at the Hanford Meteorological Station is 16 cm (6.3 in). Most of the precipitation occurs during the winter, with nearly half of the annual amount occurring in the months of November through February. Winter monthly average snowfall ranges from 0.8 cm (0.3 in) in March to 13.5 cm (5.3 in) in January. Snowfall accounts for about 38 percent of all precipitation during the months of December through February.

Atmospheric Dispersion: Good dispersion conditions associated with neutral and unstable stratification exist about 57 percent of the time during the summer.

Air Quality: Air quality in the vicinity of the Hanford Site is generally classified as quite good. Wind-eroded dust, resulting from plowed fields and arid terrain with sparse vegetation, is an occasional problem in the area. The atmospheric conditions that produce the dust are favorable to pollutant transport and diffusion.

3.3.3.5 Ecology

The Hanford Site is made up of relatively large, undisturbed (1,450 km^2, about 560 mi^2) expanses of shrub-steppe desert that contain numerous plant and animal species suited to the region's semi-arid environment. The Hanford Site consists of mostly undeveloped land, with facilities only occupying about 6 percent of the total available area. Most of the Hanford Site has not experienced tillage or livestock grazing since the early 1940's.

The Hanford Site vegetation has been characterized as a shrub-steppe (DOE, 1995c) with relatively low productivity. In the early 1800s, the dominant plant was the big sagebrush with an understory of perennial bunchgrasses, but with the advent of livestock and crop raising, the natural vegetation was overtaken by what is today the dominant plant, cheatgrass. Some planted trees exist and serve as nesting platforms for several species of birds, including hawks, owls, ravens, magpies, and great blue herons, and as night roosts for wintering bald eagles (Rickard and Watson, 1985). Today, the vegetation picture at the Hanford Site consists of eight major kinds of plant communities: sagebrush/bluebunch wheatgrass, sagebrush/cheatgrass or sagebrush/Sandberg's bluegrass, sagebrush-bitterbrush/cheatgrass, greasewood/cheatgrass-saltgrass, winterfat/Sandberg's bluegrass, thyme buckwheat/Sandberg's bluegrass, cheatgrass-tumble mustard, willow or riparian, spiny hopsage, and sand dunes. More than 600 species of plants have been identified at the Hanford Site (Sackschewsky et al., 1992). A distribution of the dominant plant communities is shown in Figure 3-62.

More than 300 species of terrestrial and aquatic insects have been found on the Hanford Site. Grasshoppers and darkling beetles are among the more conspicuous groups, and along with other species, are important in the food web of the local birds and mammals. Approximately 12 species of amphibians and reptiles are known to exist on the Hanford Site (Fitzner and Gray, 1991). The most abundant reptile is the side-blotched lizard, although short-horned and sagebrush lizards are also seen frequently. Also common are gopher snakes, yellow-bellied racers, the Pacific rattlesnake, toads, and frogs.

More than 125 species of birds have been identified on the Hanford Site (Rogers and Rickard, 1977). The horned lark and western meadowlark are the most abundant nesting birds in the shrub-steppe. The Hanford Site supports populations of chukar partridge, gray partridge, and sage grouse, with the greatest concentration in the Rattlesnake Hills. Wastewater ponds at the Hanford Site are important habitats for songbirds, shore birds, ducks, and geese. The most important waterfowl is the Canada goose. Hawks and owls use the Hanford Site as a refuge, especially during nesting (DOE, 1995c).

Approximately 39 species of mammals have been identified on the Hanford Site (Fitzner and Gray, 1991). Most are small and nocturnal. Of this group, the Great Basin pocket mouse is the most abundant, and others include the deer mouse, Townsend ground squirrel, pocket gopher, harvest mouse, Norway rat, sagebrush vole, grasshopper mouse, vagrant, Leasts chipmunk, and Merriam vole. Larger mammals include the mule deer and elk. The largest vertebrate predator inhabiting the Hanford Site is the coyote. A herd of wild, free-roaming elk is centered almost entirely on the Arid Lands Ecology Reserve, a part of the Hanford Site established as an environmental research study area in 1968.

The Columbia River is the dominant aquatic ecosystem, and the river supports a large and diverse community of plankton, benthic invertebrates, fish, and other communities. Plankton populations in the Hanford reach are influenced by communities that develop in the reservoir of upstream dams, with phytoplankton and zooplankton populations being largely transient, flowing from one reservoir to another. Phytoplankton species include diatoms, golden or yellow-brown algae, red algae, and dinoflagellates. Zooplankton populations in the Hanford reach of the Columbia are generally sparse. All major freshwater benthic taxa are represented in the river. Forty-three species of fish had been identified in the river (DOE, 1995c), and since then the brown bullhead has been collected, bringing the number to 44. Of these, the Chinook salmon, sockeye salmon, coho salmon, and steelhead trout use the river as a migration route to and from upstream spawning areas, and are of the greatest economic importance. Small spring streams contain diverse biotic communities and are extremely productive, consisting of dense blooms of watercress and aquatic insects. Temporary wastewater ponds and ditches on the Hanford Site develop riparian communities and become quite attractive to migrating birds in autumn and spring.

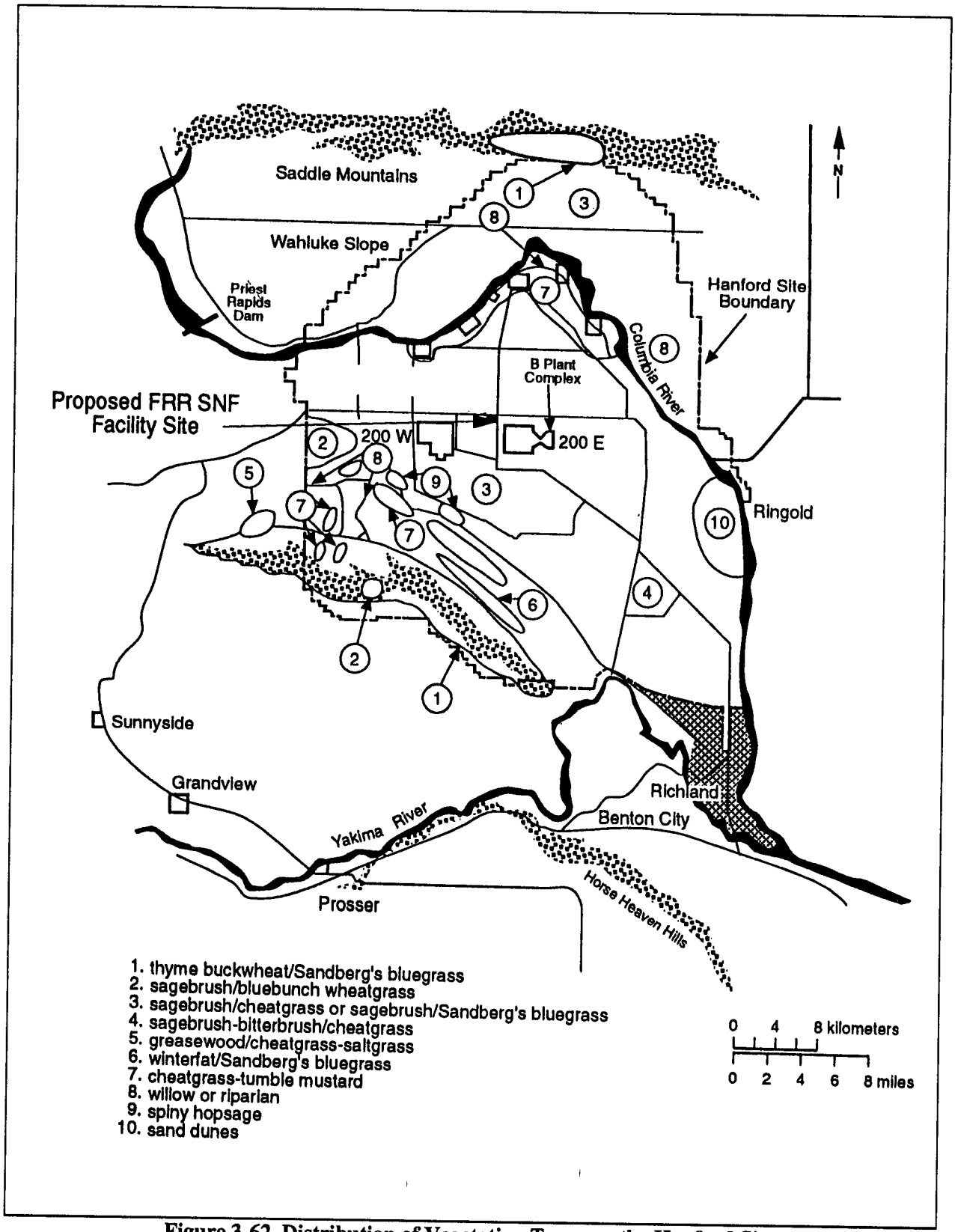


Figure 3-62 Distribution of Vegetation Types on the Hanford Site

Threatened, Endangered, and Candidate Plant and Animal Species: Threatened and endangered species, as listed by both the Federal Government and the State of Washington, are shown in Table 4.9-1 of Appendix A, Volume 1 of the Programmatic SNF&INEL Final EIS (DOE, 1995c). No plants or mammals on the Federal list are known to occur on the site. There are, however, several species of plants and animals that are under consideration for formal listing. Two species of plants are included in the State listing. Columbia milk-vetch, found on dry land benches along the river, is listed as threatened, and yellowcress, found on the wetted zone of the water's edge, is designated as endangered. The Federal Government lists the American peregrine falcon as endangered and the bald eagle as threatened. The State of Washington lists (in addition to the peregrine falcon and bald eagle) the white pelican and sandhill crane as endangered, and the ferruginous hawk as threatened. The peregrine falcon is a casual migrant to the Hanford Site and does not nest there. The bald eagle is a regular winter resident, foraging on dead salmon and waterfowl along the river, but not nesting on the Hanford Site. Ferruginous hawks have increasingly used power poles for nesting sites. Mammals considered endangered by the State are the pygmy rabbit, the Merriam shrew, the pallid bat, and the long-eared myotis.

Several small spring streams, wetlands, temporary water bodies, and national and State wildlife refuges are located on, or adjacent to, the Hanford Site.

3.3.3.6 Land Use

The Hanford Site encompasses 1,450 km^2 (560 mi^2), and includes several DOE operational areas. The major areas are:

- The entire Hanford Site, which has been designated a National Environmental Research Park;
- The 100 Areas, bordering on the right bank (south shore) of the Columbia River, which are the sites of the eight retired plutonium production reactors. The 100 Areas occupy about 11 km^2 (4.2 mi^2);
- The 200-West and 200-East Areas are located on a plateau about 8 and 11 km (5.0 and 6.8 mi), respectively, from the Columbia River. For some time, these areas have been dedicated to fuel reprocessing and waste processing management and disposal activities. The 200 Areas cover about 16 km^2 (6.2 mi^2);
- The 300 Area, located just north of the city of Richland, is the site of nuclear research and development and nuclear fuel fabrication. This area covers 1.5 km^2 (0.6 mi^2);
- The 400 Area covers about 0.6 km^2 (0.25mi^2) and is about 8 km (5 mi) north of the 300 Area and is the site of the Fast Flux Test Facility used in the testing of breeder reactor systems. Also included in this area is the Fuels and Material Examination Facility;
- The 600 Area includes all of the Hanford Site not occupied by the 100, 200, 300, or 400 Areas. Land uses within the 600 Area include:
  - The Arid Lands Ecology Reserve, a 310 km^2 (120 mi^2) tract set aside for ecological studies,
  - 4 km^2 (1.5 mi^2) leased by the State of Washington, part of which is used for low-level radioactive waste disposal,

- 4.4 km^2 (1.7 mi^2) for Washington Public Power Supply System nuclear power plants,
- 2.6 km^2 (1.0 mi^2) transferred to the State of Washington as a potential site for the disposal of nonradioactive hazardous wastes,
- About 130 km^2 (50 mi^2) under revocable use permit to U.S. Fish and Wildlife Refuge,
- 225 km^2 (87 mi^2) under revocable use permit to the Washington State Department of Game for recreational game management,
- Support facilities for the controlled access areas, and
- Laser Intercrometer Gravitational Wave Observatory.

Surrounding the Hanford Site, 660 km^2 (255 mi^2) have been designated for Arid Lands Ecology Reserve, U.S. Fish and Wildlife Refuge, and Washington State Department of Game (DOE, 1986a).

Land use in other areas includes urban and industrial development, irrigated and dry-land farming, and grazing. In 1985, wheat represented the largest single crop in terms of area planted in Benton and Franklin counties with 116,145 ha (287,000 acres). Corn, alfalfa, hay, and barley are other major crops in Benton and Franklin counties.

In 1986, the Columbia Basin Project, a major irrigation project to the north of the Tri-Cities (Richland, Pasco, and Kennewick), produced gross crop returns of $343 million, representing 19 percent of all crops grown in Washington State. In 1986, the average gross crop value per irrigated ha was $1,640 ($664 per irrigated acre). The largest percentages of irrigated acres produced alfalfa hay (29.4 percent of irrigated acres), wheat (15.0 percent), and corn (feed grain) (9.4 percent). Other significant crops are potatoes, apples, dry beans, asparagus, and pea seed.

3.3.3.7 Noise

Studies at the Hanford Site dealing with the propagation of noise have dealt primarily with occupational noise at work sites. Environmental noise levels have not been extensively evaluated because of the remoteness of most the Hanford activities, and isolation from receptors that are covered by Federal or State statutes. This discussion will focus on what little environmental noise data is available. The majority of available information consists of model predictions, which in many cases have not been verified, since these predictions indicate that the potential to violate Federal or State standards is remote or unrealistic.

The Noise Control Act of 1972 and its subsequent amendments (Quiet Communities Act of 1978, 42 USC 4901-4918, 40 CFR 201-211) directs the regulation of environmental noise to the State. The State of Washington has adopted RCW 70.107, which authorizes the Department of Ecology to implement rules consistent with Federal noise control legislation. RCW 70.107 and the implementing regulations embodied in WAC 173-60 through 173-70 define the regulation of environmental noise levels. Maximum noise levels are defined for the zoning of the area for the environmental designation for noise abatement. The Hanford Site is classified as a Class C environmental designation for noise abatement area on the basis of industrial activities. Unoccupied areas are also classified as Class C areas by default, because they

are neither Class A (residential) nor Class B (commercial). Maximum noise levels are established based on the environmental designation for noise abatement classification of the receiving area and the source area (DOE, 1995c).

3.3.3.8 Transportation

The Tri-Cities serve as a regional transportation and distribution center with major air, land, and river connections. The Tri-Cities area has direct rail service, provided by Burlington Northern and Union Pacific, which connects the area to more than 35 States (Figure 3-63). Union Pacific operates the largest fleet of refrigerated railcars in the United States, and is essential to food processors that ship frozen food from this area. Passenger rail service is provided by Amtrak, which has a station in Pasco.

The Hanford Site infrequently uses docking facilities at the ports of Benton on the Columbia River. No barge accidents were reported in 1988 (DOE, 1995c).

Daily air passenger and freight services connect the area with most major cities through the Tri-Cities Airport in Pasco. The airport is currently served by two commuter-regional and two national airlines. The main runway is 2,350 m (7,755 ft) in length, and can accommodate landings and takeoffs by medium-range commercial aircraft, such as the Boeing 727-200 and Douglas DC-9. Two additional airports, located in Richland and Kennewick, are limited to serving private aircraft.

The Tri-Cities are linked to the region by five major roads. Route 395 joins the area with Spokane to the northeast. Both route 395 and route 240, which crosses through the Hanford Site, connect with Interstate 90 to the north. Route 12 links the region with Yakima to the northwest, Lewiston, ID to the east, and Walla Walla to the southeast. Finally, the area is linked to Interstate 84 to the south, via Interstate 82 and Route 14. Routes 240 and 24 traverse the Hanford Site and are maintained by the State of Washington. Other roads within the Hanford Site are maintained by DOE.

3.3.3.9 Socioeconomics

The level of operations at the Hanford Site plays a dominant role in the socioeconomics of the Tri-Cities and other parts of Benton and Franklin counties. The agricultural community also has a significant effect on the local economy. Any major changes in the Hanford Site operations will affect the Tri-Cities and other areas of Benton and Franklin counties.

Three major sectors have been the principal driving forces of the economy in the Tri-Cities since the early 1970's: (1) DOE and its contractors operating the Hanford Site, (2) Washington Public Power Supply System in its construction and operation of nuclear power plants, and (3) the agricultural community, including a substantial food processing component. Most of the goods and services produced by these sectors are exported outside the Tri-Cities. In addition to direct employment and payrolls, these major sectors also support a sizable number of jobs in the local economy through their procurement of equipment, supplies, and business services. Three other components can be identified a contributors to the economic base of the Tri-Cities economy. These include other employers, such as: (1) Siemens Nuclear Power Corporation in North Richland, (2) Sandvik Special Metals in Kennewick, and (3) Boise-Cascade's Wallula corrugated paper mill, tourism, and Government transfer payments in the form of pension benefits.

The Hanford Site dominates the local employment picture with more than one-quarter of the total nonagricultural jobs in Benton and Franklin counties (15,552 out of 64,300), so the Hanford Site payroll impacts the Tri-Cities and State economy. In 1991, the Hanford Site employment accounted directly for

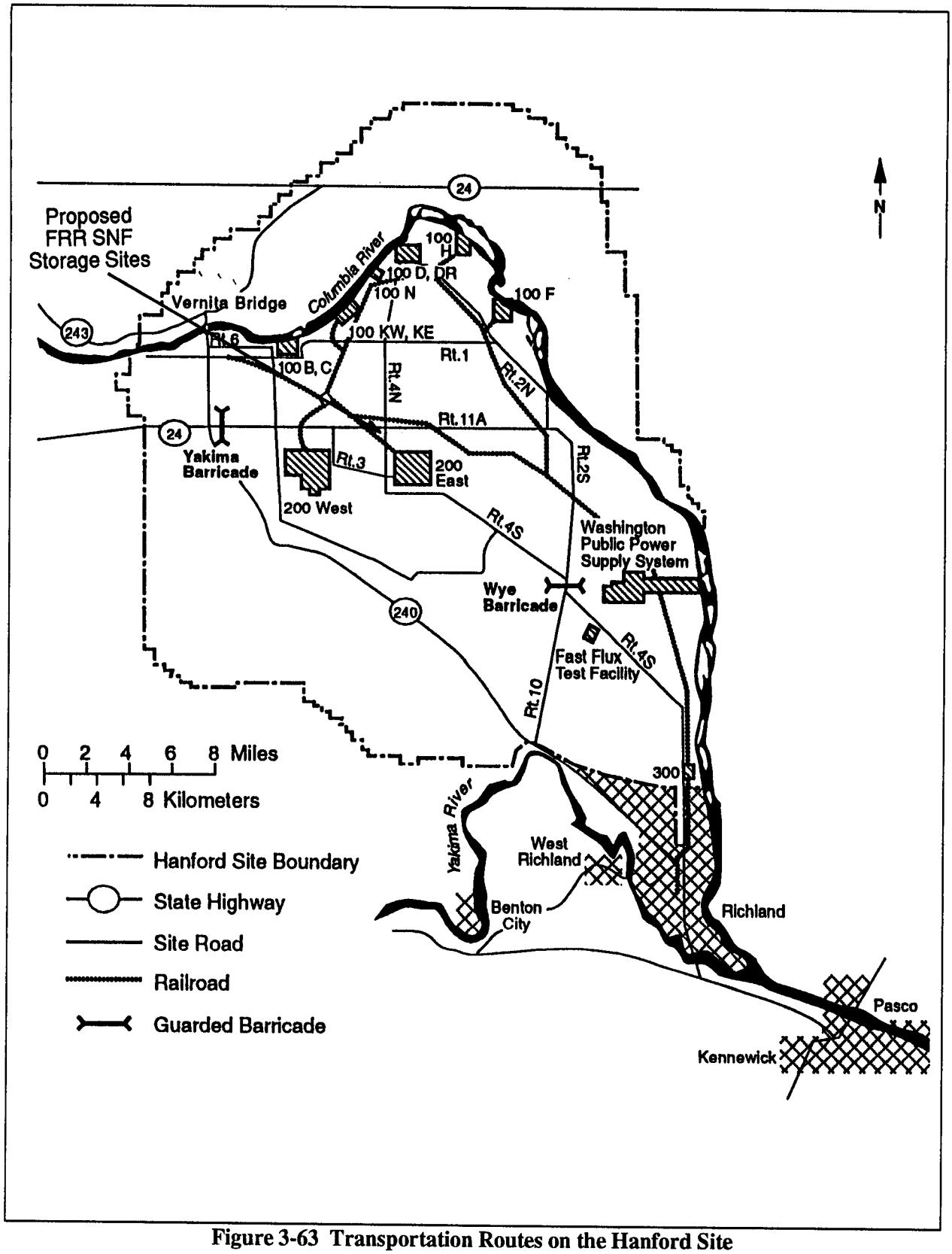


Figure 3-63 Transportation Routes on the Hanford Site

24 percent of total nonagricultural employment in Benton and Franklin counties, and slightly more than 0.6 percent of all nonagricultural Statewide jobs. In 1991, the Hanford Site operations directly accounted for an estimated 42 percent of the payroll dollars earned in the area.

The Washington Public Power Supply System continues to be a major employer in Richland, with more than 1,700 workers and an approximate $71.6 million in payroll during the year. In 1990, agriculture was responsible for nearly 12,900 jobs, nearly 17 percent of total employment. This includes about 2,200 farm proprietors accounting for $121 million in crop and livestock production which provides 7,600 wage and salary jobs, and "agri-business" (farm and ranch supporting activities such as application of fertilizers, sales of farm supplies and equipment, etc.) accounting for 900 jobs. Employment in the food processing sector included 20 food processors producing potato products, canned fruits and vegetables, wine, and animal feed.

Other major employers include about 3,500 workers in Benton and Franklin counties. Tourism has increased in the area, and overall tourism expenditures in the Tri-Cities were roughly $77.5 million in 1990. In 1990, 15,903 people over the age of 65 resided in Benton and Franklin counties. This segment of the population supports the local economy on the basis of income received from Government transfer payments and pensions, private pension benefits, and prior individual savings. A summary of estimated major Government pension benefits received by the residents of Benton and Franklin counties in 1990 is shown in Table 4.3-7 of Appendix A, Volume 1 of the Programmatic SNF&INEL Final EIS (DOE, 1995c). The estimated income of this component of the basic sector is roughly equivalent to the entire agricultural sector.

Estimates by the U.S. Bureau of the Census for 1990 place Benton and Franklin counties' population totals at 112,560 and 37,473, respectively. Within each county, the 1990 estimates distribute the Tri-Cities population as follows: Richland, 32,315; Kennewick, 42,159; and Pasco, 20,337. The 1990 estimates of racial categories by the Bureau of the Census indicate that in Benton and Franklin counties, Asians represent a lower proportion, and individuals of Hispanic origin represent a higher proportion of the racial distribution than those in the State of Washington. Fifty-six percent of the population of Benton and Franklin counties is under the age of 35, compared to 54 percent for the State of Washington, and the 65-yr-old and older group constitutes 10 percent of the population, compared to 12 percent for the State.

Social and economic impacts of the Hanford Site operations are concentrated in Benton County, Franklin County, and the Tri-Cities area made up of Pasco, Richland, and Kennewick. The region of influence for the Hanford Site is represented by the 80 km (50 mi) radius around the site. Figure 3-64 represents the general ethnic characteristics of the population within the 80 km (50 mi) radius. Low income data for the region of influence is shown in Figure 3-65. A low-income household is one with an income of 80 percent or lower than the median income of the county. Approximately 42 percent of the households in the region of influence are low income families.

In 1990, nearly 92 percent of all housing (38,781 total units) in the Tri-Cities was occupied. Single-unit housing, which represents nearly 58 percent of the total units, has a 96 percent occupancy rate. Multiple-unit housing has an occupancy rate of nearly 91 percent. Pasco has the lowest occupancy rate, 89 percent in all categories of housing, followed by Kennewick (93 percent) and Richland (94 percent). Representing nine percent of the housing unit types, mobile homes have an 81 percent occupancy rate.

Primary and secondary education are served by the Richland, Kennewick, Pasco, and Kiona-Benton school districts. In 1992, spring enrollment for all districts was approximately 24,876 students. Post-secondary education in the Tri-Cities area is provided by a junior college, Columbia Basin College, and the Tri-Cities branch campus of Washington State University.

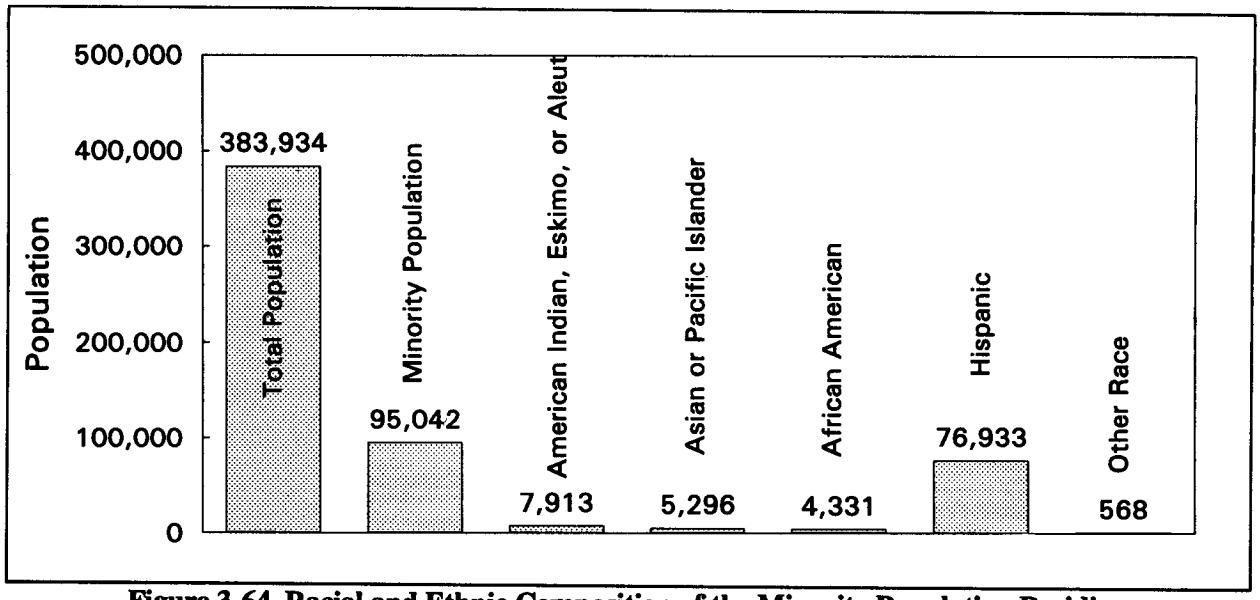


Figure 3-64 Racial and Ethnic Composition of the Minority Population Residing within 80 km (50 mi) of the Hanford Site

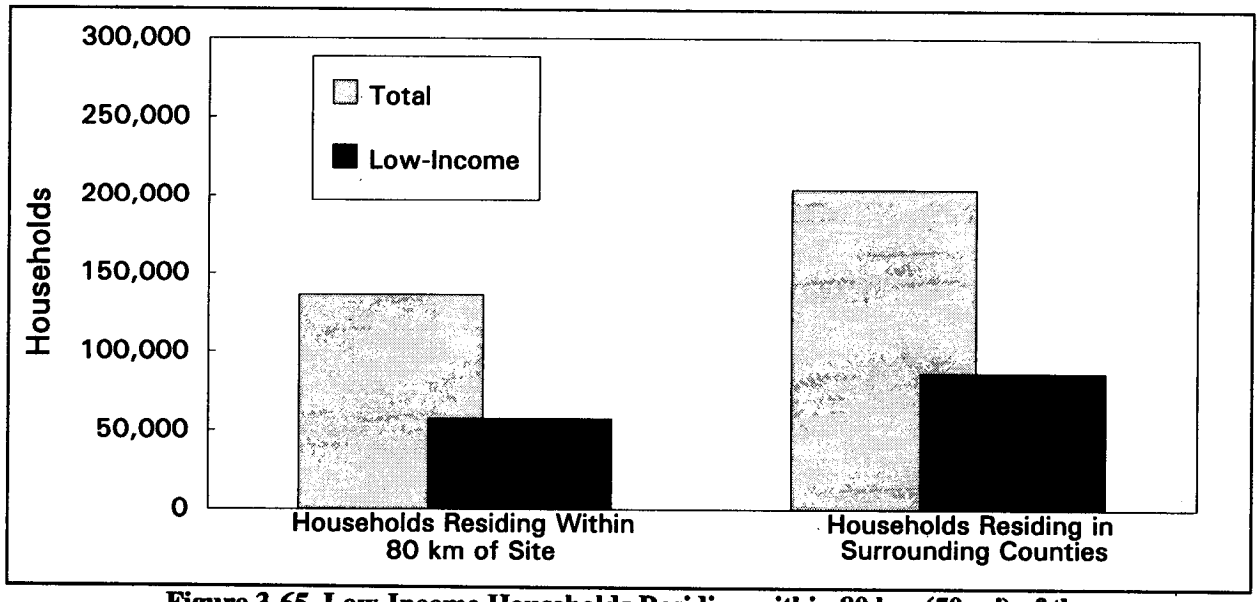


Figure 3-65 Low-Income Households Residing within 80 km (50 mi) of the Hanford Site

The Tri-Cities have three major hospitals and four minor emergency centers. Kadlec Medical Center, located in Richland, has 136 beds and functions at an average of 39.5 percent capacity. Kadlec Medical Center's 5,754 annual admissions represent more than 42 percent of the Tri-Cities market. Kennewick General Hospital maintains an average 45.5 percent occupancy rate of its 71 beds with 3,619 admissions. Our Lady of Lourdes Hospital, located in Pasco, reports an average occupancy rate of 36.5 percent.

Police and fire protection in Benton and Franklin counties is provided by Benton and Franklin county sheriff's departments, local municipal police departments, and the Washington State Patrol Division, headquartered in Kennewick. The Hanford Fire Patrol is composed of 126 trained firefighters.

The principal source of water in the Tri-Cities and the Hanford Site is the Columbia River, from which the water systems of Richland, Pasco, and Kennewick draw a large portion of the average 43 billion liters (11.4 billion gal) used in 1991. Electricity is provided by the Benton County Public Utility District, Benton Rural Electric Association, Franklin County Public Utility District, and city of Richland Energy Services Department. In the Pacific Northwest, hydropower, and to a lesser extent, coal and nuclear power, constitute the region's electrical generation system. Throughout the 1980's, the Northwest had more electric power than it required, and was operating at a surplus. This surplus has been exhausted, and there is only approximately enough power supplied by the existing system to meet the current electricity needs.

3.3.3.10 Historical, Archaeological, and Cultural Resources

The Hanford Site is rich in cultural resources, and contains numerous well-preserved archaeological sites representing both prehistoric and historical periods. The area is considered a homeland by many Native Americans.

More than 10,000 years of prehistoric human activity in the Middle Columbia River region have left extensive archaeological deposits along river shores (DOE, 1995c) and well-watered areas inland from the river (DOE, 1995c; Greene, 1975;). Graves are common in various settings, and spirit quest monuments are found on high, rocky summits (Rice, 1968). By virtue of their inclusion in the Hanford Site, from which the public is restricted, archaeological deposits found in the Hanford reach of the Columbia River, on adjacent plateaus, and mountains have been spared some of the disturbances that have befallen other sites.

There are currently 248 prehistoric archaeological sites recorded in the files of the Washington State Office of Archaeology and Historic Preservation. Forty-seven of these sites are included on the National Register of Historic Places, two as single sites (45BN121, the Hanford Island Site; 45GR137, Paris Site), and the rest in seven archaeological districts. In addition, a nomination has been prepared for one cultural district (Gable Mountain/Gable Butte), and a renomination for two additional archaeological districts is pending (Wahluke, Coyote Rapids). Two other sites, 45BN90 and 45BN412, are considered eligible for the National Register. Archaeological sites include remains of numerous pithouse villages, various types of open campsites, and cemeteries along the riverbanks (DOE, 1995c), spirit quest monuments, hunting camps, game drive complexes and quarries in mountains and rocky bluffs, hunting/kill sites in lowland stabilized dunes, and small temporary camps near perennial sources of water located away from the river (Rice, 1968).

Native American people of various tribal affiliations have populated the Hanford reach of the Columbia River since prehistoric and early historic times. Wanapums and Yakama people of the Chamnapum band, and some of their descendants still live nearby, while others have been incorporated into the Yakama and Umatilla Reservations. Palus people, who lived on the lower Snake River, joined the Wanapum and Chamnapum to fish the Hanford reach and inhabited the river's west bank (DOE, 1995c). Walla Walla and Umatilla people also made periodic visits to the area to fish. These groups retain traditional and secular ties to the region, with native plant and animal foods, some found on the Hanford Site, being used in ceremonies. Certain landmarks, especially Rattlesnake Mountain, Gable Mountain, Gable Butte, Goose Egg Hill and others along the river are considered sacred. The many cemeteries found along the river are considered sacred by these groups.

Two hundred-two historic archaeological sites and 11 other historic localities have been recorded in the published literature. Localities include the Allard Pumping Plant at Coyote Rapids, the Hanford Irrigation Ditch, the Hanford townsite, Wahluke Ferry, the White Bluffs townsite, the Richmond Ferry, Arrowsmith

townsite, a cabin at East White Bluffs ferry landing, the White Bluffs road, the old Hanford high school, and the Cobblestone Warehouse at Riverland (DOE, 1995c). In addition to recorded sites, numerous data from additional unrecorded sites, including homesteads, corrals, and dumps, have been recorded by the Hanford Cultural Resources Laboratory since 1987. The 100-B Reactor has been listed on the National Register of Historic Places. Other Manhattan Project facilities remain to be evaluated.

3.3.4 Description of the Affected Environment at the Oak Ridge Reservation

The Oak Ridge Reservation is a key DOE site hosting three separate facilities with missions including basic and applied research and development; storage of special nuclear materials; weapons dismantlement, storage, and evaluation; and environmental restoration and waste management. The site is operated for DOE by Martin Marietta Energy Systems. This section describes the potentially affected environment at the Oak Ridge Reservation.

3.3.4.1 Geology

The Oak Ridge Reservation lies within the western portion of the Valley and Ridge Province, near the boundary with the Cumberland Plateau, in the State of Tennessee (Figure 3-66). The Valley and Ridge Province is characterized by numerous linear ridges and valleys that trend approximately southwest-northeast. A generalized geologic map of the Oak Ridge Reservation is shown in Figure 3-67. The Oak Ridge Reservation is mostly underlain by the Rome Formation and Conasauga, Knox, and Chickamauga Groups, sedimentary rocks of Cambrian and Ordovician age. A detailed description of these formations is given in the Programmatic SNF&INEL Final EIS (DOE, 1995c).

Sinkholes, large springs, caves, and other karst features are common in the Knox Group, and those parts of the Oak Ridge Reservation underlain by limestones and dolomites are classified as karst terrains. Although no site-specific geologic characterization has been conducted at the West Bear Creek Valley site, it appears that the proposed site for the construction of a foreign research reactor spent nuclear fuel storage facility is located over the lower Conasauga Group strata not normally characterized by karst development.

The soils found in the Oak Ridge Reservation vicinity generally contain clay minerals, chert, and quartz sand (Hatcher et al., 1992). Soils on the Oak Ridge Reservation tend to retain moisture, and are typically 90 percent saturated below a depth of 3 m (10 ft) (Ketelle and Huff, 1984). Depth of soil profiles on the Oak Ridge Reservation vary from 15 cm (5.9 in) on slopes, to 18 m (60 ft) over dolomites in the Knox Group (Boyle et al., 1982).

3.3.4.2 Seismology and Volcanology

The Oak Ridge Reservation is located in a region of moderate seismic activity, having an average of one to two earthquakes per year, with seismic activity occurring in bursts followed by long periods of inactivity. From 1811 to 1975, only five major earthquakes or earthquake series have affected the Oak Ridge Reservation area. No deformation of recent surface deposits has been detected, and seismic shocks from the surrounding, more seismically active areas, are dissipated by distance from the epicenters (Boyle et al., 1982). During the 1811 to 1975 period, none of the earthquakes were of a magnitude that caused severe damage to buildings or structures.

The underlying structure of the Oak Ridge Reservation is complex due to the extensive faulting and deformation characteristic of the region. There are three regional thrust faults in the Oak Ridge Reservation area, the Kingston, Whiteoak Mountain, and Copper Creek Faults. All three strike to the

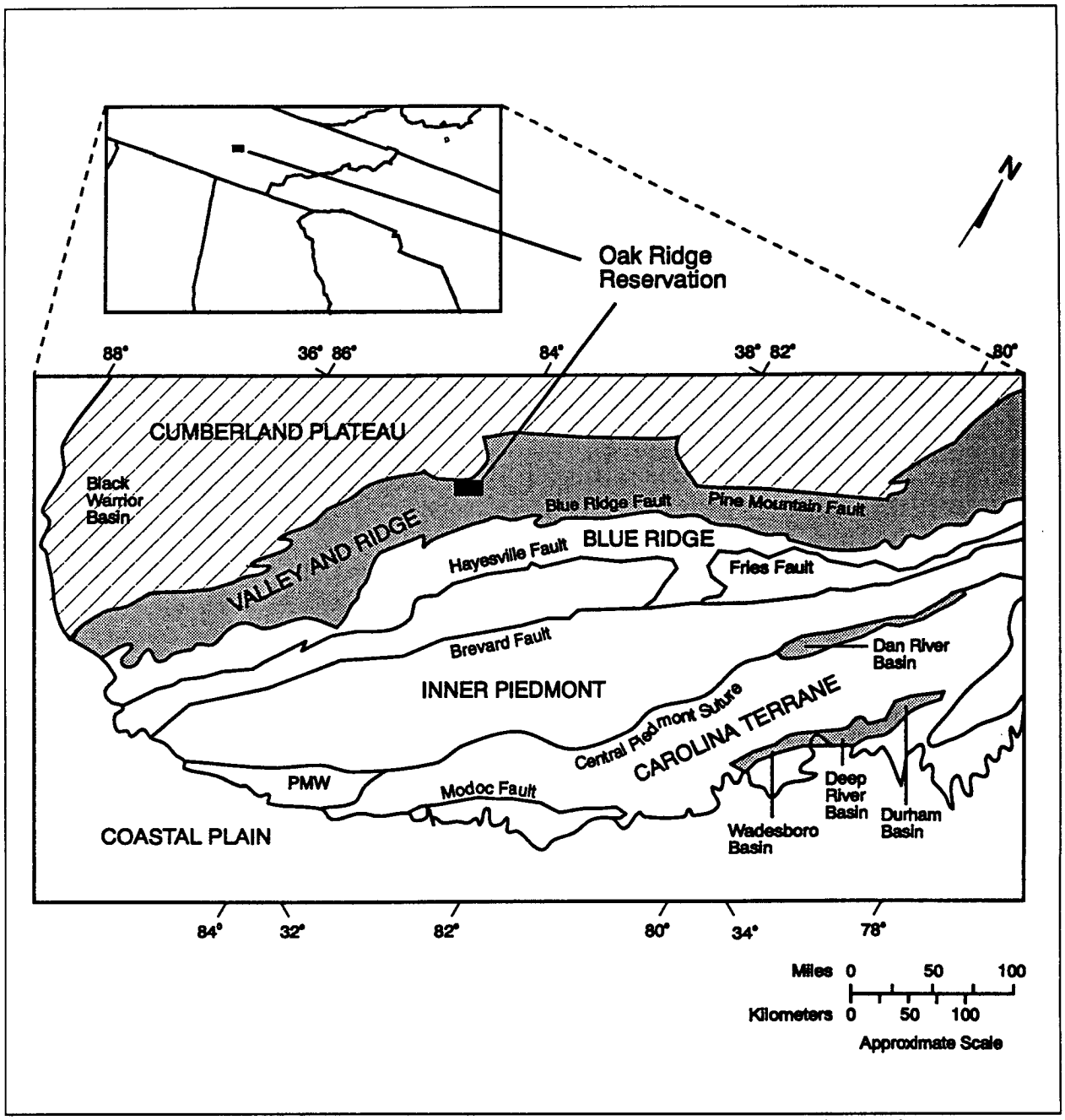


Figure 3-66 Generalized Map of the Southern Appalachian Geologic Provinces Showing the Location of the Oak Ridge Reservation

northeast and dip to the southeast. The most recent movement on the faults was during the Late Pennsylvanian/Early Permian periods (280 to 290 million years ago), and consequently, the faults are not considered to be capable at present (Butz, 1984).

There is no evidence that there has been significant volcanic activity in the vicinity of the Oak Ridge Reservation for more than 1 million years (DOE, 1995c). Three studies conducted specifically for the Oak Ridge Reservation have been summarized (Beavers et al., 1982).

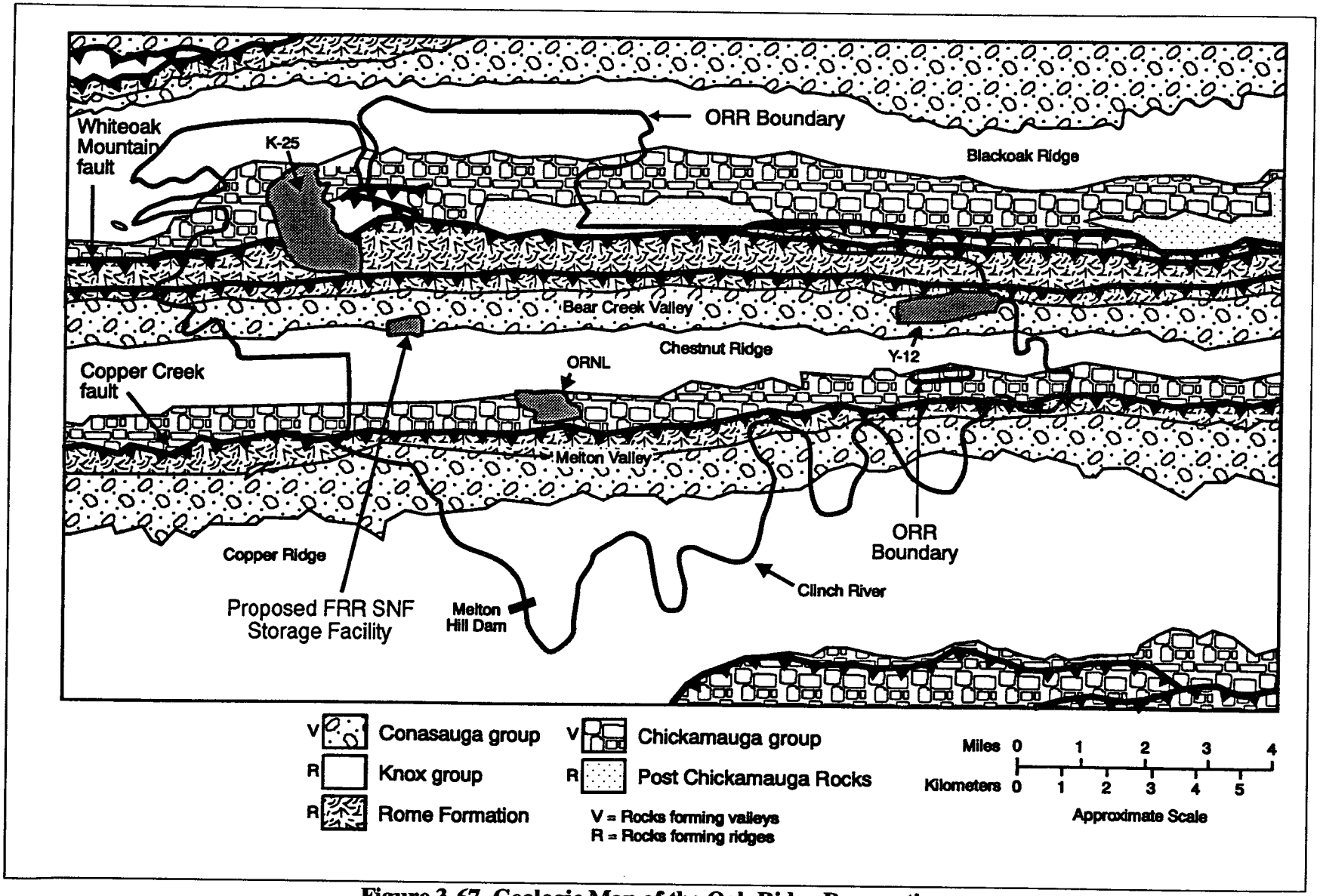


Figure 3-67 Geologic Map of the Oak Ridge Reservation

3.3.4.3 Hydrology

3.3.4.3.1 Surface Water

The hydrologic system on the Oak Ridge Reservation is controlled by the Clinch River (MMES, 1993a). Its drainage area is about 11,422 km^2 (4,410 mi^2) (Boyle et al., 1982). All water that drains from the Oak Ridge Reservation enters the Clinch River, and subsequently the Tennessee River. Flow in the Clinch-Tennessee river system is regulated by multi-purpose dams of the Tennessee Valley Authority.

The Oak Ridge Reservation is drained by a network of tributaries of the Clinch River. A Statewide stream classification system based on water quality, water use, and resident aquatic biota designates most streams on the Oak Ridge Reservation for fish and aquatic life, irrigation and livestock watering (MMES, 1993b). The drainage pattern on the Oak Ridge Reservation is a weakly developed "trellis" pattern (Lee and Ketelle, 1987), and the surface drainage patterns are also affected by karst topography.

Heavy precipitation in the area causes localized flooding, primarily in the city of the Oak Ridge (MMES, 1993a) and along the Clinch River. Figure 3-68 shows approximate 500-yr floodplains. A number of wetlands occur on the Oak Ridge Reservation (MMES, 1993b), including characteristic forested wetlands along creeks, wet meadows and marshes associated with streams and seeps, and emergent communities in shallow embayments and ponds.

Surface Water Quality: Water quality in the Clinch River is affected by the Oak Ridge Reservation activities, by contaminants introduced upstream from the Oak Ridge Reservation, and by flow regulation at the Tennessee Valley Authority dams. Stream impoundment has resulted in a rise in water temperatures, sediment retention, and contaminant adsorption.

The Clinch River supplies most of the water to the Oak Ridge Reservation, the city of Oak Ridge, and other cities along the river (MMES, 1993a). Major water uses in the Oak Ridge area include withdrawals for industrial and public water supplies, commercial and recreational navigation, and other recreational activities such as fishing, boating and swimming. Water for the city of Oak Ridge is withdrawn upstream from any of the Oak Ridge Reservation discharge points. Five public water supplies, including the cities of Kingston and Harriman, TN, are located downstream of the Oak Ridge Reservation (MMES 1993a). These are located 4 km (2.5 mi) above and 34 km (21 mi) below the mouth of Poplar Creek, respectively.

3.3.4.3.2 Groundwater

Groundwater beneath the Oak Ridge Reservation is heavily influenced by the site geologic structure (Solomon et al., 1992). Geologic units of the Oak Ridge Reservation are assigned to two broad hydrologic groups, Knox Aquifer and the Oak Ridge Reservation aquitards. These aquitards may store fairly large volumes of water, but they transmit only limited amounts.

The Knox Aquifer is the only true aquifer of the Oak Ridge Reservation, and is the primary source of sustained natural flow in perennial streams (Solomon et al., 1992). Flow volumes and potential groundwater flow path length in the Knox Aquifer are greater than in the aquitard. No spent nuclear fuel management facilities would be sited in areas overlying the Knox aquifer.

Recently published reports such as "Status Report; A Hydrologic Framework for the Oak Ridge Reservation", and "Status Report on the Geology of the Oak Ridge Reservation" have all used the term "aquitard" to describe the Pumpkin Valley Shale and a number of the other geologic units beneath the Oak Ridge Reservation. No site-specific data are available to determine at what depth Pumpkin Valley Shale is

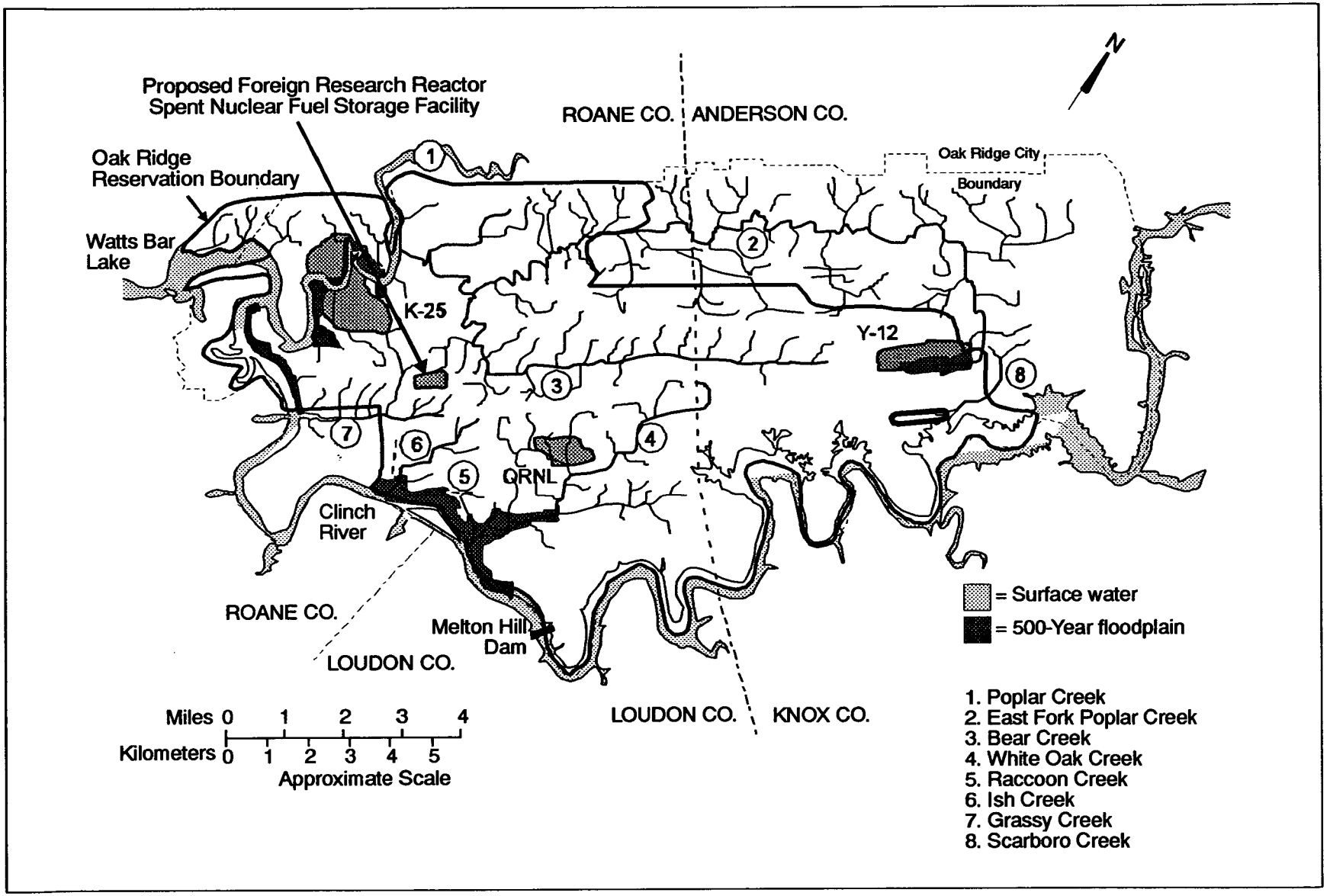


Figure 3-68 Locations of the Clinch River and Tributaries on the Oak Ridge Reservation

encountered at the West Bear Creek Valley, the proposed site for the construction of foreign research reactor spent nuclear fuel storage facilities. It would be logical, however, to think that at depths of 18 m (60 ft) or less on the site, the water-bearing unit most likely to be encountered would be an aquitard (DOE, 1995c).

Groundwater Quality: Background groundwater quality at the Oak Ridge Reservation is generally good in the surficial aquifer zones, and poor in the bedrock aquitards at depths greater than 305 m (1,000 ft) (DOE, 1993d). Groundwater has been contaminated downgradient from waste management facilities and other industrial sources, and discharge of contaminated groundwater has introduced contaminants to streams. Principal groundwater contaminants that exceed applicable standards at the Y-12 Plant include volatile organics, nitrates, heavy metals, and radioactivity (MMES, 1993b). There is one known instance of offsite migration of contaminants from the Oak Ridge Reservation. In 1994, DOE announced that elevated levels of four industrial solvents (carbon tetrachloride, chloroform, tetrachloroethylene, and trichloroethylene) had been detected in the Knox Aquifer monitoring wells east of the Y-12 Plant (Bowdle, 1994). The same solvents are found in groundwater monitoring wells within the Y-12 Plant.

There are no sole-source aquifers beneath the Oak Ridge Reservation (DOE, 1993d). Water rights are not an issue in the region. All groundwater at the Oak Ridge Reservation is classified as Class II (current and potential sources of drinking water and those waters having other beneficial uses).

Although surface water sources provide the main portion of potable water supplies in the area, groundwater does provide for some domestic, municipal, farm, irrigation, and industrial use (MMES, 1993b). Single-family wells are common in areas not served by public water supplies (MMES, 1992). Due to the abundance of surface water and its proximity to the points of use, almost no groundwater is used at the Oak Ridge Reservation (DOE, 1993d).

3.3.4.4 Meteorology

The Oak Ridge Reservation is located within the Great Valley of Tennessee, in which Cumberland Plateau borders to the northwest and the Great Smoky Mountains lie to the southeast. The climate at the Oak Ridge Reservation is influenced by these terrain features.

Wind: The wind direction above the ridgetops and within the valleys tends to follow the orientation of the valleys. The prevailing wind direction is from the southwest, with a secondary maximum from the northeast during the winter, spring, and summer months. This situation is reversed in the fall. Damaging winds are uncommon in the region. Peak gusts recorded in the Great Valley are generally in the 27 to 31 m per sec (60 to 70 mph) range for the months of January through July, in the 22 to 27 m per sec (50 to 60 mph) range for August, September, and December, and in the 16 to 20 m per sec (36 to 45 mph) range in October and November.

Temperature and Humidity: The average daily temperature at the Oak Ridge National Weather Service Station was 14.2°C (57.6°F) for the period of record 1961-1990. The average daily temperature varied from a low of 2.6°C (36.7°F) in January to a high of 24.8°C (76.6°F) in July. The mean relative humidity was 86 percent, with the mean monthly maximum of 92 percent occurring in July and August, and the mean monthly minimum of 80 percent occurring during February and March.

Precipitation: Winter is the wettest of the seasons in the Oak Ridge Reservation area, March and December are the wettest months, and October is the driest. The maximum monthly precipitation was 48.9 cm (19.3 in) in July, while maximum rainfall in a 24-hr period observed at the Oak Ridge National Weather Service was 19 cm (7.5 in), recorded in August 1960 (DOE, 1995c). The annual average precipitation reported by the National Weather Service for the Oak Ridge was 137.2 cm (54 in).

On average, about 51 thunderstorm days per year are recorded at the Oak Ridge National Weather Service station. The Great Valley of Tennessee is infrequently subject to tornadoes. The western half of the State has experienced three times as many tornadoes as the eastern half, where the Oak Ridge Reservation is located. The Oak Ridge Reservation did experience a tornado from a severe thunderstorm on February 21, 1993. The tornado path passed the Y-12 Plant in an east-northeast direction for approximately 21 km (13 mi), ending just north of Knoxville. The wind speeds associated with this tornado ranged from 18 m per sec (40 mph) to nearly 58 m per sec (130 mph), depending on the location along the path (DOE, 1993c). Hurricanes are rarely sustained once they reach as far inland as the Great Valley, due to the rapid loss of energy.

Atmospheric Dispersion: The transport and dispersion of airborne material are direct functions of air movement. The atmospheric conditions are unstable (Stability Classes A through C) approximately 5 percent of the time, neutral (Class D) approximately 43 percent of the time, and stable (Classes E through G) approximately 52 percent of the time at the 10 m (33 ft) level.

Air Quality: A summary of the Oak Ridge Reservation airborne radionuclide emissions for 1992 is presented in Table 4.7-1 of Appendix F, Volume 1 of the Programmatic SNF&INEL Final EIS (DOE, 1995c). The maximum effective dose equivalent at the Oak Ridge Reservation boundary is 3.3 mrem as calculated by the GENII code. This is 33 percent of the National Emissions Standards for Hazardous Air Pollutants.

The Oak Ridge Reservation is located in Anderson and Roane Counties in the Eastern Tennessee-Southwestern Virginia Interstate Air Quality Control Region 207. As of 1993, the areas within this Air Quality Control Region were designated as attainment with respect to all National Ambient Air Quality Standards (40 CFR 81.343).

3.3.4.5 Ecology

Land for the Oak Ridge Reservation was primarily in agricultural use, including woodlots and woodlands used for pasture, at the time of acquisition by DOE's predecessor agencies. At least half of the Oak Ridge Reservation was forested. Most of the forest had been partially cut for timber, but not completely cleared on steep slopes. Natural plant communities have re-established themselves on most of the Oak Ridge Reservation, although many areas are maintained as pine plantations or nonforested areas (ORNL, 1988). Approximately 10 percent of the Oak Ridge Reservation has been developed since it was withdrawn from public access, and the remainder of the site has reverted to or been planted with natural vegetation (MMES, 1989).

The vegetation of the Oak Ridge Reservation has been categorized into seven plant communities (Parr and Pounds, 1987). The Oak Hickory forest is one of the most extensive plant communities on the Oak Ridge Reservation. Another abundant plant community is the Pine Hardwood forest and Pine plantations. A total of 899 species, subspecies, and varieties of plants have been identified on the Oak Ridge Reservation (Cunningham and Pounds, 1991). The Oak Ridge Reservation also provides habitat for a large number of animal species. Twenty-six species of amphibians, 33 species of reptiles, 169 species of birds, and 39 species of mammals have been recorded at the Oak Ridge Reservation (Parr and Evans, 1992).

Vegetative communities of the West Bear Creek site are typical of the Oak Ridge Reservation as a whole, composed of second-growth oak-hickory forest and mixed pine-hardwood forest. There are some loblolly pine plantations adjacent to the northern edge of the powerline right-of-way and between the right-of-way and Bear Creek Road (Rosensteel, 1994). Fauna of the site would also be similar to those expected throughout the Oak Ridge Reservation.

Wetlands on the Oak Ridge Reservation include emergent, scrub/shrub, and forested wetland located in embayments of the Melton Hill and Watts Bar Reservoirs that border the Oak Ridge Reservation, along all the major streams, including East Fork Poplar Creek, Poplar Creek, Bear Creek, and their tributaries, in old farm ponds, and around groundwater seeps. Originating on the lower slopes of Pine Ridge are several headwater tributary systems on Grassy Creek that flow from north to south across the West Bear Creek site. The stream valleys contain forested wetlands.

Aquatic habitats on or adjacent to the Oak Ridge Reservation range from small, free-flowing streams in undisturbed watersheds to larger streams with altered flow patterns due to dam construction. These aquatic habitats include tailwaters, impoundments, reservoir embayments, and large and small perennial streams.

A National Environmental Research Park Aquatic Reference Area is located along Grassy Creek and its tributaries, one of which runs through the eastern portion of the proposed spent nuclear fuel management site. Grassy Creek has a diverse assemblage of invertebrates and fish species for a stream its size. The Oak Ridge Reservation uses Grassy Creek as a reference area for studies of other streams affected by site development (Pounds et al., 1993).

Threatened, Endangered, and Candidate Plant and Animal Species: No animal species listed by the Federal Government as threatened or endangered are known to reside on the Oak Ridge Reservation (Kroodsma, 1987). The bald eagle is a winter visitor to Watts Bar Lake and Melton Hill Lake. None of the species listed in Table 4.9-1 of Appendix F, Volume 1 of the Programmatic SNF&INEL Final EIS have been recorded on the proposed West Bear Creek Valley site (DOE, 1995c). Table 4.9-1 of Appendix F, Volume 1 of the Programmatic SNF&INEL Final EIS lists Federally and State-listed threatened, endangered or other special-status species designated by the Endangered Species Act and/or the State's Nongame and Endangered Species and the Rare Plant Protection and Conservation laws (DOE, 1995c). Preferred habitat within the site indicates a greater potential for occurrence of the barn owl, black vulture, Cooper's hawk, red-shouldered hawk, and sharp-shinned hawk (DOE, 1995c). No intensive threatened and endangered species surveys have been completed for the site, but they are currently in progress for the entire the Oak Ridge Reservation (King et al., 1994).

3.3.4.6 Land Use

The Oak Ridge Reservation occupies an area of approximately 14,029 ha (34,667 acres) in eastern Tennessee, in a predominantly rural area about 40 km (25 mi) west of Knoxville. The Oak Ridge Reservation is within the jurisdictional boundaries of the city of Oak Ridge, and also lies within Roane and Anderson Counties (MMES, 1989).

Land use activities at the Oak Ridge Reservation have historically occurred within the boundaries of the three main plant sites (Y-12, the Oak Ridge National Laboratory, and K-25). The Oak Ridge Reservation has been used by research institutions, universities, and Government agencies as a site for the study of terrestrial ecology, aquatic ecology, forestry, and agriculture. Land uses bordering the Oak Ridge Reservation are primarily forest and agricultural. Residential and commercial are the only other significant uses of land in the vicinity, and occur along the northeast and northwest boundaries of the Oak

Ridge Reservation in the city of Oak Ridge. Figure 3-69 shows the land use in and around the Oak Ridge Reservation. The entire Oak Ridge Reservation has been placed under the forestry, agriculture, industry, and research zoning classification by the city of Oak Ridge. This classification does not bind DOE land use decisions on the site.

The region surrounding the Oak Ridge Reservation has numerous local, State, and national public recreation areas. Several lakes exist within the region surrounding the Oak Ridge Reservation, offering year-round recreational activities such as fishing and boating. The Oak Ridge Reservation is a controlled area, with public access limited to through traffic on Tennessee State Routes 95, 58, 62, 162, and 170 (MMES, 1991). There are no onsite areas that are subject to Native American Treaty rights or that contain any prime or unique farmland.

3.3.4.7 Noise

The major noise sources within the Oak Ridge Reservation occur primarily in developed operational areas and include various facilities, equipment, and machines. Major noise sources outside the operational areas consist primarily of vehicles and railroad operations. At the site boundary, noise from these sources would be barely distinguishable from background noise levels. The State of Tennessee has not established specific numerical environmental noise standards applicable to the Oak Ridge Reservation. The acoustic environment along the Oak Ridge Reservation site boundary is typical of a rural location, with the average soundlevel in the range of 35 to 50 decibels, A-weighted.

3.3.4.8 Transportation

The region of influence for the Oak Ridge Reservation includes site roads and regional roads up to approximately 24 km (15 mi) in Anderson, Blount, Knox, Loudon, and Roane counties. Primary roads on the Oak Ridge Reservation include Tennessee State Routes 95, 58, 62, 162, and 170 (Bethel Valley Road), and Bear Creek Road. Except for Bear Creek Road east of Route 95, all are public roads. The remaining roads on the Oak Ridge Reservation are private. Interstates 75 and 40, and Tennessee State Routes 162, 62, and 61 form a loop around the Oak Ridge Reservation (Figure 3-70).

Current baseline traffic (i.e., 1994) along segments providing access to the Oak Ridge Reservation is projected to contribute to differing service level conditions (TDOT, 1991). Tennessee State Route 61 would operate at level of service D between Interstate 75 at Norris and U.S. Route 25W at Clinton, and at level of service C between U.S. Route 25W at Clinton to Tennessee State Route 62 east of Oliver Springs. Tennessee State Routes 58 and 170 (providing access from the east), as well as Bear Creek Road, would operate between levels of service C and A. Tennessee State Routes 62 and 95 would operate at widely varying levels of service in the vicinity of the Oak Ridge Reservation. Tennessee State Route 62 would operate at a level of service E between Tennessee State Route 95 at Oak Ridge and Tennessee State Route 170 between Tennessee State Route 170 and Tennessee State Route 162. Tennessee State Route 95 would operate at a level of service E between Tennessee State Route 61 and Tennessee State Route 62 at Oak Ridge.

No public transportation service exists on the Oak Ridge Reservation. Other modes of transportation within the region of influence include railways and waterways. Railroad service in the region of influence is provided by CSX Transportation and the Norfolk Southern Corporation. Waterborne transportation is via the Clinch River. The Clinch River waterway has rarely been used for DOE business, and no designated port facilities exist for such purposes (U.S. Army Corps of Engineers, 1994).

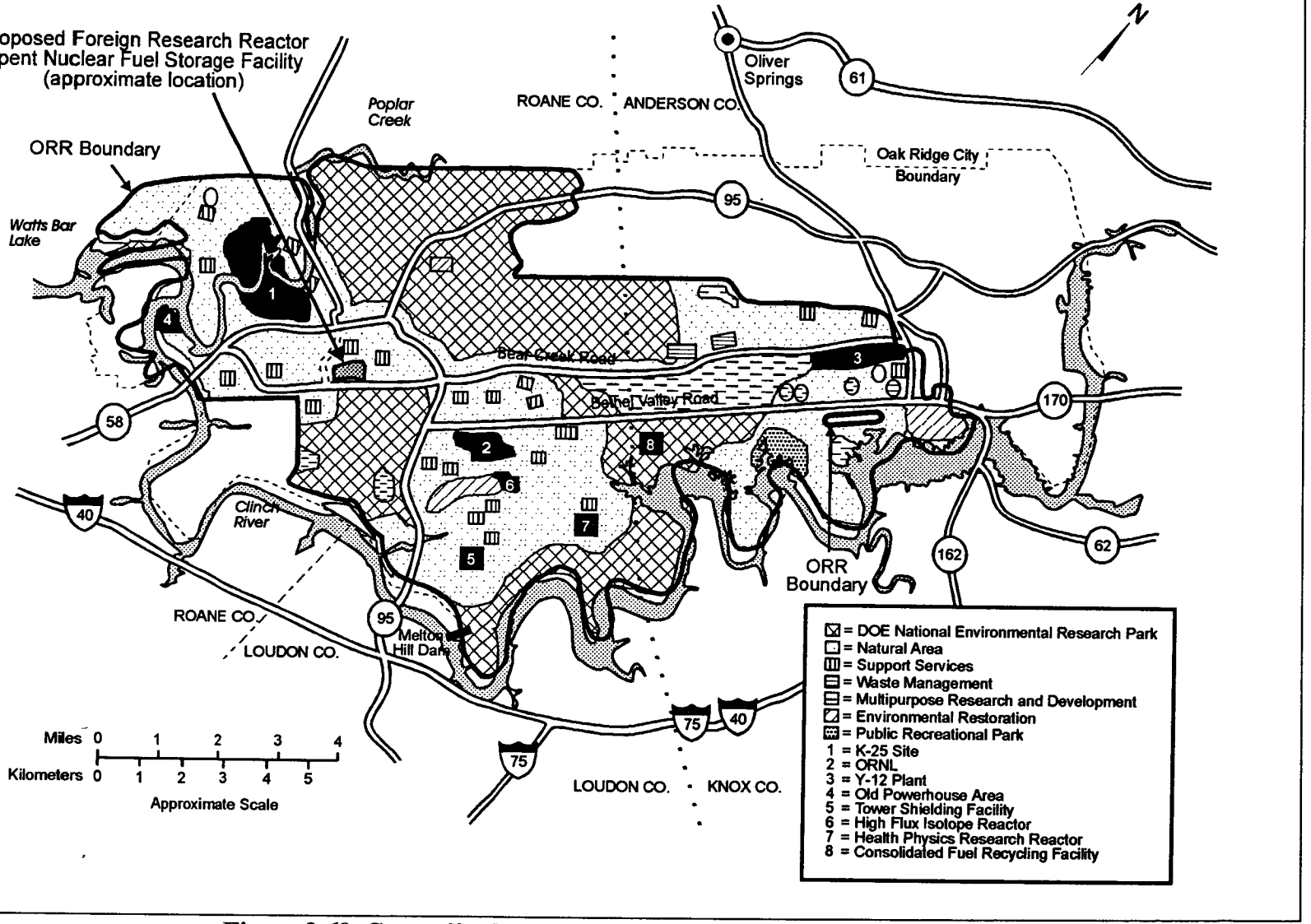


Figure 3-69 Generalized Land Use at the Oak Ridge Reservation

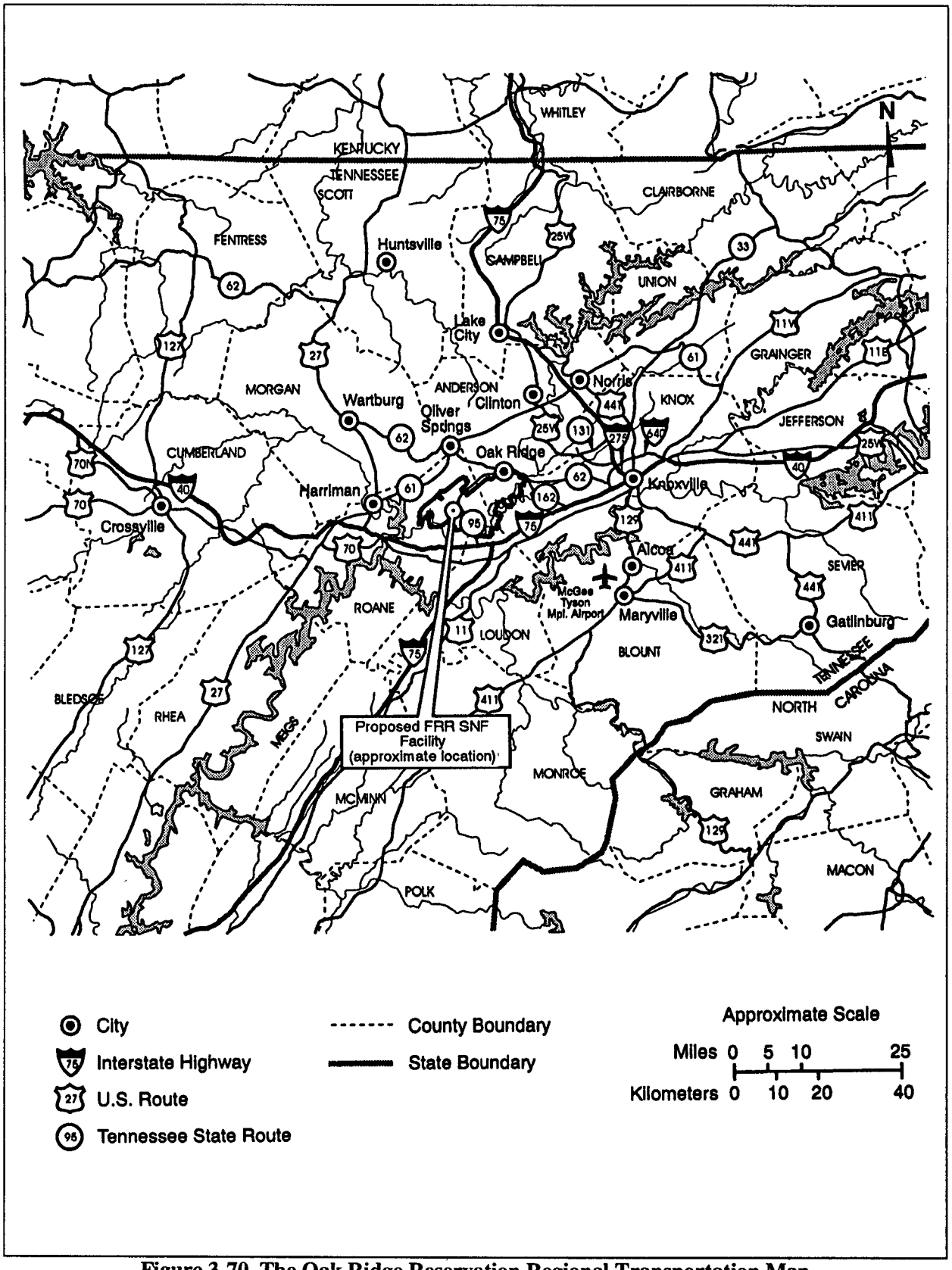


Figure 3-70 The Oak Ridge Reservation Regional Transportation Map

McGhee Tyson Airport in Knoxville, 64 km (40 mi) from the Oak Ridge Reservation, receives jet air passenger and cargo services from both national and international carriers. The closest air transportation facility to the Oak Ridge Reservation is Atomic Airport in Oliver Springs. Numerous other private airports are located throughout the region of influence (DOE, 1995c).

3.3.4.9 Socioeconomics

The region of influence includes the current residential distribution of DOE and contractor personnel employed by the Oak Ridge Reservation, the probable location of offsite contractor operations, and the probable location of labor and capital supporting indirect economic activity linked to the Oak Ridge Reservation. The region of influence includes the counties where 92 percent of DOE and contractor personnel employed by the Oak Ridge Reservation reside.

Regional economic linkage supporting production activity at the Oak Ridge Reservation occurs primarily with Anderson, Knox, Loudon, and Roane counties, where most of the offsite supporting contractors and labor and capital supporting indirect economic activity linked to the Oak Ridge Reservation are located. The total population of the region of influence is projected to be 489,230 persons in 1995 (DOE, 1995c), and is projected to grow at an annual average rate of less than 1 percent, reaching 538,820 persons in 2004. The labor force is also projected to grow at an annual average rate of less than 1 percent, growing to 360,000 persons in 2004. The total employment is projected to grow at an annual average rate of approximately 1 percent, growing from 292,700 jobs in 1995 to 338,070 jobs in 2004.

Figure 3-71 shows the racial and ethnic composition of minorities within 80 km (50 mi) of spent nuclear fuel management sites on the Oak Ridge Reservation. In comparison with the other four candidate sites, the Oak Ridge Reservation has the smallest percentage, about 6 percent, of minorities in the population residing around the site. African Americans make up approximately 76 percent of the minority population, while Hispanics and Asian Americans make up 8 to 9 percent of the minority population.

Figure 3-72 presents the low-income households residing within 80 km (50 mi) of the Oak Ridge Reservation. About 44 percent of the households are classified as having an income no larger than 80 percent of the median income for the county of residence. This percentage is typical of that for counties within 80 km (50 mi) of the spent nuclear fuel management sites.

The Oak Ridge Reservation fire protection services are provided by the fire departments on the reservation. The Oak Ridge Reservation fire departments have mutual aid agreements among themselves and with the city of Oak Ridge (DOE, 1995c). Twelve city, county, and State law enforcement agencies provide police protection in the region of influence. Law enforcement on the Oak Ridge Reservation is provided by the city of Oak Ridge Police Department. Security enforcement is provided by the prime management and operations contractor (MMES, 1989). Four county school districts (Anderson, Knox, Loudon, and Roane) and five city school districts (Clinton, Oak Ridge, Lenoir City, Kingston, and Harriman) provide public education services in the region of influence. In 1992, the nine school districts had an average daily membership of 75,825 students. Between 1980 and 1990, the number of housing units in the region of influence increased 14 percent from 181,299 to 206,234. In 1980 and 1990, the homeowner vacancy rates in the region of influence averaged 1.4 and 1.5 percent, respectively (DOE, 1995c).

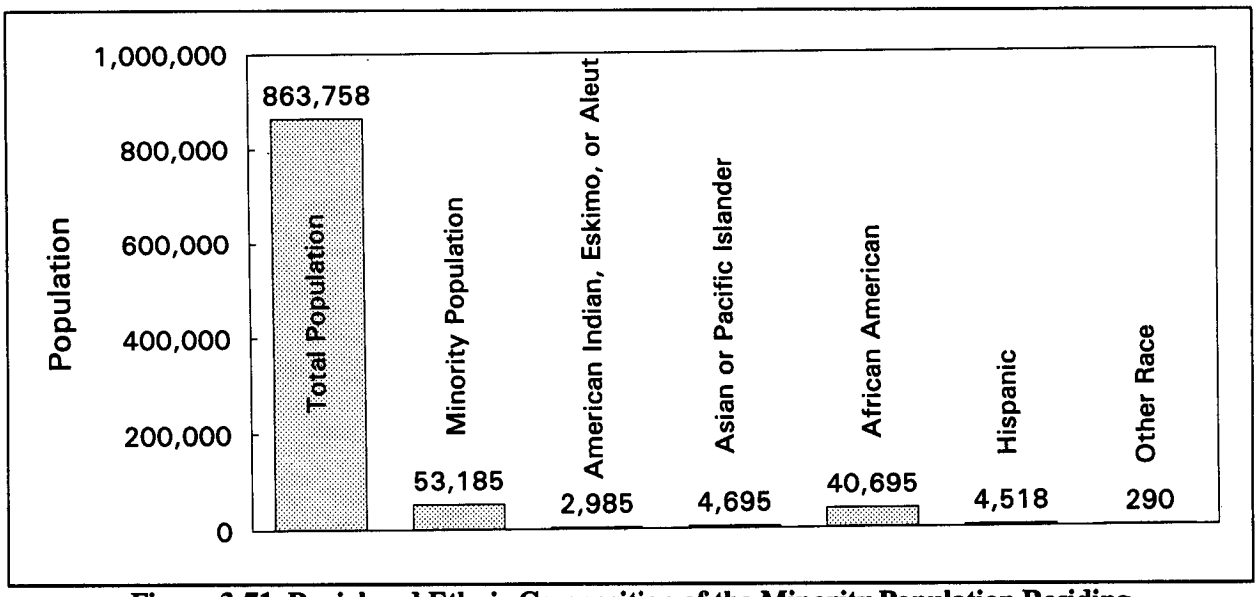


Figure 3-71 Racial and Ethnic Composition of the Minority Population Residing within 80 km (50 mi) of the Oak Ridge Reservation

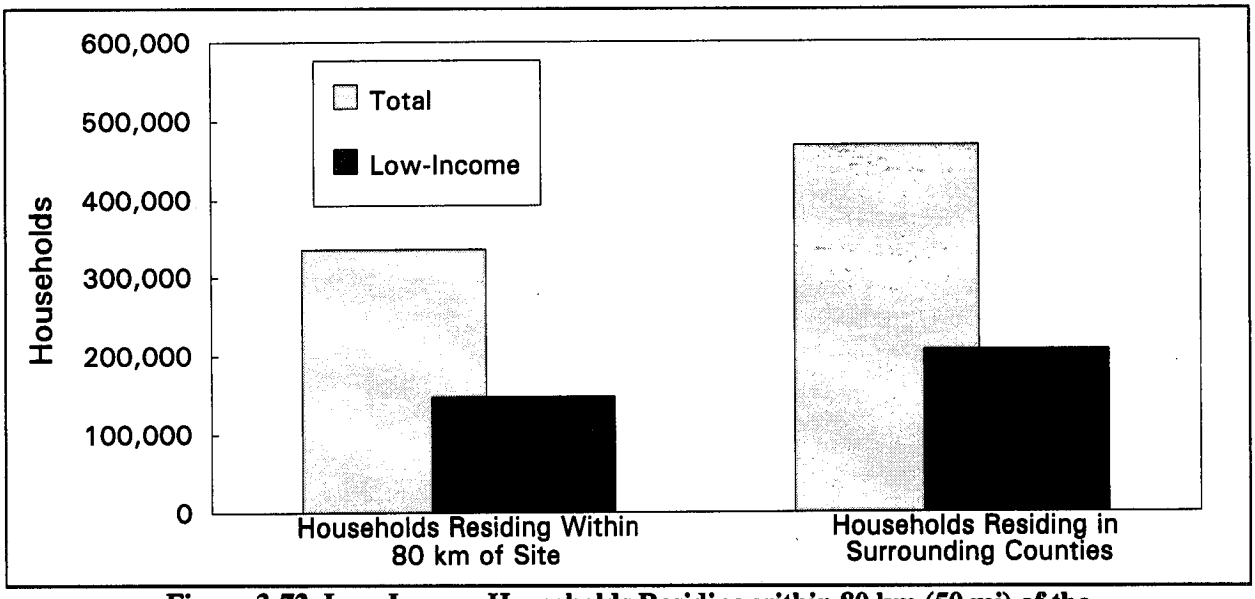


Figure 3-72 Low-Income Households Residing within 80 km (50 mi) of the Oak Ridge Reservation

3.3.4.10 Historical, Archaeological, and Cultural Resources

A limited survey conducted in 1975 did not identify any cultural resources on the Oak Ridge Reservation at the West Bear Creek Valley site (DOE, 1995c). No prehistoric or historic resources are expected to be located on the site. There are no known Native American resources on the proposed site.

3.3.5 Description of the Affected Environment at the Nevada Test Site

The Nevada Test Site is primarily used for the development and testing of nuclear weapons. This section describes the potentially affected environment of the site. The location of the site is shown in Figure 3-73.

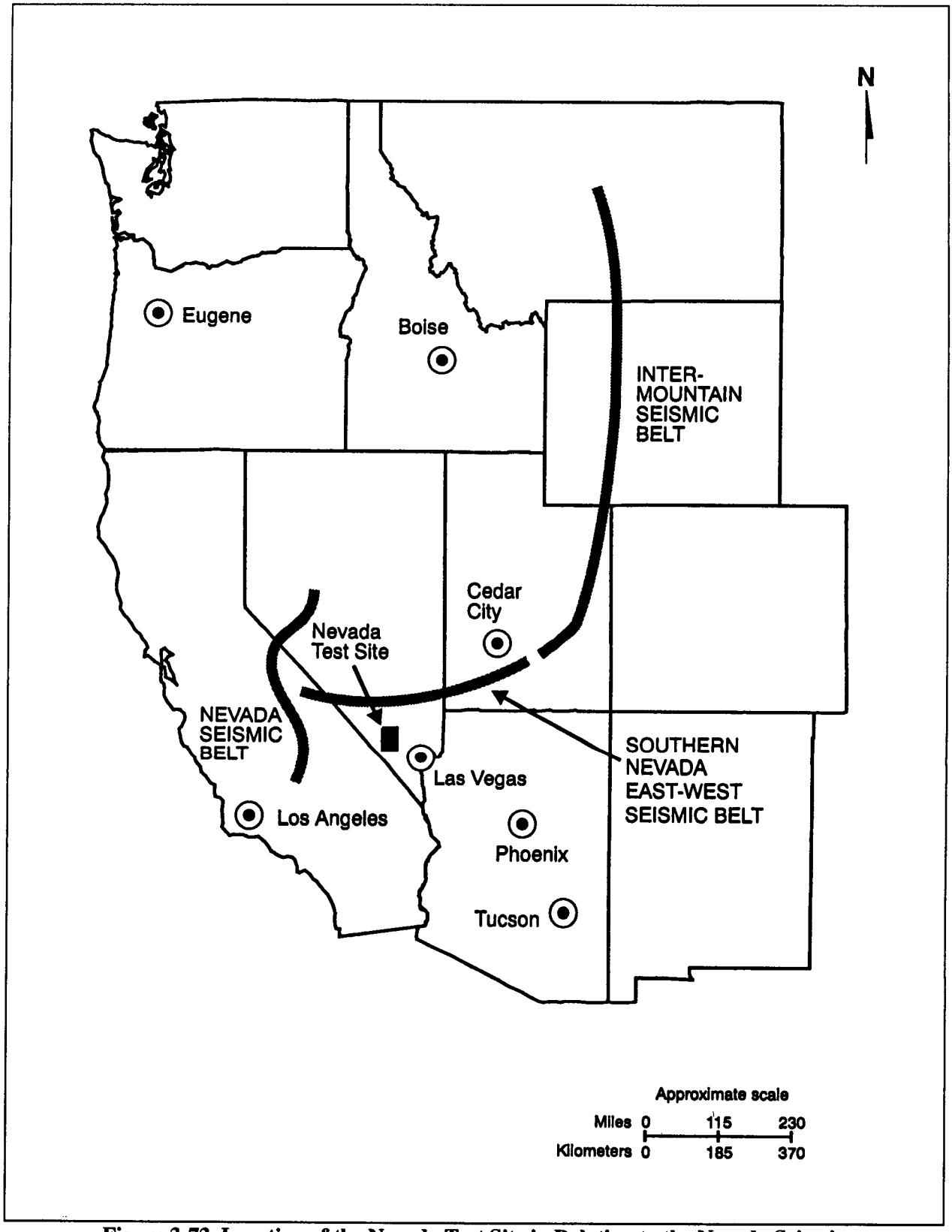


Figure 3-73 Location of the Nevada Test Site in Relation to the Nevada Seismic Belt, the Intermountain Seismic Belt, and the Southern Nevada East-West Seismic Belt

3.3.5.1 Geology

The Nevada Test Site is located east and north of the Walker Lane-Las Vegas Valley Shear Zone (Eckel, 1968). Walker Lane is a northwest-trending belt of right-lateral faults that disrupts the regional structural grain in the southwestern part of the Great Basin along the California-Nevada border. The Las Vegas Valley Shear Zone is a concealed zone of right-lateral faulting along the north side of the Las Vegas Valley (DOE, 1988a). The local geology of the Nevada Test Site is characterized by mountain ranges composed of Precambrian and Paleozoic sedimentary rocks and Tertiary volcanic tuffs and lavas that surround alluvium-filled, topographically closed valleys. A geologic map of the site is shown as Figure 3-74 (DOE, 1993b). The sedimentary rocks are complexly folded and faulted, and are composed mainly of carbonates (dolomite and limestone) in the upper and lower parts of the column and clastics (shale and sandstone) in the middle section. The volcanic rocks are predominantly tuffs that are high in silica.

Faulting generally occurs as thrust faults, normal faults, and strike-slip faults (DOE, 1992c). The faults are shown in Figure 3-75 (DOE, 1993b). Thrust faulting occurs as three major thrust faults, and normal faults exist in both ranges and valleys and generally strike northeast and northwest. The nearest strike-slip structure to the Nevada Test Site is the Walker Lane-Las Vegas Valley Shear Zone. Estimates of horizontal displacement along this shear zone range from 40 to 160 km (25 to 100 mi) (DOE, 1982). Recent displacements have occurred along several faults as a consequence of underground nuclear explosions. This disturbance is not attributable to naturally-occurring seismic activity. Fault displacements are thought to have occurred as a result of the added stress produced by the explosions, the vibrations produced by the explosions, or a combination of both (Eckel, 1968). Almost all of the natural fault movement in the Nevada Test Site area occurred several million years ago, except movement along Yucca Fault. Movement in the Yucca Fault is believed to have occurred in the past tens of thousands to 250,000 years (DOE, 1982; DOE, 1995c).

3.3.5.2 Seismology

The Nevada Test Site lies on the southern margin of the Southern Nevada East-West Seismic Belt (Figure 3-73), which is an area of relatively low historical seismicity. The regional seismicity is dominated by high-levels of seismic activity. Between 1978 and 1981, no earthquakes with magnitudes greater than 4.3 were recorded (DOE, 1986b). In 1992, a magnitude 5.6 earthquake was recorded near Little Skull Mountain at a depth of 12 km (7.5 mi). In 1993, a magnitude 3.5 earthquake was recorded southeast of the town of Mercury on the Nevada Test Site (DOE, 1995c).

The most probable source for seismic activity at the Nevada Test Site is the Cane Spring fault (Figure 3-75). Estimates of recurrence intervals for major earthquakes in the region are on the order of 25,000 years. For magnitudes of greater than or equal to 6, recurrence intervals are on the order of 2,500 years, and for magnitudes of greater than or equal to 5, recurrence intervals are on the order of 250 years (DOE, 1986b).

3.3.5.3 Hydrology

3.3.5.3.1 Surface Water

The drainage basins and the generalized directions of surface water flow near the Nevada Test Site are shown in Figure 3-76 (USAF et al., 1991). The boundary lines of the drainage basins occur principally along topographic divides (DOE, 1988a). Almost all streamflow in the Nevada Test Site area is

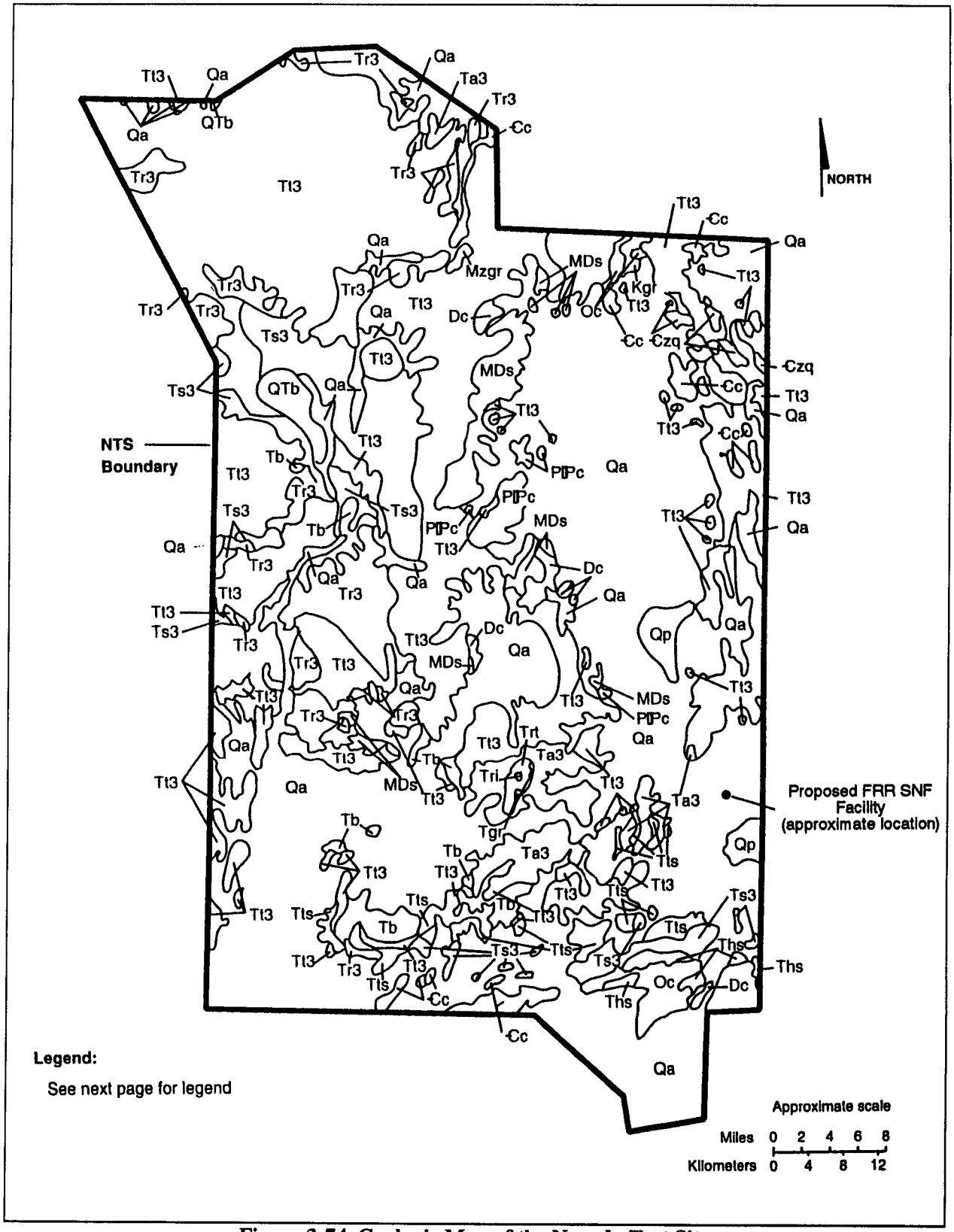


Figure 3-74 Geologic Map of the Nevada Test Site

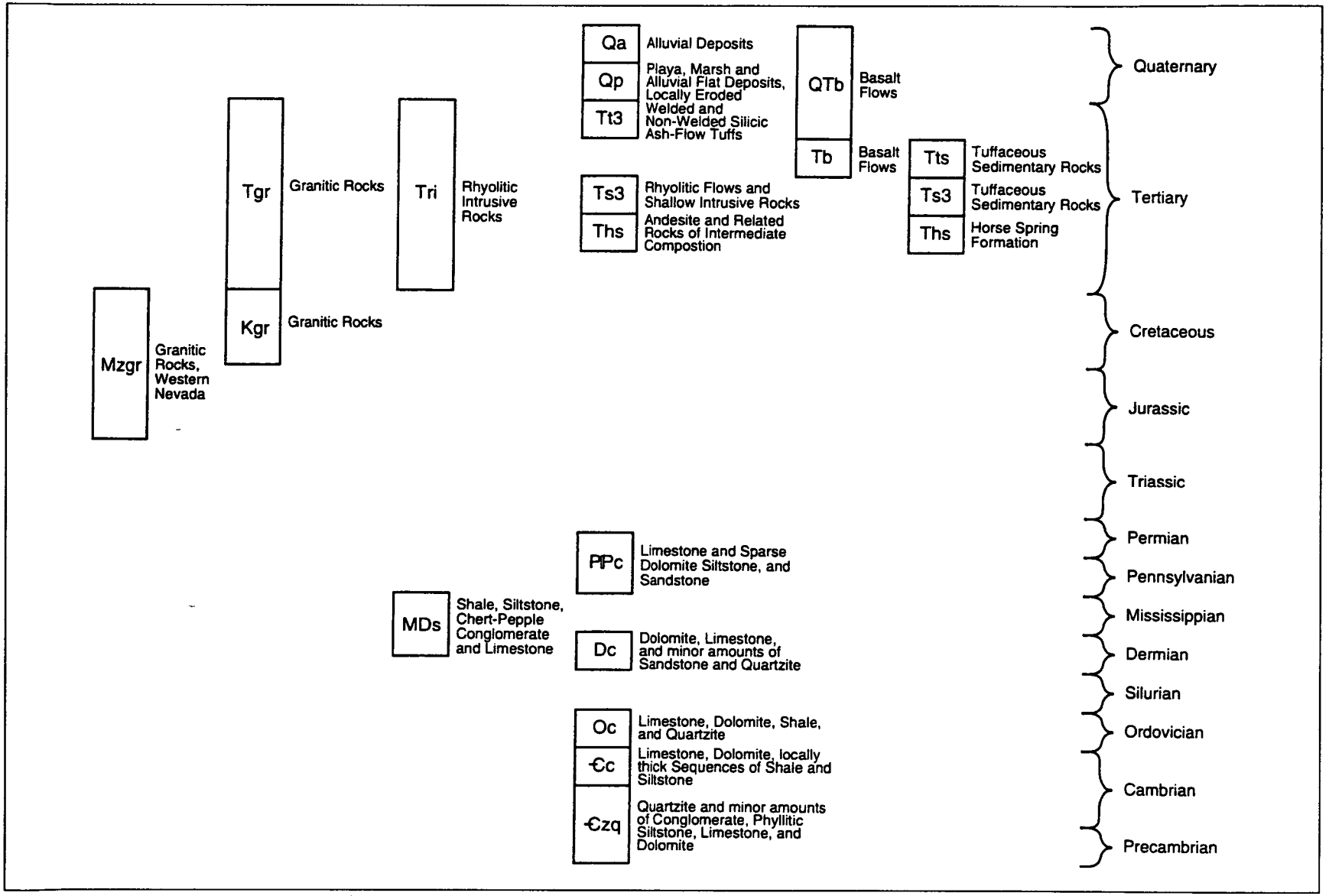


Figure 3-74 Geologic Map of the Nevada Test Site (Continued)

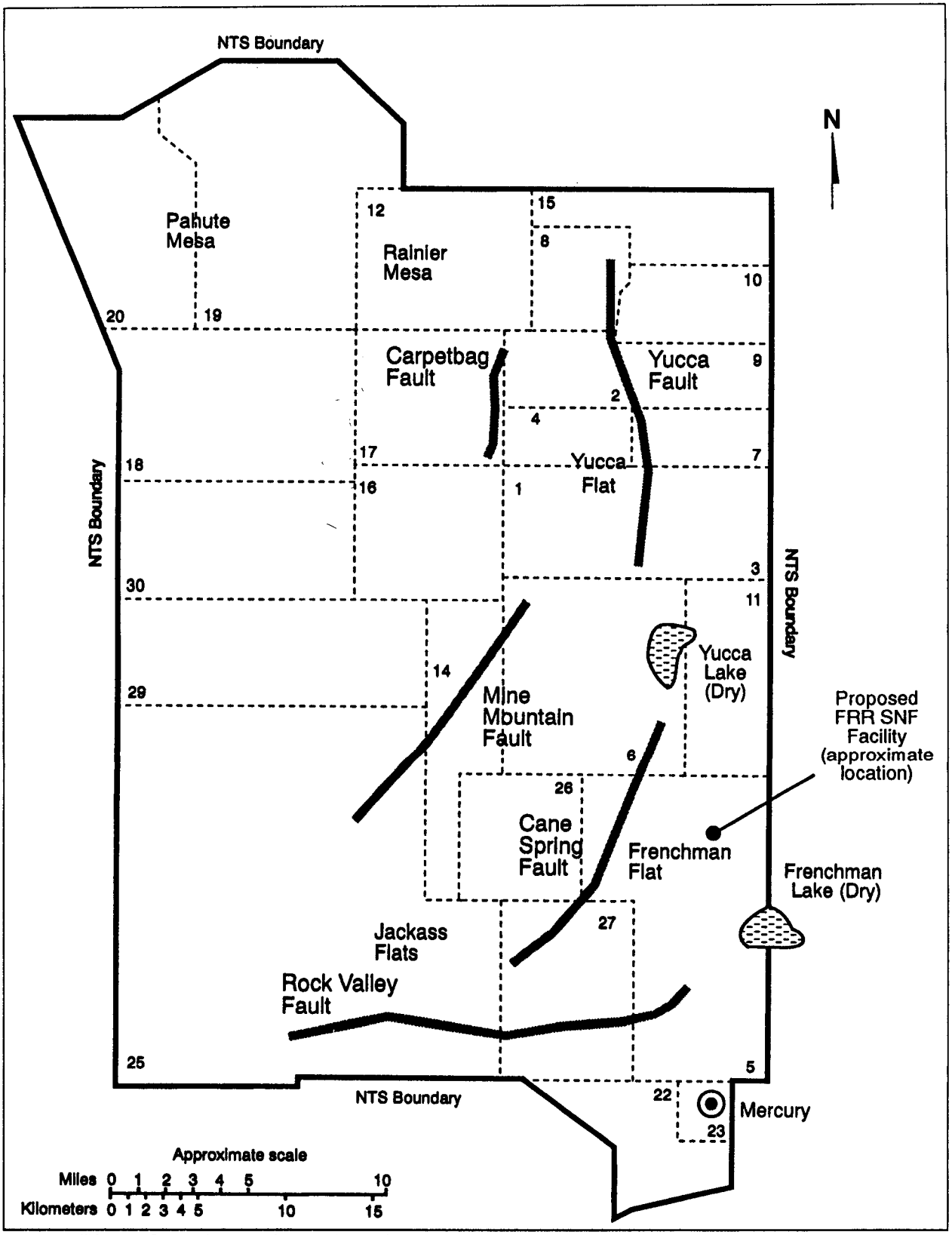


Figure 3-75 Approximate Location of Proposed Facility in Relation to Major Faults at the Nevada Test Site

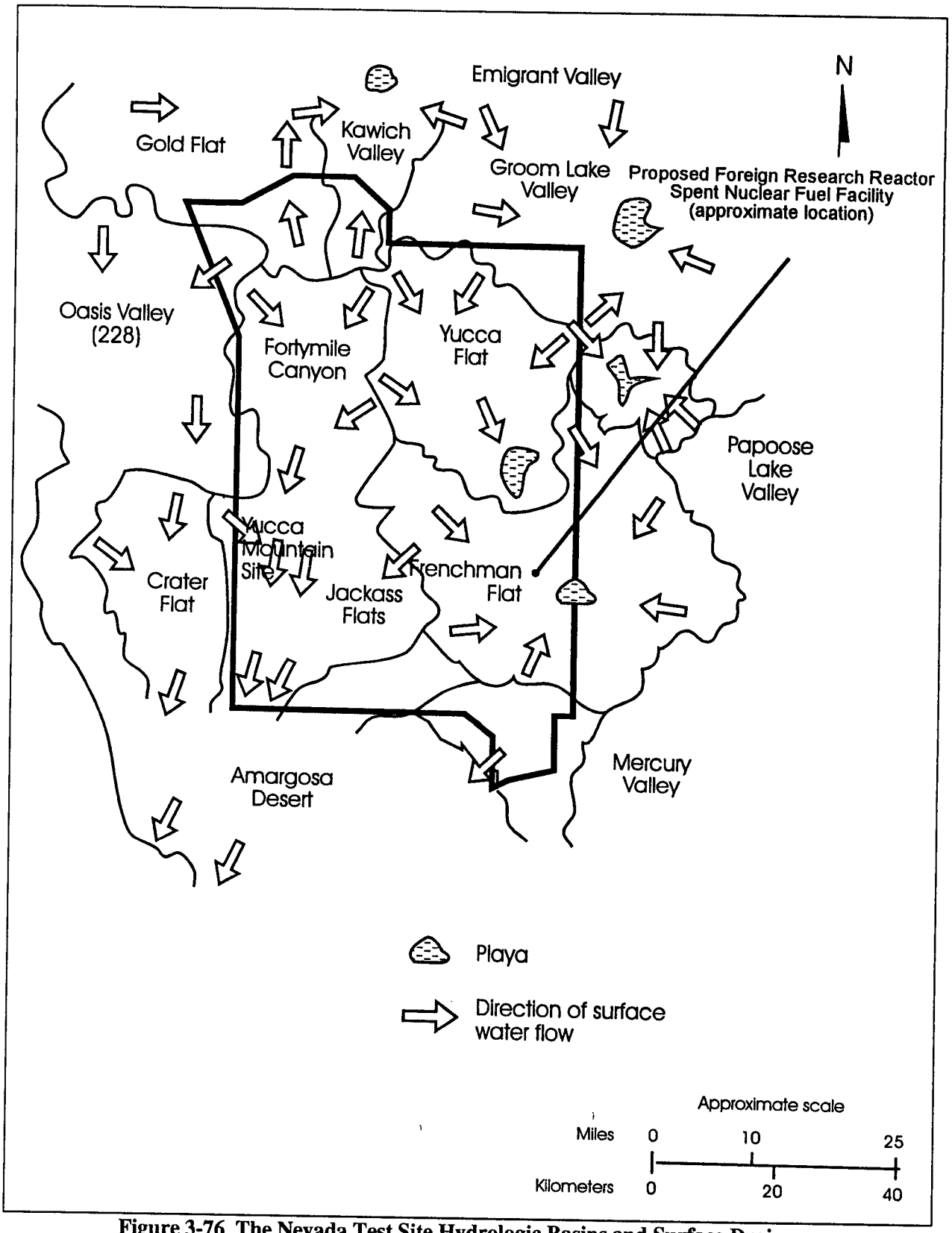


Figure 3-76 The Nevada Test Site Hydrologic Basins and Surface Drainage Direction

ephemeral, and therefore almost no streamflow data have been collected. The ephemeral character of streamflow has also limited the onsite monitoring of surface water quality. Perennial surface water originates from springs, and is restricted to source pools at some large springs. Because of the extreme aridity of this region, most of the spring discharge travels only a short distance before evaporating or infiltrating back into the ground (DOE, 1986b). The western half and southernmost part of the Nevada Test Site have channel systems which carry runoff beyond the Nevada Test Site boundaries during infrequent, very intense storms.

Two watersheds, Fortymile Canyon and Jackass Flats, have the potential for endangering offsite public health and safety due to flooding. Regional peak-flood flow equations for the southern Nevada area indicate that the 100-yr peak flow from the Fortymile Canyon drainage is approximately 370 m^3 per sec (97,744 gal per sec), and 230 m^3 per sec (60,760 gal per sec) from the Jackass Flats drainage (USAF et al., 1991). Underground nuclear testing has resulted in the release of radioactive materials at the land surface. There is the potential for 100-yr floods to transport these contaminants beyond the boundaries of the Nevada Test Site.

3.3.5.3.2 Groundwater

The hydrogeology at the Nevada Test Site is characterized by great depths to the groundwater table, and slow velocity of movement of water in the saturated and unsaturated zones (DOE, 1992c). Depth to groundwater varies from about 200 m (660 ft) beneath valleys in the southern part of the Nevada Test Site, to more than 500 m (1,650 ft) beneath Pahute Mesa. Locally, there are perched water tables at shallow depths (USAF et al., 1991). Perched aquifers have been reported at depths of 21 m (70 ft) in the southwestern part of Frenchman Flat. In the eastern portions of the Nevada Test Site, the water table occurs generally in the alluvium and volcanic rocks above the regional carbonate aquifer (DOE, 1993a).

Six major aquifers occur in the area. The hydrologic and geologic properties of these aquifers vary (DOE, 1988a). The lower carbonate and valley fill aquifers are the main sources of groundwater in the eastern part of the Nevada Test Site (DOE, 1986b). Four major aquitards (units tending to retard the flow of groundwater) have been reported in the area (DOE, 1986b).

Regional groundwater flow is from the north and northeast toward the regional discharge area near Ash Meadows in the Amargosa Desert (Figure 3-77). In the western portions of the area, the regional flow is from the northwest to the south and southwest. Groundwater recharge to the Ash Meadows Sub basin occurs primarily from precipitation over the mountainous areas in the northern, eastern, and southern portions of the basin (DOE, 1988a).

The hydrogeologic units that supply potable water to the Nevada Test Site have been classified as Class IIA (currently a source of drinking water) and IIB (potentially a source of drinking water), in accordance with the U.S. Environmental Protection Agency's guidelines for groundwater classification. No aquifers at the Nevada Test Site have been designated as sole-source aquifers.

Groundwater Quality: The quality of the Nevada Test Site groundwater is suitable for most purposes, and generally meets U.S. Environmental Protection Agency secondary standards for major cations and anions, and the primary standards for deleterious constituents. Contamination by radionuclides occurs below the water table as well as in the unsaturated zone above it. This contamination is a result of underground nuclear testing. The principal confirmed or suspected contaminants from these tests include various radionuclides (primarily tritium) and heavy metals.

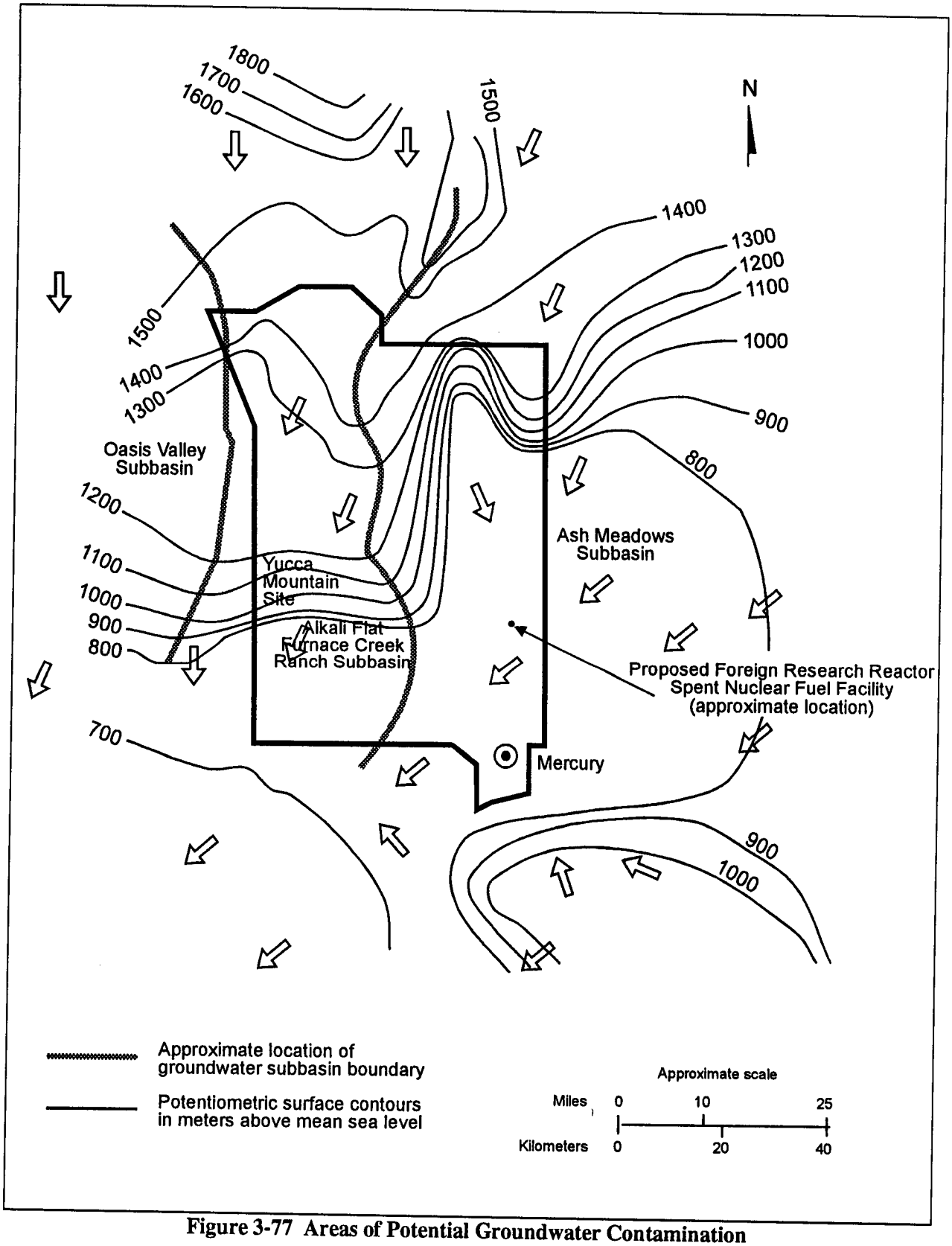


Figure 3-77 Areas of Potential Groundwater Contamination

Groundwater contamination could be transported toward the Nevada Test Site boundary by one of the regional groundwater flow systems. Groundwater flow velocities in these systems range between 1.8 and 183 m per year (6 and 600 ft per year). Due to sorption, most nuclides (other than tritium) would move at a much slower rate. The groundwater travel time from the Nevada Test Site to Ash Meadows Discharge Area is approximately 300 years. Radioactive decay, coupled with dilution and sorption, should reduce radioactivity to well below regulatory limits (USAF et al., 1991). Thus, there are no current effects on public health and safety, nor are any expected in the foreseeable future.

3.3.5.4 Meteorology

The climate at the Nevada Test Site and the surrounding region is characterized by high solar radiation, limited precipitation, low relative humidity, and large diurnal temperature ranges. The lower elevations have a climate typical of the Great Basin.

Wind: Low-level surface winds at the Nevada Test Site are influenced by the large-scale weather patterns interacting with the mountain ranges. Predominant winds are from the south during the summer, and the north during the winter. At Las Vegas, the peak wind gust on record is 145 km per hour (90 mph). Strong winds interacting with dry soil conditions are responsible for occasional duststorms or sandstorms.

Temperature and Humidity: At Area 6 (Figure 3-75) of the Nevada Test Site, the average daily maximum/minimum temperatures during the month of January are 10.6°C/-6.1°C (51.1°F/21.0°F). The average daily maximum/minimum temperatures are 35.6°C/13.9°C (96.1°F/57.0°F) in July. At Las Vegas, the coldest temperature on record is -13.3°C (8.1°F), and the warmest temperature on record is 46.7°C (116°F). The average relative humidity at 4 a.m. in Las Vegas is 40 percent. The average relative humidity at 4 p.m. is 20 percent (DOE, 1995c).

Precipitation: The average annual precipitation at Area 6 is 15 cm (5.9 in). Precipitation amounts for each month are generally less than 1.3 cm (.5 in). At Las Vegas, the greatest precipitation recorded in a 24-hr period is 6.6 cm (2.6 in). An average of 14 thunderstorm days occur each year, with maximum occurrence in July and August. Thunderstorms occasionally become severe. Tornadoes are extremely rare in Nevada (DOE, 1995c).

Atmospheric Dispersion: Data collected at Desert Rock for calendar year 1990 indicated that atmospheric conditions were unstable (Stability Classes A through C) approximately 25 percent of the time, neutral (Class D) approximately 37 percent of the time, and stable (Classes E through G) approximately 37 percent of the time for that year (DOE, 1995c).

Air Quality: In 1992, the majority of radioactive effluents at the Nevada Test Site originated from underground nuclear tests designed and conducted by two national laboratories and the Defense Nuclear Agency. Onsite monitoring of airborne particulates, noble gases, and tritiated water vapor indicated onsite concentrations that were generally not statistically different from background concentrations. Results of offsite environmental monitoring indicated none of the Nevada Test Site-related radioactivity was detected at any air sampling station, and there were no apparent net exposures detectable by the offsite dosimetry network (DOE, 1993a).

The nonradiological air emissions from the Nevada Test Site originate from concrete batch plants, aggregate crushing and processing, surface disturbance, fire training exercises, motor vehicle operations, boilers, and fuel storage. Based on the data collected by Engineering Science, Inc. at the ambient air monitoring stations, air quality at the Nevada Test Site is within applicable Federal and State standards (DOE, 1995c).

3.3.5.5 Ecology

The Nevada Test Site lies within the transition area of the Mojave desert and the Great Basin. The Nevada Test Site covers about 3,500 km^2 (1,350 mi^2), of which only 0.55 percent is developed (DOE, 1988b).

Plant communities on the Nevada Test Site have been classified according to the dominant shrub. Approximately 700 taxa have been identified on the Nevada Test Site (ERDA 1976; DOE, 1991b, DOE, 1993b). Figure 3-78 presents the general plant communities identified on the Nevada Test Site. The dominant plant communities in the Mojave desert are creosote bush. The dominant plant communities in the transition zone between the Mojave desert and the Great Basin are blackbrush, desert thorn, and hopsage. The dominant plant communities in the Great Basin are big sagebrush and black sagebrush, saltbush, and desert thorn.

There are more than 30 species of reptiles and amphibians, 190 species of birds, and 50 species of mammals on the Nevada Test Site (ERDA, 1976; RSN, 1993). Sewage ponds and man-made reservoirs have become an important resource for wildlife. Reptiles and amphibians on the Nevada Test Site include 1 species of desert tortoise, 14 species of lizards, and 17 species of snakes. Birds on the Nevada Test Site are often migratory and seasonal residents. The most-distributed species include the black-throated sparrow, house fin, red-tailed hawk, common raven, loggerhead shrike, mockingbird, ash-throated flycatcher, and mourning dove (Greger, n.d.a.; ERDA, 1976). The most abundant group of mammals on the Nevada Test Site are rodents.

There are several natural springs on the Nevada Test Site that feed flowing streams (Greger, n.d.a.). Vegetation along these channels consists of willow and tamarisk. National Wetlands Inventory maps are not available for the Nevada Test Site (DOE, 1995c).

Potential aquatic habitat on the Nevada Test Site includes surface drainage, playas, man-made reservoirs, and springs. Permanent surface water resources are limited to a few small springs. These surface drainage and playas are unable to support permanent fish populations (ERDA, 1976).

Threatened, Endangered, and Candidate Plant and Animal Species: Table 4.9-1 of Appendix F, Volume 1 of the SNF&INEL Final EIS presents a list of Federally and State-listed species that may be found in the vicinity of the Nevada Test Site (DOE, 1995c). There are no known plants that have been listed as threatened or endangered under the Endangered Species Act on the Nevada Test Site. However, the U.S. Fish and Wildlife Service has identified candidate species for listing, 11 of which may occur on or in the vicinity of the Nevada Test Site. Ten of these are Category 2 species (may be appropriate for listing as endangered or threatened but more information is needed).

Two listed reptile species on or in the vicinity of the Nevada Test Site are of concern. The chuckwalla is a Federal Candidate Category 2 species which may occur on the Nevada Test Site. The desert tortoise is the only Federally listed threatened species known to occur on the Nevada Test Site (DOE, 1995c).

Two bird species (American peregrine falcon and the bald eagle) which could occur on or within the vicinity of the Nevada Test Site are Federally listed endangered species. There are two (spotted bar and pygmy rabbit) Federal Candidate Category 2 mammal species identified as potentially occurring in the vicinity of the Nevada Test Site. There are no known fish species indigenous to the Nevada Test Site.

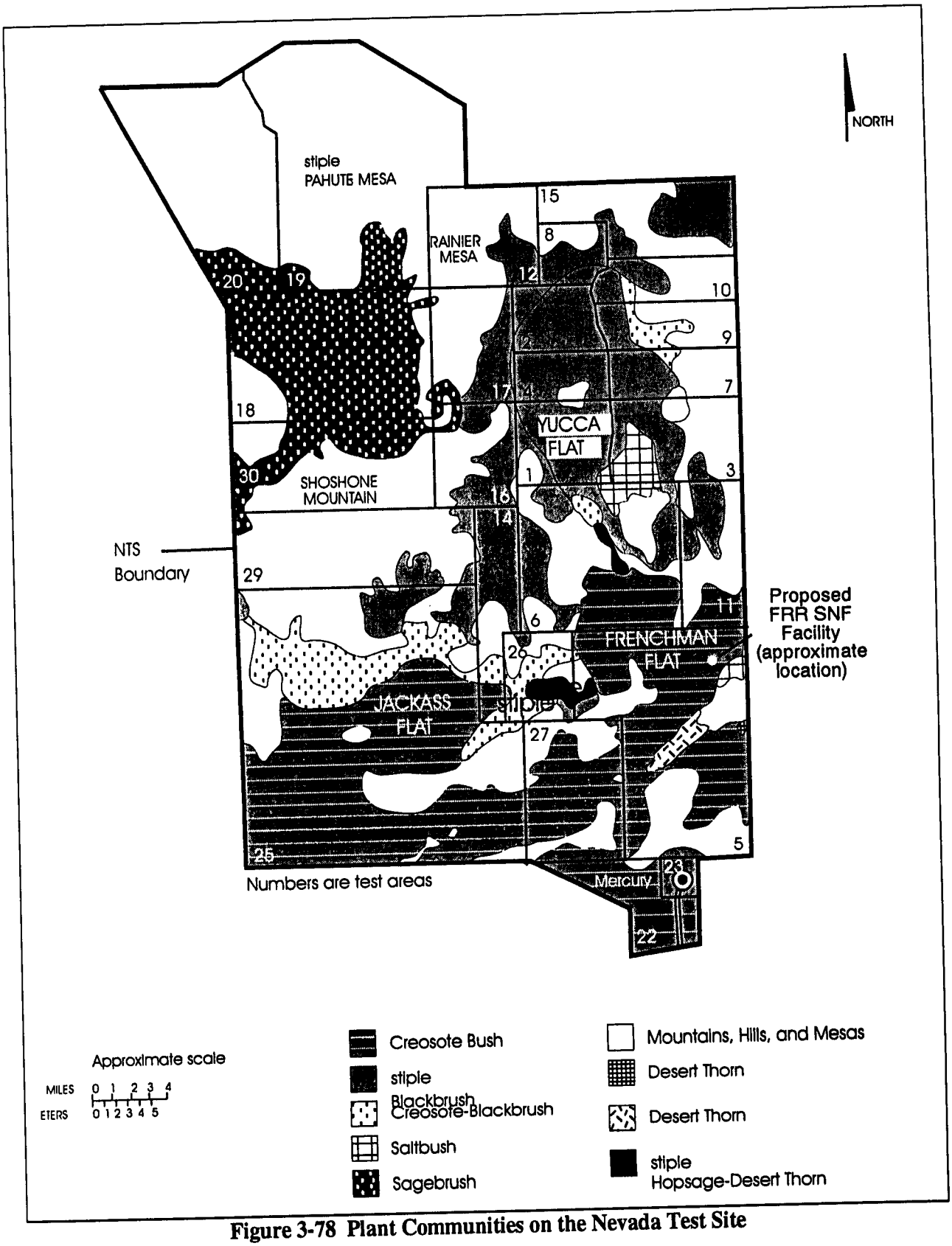


Figure 3-78 Plant Communities on the Nevada Test Site

3.3.5.6 Land Use

The Nevada Test Site occupies an area of approximately 3,500 km^2 (1,350 mi^2) in southern Nevada, in a sparsely populated area approximately 105 km (65 mi) northwest of Las Vegas. The Nevada Test Site is almost entirely surrounded by other Federally-owned lands that buffer it from lands open to the public. The Nevada Test Site is bordered by the Nellis Air Force Range on the north, east, and west, and by Bureau of Land Management lands on the south and southwest (DOE, 1993b).

Existing land use on the Nevada Test Site falls into four general categories: Testing Areas, Buffer/Reserved Areas, Industrial/Research Areas, and Waste Management Areas. According to the latest the Nevada Test Site land use map (Figure 3-79), approximately 50 percent of the land on the Nevada Test Site is buffer/reserved area for ongoing programs or projects (DOE, 1993a).

The Nevada Test Site is located in an area of sparsely vegetated desert. Principal uses in Nye County in the vicinity of the Nevada Test Site include mining, grazing, agriculture, and recreation (DOE, 1993a). Urban and residential land uses occur beyond the immediate vicinity of the Nevada Test Site. Clark County, to the southeast of the Nevada Test Site, consists of approximately 20,460 km^2 (7,900 mi^2), of which about 95 percent is owned by the Federal Government.

Numerous national, State, and local public recreation areas exist within the Nevada Test Site region. The Nevada Test Site is a controlled area, with public access limited to through traffic on U.S. Route 95, and on Lathrop Wells Road (DOE, 1993a). There are no onsite areas subject to Native American Treaty rights or that contain any prime or unique farmland (PIC, 1992).

3.3.5.7 Noise

The major noise sources at the Nevada Test Site occur primarily in developed operational areas, and include various facilities, equipment and machines, aircraft operations, and testing. No Nevada Test Site environmental noise survey data are available (DOE, 1995c). At the Nevada Test Site boundaries, noise from most sources is barely distinguishable from background noise levels. Transportation of people and materials to and from the Nevada Test Site is the noise source of importance to the public. During a normal work week about 3,300 employees travel to the Nevada Test Site each day (DOE, 1995c).

3.3.5.8 Transportation

Vehicular access to the Nevada Test Site is provided by U.S. Route 95 to the south, with off-road access to the northeast provided via Nevada State Route 375. Nevada State Route 375 and U.S. Route 95 are projected to remain at Level of Service A (free flow of traffic). The public transit serves the populated regions of Clark County. Contract buses run to the Nevada Test Site. There is no public transportation system serving the Nevada Test Site, but 70 buses a day transport employees to and from the site.

The nearest railroad is the Union Pacific, located approximately 80 km (50 mi) east of the Nevada Test Site near Las Vegas. No navigable waterways are capable of accommodating waterborne transportation of material shipments to the Nevada Test Site. McCarran International Airport in Las Vegas provides jet air passenger and cargo service from both national and local carriers.

3.3.5.9 Socioeconomics

A Nevada Test Site worker residential distribution survey from 1988 indicates that 88 percent lived in Clark County and 10 percent in Nye County (DOE, 1995c). In Clark County, most of the Nevada Test Site employees reside in the Las Vegas vicinity.

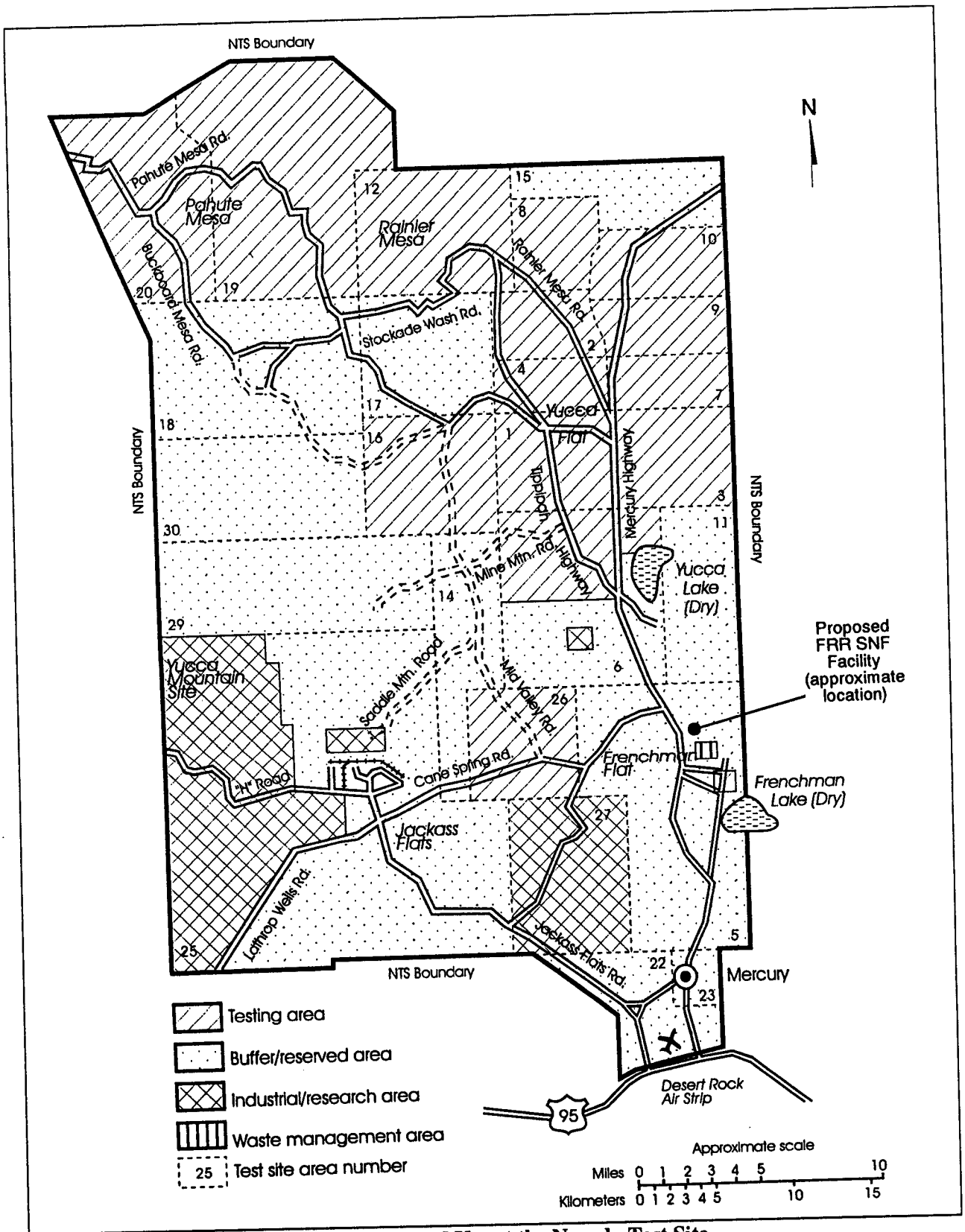


Figure 3-79 Land Use at the Nevada Test Site

Clark County: Clark County is composed of five incorporated cities (Las Vegas, Henderson, North Las Vegas, Boulder City, and Mesquite), and large expanses of unincorporated land. The area experiencing the majority of the county's development is the Las Vegas Valley (DOE, 1995c). Economic conditions in southern Nevada have improved continuously since the mid-1980's. The economy is driven by the growth in the hotel and gaming industry. Service employment accounts for nearly 45 percent of total employment, trade employment accounts for 21 percent, and Government and construction each account for an additional 10 percent (DOE, 1995c).

The unemployment rate reached a low of 4.9 percent in 1990, and increased to 7.5 percent as of June, 1993. However, the unemployment level is expected to decrease with new hotel, gaming, and amusement properties which opened at the end of 1993 (DOE, 1993a).

Nye County: The employment level in Nye county is low relative to Clark County, and includes opportunities in the services, mining, and Government sectors (DOE, 1993a). Nye County is sparsely populated, with the two largest population groupings in the communities of Pahrump and Tonopah. While tourist activity is an important part of the Nye County economy in communities along U.S. 95, mining is the major, even dominant, economic force.

The Nevada Test Site: The Nevada Test Site work force supports engineering design, construction, and operation of the site. As of January 1994, there were a total of 8,563 (3,286 on Nevada Test Site, 3,805 in Las Vegas, and 1,472 in the rest of Nevada or other areas) . The population within the 80 km (50 mi) radius of the Nevada Test Site is approximately 12,421. Minority population constitutes approximately 16 percent of the total. Figure 3-80 shows the racial and ethnic composition of the minority population within 80 km (50 mi) of the Nevada Test Site. Hispanics form more than 50 percent of the minority population.

The general characteristics of the low-income households residing within 80 km (50 mi) of the Nevada Test Site are presented in Figure 3-81. Low-income households are 48 percent of the total households.

The Nevada Test Site's fire protection capacity is structured to accommodate current mission requirements, with a self-contained firefighting department responsible for suppression and prevention. Other services include rescue, hazardous material response, training of fire personnel, fire prevention inspections, installation of all fire extinguishers at the Nevada Test Site, and fire prevention awareness programs. There is a mutual agreement between the Clark County Fire Department and all surrounding area departments to assist in any fire emergency when necessary (DOE, 1993a).

Health Care: The Nevada Test Site has a self-contained medical center that provides limited emergency treatment. Health care in the Las Vegas Area is provided through 13 full-service hospitals, with 3.44 hospital beds per 1,000 members of the population.

Education and Training: The Clark County school district provides education services for the employees who work at the Nevada Test Site. An average student/teacher ratio of 22:32 is reported for elementary school grades K-6 (DOE, 1993a). There are a number of vocational, training, and higher education institutions in the Las Vegas metropolitan area (DOE, 1993a).

Housing: Between 1980 and 1990, the number of housing units in Clark County increased by 84 percent. The increase in demand is attributable to the influx of retirees and other in-migrant population.

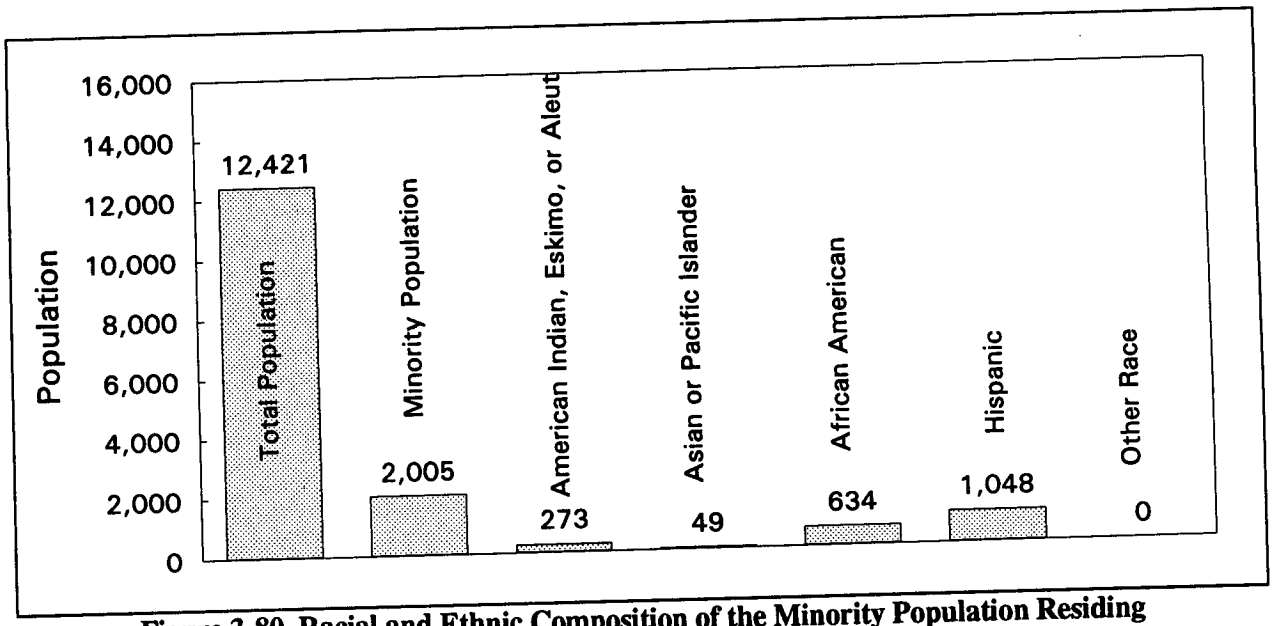


Figure 3-80 Racial and Ethnic Composition of the Minority Population Residing within 80 km (50 mi) of the Nevada Test Site

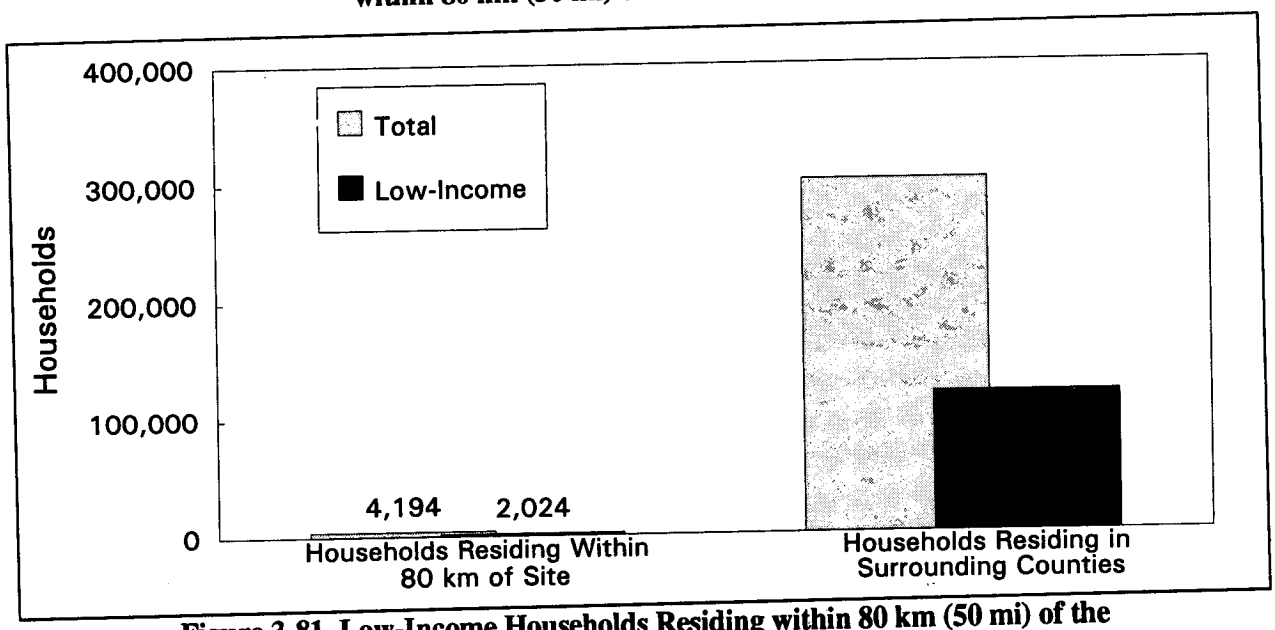


Figure 3-81 Low-Income Households Residing within 80 km (50 mi) of the Nevada Test Site

3.3.5.10 Historical, Archaeological, and Cultural Resources

People have inhabited the lands that comprise the Nevada Test Site for 12,000 years. The availability of the surface water was the primary determinant governing the location of past human occupation on these lands.

The Southern Paiute and Shoshone Native American tribes are known to have inhabited southern Nevada, including parts of what is now the Nevada Test Site. No known Native American resources are located on the Nevada Test Site (DOE, 1995c).

4. Policy Considerations and Environmental Impacts

This Chapter of the Environmental Impact Statement (EIS) describes the policy considerations and potential environmental impacts resulting from each of the management alternatives for implementation of the proposed action and the No Action Alternative. The environmental analysis addresses potential impacts of each alternative on workers, the public, and the environment. The general methodology used throughout this chapter is discussed in Section 4.1.

The policy considerations and environmental impacts of policy alternatives are described in this chapter. One policy alternative is the proposed action, which proposes the adoption of a policy whereby the United States would become involved in the management of the foreign research reactor spent nuclear fuel. The proposed action contains three separate management alternatives for adopting the policy. These management alternatives each contain different implementation alternatives related to that specific management alternative. The second policy alternative is the No Action Alternative which would involve no action by the United States in relation to the foreign research reactor spent nuclear fuel.

Each management alternative would result in very different policy considerations. Much of the foreign research reactor spent nuclear fuel analyzed in this EIS contains highly-enriched uranium (HEU), which can be used to make nuclear weapons. By adopting a policy to manage the foreign research reactor spent nuclear fuel, the proposed action would promote the U.S. goal of nuclear weapons nonproliferation by removing large amounts of HEU from civilian commerce. The No Action Alternative would be in direct conflict with the stated U.S. nuclear weapons nonproliferation goal and would seriously undermine credibility of the United States as a reliable partner in international nuclear weapons nonproliferation activities. Further, foreign research reactor operators may accuse the United States of failing to comply with its obligations under Article IV of the Non-Proliferation Treaty to share the benefits of peaceful nuclear cooperation with other countries.

Each management alternative would also result in very different environmental impacts in the United States which may vary according to the implementation alternatives of each management alternative. The No Action Alternative would have no direct environmental impacts in the United States.

Each of the three management alternatives under the proposed action is briefly summarized here. The three management alternatives were described in greater detail in Chapter 2, Sections 2.2 through 2.4. The policy considerations and environmental impacts of each alternative are described in detail in this chapter.

Management Alternative 1 — Manage Foreign Research Reactor Spent Nuclear Fuel in the United States

Management Alternative 1 of the proposed action entails acceptance and management of the foreign research reactor spent nuclear fuel in the United States. This management alternative would have direct environmental impacts in the United States.

Management Alternative 1 is composed of nine basic implementation components, as well as seven implementation alternatives that alter one of these basic components in some manner. The basic implementation of Management Alternative 1, as well as the seven implementation alternatives, are described in detail in Chapter 2, Section 2.2. The policy considerations and environmental impacts of the

basic implementation of Management Alternative 1 are presented in Section 4.2. The policy considerations and environmental impacts of the seven implementation alternatives of Management Alternative 1 are presented in Section 4.3.

Management Alternative 2 — Facilitate the Management of Foreign Research Reactor Spent Nuclear Fuel Overseas

Management Alternative 2 of the proposed action entails U.S. facilitation of overseas management of the foreign research reactor spent nuclear fuel at one or more foreign locations. No foreign research reactor spent nuclear fuel would be accepted into the United States. This would require advance negotiations and agreements with foreign reactor operators, officials in foreign governments, and reprocessing facilities. The outcome of these negotiations is uncertain. This management alternative would have no direct environmental impacts in the United States, unless the Department of Energy (DOE) decides to accept vitrified high-level waste from reprocessing facilities overseas in place of the foreign research reactor spent nuclear fuel. Very few countries have the capability to accept and store high-level wastes (GAO, 1994).

Management Alternative 2 is described in detail in Chapter 2, Section 2.3. Under this management alternative, the United States would negotiate some form of technical assistance and/or financial incentives in return for maintaining some measure of control over the foreign research reactor spent nuclear fuel containing U.S.-origin HEU. The policy considerations and environmental impacts of the two subalternatives of Management Alternative 2 are presented in Section 4.4.

Management Alternative 3 — Combination of Elements from Management Alternatives 1 and 2 (Hybrid Alternative)

Management Alternative 3 entails some combination of the elements from Management Alternatives 1 and 2, and is referred to as the Hybrid Alternative. Management Alternative 3 would likely have more direct environmental impacts in the United States than Management Alternative 2, but less than Management Alternative 1.

Management Alternative 3 is described in detail in Chapter 2, Section 2.4. For purposes of analysis, a sample Hybrid Alternative has been included to demonstrate one possible combination of elements within Management Alternatives 1 and 2, and to allow an analysis of its impacts. It is important to note that the Hybrid Alternative described is merely an example for analysis purposes, and is only one of numerous possible combinations of elements from Management Alternatives 1 and 2.

Under the Hybrid Alternative described, DOE and the Department of State would facilitate the reprocessing of the foreign research reactor spent nuclear fuel at western European reprocessing facilities (i.e., Dounreay, United Kingdom or Marcoule, France) for foreign research reactor operators in countries that can accept the reprocessing waste, as in Management Alternative 2. DOE would accept and manage the remaining foreign research reactor spent nuclear fuel in the United States, as in Management Alternative 1. The policy considerations and environmental impacts of the sample Hybrid Alternative (Management Alternative 3) are described in Section 4.5.

Other Alternatives and Comparisons

The No Action and Preferred Alternatives are discussed in Sections 4.6 and 4.7, respectively. Comparisons across all the alternatives of the potential impacts and costs are presented in Section 4.8 and 4.9, respectively. Finally, this chapter concludes by comparing the risks due to the alternatives to the risks due to other common activities in Section 4.10.

4.1 Overview of Environmental Impacts

4.1.1 Presentation of the Environmental Impacts

Potential environmental impacts associated with each segment of the affected environment of the proposed action are addressed in this chapter. These segments are presented in this section in the following order:

- Marine transport impacts,
- Port of entry impacts,
- Ground transport impacts, and
- Management Site impacts.

The impact analyses of these four segments are described in more detail in Appendices C, D, E, and F, respectively. Effects of each implementation alternative of Management Alternative 1 of the proposed action on U.S. nuclear weapons nonproliferation goals and objectives are also discussed. In addition, this chapter summarizes the potential costs associated with the alternatives. Details on costs are presented in Appendix F.

Spent nuclear fuel is transported in strong, heavy casks (NRC, 1993). After the spent nuclear fuel is delivered, the empty casks must be transported back on a return trip. Under most of the alternatives, empty casks would be transported overland, through U.S. ports, and on ships. There would be minor nonradiological impacts (vehicle emissions and potential traffic accidents) during ground transport of empty casks. These nonradiological ground transport impacts are included as part of the assessment in this EIS.

4.1.2 Key Assessment Factors

A key assessment factor is one that may differentiate among alternatives, has a measurable impact, or be of public interest. The detailed analysis of potential environmental impacts presented in the appendices of this EIS did not reveal any factor likely to cause a large impact. Because radiation exposure and its consequences is a topic of great public interest, emphasis is placed upon exposure to radiation, although DOE considers the evaluated effects of radiation to be small.

During handling operations, the principal hazard would come from radiation being emitted by the foreign research reactor spent nuclear fuel. Without adequate shielding, the radiation levels at the surface of some of the spent nuclear fuel itself would often be high enough to induce a prompt fatality. This radiation can and would be attenuated (i.e., reduced) by the shielding materials of the transportation cask, such as lead, steel, and polyethylene. Further, since radiation intensity decreases with distance, maintaining a distance from the cask would also provide radiation protection. At 100 m (330 ft) from the cask, the radiation levels would not be detectable above background radiation. All foreign research reactor spent nuclear fuel handling at the proposed foreign research reactor spent nuclear fuel management sites would take place at considerable distances from the public (greater than 100 m or 330 ft). Recently, actual radiation measurements were taken by the State of North Carolina, Department of Environment, Health, and Natural Resources, of the casks used in the first shipment of the 153 spent fuel elements covered by the Urgent Relief Environmental Assessment (DOE, 1994m). In every case, the State of North Carolina reported detecting no radiation above background levels (radiation exposure from natural sources) at a distance of 1 meter (3.3 ft) from the package surface (State of North Carolina, 1994).

Accidents involving foreign research reactor spent nuclear fuel could potentially also result in releases of radioactive material which could cause radiation exposures. For most accidents, essentially none of the radioactive material would be released because it is an integral part of the solid fuel. Larger quantities of radioactive elements could be released only when the accident generates enough energy to release particles of foreign research reactor spent nuclear fuel to the atmosphere, such as with a fire. However, the probability of such accidents is very small. For most accidents, the energy would not be high enough to damage the foreign research reactor spent nuclear fuel, so that none of the radioactive material would be released.

4.1.3 General Radiological Health Effects

The effect of radiation on people depends upon the kind of radiation exposure (alpha and beta particles, and gamma and x-rays) and the total amount of tissue exposed to radiation. The amount of radiant energy imparted to tissue from exposure to ionizing radiation is referred to as absorbed dose. The sum of the absorbed dose to each tissue, when multiplied by certain quality and weighting factors that take into account radiation quality and different sensitivities of these various tissues, is referred to as effective dose equivalent (EDE).

An individual may be exposed to radiation from outside the body, or from inside the body because radioactive materials may enter the body by ingestion or inhalation. External dose is different from internal dose in that it is delivered only during the actual time of exposure. An internal dose, however, continues to be delivered as long as the radioactive source is in the body (although both radioactive decay and elimination of the radionuclide by ordinary metabolic processes decrease the dose rate with the passage of time). The dose from internal exposure is calculated over 50 years following the initial exposure.

The annual radiation dose limit to the public from nuclear facilities operated by DOE is 100 mrem per year (NRC, 1991). The potential foreign research reactor spent nuclear fuel management sites covered by DOE operations normally operate such that the public's dose is undetectable. For comparison, it is estimated that the average individual in the United States receives a dose of about 350 mrem per year from all sources combined, including natural and medical sources of radiation and radon. A modern chest x-ray, for example, results in an approximate dose of 8 mrem, while a diagnostic hip x-ray results in an approximate dose of 83 mrem (DOE, 1995c).

Radiation can also cause a variety of adverse health effects in people. A large dose of radiation can cause prompt death. At low doses of radiation, the most important adverse health effect for depicting the consequences of environmental and occupational radiation exposures (which are typically low doses) is the potential inducement of cancers that may lead to death in later years. This effect is referred to as latent cancer fatalities (LCF) because the cancer may take years to develop and for death to occur, and may never actually be the cause of death.

In addition to LCF, other health effects could result from environmental and occupational exposures to radiation. These effects include nonfatal cancers among the exposed population and genetic effects in subsequent generations. Table 4-1 shows the dose-to-effect factors for these potential effects as well as for LCF. For simplicity, this EIS presents estimated effects of radiation only in terms of LCF. The nonfatal cancers and genetic effects are less probable consequences of radiation exposure, and are less serious.

Table 4-1 Risk of LCF and Other Health Effects from Exposure to Radiation

Population[a]	*LCF*[b]	*Nonfatal Cancers*	*Genetic Effects*	*Total Detriment*
Workers	0.0004	0.00008	0.00008	0.00056
Public	0.0005	0.0001	0.00013	0.00073

[a] *The difference between the worker risk and the general public risk is attributable to the fact that the general population includes more individuals in sensitive age groups (that is, less than 18 years of age and more than 65 years of age).*

[b] *When applied to an individual, units are lifetime probability of LCF per rem of radiation dose. When applied to a population of individuals, units are excess number of cancers per person-rem of radiation dose. Genetic effects as used here apply to populations, not individuals.*

The collective or "population" dose to an exposed population is calculated by summing the estimated doses received by each member of the exposed population. This is referred to as a "population dose." The total population dose received by the exposed population is measured in person-rem. For example, if 1,000 people each received a dose of 0.001 rem, the population dose would be 1.0 person-rem (1,000 persons x 0.001 rem = 1.0 person-rem). The same population dose (1.0 person-rem) would result if 500 people each received a dose of 0.002 rem (500 persons x 0.002 rem = 1 person-rem).

The factor used in this EIS to relate a dose to its effect is 0.0004 LCF per person-rem for workers and 0.0005 LCF per person-rem for individuals among the general population (DOE, 1995c). The latter factor is slightly higher because of some individuals in the public, such as infants, who may be more sensitive to radiation than workers. These factors are based on the *1990 Recommendations of the International Commission on Radiological Protection* (ICRP, 1991), and are consistent with those used by the U.S. Nuclear Regulatory Commission (NRC) in its rulemaking *Standards for Protection Against Radiation* (NRC, 1991). The factors apply where the dose to an individual is less than 20 rem and the dose rate is less than 10 rem per hour. At doses greater than 20 rem, the factors used to relate radiation doses to LCF are doubled. At much higher doses, prompt effects, rather than LCF, may be the primary concern. Unusual accident situations that may result in high radiation doses to individuals are considered special cases. No such cases are expected with either incident-free handling or accidents with foreign research reactor spent nuclear fuel.

These concepts may be applied to estimate the effects of exposing a population to radiation. For example, if 100,000 people were each exposed only to background radiation (0.3 rem per year), 15 LCF per year would be expected (100,000 persons x 0.3 rem per year x 0.0005 LCF per person-rem = 15 LCF per year).

Sometimes, calculations of the number of LCF associated with radiation exposure do not yield whole numbers and, especially in environmental applications, may yield numbers less than 1.0. For example, if 100,000 people were each exposed to a total dose of only 1 mrem (0.001 rem), the population dose would be 100 person-rem, and the corresponding estimated number of LCF would be 0.05 (100,000 persons x 0.001 rem x 0.0005 LCF per person-rem = 0.05 LCF).

The *average* number of deaths that would result if the same exposure situation were applied to many different groups of 100,000 people is 0.05. In most groups, nobody (zero people) would incur an LCF from the one mrem dose each member would have received. In a small fraction of the groups, one latent fatal cancer would result; in exceptionally few groups, two or more latent fatal cancers would occur. The average number of deaths over all the groups would be 0.05 latent fatal cancers (just as the average of 0, 0, 0, and 1 is 1/4, or 0.25). The most likely outcome is zero LCF.

These same concepts apply to estimating the effects of radiation exposure on a single individual. Consider the effects, for example, of exposure to background radiation over a lifetime. The "number of LCF" corresponding to a single individual's exposure to 0.3 rem per year over a (presumed) 72-year lifetime is:

1 person x 0.3 rem per year x 72 years x 0.0005 LCF per person-rem = 0.011 LCF or one chance in 91 of an LCF.

Again, this should be interpreted in a statistical sense; that is, the estimated effect of background radiation exposure on the exposed individual would produce a 1.1 percent chance that the individual would incur a latent fatal cancer. Alternatively, this method estimates that about 1 person in 91 would die of cancers induced by background radiation.

4.1.4 Risks

Another concept important to the presentation of results in this EIS is the concept of risk. Risks are most important when presenting accident analysis results. The chance that an accident might occur during the conduct of an operation is called the probability of occurrence. An event that is certain to occur has a probability of 1.0 (as in 100 percent certainty). If an accident is expected to happen once every 50 years, the frequency of occurrence is 0.02 per year (1 occurrence every 50 years = 0.02 occurrences per year). A frequency estimate can be converted to a probability statement. If the frequency of an accident is 0.02 per year, the probability of the accident occurring in a 10-year program is 0.2 (10 years x 0.02 occurrences per year).

Once the frequency (occurrences per year) and the consequences (for radiation effects, measured in terms of the number of LCF caused by the radiation exposure) of an accident are known, the risk can be determined. The risk per year is the product of the annual frequency of occurrence times the number of LCF. This annual risk expresses the expected number of LCF per year, taking account of both the annual chance that an accident might occur and the estimated consequences if it does occur.

For example, if the frequency of an accident were 0.2 occurrences per year and the number of LCF resulting from the accident were 0.05, the risk would be 0.01 LCF per year (0.2 occurrences per year x 0.05 LCF per occurrence = 0.01 LCF per year). Another way to express this risk (0.01 LCF per year) is to note that if the operation subject to the accident continued for 100 years, one LCF would be likely to occur because of accidents during that period. This is equivalent to 1 chance in 100 that a single LCF would be caused by the accident source for each year of operation. This risk can be related to the risk of death from other accidental causes for comparison. As an example, the risk of dying from a motor vehicle accident is about 1 chance in 80. Similarly, the risk of death for the average American from fire is approximately 1 chance in 500, and for death from accidental poisoning, the risk is about 1 chance in 1,000 (NNPP, 1993). Section 4.10 compares the risks calculated in this EIS to those of common activities.

4.1.5 Estimated Radiation Dose Rate Near the Foreign Research Reactor Spent Nuclear Fuel Transportation Casks

The regulatory external radiation dose rate limit for foreign research reactor spent nuclear fuel transportation casks selected for use in the marine and ground transport analysis is 10 mrem per hour at 2 m (6.6 ft) from the "exclusive use" vehicle (no other cargo) [49 Code of Federal Regulations (CFR) 173.441]. This is equivalent to approximately 23 mrem per hour at 1 m (3.3 ft). Historical data from actual cask shipments of research reactor spent nuclear fuel have shown dose rates considerably below this regulatory limit. Dose measurements of casks containing research reactor spent nuclear fuel, including the foreign research reactor spent nuclear fuel recently received under the Urgent Relief Environmental

Assessment (DOE, 1994m), are presented in Appendix F, Section F.5. The average of these measurements is 2.3 mrem per hour at 1 m (3.3 ft) from the surface of the cask. Recent measurements taken by the State of North Carolina on foreign research reactor spent nuclear fuel shipment packages, covered by the Urgent Relief Environmental Assessment, showed that the external dose rate at 1 m (3.3 ft) was undetectable above background radiation levels (State of North Carolina, 1994).

To be conservative, the analyses in this chapter use the regulatory limit of 10 mrem per hour at 2 m (6.6 ft) from the side of the transport vehicle for the radiation dose rate near the foreign research reactor spent nuclear fuel casks. This conservative value was used in the calculations of incident-free doses to members of the public, marine transport workers, port workers, and ground transport workers. For radiation workers at the spent nuclear fuel management sites, the dose rate in the vicinity of the casks was estimated by the conservative methodology presented in Appendix F, Section F.5.

4.1.6 The Effects of Radiation on Plants and Animals

There is no convincing evidence from the scientific literature that chronic radiation doses below 1 rad per day will harm animal or plant populations. It is highly probable that limitation of the exposure of the most exposed humans (the critical human group, living on and receiving full sustenance from the local area) to 100 mrem per year will lead to dose rates to plants and animals in the same area of less than 1 rad per day. DOE and NRC regulations limit annual human exposures to values far lower than those that have caused observable damage in plant and animal populations. Therefore, specific radiation protection standards for nonhuman biota are not needed (IAEA, 1992).

4.2 Management Alternative 1 – Manage Foreign Research Reactor Spent Nuclear Fuel in the United States – Basic Implementation

This section presents the policy considerations and potential environmental impacts of the basic implementation of Management Alternative 1. Under the basic implementation of Management Alternative 1, all the foreign research reactor spent nuclear fuel could be accepted into the United States. DOE and the Department of State believe this would promote the nuclear weapons nonproliferation objective of reducing, and ultimately eliminating, civil commerce in HEU. The spent nuclear fuel could be managed safely and securely at any of five DOE sites.

Policy Considerations

A critical result of this basic implementation of Management Alternative 1 would be the continued viability and vitality of the Reduced Enrichment for Research and Test Reactors (RERTR) Program, which has the goal of minimizing and eventually eliminating the use of HEU in civil nuclear programs. The successful development of alternative fuels for research reactors and the expansion of the program to Russia, the other Newly Independent States, China, South Africa, and other countries, and the establishment of a world-wide norm discouraging the use of HEU, is dependent on a United States commitment to action. Finally, this basic implementation of Management Alternative 1 would support the Administration's nuclear weapons nonproliferation objective of not encouraging reprocessing for either nuclear power or nuclear explosive purposes.

Another crucial consideration associated with Management Alternative 1 is the *Treaty on the Non-Proliferation of Nuclear Weapons*. The parties to the Non-Proliferation Treaty met in May of 1995 and agreed to extend the treaty indefinitely and without conditions. One key to the success of the 1995 Non-Proliferation Treaty Conference was the ability of the United States to convince other

Non-Proliferation Treaty parties that the nuclear weapons states had complied with their obligations under Article IV of the Non-Proliferation Treaty to assist the non-nuclear weapons states with peaceful applications of nuclear energy.

Although the Non-Proliferation Treaty was extended indefinitely, the parties also agreed to review the treaty every five years to ensure that all parties are in compliance. Any country which has been compelled to shut down its research reactors could accuse the United States of not having complied with its treaty obligations. This accusation, however ill-founded, could be made not only by the affected countries, but by any country opposed to the interests of the United States.

The amount of foreign research reactor spent nuclear fuel that would be accepted under the basic implementation of Management Alternative 1 is up to approximately 19.2 metric tons of heavy metal (MTHM) representing approximately 22,700 elements. This amount is an upper limit because if some nations were to reprocess their research reactor spent nuclear fuel, for example, the amount of foreign research reactor spent nuclear fuel accepted into the United States would be reduced. Under the basic implementation of Management Alternative 1, approximately 4.6 metric tons (5.1 tons) of HEU would be removed from international commerce.

4.2.1 Marine Transport Impacts

Because the basic implementation of Management Alternative 1 involves ocean transport, DOE and the Department of State considered the environmental impacts on the global commons (i.e., portions of the ocean not within the territorial boundary of any nation) in accordance with Executive Order 12114 (U.S. Federal Register, 1979).

4.2.1.1 General Assumptions and Analytic Approach

The basic implementation of Management Alternative 1 includes the shipment of approximately 837 transportation casks containing foreign research reactor spent nuclear fuel over a 13-year period. Of these, approximately 721 transportation casks would be transported by sea to the United States, with the remainder (116) coming overland from Canada. DOE would prefer to consolidate the approximately 721 casks on board ships to minimize the number of voyages, but it is also possible that approximately 721 voyages could be required. This section evaluates the impacts of the marine transportation, including shipment in international waters from the port of origin to the United States and coastal shipping in United States territorial waters.

Four types of commercial cargo ships are considered to be candidates to carry foreign research reactor spent nuclear fuel under the basic implementation of Management Alternative 1: containerized, breakbulk (general cargo), roll-on/roll-off, and purpose-built vessels (see Appendix C for a more complete description of these vessels). DOE and the Department of State assumed that all casks would be transported in standard International Standards Organization 20-ft shipping containers, because this is current shipping practice.

Nonradiological impacts associated with the marine shipment of 721 containerized transportation casks would be minimal. The United States receives more than 56,000 ships engaged in foreign trade at its ports each year (DOC, 1994). Shipping an additional 56 containers per year on average over the 13-year receipt period is not likely to cause any additional ships to sail beyond the number already scheduled. In the event that chartered vessels are used for this program, up to 10 voyages per year could be required, which is only 0.02 percent of the number engaged in regular commerce. Additional nonradiological impacts would be

very small whether chartered or regularly scheduled commercial vessels are used. The number of containers handled on a regular basis is so large that the addition of the foreign research reactor spent nuclear fuel containers would add essentially no impacts (cargo vessels typically carry 800 to 1,000 containers per voyage). While nonradiological marine events such as unloading or cargo shifting accidents would be possible, the nonradiological impacts would be miniscule.

The radiological impacts of transporting the foreign research reactor spent nuclear fuel by sea were considered in two ways, incident-free impacts and accident impacts. The incident-free impacts would be those that occur simply due to the marine shipping of foreign research reactor spent nuclear fuel, assuming there are no accidents. The ship's crew would be the affected individuals in this case. The accident impacts would be the consequences of reasonably foreseeable accidents that might occur. These two evaluations are discussed in the following two sections, with additional details in Appendix C.

4.2.1.2 Conservative Assumptions and Maximum Estimated Impacts of Incident-Free Marine Transport

The primary impact of incident-free marine shipping of foreign research reactor spent nuclear fuel would be upon the crews of the ships used to carry the spent nuclear fuel casks. Since the crew of a ship is normally separated from the cargo and shielded by both the cargo and the ship's structure, the risk to the crew from spent nuclear fuel transport during most crew activities would be extremely low (DOE, 1994m). The exceptions would include the exposure to the crew during loading and off-loading of the spent nuclear fuel ISO containers and during daily inspection of the ship's cargo, including the containers housing the spent nuclear fuel transportation casks. Therefore, the crew exposure during loading, daily inspection, and unloading of the transportation casks has been incorporated into the incident-free marine transport analysis. The exposure to dock workers at the foreign research reactor spent nuclear fuel port of entry is assessed in Section 4.2.2.

Daily inspections of the casks is the activity that would result in the largest doses to the ship's crew, with the inspectors considered the maximally exposed workers during incident-free marine transport. For any given voyage, DOE and the Department of State conservatively assumed that the same three inspectors would conduct all of the inspections. The impact on the inspectors would be a function of the number of inspections performed, which would depend upon the amount of time the cask is onboard. Therefore, the incident-free radiological impact on the inspectors would depend upon the total duration of the voyage, including days at sea, in intermediate ports, and days in coastal sailing between intermediate ports. The duration of the voyage was selected as the weighted average of the duration of all the shipments necessary for 721 transportation casks. (See Appendix C for further details regarding this assumption.)

To maximize the estimated impact from incident-free transport, DOE and the Department of State made conservative assumptions regarding crew exposure. Specifically, DOE and the Department of State conservatively assumed that eight and two casks (loaded two casks per hold) would be shipped per voyage of chartered and regularly scheduled commercial ships, respectively. This assumption would result in additional exposure of the ship's crew due to the effect of loading casks into holds where a loaded cask would have already been stowed, and would also increase the exposure to the crew members performing daily inspections. The additional exposure would be a result of the combination of the radiation fields surrounding each of the transportation casks.

Assuming 56 casks per year, the number of annual voyages required would range from 7 to 28, depending upon the number of casks per ship. Although the foreign research reactor spent nuclear fuel would be shipped from 40 countries worldwide and to both U.S. coasts over a 13-year receipt period, DOE and the Department of State conservatively assumed that a single crew could be involved in up to 9 voyages per

year. As a practical matter, this overstates the rate at which a crew would sail from Europe or Asia and back. Additionally, to determine the dose to the maximally exposed worker in the ship's crew, DOE and the Department of State conservatively assumed that the same individuals would conduct all the daily onboard inspections.

The dose received during daily cargo inspection would be a major contributor to the crew dose, so the duration of the voyage is an important consideration. Chartered vessels would sail directly to the port(s) of entry, yielding an average voyage duration of 18 days. DOE and the Department of State conservatively assumed that all shipments aboard regularly scheduled commercial breakbulk vessels would include two intermediate port stops in the United States, which would add 3 days to the voyage.

Table 4-2 presents the maximum estimated incident-free marine transport doses and risks. Values are provided for a chartered ship (which would not make intermediate port calls) and for a regularly scheduled commercial vessel. The values are based on the estimated time the cask would be onboard multiplied by the dose per day received as a result of inspections, plus the crew dose due to the foreign research reactor spent nuclear fuel container loading and off-loading activities. While the use of a chartered ship would result in higher per-shipment impacts (eight casks per shipment versus two for regularly scheduled commercial ships), the reduced number of voyages would offset this increase in per-shipment impacts. Therefore, the use of chartered ships instead of regularly scheduled commercial ships would result in slightly lower total crew exposures in the basic implementation of Management Alternative 1. The selection of the shipping mode, however, would not be based on crew exposures alone. Other factors, such as cost, would also be important in the choice of chartered or regularly scheduled ships. The results in Table 4-2, therefore, provide an estimate of the range of maximum worker exposures due to the shipment of the foreign research reactor spent nuclear fuel.

Table 4-2 Incident-Free Marine Transport Impacts[a]

	Regularly Scheduled Commercial Ship				*Chartered Ship*			
	Maximally Exposed Worker Dose (mrem)	*Maximally Exposed Worker Risk (LCF)*	*Population Dose to Crew (person-rem)*	*Population Risk (LCF)*	*Maximally Exposed Worker Dose (mrem)*	*Maximally Exposed Worker Risk (LCF)*	*Population Dose to Crew (person-rem)*	*Population Risk (LCF)*
Impacts Per Shipment	66[b]	0.000027	0.23	0.000091	100[b]	0.00004	0.83	0.00033
Impacts for the Basic Implementation	1,300[b,c]	0.00052[c]	85	0.034	1,300[b,c]	0.00052[c]	75	0.030

[a] *These results are based on the assumption that the dose rates associated with the casks are all derived from the exclusive-use regulatory limit. Historically, the average of these dose rates has been equal to about one-tenth of this regulatory limit, so this assumption is conservative.*

[b] *If an individual works on repeated shipments, this maximally exposed worker dose could exceed the annual regulatory limit. Therefore, DOE would require that mitigation measures be implemented to keep the maximally exposed worker dose down to 100 mrem per year or lower. See Appendix C for estimates of the total exposure to the ships' crews without mitigation measures.*

[c] *These results are based on the conservative assumption that one individual receives the maximum annual dose (100 mrem) every year for 13 years.*

Marine transport workers are not trained to be radiation workers, so they would not be subject to the radiation worker limit of 5,000 mrem/yr. The applicable regulatory limit for these workers would be the same as for the general public: 100 mrem/yr. As the table shows, the highest estimated maximally

exposed worker risk is 0.00052 LCF, which is based on the annual regulatory limit every year for 13 years. This means that the chance of this individual incurring a cancer due to the basic implementation of Management Alternative 1 would be less than one in a thousand.

The highest estimated population risk is about 0.034 LCF, which is much less than 1 LCF.

4.2.1.3 Conservative Assumptions and Maximum Estimated Impacts of Accidents During Marine Transport

The basic implementation of Management Alternative 1 could potentially impact the marine environment in the event of an accident involving the release of radioactive material from the spent nuclear fuel. This section discusses possible accidents and their consequences.

The range of accidents that could occur during marine transport is quite broad. The ship could collide with another vessel or an object such as a shoal, rock, or wreck. Foul weather could damage or sink the ship, or the ship could experience a fire, explosion, or other problem. To reduce the risk due to potential accidents, the casks that would carry the foreign research reactor spent nuclear fuel have been designed to prevent damage to the cask contents in all but the most severe, and least likely, cases. See Appendix B of this EIS for a description of the foreign research reactor spent nuclear fuel transportation casks.

Two scenarios emerge that could potentially threaten the marine environment and possibly humans: the cask could be damaged and then involved in a fire, or the cask could sink. These cases are discussed in more detail below.

Cask Damaged Followed by a Fire

A ship carrying foreign research reactor spent nuclear fuel could be involved in a severe collision with another ship. It is possible that a transportation cask, carried on a ship involved in such a collision, could be exposed to impact forces resulting from the collision. In that event, the cask could be damaged. However, only a small fraction, at most, of the force generated in a collision of one ship with another would be brought to bear on a transportation cask for two reasons. First, the force of a ship-to-ship collision would be distributed over the entire area of contact between the two ships, which means that the force density (force per unit of area) that would result from a collision must be considered. The maximum cross sectional area presented by a transportation cask would be small in comparison to the typical impacted area, so that even if a cask were located directly in the path of the collision and unprotected by intervening hulls, bulkheads, etc., the force that might be exerted on such a cask would be limited by the force density.

Secondly, ships floating on water are yielding objects, so that some portion of the energy of impact would be transmitted to the water. Even severe collisions with large impact forces, by themselves, would not necessarily result in catastrophic failure of a transportation cask. Thus, it would be even more unlikely for a less severe collision to result in the breach of a cask and, thereafter, a release of any of its contents. Attachment 4 to Appendix D discusses in detail the forces involved in ship collisions.

If it is assumed, however, that a ship collision breaches the cask, a release of radioactive material would be possible. In such a circumstance, the release would be small because the spent fuel is metallic and thus would release very limited quantities of radioactive material, even if mechanically damaged. However, due to the severity of the collision required to breach the cask, the ship carrying the foreign research reactor spent nuclear fuel cask would be severely damaged and probably would sink. Whether the ship would sink or not, the only humans that could be affected (the crew) would most likely not be in the vicinity of the impact point of the collision, where the damaged cask would be located.

The limiting accident is a ship collision severe enough to breach a cask carrying foreign research reactor spent nuclear fuel and also cause a large fire. Some of the radioactive contents of the cask could be released and carried into the air by the heated gases of the fire as a plume of radioactive particles. For an airborne release of this type to occur, the cask-carrying vessel must stay afloat during and immediately after the accident. In practice, this would mean that the ship must stay afloat for a period of some hours following an accident of the requisite severity. This latter condition must be satisfied for atmospheric dispersal to occur, even though marine casualty files indicate that a common outcome of severe ship collisions is rapid sinking, often within a matter of minutes. Assuming the cask was damaged by a severe collision; and the ship remained afloat despite the severe collision; and the cask was engulfed in flames for a time sufficient to release a radioactive plume, there would likely be no human population on the ocean (excluding the crew) who could be affected.

It is possible that the ship could be in coastal waters (i.e., beyond the port's sea buoy) at the time of this severe collision. Except in port, a ship is seldom within 16 km (10 mi) of a population center, so the port accident public risk analysis in the next section covers public risk in this scenario. The ship's crew and people onboard other vessels that may come to provide assistance could be exposed to any released radioactive material. The number of people potentially exposed would be less than that used in the port accident analysis for populations near a port [less than 1.6 km (1 mi) from the port]. Additionally, accident frequencies at sea tend to be lower than in-port accident frequencies. Therefore, both the consequences and risks for an accident at sea are covered by the results of the port accident analysis.

Risks associated with this type of accident at sea are covered by the risks of the same type of accident in ports because humans in the vicinity of the accident at sea are much fewer in number than even the least populated port.

Sunken Cask

The second scenario of concern is that a foreign research reactor spent nuclear fuel cask or casks would be sunk. This could be the result of the ship sinking, of the casks being somehow swept overboard, or of a ground transport accident on a causeway. Submersion of an intact cask would not necessarily result in a release of its contents, as spent nuclear fuel casks are designed to withstand at least a 15 m (50 ft) immersion. It has been demonstrated that cask seals will remain intact at much greater depths (DOE, 1994m). Should a loaded foreign research reactor spent nuclear fuel cask (damaged or undamaged) sink anywhere in the U.S. coastal waters, it will be recovered regardless of depth. U.S. Coastal waters in this case refers to waters within the 12 mile territorial limit. Recovery would be accomplished, even in the deepest parts of U.S. coastal waters, such as in Puget Sound, which reaches 305 meters or 1,000 feet (Encyclopedia Americana, 1991). Elsewhere in the world, spent nuclear fuel casks can, and likely would, be recovered from water up to 200 m (660 ft) deep, which is beyond the range typical of coastal and port depths. Typically 200 m (660 ft) is considered the limit of the continental shelf. Recovery at depths greater than 200 m (660 ft) is possible but is more difficult.

If a sunken cask containing foreign research reactor spent nuclear fuel were recovered, the effect on the marine environment would be minimal, even if the recovery effort required up to 1 year to complete. The release to the ocean water of radioactive particles from the spent nuclear fuel requires that first the metallic spent fuel corrode, then the radioactive particles escape from the cask. Even if the cask were damaged, the most likely damage to a spent nuclear fuel cask, either from mechanical trauma or excessive depth, would be failure of the seal. Seal failure would allow seawater to enter the cask to begin the corrosion of the metallic spent nuclear fuel, but the flow of water through the cask to carry out the radioactive material

would be minimal due to the small cross sectional area of the failed seal. The decay heat from the spent nuclear fuel is low, thereby providing no driving force to expel water out of the cask through the failed seal.

If a cask was not recovered, the radioactive constituents of spent nuclear fuel would be released slowly over time into the surrounding waters. Some of the radioactive material would be removed from the water by adhesion to suspended sediments. Assuming a cask were submerged on the deep ocean bottom and not recovered, the peak human dose to an individual ingesting seafood harvested from the area in which the breached submerged spent nuclear fuel cask would be located would be 114 mrem per year. If a sunken cask in coastal waters was not recovered, the peak human dose is conservatively estimated to be 14,000 mrem per year. Consequences to humans and to marine biota are presented in Table 4-3. Other studies of similar circumstances indicate that the individual dose would be even lower (DOE, 1980). Uranium (the major constituent of the spent nuclear fuel) has been found not to bioaccumulate in fish, and bioaccumulates only slightly in crustaceans and mollusks (IAEA, 1976). The peak doses for humans, fish, crustaceans, and mollusks are presented in Table 4-3 in the situation where a chartered ship carrying eight casks might sink in deep ocean. Doses for humans and other animals are expressed in units of rem and rad, respectively. Rem is discussed in some detail in Section 4.1.3. While rem is only used for measuring human exposure to radiation, rad is used to measure exposure of nonhumans to radiation. Rad is a unit of absorbed dose from ionizing radiation.

The probability provided in Table 4-3 is the probability of one ship accident and loss of a cask during the entire program. The consequences are from one unrecovered cask. The program risk is the product of the probability and the consequences. Humans would not be the principally exposed species in a marine accident involving foreign research reactor spent nuclear fuel. Estimates were made of the dose to the biota received from a damaged cask containing foreign research reactor spent nuclear fuel. This analysis assumes that the cask would lay on the deep ocean floor where it would slowly release its radioactive inventory whether it was damaged in the collision or not.

Table 4-3 Impacts of Unrecovered Casks in Deep Ocean

	Probability	*Consequences*	*Program Risk*
MEI (human)	1.7×10^{-6}	114 mrem/yr	0.00019 mrem/yr
Fish	1.7×10^{-6}	640 rad/yr	1.1 mrad/yr
Crustaceans	1.7×10^{-6}	880 rad/yr	1.4 mrad/yr
Mollusks	1.7×10^{-6}	30,000 rad/yr	49 mrad/yr

Risks associated with the release of the contents of the spent nuclear fuel elements into the deep ocean are expected to be very small due to the low probabilities and limited consequences. The highest estimated risk to the MEI is 0.00019 mrem per year for every year that the cask leaks and this hypothetical individual ingests seafood harvested from near the cask. DOE and the Department of State assume that these conditions could apply for about 5 years, so the total MEI dose would be 0.00095 mrem. This translates into a maximum estimated MEI risk of 5×10^{-10} LCF. This means that this hypothetical individual's additional chance of incurring an LCF would be less than one in a billion. The risks to fish, crustaceans, and mollusks are low enough that no adverse impacts would be expected.

Probabilities, consequences, and risks were also calculated for the cases of unrecovered casks in coastal waters, both undamaged and damaged. The results are presented in Table 4-4, again in terms of rem for humans and rad for other animals. In coastal waters, cask recovery is considered likely (NEA, 1988),

which makes the probabilities in Table 4-4 low. Comparing Tables 4-3 and 4-4 shows that the consequences of a sunken cask in coastal waters would be greater than in the deep ocean, but when multiplied by the probabilities, the risks are actually lower.

Table 4-4 Impacts of Unrecovered Casks in Coastal Waters

	Probability One Undamaged Cask	*Consequences One Undamaged Cask*	*Program Risk*
MEI (human)	2.3×10^{-8}	190 mrem/yr	4.3×10^{-6} mrem/yr
Fish	2.3×10^{-8}	77 mrad/yr	1.8×10^{-6} mrad/yr
Crustaceans	2.3×10^{-8}	81 mrad/yr	1.9×10^{-6} mrad/yr
Mollusks	2.3×10^{-8}	210 mrad/yr	4.8×10^{-6} mrad/yr
	Probability One Damaged Cask	*Consequences One Damaged Cask*	*Program Risk*
MEI (human)	4.6×10^{-11}	14,000 mrem/yr	6.4×10^{-7} mrem/yr
Fish	4.6×10^{-11}	620 mrad/yr	2.9×10^{-8} mrad/yr
Crustaceans	4.6×10^{-11}	660 mrad/yr	3.0×10^{-8} mrad/yr
Mollusks	4.6×10^{-11}	14,000 mrad/yr	6.4×10^{-7} mrad/yr

These risk estimates were derived assuming that the foreign research reactor spent nuclear fuel is shipped at a rate of one cask per voyage. Assuming a different shipping schedule, such as eight casks per voyage, would not result in a different estimate of the risks. The potentially higher consequences of an accident involving more than one shipping cask would be balanced by the reduced probability of an accident due to the reduced number of shipments. For example, the risk associated with one shipment of eight casks is equivalent to the risks associated with eight single cask shipments.

4.2.1.4 Marine Transport Cumulative Impacts

The cumulative impact of radioactive material shipments on ships' crews beyond that discussed in Section 4.2.1.2 was not estimated. In estimating the cumulative impact on port workers (see the following section) it was possible to estimate the total number of shipments of radioactive material through a port. However, it is not as simple to estimate the total number of shipments of radioactive material that involve the same ship and crew. It is expected that each ship's crew would be exposed to fewer of the shipments of radioactive material than that assumed for the port worker in the cumulative impact analysis for the port. For port workers, the impacts of the shipments other than the foreign research reactor spent nuclear fuel were of the same order of magnitude, but lower than the foreign research reactor spent nuclear fuel shipments. Therefore, the individual crew member's exposure from shipments other than the foreign research reactor spent nuclear fuel shipments would be a small fraction of the dose received due to the foreign research reactor spent nuclear fuel shipments.

4.2.1.5 Marine Transport Mitigation Measures

The principal environmental impact that would occur during marine transport would be radiation dose to the ships' crews. Most of this dose occurs because crew members must visually inspect the cargo every day for safety reasons, and the inspections cannot be curtailed.

The magnitude of the estimated impacts from this portion of the basic implementation of Management Alternative 1 is primarily due to two items: the conservative assumption that the radiation field emanating from all of the casks would be at the regulatory limit (as opposed to the levels of one-tenth of the regulatory limit that have been observed in past foreign research reactor spent nuclear fuel shipments), and the conservative assumption that the same crew member is involved in inspections for all of the casks on nine shipments during any given year. In reality, neither of these conservative assumptions would be

likely to occur. Nevertheless, to ensure that no member of a ship's crew could receive a dose above what is allowed for a member of the general public, DOE would mitigate this effect by implementing a system through its shipping contractor to track each ship and crew involved in the shipment of foreign research reactor spent nuclear fuel. DOE would also include a clause in the contract for shipment of the foreign research reactor spent nuclear fuel requiring that other crew members be used if any crew member approaches a 100 mrem dose in any year.

If a cask or casks were sunk in deep ocean or coastal waters, DOE and the Department of State would employ modern underwater search techniques to locate and recover the cask(s), thus minimizing the potential impacts to marine life.

4.2.2 Port Activities Impacts

4.2.2.1 General Assumptions and Analytic Approach

To assess the range of potential impacts on ports at which a ship carrying foreign research reactor spent nuclear fuel might call, 13 ports of entry representing a wide range of port city population densities were selected for detailed evaluation. Eight of the ports—Charleston, SC; Elizabeth, NJ (for the New York City area); Philadelphia, PA; Norfolk, VA (representing Hampton Roads); Jacksonville, FL; Savannah, GA; Wilmington, NC; and Military Ocean Terminal at Sunny Point (MOTSU), NC—are East Coast ports that represent high, medium, and low population density ports. The Norfolk Terminal was selected to represent the three terminals (Newport News, Norfolk, and Portsmouth) at Hampton Roads for the analysis of potential impacts because this terminal provides the most conservative values in terms of estimated impacts. The West Coast ports chosen for evaluation were Long Beach, CA; Concord Naval Weapons Station (NWS), CA; Portland, OR; and Tacoma, WA, to represent high and medium population density ports. On the Gulf Coast, Galveston, TX was analyzed. These ports were selected to represent a range of ports in this analysis, not necessarily as the chosen ports of entry for foreign research reactor spent nuclear fuel. Ports representative of a group of ports with similar characteristics (i.e., of similar population around the port) were selected for analysis rather than attempting to analyze accidents at every potential port. Actual port selection and specific selection criteria are discussed in Appendix D, Section D.1.

The analysis assumed that there were no restrictions on the shipping routes taken by the cargo vessel carrying the foreign research reactor spent nuclear fuel. This assumption allows the vessel to make intermediate stops at any U.S. port capable of unloading the vessel. This implies that the vessel could enter most ports capable of receiving ocean-going cargo vessels, a group of ports that far outnumbers the ports that survive the port selection criteria for the receipt of foreign research reactor spent nuclear fuel. It was conservatively assumed that regularly scheduled commercial ships carrying foreign research reactor spent nuclear fuel would pass through two intermediate U.S. ports before reaching the port of entry for the foreign research reactor spent nuclear fuel. The 13 ports with high, medium, and low population densities that were chosen for site-specific accident analysis provide a perspective on the accident risks at the more than 100 ports that could be intermediate ports of call for the foreign research reactor spent nuclear fuel vessels.

Each port stop would or could involve:

- Port entry from the sea buoy,
- Docking,
- Inspection of cargo,

- Partial unloading of cargo,
- Partial reloading of cargo, and
- Port exit to the sea buoy.

As with the marine transport, the port impacts were evaluated for two conditions: incident-free and accident conditions. Summary results are presented in the following sections. Details of the analysis are presented in Appendix D.

4.2.2.2 Conservative Assumptions and Maximum Estimated Impacts of Incident-Free Port Activities

As stated in Section 2.6, no spent nuclear fuel transportation cask has ever released its contents (radioactive material), even as a result of an accident. For this reason, release of radioactive material is not considered as part of the incident-free analysis. The only impact considered is that caused by radiation exposure due to radiation emitted by foreign research reactor spent nuclear fuel contained within the transportation casks. Since no radioactive material would be released, there would be no impacts on land, water, or air quality in any of the ports or any of the waterways used by ships in the transport of foreign research reactor spent nuclear fuel.

Risks associated with the foreign research reactor spent nuclear fuel in incident-free conditions in port are predominantly those to inspectors and port workers. Port workers and inspectors are not radiation workers as defined by NRC regulations. Thus, the maximum allowable annual exposure for these personnel would be 100 mrem, the same radiation dose limit established by the NRC to protect individual members of the public (DOE, 1990c). When a ship arrives in its first port, the spent nuclear fuel package would be inspected by customs officials, U.S. Coast Guard personnel, and others. Up to six inspections, estimated at up to 15 minutes per person per spent nuclear fuel cask, were conservatively assumed. Once inspections are complete, the ship would partially unload and reload cargo. After that, DOE and the Department of State conservatively assumed that the ship would proceed to another intermediate port and then to the port of entry for the foreign research reactor spent nuclear fuel.

To determine the incident-free risks associated with port operations, two types of ships were considered for the shipment of the foreign research reactor spent nuclear fuel. In the first case, DOE and the Department of State conservatively assumed that all shipments were made on regularly scheduled commercial breakbulk ships. This type of vessel was selected because it maximized the time required for port activities, such as off-loading and inspections. In addition, during the operations at the intermediate port stops, DOE and the Department of State conservatively assumed that other unloading and loading operations would occur in the vicinity of the container with the loaded foreign research reactor spent nuclear fuel cask in one of the intermediate ports. Risks associated with these activities, which are comparable to the risks associated with the off-loading of the foreign research reactor spent nuclear fuel, have been included in the assessment. Transport of the material on this type of vessel would therefore result in the highest worker radiation doses in the incident-free analysis. All worker exposures were calculated by estimating the times required for activities and the distances from the transportation cask to where the worker would most likely be located.

To provide a measure of the difference in the worker exposures resulting from the use of cargo vessels other than the regularly scheduled commercial breakbulk vessels, the analysis was also performed for port operations associated with the use of a chartered container vessel. This type of vessel requires the least amount of time to unload. DOE and the Department of State also assumed that a chartered vessel would

not make any intermediate port stops, so that the ship's port of entry into the United States would also be the port of entry for the foreign research reactor spent nuclear fuel. Use of these two types of vessels in the analysis provides an estimate of the range of the maximum incident-free risk associated with port operations.

At the port of entry, the casks would be off-loaded by port workers, and arrangements would be made for the immediate departure of the foreign research reactor spent nuclear fuel from the port. In recognition of instances where some delay may occur, DOE and the Department of State conservatively assumed a delay of up to 24 hours in a secure staging area. The 24-hour period for the staging of spent nuclear fuel casks was selected because it is possible that, on occasion, the spent nuclear fuel casks would not leave the secure staging area the same day that they arrived, depending on variables such as the time of day the casks clear customs and the weather. Nonetheless, DOE and the Department of State consider it unlikely that the casks would remain in the staging area for longer than 24 hours.

To estimate the maximum individual exposure, the shipments were divided into East Coast and West Coast shipments, depending on the country of origin. Spent nuclear fuel shipments from Europe, Africa, the Middle East and parts of South America were designated as East Coast shipments, all others were designated as West Coast shipments. Under these assumptions, the East Coast port(s) would receive approximately 535 casks and the West Coast port(s) approximately 186 casks. DOE and the Department of State also conservatively assumed for this analysis that all the shipments would pass through the same intermediate ports as the shipments on regularly scheduled commercial vessels and have the same port of entry.

Further, DOE and the Department of State made the very conservative assumption that the same inspectors and workers would handle every cask shipment. The per-shipment doses were then multiplied by the number of shipments for the East Coast to determine the maximally exposed worker dose for the basic implementation of Management Alternative 1.

In determining the worker population exposure, all shipments (East Coast and West Coast) were considered. This results in the integrated dose for the entire basic implementation of Management Alternative 1 which would span 13 years. The maximum estimated incident-free risks to port personnel due to the basic implementation of Management Alternative 1 are presented in Table 4-5. The incident-free risk to the general public would be zero because only workers would be near the casks in port.

This table shows the maximally exposed worker dose, worker population dose, and associated risks for the shipment of foreign research reactor spent nuclear fuel as containerized cargo on a regularly scheduled commercial breakbulk vessel and as cargo on a chartered container vessel. These figures represent the range of maximum estimated impacts for the various shipping modes available for the ocean transport of foreign research reactor spent nuclear fuel.

As the table shows, the highest estimated maximally exposed worker risk is 0.00052 LCF, which is based on the annual regulatory limit every year for 13 years. This means that the chance of this individual incurring a cancer due to the basic implementation of Management Alternative 1 would be less than one in a thousand.

The highest total population risk for port workers is 0.012 LCF, which is much less than one LCF.

Table 4-5 Incident-Free Port Activity Impacts[a,b]

Impacts per Cask Transfer

Risk Group	Regularly Scheduled Commercial Breakbulk Ship				Chartered Container Ship			
	Maximally Exposed Worker Dose (mrem)	Maximally Exposed Worker Risk (LCF)	Population Dose to Workers per Cask (person-rem)	Population Risk (LCF)	Maximally Exposed Worker Dose (mrem)	Maximally Exposed Worker Risk (LCF)	Population Dose to Workers per Cask (person-rem)	Population Risk (LCF)
Inspectors	3.8	0.0000015	0.013	0.0000052	1.3	5×10^{-7}	0.0053	0.0000021
Port Handlers, Intermediate Ports	2.2	9×10^{-7}	0.018	0.0000071	----	----	----	----
Port Handlers, Port of Destination	2.0	8×10^{-7}	0.0066	0.0000026	0.46	1.8×10^{-7}	0.0015	6×10^{-7}
Port Staging Personnel	0.36	1.4×10^{-7}	0.0045	0.0000018	0.4	2×10^{-7}	0.0046	0.0000018
Maximum	3.8	0.0000015	----	----	1.3	5×10^{-7}	----	----
Total	----	----	0.042	0.000017	----	----	0.011	0.0000045

Impacts for the Entire Basic Implementation

Risk Group	Regularly Scheduled Commercial Breakbulk Ship				Chartered Container Ship			
	Maximally Exposed Worker Dose (mrem)	Maximally Exposed Worker Risk (LCF)	Population Dose to Workers (person-rem)	Population Risk (LCF)	Maximally Exposed Worker Dose (mrem)	Maximally Exposed Worker Risk (LCF)	Population Dose to Workers (person-rem)	Population Risk (LCF)
Inspectors	1,300[c]	0.00052[c]	9.4	0.0038	670	0.00027	3.8	0.0015
Port Handlers, Intermediate Ports	1,186	0.00047	13	0.0052	----	----	----	----
Port Handlers, Port of Destination	1,072	0.00043	4.8	0.0019	250	0.0001	1.1	0.00044
Port Staging Personnel	190	0.000076	3.2	0.0013	210	0.000084	3.3	0.0013
Maximum	1,300[c]	0.00052	----	----	670	0.00027	----	----
Total	----	----	30	0.012	----	----	8.2	0.0032

[a] *These results are based on the assumption that the dose rates associated with the casks are all based on the regulatory limit. Historically, the average of these dose rates has been equal to about one-tenth of the regulatory limit, so this assumption is conservative.*

[b] *These results are all based on the assumption that each voyage carries two casks. This assumption is conservative because chartered ships may carry up to eight casks.*

[c] *With all the conservative assumptions in this analysis, the maximally exposed worker dose could theoretically exceed the annual regulatory limit. Therefore, DOE would require mitigation measures to keep the maximally exposed worker dose down to 100 mrem per year or lower. These results are based on the conservative assumption that one individual receives the maximum annual dose (100 mrem) every year for 13 years. See Appendix D for maximally exposed worker doses without mitigation measures.*

4.2.2.3 Conservative Assumptions and Maximum Estimated Impacts of Accidents During Port Activities

Section 4.2.1.3 discussed the impacts of marine accidents that could occur either in the open ocean or during coastal passages. This section discusses the impacts of accidents that could occur anywhere from the sea buoy into the port and at the pier.

Methodology

An analysis of reasonably foreseeable accidents must evaluate the consequences of possible accidents and the probability of an accident occurring. In incident-free marine transport, some exposure would be expected from radiation emitted from the casks. In the case of accidents, the probability of exposure is only an estimate of a hypothetical event. Accident probabilities are derived from published maritime accident rates. The analysis of ship collisions concludes that only one hold of the ship carrying the foreign research reactor spent nuclear fuel transportation casks would be subject to sufficient forces to potentially result in cask damage. There is no difference between the risks associated with a single shipment with two casks in a hold, and two shipments of a single cask each. The consequences of the accident with two casks in the hold may be as large as twice the consequences of an accident involving one cask. But the probability of an accident involving the ship carrying the two casks is half the probability of one of the two ships carrying a single cask being involved in an accident. Therefore, the potential risk from accidents, marine transportation of spent nuclear fuel was modeled in the port accident analysis as occurring in one cask per shipment.

Because accidents can be of any degree of severity, from a "fender bender" to one involving severe impact and prolonged fire, the severity spectrum is divided into a number of accident severity categories. Each category is assigned a conditional probability of occurrence [i.e., a probability (given that an accident occurs) that it will be of that particular severity]. In general, the more severe the accident, the more remote the chance of such an accident. In this analysis, the accident severity spectrum is divided into six categories (Wilmot et al., 1981), which are discussed further in Appendix D. The accident scenarios considered in this analysis fall into the three most severe of the six severity categories.

Accidents in the first three, least severe, categories result in no release of material from the spent nuclear fuel transportation cask. These categories include all the accident scenarios associated with handling the spent nuclear fuel cask, including dropping the cask during transfer from the vessel to the truck or train. The transportation casks are certified to maintain their integrity when dropped from 15 m (50 ft) onto a perfectly unyielding surface. During the cask transfer, however, the crane may lift the cask higher than 15 m (50 ft). As the dock surface is softer than "perfectly unyielding," the soft surface of the dock would compensate for the greater drop height. Studies (DOE, 1994m) have shown that a cask can be dropped from much higher than the certification test height onto a yielding surface, without breaching.

The accidents analyzed in the three highest severity categories include collision of vessels, either in the approach to the harbor or when the vessel transporting the foreign research reactor spent nuclear fuel would be docked. The category 4 accident severity category models a collision of two vessels resulting in the breach of the transportation cask. Severity categories 5 and 6 model collisions that would breach the cask and subsequent fires that would cause the release of additional material, with category 6 fires being more intense than those for category 5.

As mentioned above, the spectrum of accidents, including a container breach and fire, were evaluated at two locations in each of the 13 ports of entry selected to envelop the port impacts. The approach to each port, from the sea buoy to the selected dock, was examined to determine the location where the accident would be most likely as well as have the largest consequence. This point is typically near the highest

population center along the approach to the pier, and DOE and the Department of State conservatively selected this point for accident analysis. The second location where the spectrum of accidents was assumed to occur is at pier-side.

At these two locations, the probability of an accident was assigned, based on historical ship accident data (see Appendix D for details). These data were used to develop accident frequencies for collisions between vessels large enough to generate the forces sufficient to damage the cask (additional details on the development of the model used are provided in Appendix D), and to develop the frequency of collisions concurrent with fires (Lloyds, 1991). These data include information on a large number of ship voyages and accidents due to all causes. The cause of the accident (human error, weather, mechanical failure, etc.) was not identified for this analysis. However, the data apply to damage to or loss of a vessel and would include information on accidents that were caused by severe weather. Although severe weather accident scenarios are not specifically identified in the analysis, they are considered through the use of these data.

The consequence modeling for the port accident analysis was performed using the MELCOR Accident Consequences Code System (MACCS) (Jow, 1990), a code developed for the conservative modeling of accident consequences for nuclear powerplants and approved by the NRC. This code uses site-specific information, including population and meteorology, along with the identified radionuclide inventory and release fractions to determine the consequences of the accident scenarios. In determining the effects of the release of radioactive material, the MACCS code evaluates the direct dose to the public as well as several additional pathways including inhalation, ingestion, and groundshine. Groundshine is the dose received from radioactive material deposited on the ground's surface.

A conservative assumption incorporated into the risk assessment is that the entire population would remain in the area for 24 hours and therefore would be exposed to the greatest extent possible to radioactive material deposited on the ground from the plume. In reality, individuals close to an accident could be evacuated.

Atmospheric dispersion is usually the primary mechanism for dispersing any material that might be released in a severe accident. For the ship-collision-without-fire scenario (category 4), the release is modeled as occurring at the water surface level. For shipboard fires (categories 5 and 6), an elevated release due to the lifting effect of the fire is modeled. Meteorology data from the nearest National Weather Service Station were obtained for the 13 ports of entry selected as representative ports and input to the analysis of dispersion to ensure validity.

Cask Characteristics

The behavior of the cask in accidents within each accident severity category is accounted for in this analysis. "Type B" spent nuclear fuel casks (the kind in which the foreign research reactor spent nuclear fuel would be shipped) are massive, highly damage-resistant packages. Moreover, the spent nuclear fuel itself consists mostly of solid metallic materials that are not readily dispersed. Therefore, large releases would not be likely to occur, even in the most severe of accident conditions.

"Type B" packages are required to pass a series of rigorous tests that are associated with hypothetical accident conditions that might be encountered. These certification tests were developed by the International Atomic Energy Agency and promulgated as model regulations (IAEA, 1990). These model regulations have been adopted by the United States as well as all of the nations currently proposing to ship foreign research reactor spent nuclear fuel to the United States under the basic implementation of Management Alternative 1.

Ports Selected for Accident Analyses

Analyses of the impacts of possible accidents at representative ports were conducted. Thirteen ports were selected as being representative of the full range of ports in the United States, based on population and geography. Three of the ports are high-population density ports, two on the East Coast (Elizabeth, NJ and Philadelphia, PA) and one on the West Coast (Long Beach, CA). Five of the ports (Portland, OR; Tacoma, WA; Concord NWS, CA; Jacksonville, FL; and Norfolk, VA) are medium-population density ports, three on the West Coast and two on the East Coast. The remaining ports (MOTSU, NC; Galveston, TX; Savannah, GA; Wilmington, NC; and Charleston, SC) are low-population density ports. The 13 potential ports of entry for which accidents were analyzed collectively have a range of populations and geography that ensure that the results of these analyses are representative of the results that would have been reached if the analyses had been conducted for all ports. Additionally, these 13 ports include all 10 of the ports that meet all of the port selection criteria.

To demonstrate the representative nature of the analyses performed, a plot was made of the analyzed accident consequences for mean meteorological conditions at each port versus the port's population in a 16-km (10-mi) radius (Figure 4-1). The analyzed data points are shown as dots. The straight line represents the linear least squares fit of the data. Since the straight line represents an average of the data, some deviation from the line for individual data points is expected. The data fit well, with a correlation factor of 0.994455 (a correlation factor of 1.0 implies a perfect fit). This plot demonstrates the expected increase in the total population dose with an increase in port population. Deviations from the line by the calculated data are typically due to the distribution of population in relation to the local meteorology. Where most of the population is downwind of the port in normal weather, the corresponding population dose would likely be above the average line. For comparison, the total population dose due to background radiation is shown in the upper right corner. This comparison shows that population dose resulting from a severe accident would be approximately 0.2 percent of the annual background population dose.

As a check that the data from the 16-km (10-mi) radius population is valid, a similar analysis was performed correlating the 80-km (50-mi) radius population and accident consequences for seven ports. This analysis confirmed that the population dose as a function of population is linear, and therefore confirms that the range of ports selected for accident analysis fully covers the entire range of U.S. ports. More specific discussion of the results of the analyses is provided in Appendix D. This linearity of consequences and population show that any port selected for use as an intermediate port or port of entry for the foreign research reactor spent nuclear fuel, ranging from the least populous port (MOTSU) to the most populous port (Elizabeth) and including major ports of intermediate population, has had representative accident analyses performed.

Probabilities of Port Accidents

The probability of an accident occurring can be determined from historical statistics on ship collisions and mishaps. Maritime accident rate data from a Lloyd's of London database covering approximately 900,000 port calls by commercial vessels over a 15-year period (1978 to 1993) were examined to develop accident probabilities. The data indicate that the basic accident rate in and near ports is slightly less than 0.0001 accidents per port transit, or approximately 1 accident per 10,000 port visits.

Only the most severe accidents, however, would cause any damage to the cask. Thus, the conditional probabilities of occurrence of each accident severity were also developed from this database. As discussed in Appendix D, a conditional probability is defined as the probability, given that an accident has occurred, that it will be of a certain severity. To calculate overall probability of an accident of a particular severity, the base accident probability (accident rate) must be multiplied by the conditional probability.

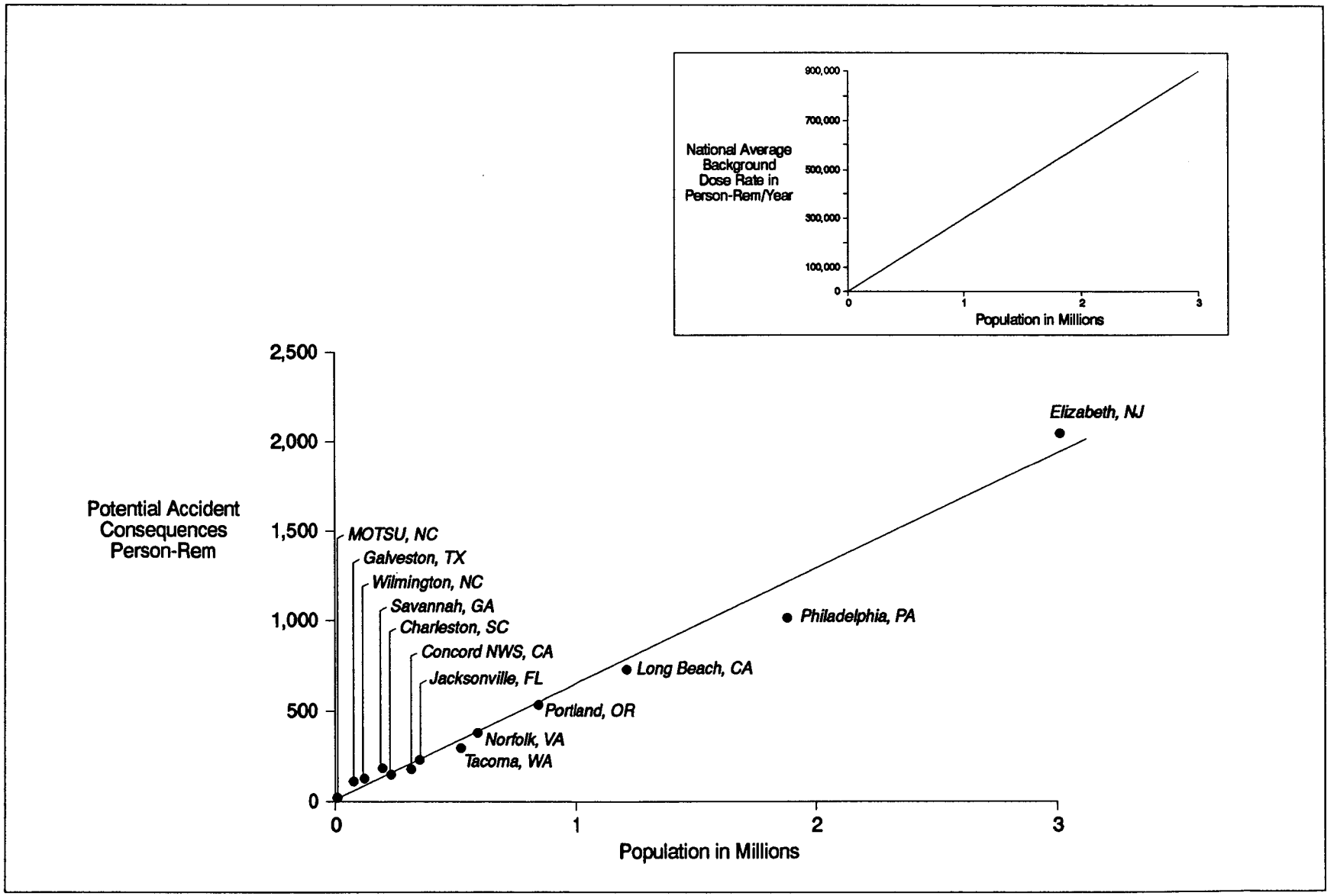


Figure 4-1 Consequences Versus Population [for a 16-km (10-mi) Radius]

Accidents are ranked according to their release categories. Release category 4 would result from the cask being damaged and compromised. Release category 5 would result from a damaged and compromised cask being enveloped in a fire. Release category 6 would result from a damaged and compromised cask being enveloped in a longer fire than a category 5 fire. The probabilities for the category 4, 5, and 6 accidents are 0.000006, 5×10^{-9}, and 6×10^{-10}, respectively. DOE and the Department of State assumed that it was equally likely that the accident occurs at the dock or in the channel, during the approach to the dock.

Consequences of Port Accidents

The consequence of an accident indicates the result, given that the accident were to occur, without any consideration for the likelihood of the accident occurring. The analysis conducted to determine the impacts of an accident involving foreign research reactor spent nuclear fuel in ports yields two different measures of the consequences. One measure is a calculation of the number of LCF that might result if the accident were to occur. These results are presented in Table 4-6 for the three most severe types of accidents under mean meteorological conditions.

The results presented in Table 4-6 are based on the mean consequences, so they are equivalent to results expected for the accidents in the respective release categories. These results are also based on the conservative assumption that accidents involve a cask carrying the highest inventory of nuclear material expected. Appendix D provides information on the consequences associated with the range of spent nuclear fuel types considered.

Examination of Table 4-6 shows that the most adverse consequence (2.9 LCF) arises from a Release category 5 accident in the channel approaching the Port of Elizabeth. This places the vessel just west (and generally upwind) of New York City. Although some of the release fractions change between categories 5 and 6, most of them do not. Therefore, the total population dose and the related number of LCF are about the same for Release categories 5 and 6. Release category 4 would be a release with no fire. In the absence of a fire, the release would remain at ground or water level without wide dispersion, hence the greatly reduced number of affected individuals and reduced consequences.

In addition to calculating the health effects of an accident on man, the MACCS code also calculates the impact of the accident on the land and structures around the accident site. These effects are characterized by the costs of activities required to bring the land and structures back into a usable condition. These activities are characterized as (1) no remedial action required; (2) decontamination – the resources can be returned to use immediately after clean-up; (3) interdiction – the resources must be temporarily abandoned, for several years, prior to their return to use; and 4) condemnation – the resources are considered unusable for an extended period. In all of the consequence analyses performed for each of the accident sites, there are no costs calculated that are associated with decontamination, interdiction, or condemnation. This means that all of the land and structures would be immediately available for use. (The consequences calculated by MACCS for the immediate vicinity of the accident are based on average value for the area within 1.6 km (1 mi) of the accident. Even though the average consequences calculated by MACCS show no costs associated with accident clean-up, the area immediately around the ship carrying the foreign research reactor spent nuclear fuel (i.e., the dock area) may require some remedial activity).

A sensitivity analysis was performed to address the potential impact of shipboard fires with extremely high temperatures that could result in the foreign research reactor spent nuclear fuel attaining temperatures above the melting point of the aluminum-based fuel or the combustion temperature of the TRIGA fuel. This analysis shows that the maximum consequences of such a fire are a factor of 100 larger than those

Table 4-6 Port Accident Consequences (LCF)

Locations	Accident Severity Category[a]		
	4	5	6
Elizabeth at the Dock	0.00010	2.8	2.7
Elizabeth in the Channel	0.00016	2.9	2.8
Long Beach at the Dock	0.000093	2.0	2.0
Long Beach in the Channel	0.000035	1.8	1.9
Philadelphia at the Dock	0.000078	1.2	1.2
Philadelphia in the Channel	0.000037	1.2	1.2
Portland at the Dock	0.000034	0.52	0.53
Portland in the Channel	0.000023	0.50	0.51
Norfolk at the Dock	0.000024	0.38	0.37
Norfolk in the Channel	0.000013	0.30	0.30
Charleston at the Dock (Wando Terminal)	0.000011	0.19	0.19
Charleston at the Dock (NWS Charleston)	0.0000068	0.22	0.22
Charleston in the Channel	0.000017	0.19	0.19
Tacoma at the Dock	0.000024	0.75	0.80
Tacoma in the Channel	0.000017	0.63	0.66
Concord NWS at the Dock	0.000019	0.90	0.96
Concord NWS in the Channel	0.000041	1.40	1.50
Jacksonville at the Dock	0.000012	0.31	0.31
Jacksonville in the Channel	0.000011	0.24	0.25
Savannah at the Dock	0.000025	0.23	0.23
Savannah in the Channel	0.0000059	0.18	0.19
Wilmington at the Dock	0.000017	0.22	0.23
Wilmington in the Channel	0.0000042	0.098	0.10
Galveston at the Dock	0.000032	0.64	0.70
Galveston in the Channel	0.000014	0.63	0.69
MOTSU at the Dock	0.0000032	0.099	0.11
MOTSU in the Channel	0.0000042	0.098	0.10

[a] *These accident release categories are the three highest in severity.*

calculated for the base case (Appendix D, Section D.5.4.2.2, Table D-31). An extremely high temperature ship fire is highly unlikely (one in ten billion per shipment) and the risks are comparable to those calculated in the base case. This analysis also addressed the impact of an accident on the land around the port. Using the same characterizations as described in the preceding paragraph, the largest mean impact distance is a decontamination and interdiction distance which is limited to approximately 300 m (1,000 ft). The analysis also shows that this distance is representative of the impact of this highly improbable type of accident at any of the ports included in the proposed action.

Risks

The calculated risk (probability times consequence) to the nearby population on a per-shipment basis assuming one cask per shipment and for the entire basic implementation of Management Alternative 1 is presented in Table 4-7. Each risk value is the sum of the risks from accident severity categories 4, 5, and 6. (A sensitivity study was performed to assess the risks associated with accidents that result in extremely high temperature fires. This sensitivity study was limited to an analysis of the per-shipment risks associated with shipment of spent nuclear fuel through the highest population density port, Elizabeth, NJ. Even though the consequences of this type of an accident are orders of magnitude larger than those

calculated for the base case analysis, this type of event is highly improbable and the risks are comparable to those calculated in the base case. A more detailed comparison of the base case and sensitivity analyses is presented in Appendix D, Section 5.4.3.2.)

Table 4-7 Port Accident Risks

Port	Per Shipment of One Cask		Total All Shipments	
	Population Dose (person-rem)	Population Risk (LCF)	Population Dose (person-rem)	Population Risk (LCF)
Elizabeth via:				
• Two High Population Ports	0.00013	5.6×10^{-8}	0.070	0.000029
• One High and One Intermediate Population Port	0.00011	4.8×10^{-8}	0.060	0.000025
• One High and One Low Population Port	0.00011	4.5×10^{-8}	0.057	0.000024
• Two Intermediate Population Ports	0.000056	2.4×10^{-8}	0.030	0.000013
• One Intermediate and One Low Population Port	0.000051	2.2×10^{-8}	0.027	0.000011
• Two Low Population Ports	0.000046	2.0×10^{-8}	0.024	0.000010
• Direct	0.000042	1.8×10^{-8}	0.022	0.0000094
Long Beach via:				
• Two High Population Ports	0.00011	4.7×10^{-8}	0.058	0.000025
• One High and One Intermediate Population Port	0.000080	3.4×10^{-8}	0.042	0.000018
• One High and One Low Population Port	0.000071	3.0×10^{-8}	0.038	0.000016
• Two Intermediate Population Ports	0.000050	2.1×10^{-8}	0.026	0.000011
• One Intermediate and One Low Population Port	0.000041	1.8×10^{-8}	0.022	0.0000092
• Two Low Population Ports	0.000032	1.4×10^{-8}	0.017	0.0000072
• Direct	0.000028	1.2×10^{-8}	0.015	0.0000062
Philadelphia via:				
• Two High Population Ports	0.00011	4.5×10^{-8}	0.057	0.000024
• One High and One Intermediate Population Port	0.000088	3.7×10^{-8}	0.047	0.000020
• One High and One Low Population Port	0.000083	3.5×10^{-8}	0.044	0.000019
• Two Intermediate Population Ports	0.000031	1.4×10^{-8}	0.016	0.0000072
• One Intermediate and One Low Population Port	0.000026	1.1×10^{-8}	0.014	0.0000061
• Two Low Population Ports	0.000021	9.3×10^{-9}	0.011	0.0000049
• Direct	0.000017	7.5×10^{-9}	0.0092	0.0000040
Portland via:				
• Two High Population Ports	0.000090	3.8×10^{-8}	0.047	0.000020
• One High and One Intermediate Population Port	0.000059	2.5×10^{-8}	0.031	0.000013
• One High and One Low Population Port	0.000050	2.2×10^{-8}	0.027	0.000011
• Two Intermediate Population Ports	0.000029	1.3×10^{-8}	0.015	0.0000066
• One Intermediate and One Low Population Port	0.000020	9.0×10^{-9}	0.011	0.0000047
• Two Low Population Ports	0.000011	5.1×10^{-9}	0.0059	0.0000026
• Direct	0.0000073	3.2×10^{-9}	0.0039	0.0000017
Norfolk via:				
• Two High Population Ports	0.000095	4.0×10^{-8}	0.050	0.000021
• One High and One Intermediate Population Port	0.000076	3.2×10^{-8}	0.040	0.000017
• One High and One Low Population Port	0.000071	3.0×10^{-8}	0.037	0.000016
• Two Intermediate Population Ports	0.000019	8.3×10^{-9}	0.0098	0.0000044
• One Intermediate and One Low Population Port	0.000014	6.1×10^{-9}	0.0072	0.0000032
• Two Low Population Ports	0.0000088	4.0×10^{-9}	0.0046	0.0000021
• Direct	0.0000048	2.1×10^{-9}	0.0025	0.0000011
Charleston (Wando Terminal) via:				
• Two High Population Ports	0.000092	3.9×10^{-8}	0.049	0.000021
• One High and One Intermediate Population Port	0.000074	3.1×10^{-8}	0.039	0.000016
• One High and One Low Population Port	0.000069	2.9×10^{-8}	0.036	0.000015
• Two Intermediate Population Ports	0.000016	7.4×10^{-9}	0.0087	0.0000039

Port	Per Shipment of One Cask		Total All Shipments	
	Population Dose (person-rem)	Population Risk (LCF)	Population Dose (person-rem)	Population Risk (LCF)
• One Intermediate and One Low Population Port	0.000012	5.2×10^{-9}	0.0061	0.0000027
• Two Low Population Ports	0.0000066	3.1×10^{-9}	0.0035	0.0000016
• Direct	0.0000027	1.2×10^{-9}	0.0014	6.4×10^{-7}
Charleston (NWS Charleston) via:				
• Two High Population Ports	0.000093	3.9×10^{-8}	0.049	0.000021
• One High and One Intermediate Population Port	0.000074	3.1×10^{-8}	0.039	0.000017
• One High and One Low Population Port	0.000069	2.9×10^{-8}	0.036	0.000015
• Two Intermediate Population Ports	0.000017	7.5×10^{-9}	0.0084	0.0000039
• One Intermediate and One Low Population Port	0.000012	5.3×10^{-9}	0.0058	0.0000028
• Two Low Population Ports	0.0000068	3.2×10^{-9}	0.0032	0.0000016
• Direct	0.0000028	1.3×10^{-9}	0.0011	6.8×10^{-7}
Galveston via:				
• Two High Population Ports	0.000099	4.2×10^{-8}	0.052	0.000022
• One High and One Intermediate Population Port	0.000080	3.4×10^{-8}	0.042	0.000018
• One High and One Low Population Port	0.000075	3.2×10^{-8}	0.040	0.000017
• Two Intermediate Population Ports	0.000023	1.0×10^{-8}	0.012	0.0000053
• One Intermediate and One Low Population Port	0.000018	8.0×10^{-9}	0.0094	0.0000042
• Two Low Population Ports	0.000013	5.8×10^{-9}	0.0068	0.0000031
• Direct	0.0000090	4.0×10^{-9}	0.0047	0.0000021
Jacksonville via:				
• Two High Population Ports	0.000094	4.0×10^{-8}	0.050	0.000021
• One High and One Intermediate Population Port	0.000075	3.2×10^{-8}	0.040	0.000017
• One High and One Low Population Port	0.000070	2.9×10^{-8}	0.037	0.000016
• Two Intermediate Population Ports	0.000018	7.9×10^{-9}	0.0093	0.0000041
• One Intermediate and One Low Population Port	0.000013	5.7×10^{-9}	0.0067	0.0000030
• Two Low Population Ports	0.0000078	3.6×10^{-9}	0.0041	0.0000019
• Direct	0.0000038	1.7×10^{-9}	0.0020	9.0×10^{-7}
Savannah via:				
• Two High Population Ports	0.000093	3.9×10^{-8}	0.049	0.000021
• One High and One Intermediate Population Port	0.000074	3.1×10^{-8}	0.039	0.000016
• One High and One Low Population Port	0.000069	2.9×10^{-8}	0.036	0.000015
• Two Intermediate Population Ports	0.000017	7.5×10^{-9}	0.0088	0.0000039
• One Intermediate and One Low Population Port	0.000012	5.3×10^{-9}	0.0062	0.0000028
• Two Low Population Ports	0.0000068	3.2×10^{-9}	0.0036	0.0000017
• Direct	0.0000028	1.3×10^{-9}	0.0015	6.9×10^{-7}
Wilmington via:				
• Two High Population Ports	0.000092	3.9×10^{-8}	0.049	0.000021
• One High and One Intermediate Population Port	0.000073	3.1×10^{-8}	0.039	0.000016
• One High and One Low Population Port	0.000068	2.9×10^{-8}	0.036	0.000015
• Two Intermediate Population Ports	0.000016	7.2×10^{-9}	0.0084	0.0000038
• One Intermediate and One Low Population Port	0.000011	5.0×10^{-9}	0.0058	0.0000026
• Two Low Population Ports	0.0000062	2.9×10^{-9}	0.0032	0.0000015
• Direct	0.0000022	1.0×10^{-9}	0.0012	5.3×10^{-7}
Tacoma via:				
• Two High Population Ports	0.000092	3.9×10^{-8}	0.049	0.000021
• One High and One Intermediate Population Port	0.000062	2.6×10^{-8}	0.033	0.000014
• One High and One Low Population Port	0.000053	2.3×10^{-8}	0.028	0.000012
• Two Intermediate Population Ports	0.000031	1.4×10^{-8}	0.017	0.0000072
• One Intermediate and One Low Population Port	0.000023	1.0×10^{-8}	0.012	0.0000053
• Two Low Population Ports	0.000014	6.1×10^{-9}	0.0072	0.0000032
• Direct	0.0000097	4.3×10^{-9}	0.0051	0.0000023

Port	Per Shipment of One Cask		Total All Shipments	
	Population Dose (person-rem)	Population Risk (LCF)	Population Dose (person-rem)	Population Risk (LCF)
Concord NWS via				
• Two High Population Ports	0.000099	4.2×10^{-8}	0.052	0.000022
• One High and One Intermediate Population Port	0.000069	2.9×10^{-8}	0.036	0.000015
• One High and One Low Population Port	0.000060	2.5×10^{-8}	0.032	0.000013
• Two Intermediate Population Ports	0.000038	1.7×10^{-8}	0.020	0.0000087
• One Intermediate and One Low Population Port	0.000029	1.3×10^{-8}	0.016	0.0000067
• Two Low Population Ports	0.000021	9.0×10^{-9}	0.011	0.0000047
• Direct	0.000017	7.1×10^{-9}	0.0088	0.0000038
MOTSU via:				
• Two High Population Ports	0.000091	3.9×10^{-8}	0.048	0.000020
• One High and One Intermediate Population Port	0.000072	3.1×10^{-8}	0.038	0.000016
• One High and One Low Population Port	0.000067	2.8×10^{-8}	0.036	0.000015
• Two Intermediate Population Ports	0.000015	6.8×10^{-9}	0.0080	0.0000036
• One Intermediate and One Low Population Port	0.000010	4.6×10^{-9}	0.0054	0.0000024
• Two Low Population Ports	0.0000053	2.5×10^{-9}	0.0028	0.0000013
• Direct	0.0000013	6.2×10^{-10}	0.00069	3.2×10^{-7}

The column on the left indicates the port of entry for the foreign research reactor spent nuclear fuel and the possible combinations of two intermediate ports, as well as no intermediate ports (direct). The second and third columns present two measures of the risk on a per-shipment basis. These risks are based on the conservative assumption that all East and West Coast deliveries would follow the same route for all shipments. The fourth and fifth columns sum the per-shipment risks for all of the shipments, for the entire basic implementation of Management Alternative 1. The two columns under the heading of "Total All Shipments" are the product of the per-shipment risk data for each type of spent nuclear fuel cask with the number of casks of that spent nuclear fuel type. DOE and the Department of State conservatively assumed in these calculations that each port would receive all the casks.

Consider first the per-shipment population exposure risk for a shipment of foreign research reactor spent nuclear fuel to Elizabeth via two high-population density ports. This value, 0.00013 person-rem, is the risk from one cask shipment of the highest nuclear material inventory which would first pass through two high-population density ports, such as Boston and Philadelphia, then would be delivered to Elizabeth. The risk of this cask shipment would be the sum of the risks associated with each of the three ports, because an accident could occur in any of the ports. Since risk is the product of consequences and probability, and probability has no units, the risk would be expressed in the units of the consequences, in this case population exposure (person-rem).

Comparing the risk of sending the foreign research reactor spent nuclear fuel to Elizabeth via two high-population density ports (0.00013 person-rem) to sending the spent nuclear fuel directly to Elizabeth (0.000042 person-rem) shows that the risk would be cut by about two-thirds by eliminating the intermediate ports. This is expected, since the estimated overall risk is the sum of the risk at each of the three ports, and three high-population density ports would have roughly the same risks. Now compare the per-shipment risk of using a low-population density port, say MOTSU, via two low-population density ports. Table 4-7 indicates that this risk would be 0.0000053 person-rem, or about 25 times lower than the highest risk, Elizabeth via two high population ports. All per-shipment risks are conservatively based on the highest nuclear material inventory cask to maximize the potential risk.

The manner of evaluating the per-shipment risk of LCF in Table 4-7 is the same as for the per-shipment population exposure risk. Once again, shipping the foreign research reactor spent nuclear fuel through or into high-population density ports would increase the risk, as would using ships that pass through intermediate ports on their way to the port of entry.

The range of total population risks would be from 0.070 to 0.00069 person-rem for the population dose and from 0.000029 to 3.2 x 10^{-7} LCF for the risk, comparing shipping to Elizabeth via two high-population density ports and shipping to MOTSU without intermediate ports. The highest estimated population risk due to port accidents that might occur due to the basic implementation of Management Alternative 1 is 0.000029 LCF. This means that there would be less than a one in ten thousand chance of some member of the public incurring an LCF due to the basic implementation of Management Alternative 1 port transits.

The highest estimated MEI accident risk is conservatively determined by multiplying the accident probability by the consequences, in terms of dose to the MEI, of that accident. The MEI in this case is assumed to be an individual at the center of the plume less than 1.6 km (1 mi) from the accident. The highest average MEI doses calculated for the accident severity categories are: 0.11 mrem for category 4, 117 mrem for category 5, and 95 mrem for category 6. See Appendix D, Section D.5.4.2.2 for details. The reason MEI dose for category 6 is relatively lower than that for category 5 is because the larger category 6 associated fire would disperse the radioactive material faster and farther than the category 5 fire. For the 721 shipments in the basic implementation of Management Alternative 1, and using the per port transit accident probabilities in Appendix D, the highest MEI accident risk is estimated to be 0.00042 mrem. This corresponds to about 2 x 10^{-10} LCF. This means that the chance of the MEI incurring an LCF due to a port accident under the basic implementation of Management Alternative 1 would be less than one in a billion.

Emergency Management and Response

Emergency response capabilities for a foreign research reactor spent nuclear fuel mishap would be available through the U.S. Coast Guard and the local jurisdictions surrounding each candidate port of entry, with specialized support available from DOE. The specialized analysis and identification of potential hazards, use of the robust "Type B" packaging, specific emergency plan and procedure development, training, response rehearsal, and interagency coordination for efficient and effective response would minimize the potential consequences should a foreign research reactor spent nuclear fuel mishap occur. The specific emergency management and response capabilities and responsibilities are described in Chapter 2, Section 2.7.

At military ports, the U.S. Coast Guard routinely provides safety/security screen escorts. The addition of foreign research reactor spent nuclear fuel shipments would have almost no effect on their ongoing operations.

Consequences of Port Accidents

A sensitivity analysis was performed to address the potential impact of extremely high temperature fires, fires that could result in the foreign research reactor spent nuclear fuel attaining temperatures above the melting point of the aluminum based fuel or the combustion temperature of the TRIGA fuel, on the consequences of an accident in port. This analysis, which uses the Port of Elizabeth, NJ as the site of the accident, is presented in Appendix D, Section D.5.4.3.2, and shows that even though the consequences of this type of an accident are two orders of magnitude larger than those calculated for the base case analysis, this type of event is highly improbable and the risks are comparable to those calculated in the base case.

This analysis also addressed the impact of an accident on the land around the port. Using the same characterizations as described in the preceding paragraph, the largest mean impact distance is a decontamination and interdiction distance which is limited to approximately 300 meters (1000 feet). The analysis also shows that this distance is representative of the impact of this highly improbable type of accident at any of the ports included in the proposed action.

4.2.2.4 Cumulative Impacts of Port Activities

Port workers are expected to be exposed to other shipments of radioactive materials in addition to those associated with the basic implementation of Management Alternative 1. These shipments include DOE and commercially initiated programs. An assessment has been made of the cumulative impact of the incident-free dose to the maximally exposed worker from all of these activities. The cumulative analysis is based on data collected at several ports for 2.5 years (January 1992 through June 1994). The maximally exposed port worker is estimated to receive less than 10 mrem per year from commercial shipments. Details of this analysis are presented in Appendix D, Section D.4.6. As previously stated, based on cask dose rates equal to the regulatory limit, the maximally exposed port worker could receive an annual dose greater than the NRC and DOE regulatory limit of 100 mrem per year (NRC, 1991). Therefore, DOE would implement mitigation measures.

4.2.2.5 Port Activities Mitigation Measures

As with marine transport, the principal environmental impact that would occur during port activities is radiation dose to workers. No members of the general public would be close enough to the transportation cask to receive any radiation dose. The workers would receive this dose during safety inspections and handling activities which cannot be curtailed.

Two conservative assumptions in this analysis drive the maximally exposed worker dose higher than would actually be expected. The radiation dose rate near every foreign research reactor spent nuclear fuel shipping container is assumed to be equal to the regulatory limit and the same individual is assumed to conduct all the inspections. Neither of these is actually likely to occur.

Nevertheless, DOE and the Department of State would require, through a clause in the shipping contracts, some administrative controls on the port workers to mitigate the radiation doses to the workers during inspection and handling activities. DOE and the Department of State would implement a system to track the inspectors and other port workers actually involved in the shipment of foreign research reactor spent nuclear fuel. If any inspector's or worker's dose approaches 100 mrem in any year, then DOE and the Department of State would require other inspectors or workers to be used. In this way, the maximally exposed worker dose would be constrained to the regulatory limit.

If a cask or casks were sunk in coastal waters, DOE and the Department of State would employ modern underwater search techniques to locate and recover the cask(s), thus minimizing the potential impacts to marine life.

4.2.2.6 Environmental Justice at the Port(s)

Executive Order 12898 deals with the issue of environmental justice and directs Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations.

The concept of environmental justice is discussed in more detail in Appendix A. During normal port activities associated with receipt of the foreign research reactor spent nuclear fuel shipments—including harbor activities, unloading the ship, transfer of the spent nuclear fuel containers to truck or train, and movement out of the port city—the dominant radiological impacts have been shown to be the exposures received by the workers in the immediate vicinity of the shipping container. These individuals include the inspectors, shipping container handlers, truck drivers, etc. Since the intensity of the gamma radiation falls off rapidly with distance, the doses that might be received by other workers and members of the general population can in theory be calculated, but would not generally be measurable or distinguishable from natural background radiation.

Potential radiological impacts to people residing near the port are associated with low probability (less than one in a million) accidents that are so severe that the spent nuclear fuel casks would be ruptured and a fire would burn long enough around the cask that some of the radioactive material would be released. In this case, some of the radioactive spent nuclear fuel might be vaporized and lifted by the heat of the fire and carried downwind of the accident location. Where and how far this radioactive material would go before being deposited on the ground would depend on how high the heat from the fire lofts it and the particular weather conditions at the time. Most of this vaporized spent nuclear fuel would be expected to be deposited in the first few kilometers downwind of the fire but small amounts could be carried out for several tens of kilometers.

Because the particular details of both the accident conditions (such as the severity of a fire) and the weather conditions at the time of an accident could vary so much, a range of accident conditions and wind directions, wind speeds, and other weather conditions were examined during the evaluation of accidents (see Section 4.2.2.3). Population impact evaluations were performed for distances out to 80 km (50 mi). The risk of LCF was found to be so small that zero LCF would be expected due to accidents at ports.

Appendix A describes minority populations and low-income households residing near the ports. Calculations for incident-free and accident conditions clearly demonstrate that for the general population, including minority and low-income groups, the radiological impacts would be very low. Minority or low-income populations living near the potential ports of entry would not be subjected to any greater impacts. Therefore, these populations would not receive disproportionately high and adverse impacts. They would be subject to the same very low impacts as would the general population.

Implementation of the proposed action would have extremely low nonradiological effects on the environment at candidate ports, including the social and economic status of the general population, minority populations, and the low-income population surrounding candidate ports. Economic benefits that would result from increased cargo handling and transportation in the port area would be extremely small for the general population or any particular segment of the population residing near candidate ports.

4.2.3 Ground Transport Impacts

Foreign research reactor spent nuclear fuel is transported in large, heavy containers called transportation casks. Transportation casks are designed and constructed to contain the radioactivity in spent nuclear fuel during severe transportation accidents. NRC has estimated that transportation casks will withstand 99.4 percent of truck and rail accidents without sustaining damage sufficient to breach the transportation cask (NRC, 1987). Only in the worst conceivable conditions, which are of low probability, could a transportation cask of the type used to transport spent nuclear fuel be so damaged that there is a reasonable possibility of release of radioactivity to the environment.

Spent nuclear fuel has been transported along highways, railways, and waterways since 1949. Federal standards describe the routing requirements for spent nuclear fuel shipments. Spent nuclear fuel transported includes foreign research reactor, commercial, naval, and DOE spent fuel. Since 1949, there have been 21 incidents involving vehicles carrying irradiated fuel elements. None of these incidents resulted in damage to the structural integrity of a cask or the release of the cask's contents.

4.2.3.1 Conservative Assumptions and Analytic Approach

Transportation impacts may be divided into two parts: the impacts due to incident-free transportation and the impacts due to transportation accidents. For incident-free transportation and transportation accidents, impacts may be further divided into two parts: nonradiological impacts and radiological impacts. The nonradiological impacts consist of the vehicular impacts of transportation, such as vehicular emissions and traffic accidents.

For incident-free transportation, the radiological impacts would result from the radiation field that surrounds the cask. For transportation accidents, the radiological impacts would be based on the radioactivity released from the spent nuclear fuel transportation cask during the accident. Impacts are estimated for workers and the population along the transportation route.

For both incident-free transportation and transportation accidents, methodology developed by NRC and used by DOE in the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (SNF&INEL Final EIS) (DOE, 1995c) was used to estimate the impacts for foreign research reactor spent nuclear fuel in this EIS. These impacts were quantified as the estimated number of radiation-related cancer fatalities and the estimated number of nonradiological fatalities from vehicular emissions and traffic accidents. Appendices B, C, D, E, and F of this EIS contain more details on the equipment, regulations, and experience associated with spent nuclear fuel transportation, and the methodology, data, and conservative assumptions used to develop these estimates.

Under the basic implementation of Management Alternative 1, acceptance of the foreign research reactor spent nuclear fuel would require the transport of approximately 837 casks from seaports and Canadian border crossings to DOE facilities. The number of casks was determined by assigning the spent nuclear fuel from each foreign research reactor to a reasonably available and capable cask. Conservative assumptions were used to estimate cask capacity, which is based on physical, thermal, and radiological characteristics of the spent nuclear fuel. Appendix B contains more details on the foreign research reactor spent nuclear fuel transportation casks.

For the purposes of analysis in this EIS, the initial ground transportation activities to the Savannah River Site and/or the Idaho National Engineering Laboratory is called Phase 1, and the possible subsequent intersite ground transport and continued management is called Phase 2. The impact assessment includes analysis of between 13 and 161 intersite shipments, depending upon the mode of transportation (truck or rail) and the potential foreign research reactor spent nuclear fuel management sites that might be selected. Intersite shipments would be fewer than foreign shipments because the spent nuclear fuel would be cooler. Larger casks would likely be used, and more foreign research reactor spent nuclear fuel would be consolidated.

The first step in the ground transportation analysis was to determine the incident-free and accident risk factors, on a per-shipment basis assuming one cask per shipment, for transportation of the various spent nuclear fuel casks. Risk factors, as any risk estimate, are the product of the probability of exposure and the magnitude of the exposure. Accident risk factors were calculated for radiological and nonradiological

traffic accidents. The probabilities and the magnitudes of exposure are discussed in Appendix E. Incident-free risk factors were calculated for crew and public exposure to radiation emanating from the cask, and public exposure to the chemical toxicity of the transportation vehicle exhaust. The probability of incident-free exposure and the magnitudes of exposure are discussed in Appendix E.

Calculation of risk factors was accomplished by first using the HIGHWAY (Johnson, et al., 1993a) and INTERLINE (Johnson, et al., 1993b) computer codes to choose representative routes in accordance with the U.S. Department of Transportation regulations. These codes provide population estimates along the routes so that the RADTRAN (Neuhauser, 1993) and RISKIND (Yuan, et al., 1993) codes could be used to determine the risk factors associated with ground transportation activities. These computer codes are described in more detail in the Programmatic SNF&INEL Final EIS (DOE, 1995c) and Appendix E of this EIS.

The single largest contributor to the ground transport population doses (about 80 percent) calculated with RADTRAN was found to be the dose to members of the public at truck stops. The parameters used to calculate doses during truck stops are quite conservative. The parameters are based on the assumption that stops occur as a function of distance, with a truck stop rate of 0.011 hr per km (0.018 hr per mi). This stop rate results in over an hour of stop time per 100 km (62 mi) of travel. It was further assumed that at each stop, an average of 50 people are exposed at a distance of 20 m (66 ft). These parameters were used because they are the default parameters in the RADTRAN code and they were used in the Programmatic SNF&INEL Final EIS (DOE, 1995c). These conservative assumptions that are built in the code are highly unlikely to occur.

The next step is to use the risk factors and the number of shipments to estimate the risk of every possible way the foreign research reactor spent nuclear fuel program could be implemented. Because of the large number of ports, cask types, spent nuclear fuel types, and implementation options, simplifying assumptions are needed to control the amount of repetitive analysis:

- A review of the accident risk factors for the various types of spent nuclear fuel (see Appendix E) indicates that there is relatively little variation between the different types of foreign research reactor spent nuclear fuel, thus, it is not overly conservative to use the highest risk factors for all shipments.

- Spent nuclear fuel from countries bordering the Atlantic Ocean and Mediterranean Sea was assumed to arrive on the East Coast of the United States. Spent nuclear fuel from countries bordering the Indian and Pacific Oceans was assumed to arrive on the West Coast. This is conservative from an overland transportation standpoint, because, as shown in Appendix E, marine shipment to the coast nearest the management site would reduce the risk factors for the overland shipment.

- To account for the return transport of empty casks, the impacts due to vehicle emissions and traffic accidents were multiplied by two.

The foreign research reactor spent nuclear fuel could arrive at any of the ports of entry selected by DOE and the Department of State using criteria that are detailed in Appendix D, and would be likely to arrive at a variety of these ports. Therefore, the proposed impacts were completely analyzed three times, consisting of an upper bounding case, a lower bounding case, and an average case, for both truck and rail shipments. The upper bound case conservatively assumes the port(s) with the highest risk factors was chosen for each

transportation activity. The risk factors are generally a function of distance and total population along the port to management site route, so the port chosen often shifted between Phase 1 and Phase 2. Conversely, the lower-bound case assumes ports with the lowest risk factors.

The average case is designed to provide a realistic estimate of the ground transport risk of transporting the foreign research reactor spent nuclear fuel. The risk factors are an arithmetic average of the risk factors for all acceptable ports. This represents the risk associated with the basic implementation of Management Alternative 1 and receiving foreign research reactor spent nuclear fuel at a variety of commercial ports.

Since each potential port of entry and each management site is capable of receiving spent nuclear fuel via rail or highway, the program was analyzed using each mode of transportation. The exception to this is the Nevada Test Site which has no existing rail capability, so that link was approximated by a hypothetical rail line to the Yucca Mountain Site. Additionally, the potential to use trucks to carry the relatively small casks from ports to potential foreign research reactor spent nuclear fuel management sites and rail to carry larger casks between potential foreign research reactor spent nuclear fuel management sites was analyzed. Site to site shipment would not occur until approximately 2006, so it is difficult to precisely predict which cask would be used. The analysis is based on a truck cask that carries 4 times as much spent nuclear fuel as a foreign cask, and a rail cask that carries 10 times as much spent nuclear fuel.

4.2.3.2 Impacts of Incident-Free Ground Transport

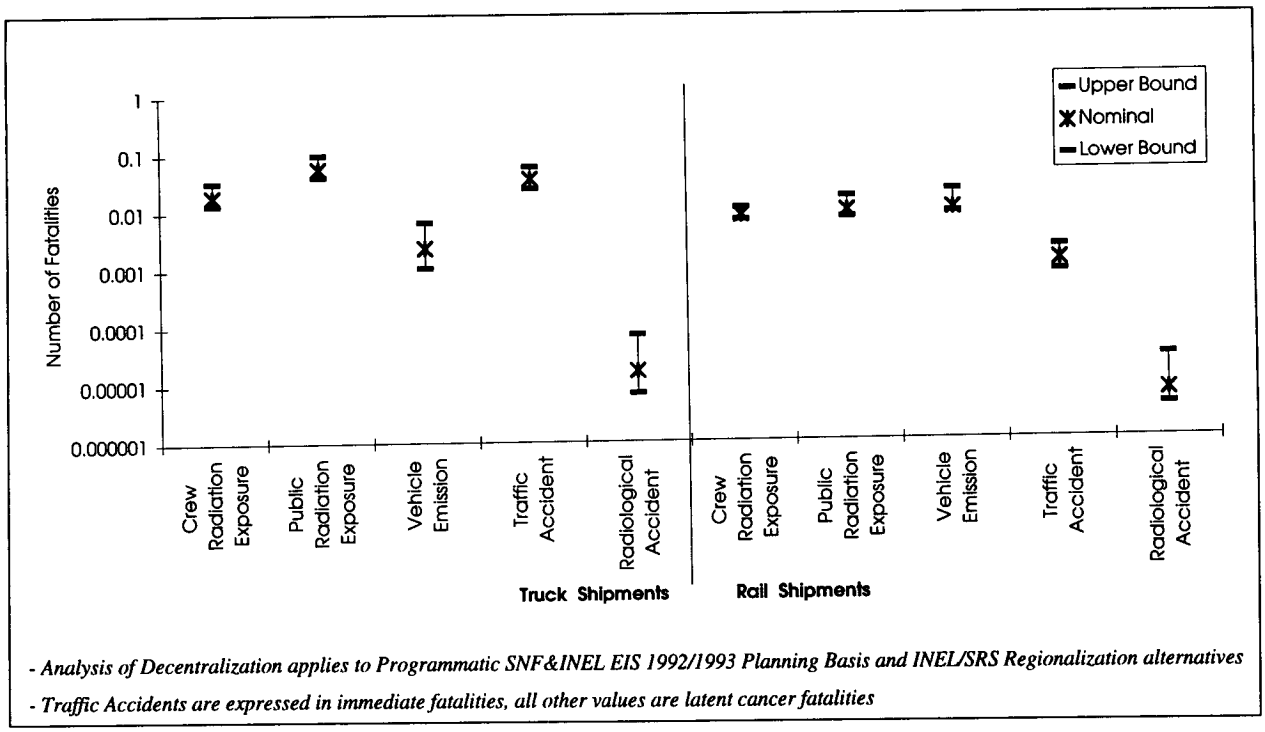
The incident-free transportation of spent nuclear fuel was estimated to result in total population risk that ranged from 0.013 to 0.30 over the entire duration of the program. These fatalities are the sum of the estimated number of radiation-related LCF to the public and the transportation workers. Thus, the calculated maximum risk value for overland transportation is less than one fatality from cancer due to the basic implementation of Management Alternative 1. The range of fatality estimates is caused by two factors: (1) the option of using truck or rail to transport spent nuclear fuel; and (2) combinations of Phase 1 and Phase 2 sites that create varying cask shipment numbers and distances.

The estimated number of LCF due to radiation exposure for transportation workers ranged from 0.006 to 0.071. The estimated number of radiation-related LCF for the general population ranged from 0.007 to 0.22, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.001 to 0.052. These incident-free results apply to the workers and the public because both would be close enough to the cask to receive some radiation dose.

The impacts of transportation which are based on four Programmatic SNF&INEL Final EIS (DOE, 1995c) programmatic alternatives are summarized in Figures 4-2 through 4-5. The impacts of these additional programmatic alternatives are described in more detail in Appendix E.

The highest estimated ground transport maximally exposed worker risk is 0.00052 LCF, just like the marine transport and port worker risks. This estimate is based on the conservative assumption that one truck driver makes enough trips to reach the regulatory limit of 100 mrem per year every year for 13 years. This means that under the assumptions described above, the chance of this individual incurring an LCF due to the basic implementation of Management Alternative 1 would be less than one in a thousand.

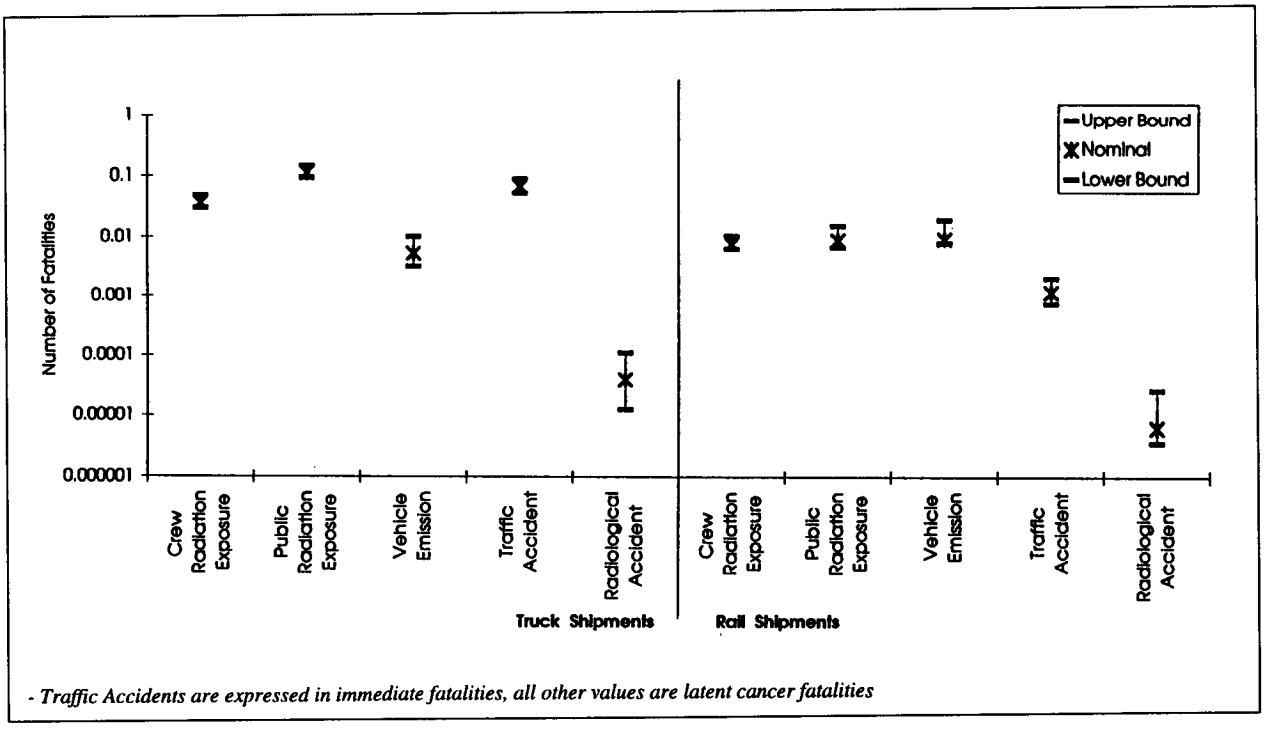
The highest estimated incident-free population risk is 0.30 LCF, which means that there would be a 30 percent chance of one additional cancer fatality among the public and the ground transport workers due to the basic implementation of Management Alternative 1.



- Analysis of Decentralization applies to Programmatic SNF&INEL EIS 1992/1993 Planning Basis and INEL/SRS Regionalization alternatives

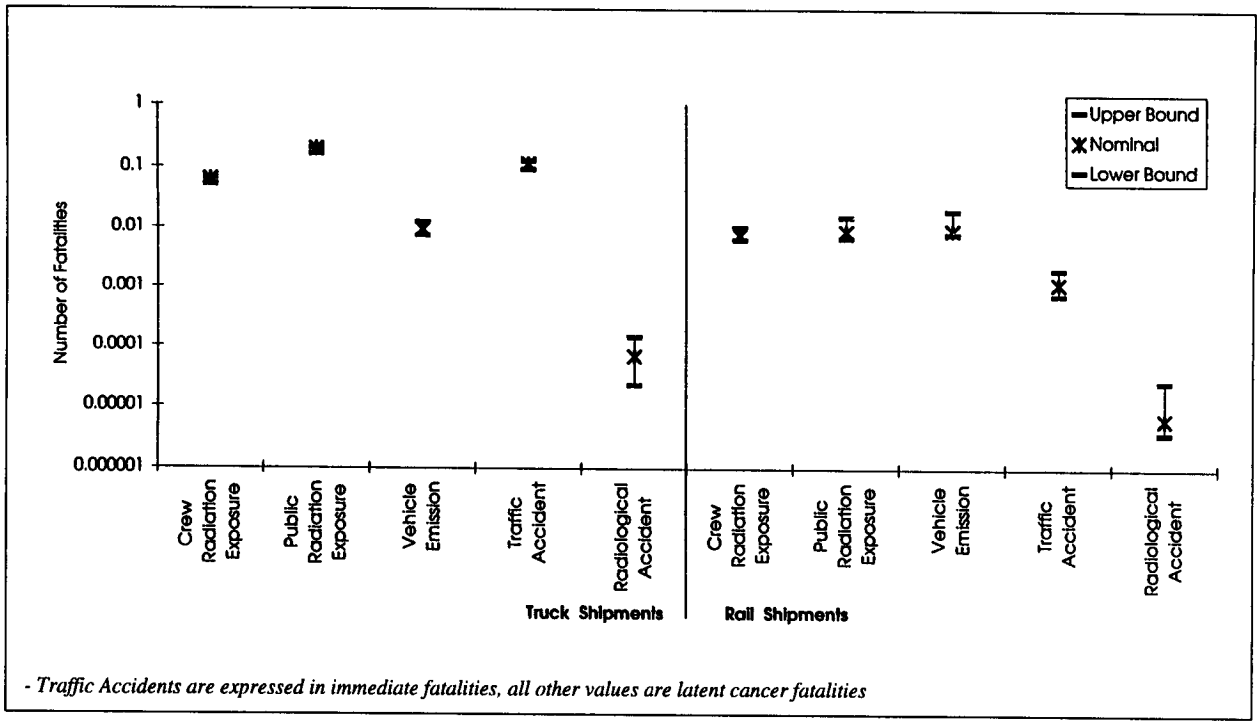
- Traffic Accidents are expressed in immediate fatalities, all other values are latent cancer fatalities

Figure 4-2 Range of Estimated Fatalities (Latent and Immediate) Under Basic Implementation of Management Alternative 1 and the Programmatic SNF&INEL Final EIS Decentralization Alternative



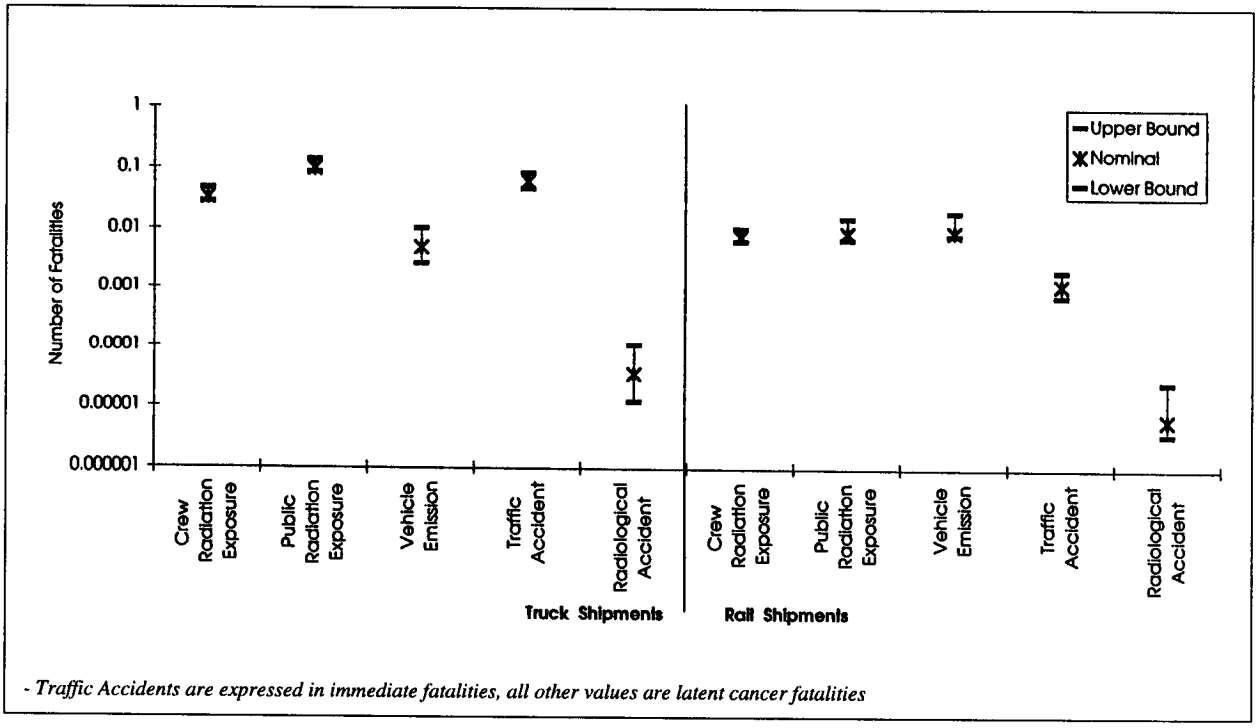
- Traffic Accidents are expressed in immediate fatalities, all other values are latent cancer fatalities

Figure 4-3 Range of Estimated Fatalities (Latent and Immediate) Under Basic Implementation of Management Alternative 1 and the Programmatic SNF&INEL Final EIS Regionalization by Fuel Type Alternative



- Traffic Accidents are expressed in immediate fatalities, all other values are latent cancer fatalities

Figure 4-4 Range of Estimated Fatalities (Latent and Immediate) Under Basic Implementation of Management Alternative 1 and the Programmatic SNF&INEL Final EIS Centralization to the Savannah River Site Alternative



- Traffic Accidents are expressed in immediate fatalities, all other values are latent cancer fatalities

Figure 4-5 Range of Estimated Fatalities (Latent and Immediate) Under Basic Implementation of Management Alternative 1 and the Programmatic SNF&INEL Final EIS Centralization to the Idaho National Engineering Laboratory Alternative

4.2.3.3 Impacts of Accidents During Ground Transport

The most severe accidents that might reasonably occur on this leg of the journey are truck or train crashes, followed by a large fire. If an accident occurred on a causeway at or near a port that caused a cask to fall into seawater, the consequences would be the same as if a cask fell off a ship into seawater. These consequences are presented in Section 4.2.1.3 under the subheading "Sunken Cask." Each State, and most local jurisdictions, maintain a hazardous materials response capability and a radiological protection program. These capabilities, along with the DOE radiological response assets that would be on-call for immediate technical assistance and response, would provide a high-level of expertise and would reduce the potential impacts of a foreign research reactor spent nuclear fuel accident.

Since hazardous materials team training is required to include radiological materials response, each team possesses a basic level of understanding and capability for a foreign research reactor spent nuclear fuel incident response. An incremental enhancement for spent nuclear fuel-specific response characteristics and planning may be required, especially for those jurisdictions along selected routes whose emergency responders are primarily volunteer organizations.

The development of a transportation plan specifically for the shipping campaign that would incorporate and integrate State and local emergency response plans, would increase emergency responder effectiveness and reduce the potential consequences of a foreign research reactor spent nuclear fuel accident.

Each State's emergency planning infrastructure, using the Local Emergency Planning Committees to the State Emergency Response Commission, enables these jurisdictions to identify and resolve potential emergency management and response issues and communicate issues that would require DOE and Department of State attention. This, along with DOE's Transportation External Coordination/Working Group, would ensure that all concerned agencies would be involved in the planning process to address potential problems before they become major hazards.

Risks

The total ground transportation accident risks for the basic implementation of Management Alternative 1 are estimated to range from 0.000004 to 0.00028 LCF from radiation and from 0.001 to 0.14 for traffic fatality, depending on the transportation mode and potential foreign research reactor spent nuclear fuel management sites that might be selected. Section 4.10 compares these risks to those of common activities. The reason for the range of fatality estimates is the same as those described for incident-free transportation. The risk of 0.14 for a traffic fatality means that under these conservative assumptions there would be a 14 percent chance of a traffic fatality related to the basic implementation of Management Alternative 1.

The maximum foreseeable offsite transportation accident would involve a shipment of foreign research reactor spent nuclear fuel in a suburban population zone under neutral (average) weather conditions. The accident has a probability of occurrence of about 0.0000001 per year (one chance in ten million), and could result in 14 person-rem and no fatalities. The probability of an accident occurring is at least an order of magnitude smaller in either an urban area or under stable atmospheric conditions. The consequences are less than an order of magnitude larger.

The impacts of transportation accidents are summarized in Figures 4-2 through 4-5, as described in the previous section, and are described in more detail in Appendix E. These tables can be used to assess the bounded absolute and relative risk under each representative Programmatic SNF&INEL Final EIS alternative.

The highest estimated MEI radiological risk to members of the public due to accidents during ground transport is 1.4×10^{-11} LCF. This means that the chance of this individual incurring a cancer due to the basic implementation of Management Alternative 1 would be less than one in ten billion.

The highest estimated population radiological risk due to accidents is 0.00028 LCF, which is much less than one LCF.

4.2.3.4 Ground Transport Cumulative Impacts

The Programmatic SNF&INEL Final EIS (DOE, 1995c) analyzed the cumulative impacts of ground transportation, taking into account impacts from: (1) historical shipments of spent nuclear fuel to the five proposed foreign research reactor spent nuclear fuel management sites; (2) the programmatic alternatives; (3) other reasonably foreseeable actions that include transportation of radioactive material; and (4) general radioactive materials transportation that is not related to a particular action. The transportation of foreign research reactor spent nuclear fuel is included in the calculated totals under the spent nuclear fuel shipments for the Programmatic SNF&INEL Final EIS Alternatives 1 through 5. Proposed transportation of all spent nuclear fuel (of which the foreign research reactor fuel is a small component) accounts for less than one percent of the total LCF attributable to the transportation of radioactive material, and foreign research reactor spent nuclear fuel accounts for less than one quarter of that one percent. The total number of LCF over the time period 1943 through 2035 was estimated to be 290.

4.2.3.5 Ground Transport Mitigation Measures

The principal environmental impacts that would occur during ground transport are: (1) LCF due to radiation exposure, (2) LCF due to vehicular emissions, and (3) immediate fatalities due to traffic accidents. All three of these would be reduced by choosing port(s) of entry close to the management site(s). This would minimize the distance that must be covered by the vehicle(s).

Furthermore, in the case of truck transport, the truck driver(s) would be monitored for radiation dose. The annual maximally exposed worker limit of 100 mrem would never be approached during any single shipment, but the same driver could be used for multiple shipments throughout a year. DOE would implement mitigation measures through the foreign research reactor spent nuclear fuel acceptance contracts to ensure that each individual driver's dose remains below the regulatory limit. If any individual truck driver accumulates a dose approaching this limit in a year, DOE would require that new driver(s) be used to keep each individual driver's dose below the regulatory limit.

Since the casks would produce a radiation field of less than 10 mrem/hr at 2 m (6.6 ft) from the vehicle, an individual member of the general public would have to be within 2 m (6.6 ft) of the vehicle for at least ten hours in a year to receive a dose equal to the regulatory limit of 100 mrem/yr. A truck is not likely to sit in a traffic jam right beside another vehicle for as long as ten hours and an individual gas station attendant is not likely to spend ten hours refueling the trucks carrying foreign research reactor spent nuclear fuel. Therefore, DOE does not plan to implement ground transport mitigation measures for members of the general public.

4.2.3.6 Barge Transport

DOE and the Department of State have examined the possibility of using barges for the transport of foreign research reactor spent nuclear fuel as a substitute for truck or rail transport. The only two locations where barge transport is feasible are from the Port of Portland, OR up the Columbia River to the Hanford

Site and from the Port of Savannah, GA up the Savannah River to the Savannah River Site. Barge transport could only be implemented if one or both of these port/site combinations is selected in the Record of Decision.

For barge transport up the Columbia River, the incident-free radiological risk to the public would be approximately 0.0000043 LCF per cask shipment. This is slightly lower than the similar truck and rail shipment risks, which would be 0.000029 and 0.0000058 LCF per shipment, respectively. For barge transport up the Savannah River, the incident-free radiological risk to the public would be approximately 0.0000019 LCF per cask shipment. This is slightly lower than the similar truck and rail shipment risks, which would be 0.000028 and 0.0000026 LCF per shipment, respectively.

For barge transport up the Columbia River, the accident radiological risk due to both airborne and waterborne pathways would be approximately 3.5×10^{-8} LCF per cask shipment. This is slightly higher than the similar truck and rail shipment risks, which would be 1.5×10^{-8} and 3.8×10^{-9} LCF per shipment, respectively. For barge transport up the Savannah River, the accident radiological risk due to both airborne and waterborne pathways would be approximately 2.9×10^{-8} LCF per cask shipment. This is slightly higher than the similar truck and rail shipment risks, which would be 9.4×10^{-9} and 1.1×10^{-9} LCF per shipment, respectively.

The barge transport analysis is presented in more detail in Appendix E, Section E.8.15. The net result is that the foreign research reactor spent nuclear fuel could be transported by barge with approximately the same level of risk to workers and the public as if it was transported by truck or rail.

4.2.3.7 Environmental Justice Along Ground Transport Routes

The dominant radiological risks and impacts associated with incident-free transportation activities are the exposures received by the workers in the immediate vicinity of the casks and people who might be near the casks at truck stops. These individuals would be the only people receiving a measurable exposure during a spent nuclear fuel shipment. As discussed in Section 4.2.3.2, the number of radiation-related latent cancer deaths among transportation workers and the general public combined was calculated to be less than one. The same is true for cancer due to vehicle emissions. Ground transportation accidents would be expected to result in no additional radiological impacts to the population in the vicinity of the accident. Potential impacts from low probability accidents vary considerably and are dependent on the accident conditions (such as the size of the resulting fire, if any) and the weather conditions at the time of an accident. Transportation accidents were estimated to result in no LCF due to radiation and less than 0.2 immediate deaths due to traffic fatalities (see Section 4.2.3.3).

As described in Appendix A, the percentage of the total population comprised of minorities or low-income households varies among routes. Calculations for incident-free and accident conditions demonstrate that for the general population the radiological impacts would be very low. Minority or low-income populations living near these routes would not be subjected to any greater impacts. Therefore, these populations would not receive disproportionately high and adverse impacts. They would be subject to very low impacts as would the general population.

Implementation of the proposed action would have extremely low nonradiological effects on the environment along transportation routes, including the social and economic status of the general population, minority populations, and the low-income population residing along the transportation routes. Economic benefits that would result from increased transportation of cargo along transportation routes would be extremely small for the general population or any particular segment of the population residing along the transportation routes.

4.2.4 Foreign Research Reactor Spent Nuclear Fuel Management Sites

This section presents the potential environmental impacts from the basic implementation of Management Alternative 1 at the potential foreign research reactor spent nuclear fuel management sites, namely the Savannah River Site, the Idaho National Engineering Laboratory, the Hanford Site, the Oak Ridge Reservation, and the Nevada Test Site. It summarizes the detailed site analysis presented in Appendix F, Sections F.4, F.5, and F.6. The analysis examined environmental topics such as land use, socioeconomics, cultural resources, aesthetic and scenic resources, geology, air quality, water quality, ecology, occupational and public health and safety, noise, traffic and transportation, utilities and energy, and waste management. The analysis showed that the basic implementation of Management Alternative 1 would not have a major effect on any of the environmental topics. Further, none of the environmental topics would clearly differentiate among the potential foreign research reactor spent nuclear fuel management sites.

Because of the public interest in radiation exposure to workers and the public, Section 4.2.4.1 discusses in detail the impacts on occupational and public health and safety from the basic implementation of Management Alternative 1, even though the analysis concludes that such impacts are very low. Section 4.2.4.2 summarizes the impacts on the other environmental topics. Section 4.2.4.3 discusses the cumulative impacts of the basic implementation of Management Alternative 1 at each candidate management site, and Section 4.2.4.4 addresses the waste management and mitigation measures available under the basic implementation of Management Alternative 1. Later in this chapter, Section 4.10 compares the risks of the basic implementation of Management Alternative 1 to risks of common activities.

4.2.4.1 Occupational and Public Health and Safety

Possible sources of occupational and public radiological exposure from foreign research reactor spent nuclear fuel include: (1) emissions of radioactive material from incident-free operations, (2) incident-free handling activities, and (3) emissions from accident conditions. Foreign research reactor spent nuclear fuel management is not expected to impact occupational and public health and safety. Nonradiological exposures are not likely to occur during construction or operation of foreign research reactor spent nuclear fuel storage facilities. Radiological exposures are presented in individual subsections for emissions-related impacts, handling-related impacts, and accident-related impacts.

Conservative Assumptions and Impacts to the Public of Incident-Free Site Activities

Doses that could be received by the public during incident-free operation of foreign research reactor spent nuclear fuel storage facilities could only be due to emissions of radioactive material that becomes airborne. The public would be too far from the storage facilities to receive any direct exposure. In summary:

- Doses were calculated for the MEI, defined as an individual living at the management site boundary receiving the maximum exposure, and for the general population within an 80 km (50 mi) radius of the facility. These doses would result from incident-free airborne radiological emissions released during foreign research reactor spent nuclear fuel transfer from the transportation cask to the storage facility and from foreign research reactor spent nuclear fuel storage.

- Radiological airborne emissions consist of two parts: (1) emissions from gaseous releases during receipt and unloading of the transportation casks; and (2) emissions during the management period. The emissions during receipt and unloading were calculated conservatively assuming one percent of the foreign research reactor spent nuclear fuel

would fail during transport and the associated gaseous fission products would be released during the transfer at the management site. DOE and the Department of State also conservatively assumed that unloading the spent nuclear fuel cask in a dry cell would allow all free gaseous fission products to be released to the environment, while unloading in a wet pool would allow 90 percent of the halogens to be retained in the water. Radiological emissions during wet storage were based on historical data at the Receiving Basin for Offsite Fuels (RBOF) at the Savannah River Site. The emissions during incident-free dry storage would be zero because the spent nuclear fuel would be stored in sealed containers. The methodology and conservative assumptions used for the calculation of radiological emissions under the basic implementation of Management Alternative 1 are discussed in detail in Appendix F, Section F.6.

- Doses were calculated separately for each phase of the program at each candidate management site to accommodate the two-phased implementation of the basic implementation of Management Alternative 1. For example, in the case where the Nevada Test Site, the Hanford Site, or the Oak Ridge Reservation is selected as a Phase 2 site, with the Savannah River Site or the Idaho National Engineering Laboratory as a Phase 1 site, doses were calculated at the Savannah River Site or the Idaho National Engineering Laboratory for Phase 1, and at the Hanford Site, Oak Ridge Reservation, or the Nevada Test Site for Phase 2.

- Doses from an operation which combines an existing wet or dry storage facility for spent nuclear fuel receiving and characterization and dry storage casks to enhance storage capacity are bounded by the doses calculated for the existing facility.

- Doses were conservatively calculated for the maximum quantity of foreign research reactor spent nuclear fuel that could be received at each storage site as discussed in Appendix F, Section F.4.

Tables 4-8 through 4-12 summarize the annual emission-related doses to the public and the associated risks for the MEI and population at each site. Integrated doses for the duration of a specific implementation period can be obtained by multiplying the annual dose by the number of years in the period. In general, receipt and unloading at wet storage facilities produces lower public risk than at dry storage facilities.

Table 4-8 Annual Public Impacts for Foreign Research Reactor Spent Nuclear Fuel Receipt and Storage at the Savannah River Site

Facility	*MEI Dose (mrem/yr)*	*MEI Risk (LCF/yr)*	*Population Dose (person-rem/yr)*	*Population Risk (LCF/yr)*
Receipt/Unloading at:				
• RBOF (wet storage)	0.00011	5.5×10^{-11}	0.0057	0.0000028
• L-Reactor Basin (wet storage)	0.000073	3.7×10^{-11}	0.0046	0.0000023
• New Dry Storage Facility	0.00018	9.0×10^{-11}	0.0086	0.0000043
Storage at:				
• RBOF (wet storage)	1.2×10^{-9}	6.0×10^{-16}	6.2×10^{-8}	3.1×10^{-11}
• L-Reactor Basin (wet storage)[a]	0.00036	1.8×10^{-10}	0.022	0.000011
• New Dry Storage Facility	0	0	0	0

[a] *L-Reactor basin doses are due to existing conditions. The foreign research reactor spent nuclear fuel contribution would be six orders of magnitude lower.*

Table 4-9 Annual Public Impacts for Foreign Research Reactor Spent Nuclear Fuel Receipt and Storage at the Idaho National Engineering Laboratory

Facility	MEI Dose (mrem/yr)	MEI Risk (LCF/yr)	Population Dose (person-rem/yr)	Population Risk (LCF/yr)
Receipt/Unloading at:				
• IFSF[a]/CPP-749 (dry storage)	0.00056	2.8×10^{-10}	0.0045	0.0000023
• Fluorinel Dissolution and Fuel Storage (FAST) (wet storage)	0.00038	1.9×10^{-10}	0.0031	0.0000016
• New Dry Storage Facility[b]	0.00056	2.8×10^{-10}	0.0045	0.0000023
Storage at:				
• IFSF[a]/CPP-749 (dry storage)	0	0	0	0
• FAST (wet storage)	3.8×10^{-9}	1.9×10^{-15}	3.1×10^{-8}	1.6×10^{-11}
• New Dry Storage Facility[b]	0	0	0	0

[a] *Irradiated Fuel Storage Facility*

[b] *The doses for this new dry storage facility are assumed to be equal to those for IFSF/CPP-749.*

Table 4-10 Annual Public Impacts for Foreign Research Reactor Spent Nuclear Fuel Receipt and Storage at the Hanford Site

Facility	MEI Dose (mrem/yr)	MEI Risk (LCF/yr)	Population Dose (person-rem/yr)	Population Risk (LCF/yr)
Receipt/Unloading at:				
• Fuel Material Examination Facility (FMEF) (dry storage)	0.00020	1.0×10^{-10}	0.011	0.0000055
• New Dry Storage Facility[a]	0.00025	1.3×10^{-10}	0.015	0.0000075
Storage at:				
• FMEF (dry storage)	0	0	0	0
• New Dry Storage Facility[a]	0	0	0	0

[a] *The doses for this new dry storage facility are different from those for FMEF due to the different release height and location.*

Table 4-11 Annual Public Impacts for Foreign Research Reactor Spent Nuclear Fuel Receipt and Storage at the Oak Ridge Reservation

Facility	MEI Dose (mrem/yr)	MEI Risk (LCF/yr)	Population Dose (person-rem/yr)	Population Risk (LCF/yr)
Receipt/Unloading at:				
• New Dry Storage Facility	0.089	4.5×10^{-8}	0.085	0.000043
Storage at:				
• New Dry Storage Facility	0	0	0	0

Table 4-12 Annual Public Impacts for Foreign Research Reactor Spent Nuclear Fuel Receipt and Storage at the Nevada Test Site

Facility	MEI Dose (mrem/yr)	MEI Risk (LCF/yr)	Population Dose (person-rem/yr)	Population Risk (LCF/yr)
Receipt/Unloading at:				
• Engine Maintenance and Disassembly (E-MAD) (dry storage)	0.00076	3.8×10^{-10}	0.00093	4.7×10^{-7}
• New Dry Storage Facility[a]	0.00076	3.8×10^{-10}	0.00093	4.7×10^{-7}
Storage at:				
• E-MAD (dry storage)	0	0	0	0
• New Dry Storage Facility[a]	0	0	0	0

[a] *The doses for this new dry storage facility are assumed to be equal to those for E-MAD.*

Among all the potential foreign research reactor spent nuclear fuel management sites, the maximum estimated annual incident-free public MEI radiological exposure from emissions is 0.09 mrem per year. This exposure would occur at the Oak Ridge Reservation (Table 4-11) during receipt and handling. It is much higher than all other corresponding dose rates in Tables 4-8 through 4-12. The receipt period would be about 3 years, so the total MEI dose would be 0.27 mrem. The associated probability for incurring one LCF would be 1.4×10^{-7} for the MEI, which represents less than two chances in ten million of developing a fatal cancer from radiological exposure.

The highest annual incident-free population risk among the Savannah River Site and the Idaho National Engineering Laboratory (Phase 1 sites) is 0.000011 LCF per year (Tables 4-8 and 4-9), which would be due to emissions from L-Reactor Basin at the Savannah River Site. Assuming some foreign research reactor spent nuclear fuel is stored in this basin for the entire 10 years of Phase 1 plus 3 years to transfer it to a Phase 2 site, the Phase 1 component of this population risk would be as high as 0.00014 LCF. The highest annual incident-free population risk from a new dry storage facility at a potential Phase 2 site (Tables 4-8 through 4-12), is 0.000043 LCF per year, which would be due to receipt/unloading at the Oak Ridge Reservation. Assuming that foreign research reactor spent nuclear fuel could be received at the Oak Ridge Reservation for as long as 3 years, the Phase 2 component of this population risk would be 0.00013 LCF. This is higher than any other combination of Phase 2 dry storage annual risks and durations. Adding the Phase 1 and Phase 2 population risks yields 0.00027 LCF for the total population risk to the public living near the sites due to incident-free conditions.

Conservative Assumptions and Impacts to Workers of Incident-Free Site Activities

Workers would receive radiation doses during handling operations, such as receiving and unloading foreign research reactor spent nuclear fuel transportation casks at the management site, transferring foreign research reactor spent nuclear fuel from one facility to another within the management site, or packaging the foreign research reactor spent nuclear fuel for shipment to another management site. Detailed analysis of the potential impacts is given in Appendix F of this EIS. In summary:

- The maximally exposed worker dose estimate is based on the regulatory limit of 5,000 mrem per year for radiation workers at all DOE management sites. DOE and the Department of State conservatively assumed that an individual worker received this dose every year for all 13 years that the handling operations would be in progress. Although this assumption is highly unlikely, the calculated total maximally exposed worker dose is 65,000 mrem and the associated risk is 0.026 LCF. This means that this individual would have a nearly three percent higher chance of incurring an LCF.

- Worker population doses were estimated by considering the type and duration of all operations performed by the workers during the handling of each transportation cask and storage cask as appropriate, including: (1) the number of workers needed, (2) the duration of a specific operation, and (3) the distance between the transportation cask and the operation being performed. Only the workers actually performing the operations receive radiation doses, and thus would have an increased risk of incurring an LCF. If the total radiation dose is received by a small number of workers, each worker would have a higher risk of cancer than if the total dose is received by a large number of workers. The dose rate in the vicinity of the transportation and storage casks assumed for the estimates was based on the conservative methodology presented in Appendix F, Section F.5. As noted in Section F.5, worker population doses associated with dry storage cask design may be higher than those associated with the vault design because of the additional worker

activities associated with the handling of the cask that transfers the canistered spent fuel to the concrete structure. The worker population doses reported below for new dry storage conservatively reflect the cask design.

- The number of casks handled at each potential foreign research reactor spent nuclear fuel management site would depend on the number of cask shipments considered under the ground transportation options discussed in Section 2.6.4.1, and the amount of foreign research reactor spent nuclear fuel expected to be transferred between facilities during Phase 2.

Table 4-13 provides a summary of the number of casks that would be handled at each potential foreign research reactor spent nuclear fuel management site under the Centralization Alternative in the Programmatic SNF&INEL Final EIS (DOE, 1995c) and in the current EIS.

Table 4-13 Estimated Number of Shipments to and from Each Potential Foreign Research Reactor Spent Nuclear Fuel Management Site

Candidate Storage Site	*Incoming Shipments*	*Intersite Shipments*	*Outgoing Shipments*	*Total Shipments*
Savannah River Site or Idaho National Engineering Laboratory Phase 1	644[a]	0	161	805
Savannah River Site or Idaho National Engineering Laboratory Phases 1 and 2	837[b]	209	0	1,046
Hanford Site or Oak Ridge Reservation or Nevada Test Site Phase 2	354[c]	0	0	354

[a] *10-year receipt in foreign research reactor spent nuclear fuel certified casks.*

[b] *13-year receipt in foreign research reactor spent nuclear fuel certified casks.*

[c] *161 from near term site using large truck casks and 193 from ports using foreign research reactor spent nuclear fuel certified casks.*

Tables 4-14 through 4-18 present the population doses and risks that would be received by the members of the working crew, if that crew handled the total number of casks at each management site. The results do not include shipments in large rail casks.

Table 4-14 Handling-Related Impacts to Workers at the Savannah River Site

	Worker Population Dose (person-rem)		*Worker Population Risk (LCF)*	
	RBOF/L-Reactor	*New Dry Storage*	*RBOF/L-Reactor*	*New Dry Storage*
Phase 1	250	NA	0.10	NA
Phases 1 and 2	NA	416[a]	NA	0.17[a]

[a] *Cask design*

Table 4-15 Handling-Related Impacts to Workers at the Idaho National Engineering Laboratory

	Worker Population Dose (person-rem)			*Worker Population Risk (LCF)*		
	IFSF[a]/CPP-749	*FAST*	*New Dry Storage*	*IFSF[a]/CPP-749*	*FAST*	*New Dry Storage*
Phase 1	257	250	NA	0.10	0.10	NA
Phases 1 and 2[b]	NA	NA	424[c]	NA	NA	0.17[c]
Phases 1 and 2[d]	NA	NA	416[c]	NA	NA	0.17[c]

[a] *Irradiated Fuel Storage Facility*

[b] *Phase 1 at IFSF/CPP-749*

[c] *Cask design*

[d] *Phase 1 at FAST*

Table 4-16 Handling-Related Impacts to Workers at the Hanford Site

	Worker Population Dose (Person-rem)	*Worker Population Risk (LCF)*
	FMEF/New Dry Storage	*FMEF/New Dry Storage*
Phase 2	266[a]	0.11[a]

[a] *Cask design*

Table 4-17 Handling-Related Impacts to Workers at the Oak Ridge Reservation

	Worker Population Dose (Person-rem)	*Worker Population Risk (LCF)*
	New Dry Storage	*New Dry Storage*
Phase 2	266[a]	0.11[a]

[a] *Cask design*

Table 4-18 Handling-Related Impacts to Workers at the Nevada Test Site

	Worker Population Dose (person-rem)		*Worker Population Risk (LCF)*	
	E-MAD	*New Dry Storage*	*E-MAD*	*New Dry Storage*
Phase 2	113	266[a]	0.05	0.11[a]

[a] *Cask design*

According to the above tables, the highest dose to a working crew at a single site would be 424 person-rem at the Idaho National Engineering Laboratory in the analyzed case which assumes that all foreign research reactor spent nuclear fuel is received in the Irradiated Fuel Storage Facility and/or the CPP-749 facility (dry storage) during Phase 1 and is transferred to a new dry storage facility at the Idaho National Engineering Laboratory in Phase 2. The associated number of additional LCF is 0.17. The highest dose to working crews for both phases in more than one site is 523 person-rem: 266 person-rem at one of the 3 Phase 2 sites, plus 257 person-rem at the Idaho National Engineering Laboratory as the Phase 1 site. The associated probability for developing one LCF among the working crews of the two sites is 0.21.

Conservative Assumptions and Accident-Related Impacts

An evaluation of hypothetical accidental radioactive material releases at the potential foreign research reactor spent nuclear fuel management sites was performed to assess the impact of possible radiation exposure to individuals and the general population (see also Appendix F, Section F.6). All inputs are site-specific except for the radioactivity release. Site-specific information includes meteorological conditions, population distribution, and food production and consumption rates within 80 km (50 mi) of the management location.

The radiation doses to the following individuals and the general population are calculated for accident conditions at the spent nuclear fuel management facility:

- Worker: An individual located 100 m (330 ft) from the radioactive material release point. (The impact of accidents on close-in workers is not calculated numerically but is discussed qualitatively for each accident at the end of this section.) For elevated release (from a tall stack), the worker dose was calculated at a point of maximum dose. The distance at which the maximum dose occurs is frequently greater than 100 m (330 ft) for elevated release.

The direction to the worker was chosen as the direction to the maximally exposed sector. The dose to the worker is calculated for the 50th-percentile meteorological condition (DOE, 1992a).

- Maximally Exposed Individual (MEI): A theoretical member of the general public living at the management site boundary receiving the maximum exposure. This individual is conservatively assumed to be located in a direction downwind from the release point. The dose to the MEI is shown for the conservative 95th-percentile meteorological condition.

- Nearest Public Access Individual (NPAI): An individual stranded on a highway or public access road near to the facility at the time of an accident. The distance to the NPAI was chosen as the distance to the nearest public access point; the direction was chosen as the direction to that point. The dose to the NPAI is shown for the conservative 95th-percentile meteorological condition.

- General population within an 80-km (50-mi) radius of the facility: The dose calculations are performed for the direction downwind from the release point that results in highest dose to the public. The dose to the population is shown for the conservative 95th-percentile meteorological condition.

The radiation dose to individuals and the public resulting from exposure to radioactive contamination was calculated using external (direct exposure), inhalation, and ingestion pathways. Dispersion in air from point of release was estimated with both 50th-percentile and 95th-percentile meteorological conditions. The 50th-percentile condition represents the median meteorological condition. The 95th-percentile condition is defined as that condition which is not exceeded more than 5 percent of the time, and is more conservative than the 50th-percentile condition.

The ingestion dose is calculated by considering that the individual and the public would consume the contaminated food produced in the vicinity [up to 80 km (50 mi)] of the accident. This is conservative, and it is expected that continued consumption of contaminated food products by the public would be suspended if the projected dose exceeded the protective action guidelines developed by the U.S. Environmental Protection Agency (EPA, 1991a). To ensure a consistent and conservative analytical basis, no reduction of exposure due to a protective action guideline was used in this analysis.

Accidents considered for detailed analysis are similar to those that were analyzed in the Programmatic SNF&INEL Final EIS. The selection of the accidents was based on the following considerations:

(1) criticality caused by human error during operation, equipment failure, or earthquake; (2) mechanical damage to foreign research reactor spent nuclear fuel during examination and preparation (cropping off the aluminum and nonfuel end of a spent fuel element); and (3) accident involving an impact by either an internal or an external initiator with and without an ensuing fire.

Six accident scenarios were evaluated at each management location using identical source terms (estimated amounts of radioactive material released during postulated accidents). The wet pool accidents are assumed to be cutting into the fuel region or mechanical damage due to operator error, an accidental

criticality, and an aircraft crash into the water pool facility. The dry storage accidents are assumed to be cutting into the fuel region or mechanical damage during examination work and handling in a dry cell, dropping of a spent nuclear fuel cask, and an aircraft crash with an ensuing fire.

Tables 4-19 through 4-23 present the frequencies and the consequences of postulated accidents to the offsite MEI, NPAI, and offsite population for the 95th-percentile meteorological conditions using the conservative assumptions and input values discussed above. The worker doses are calculated only for the 50th-percentile meteorology. This is an individual assumed to be 100 m (330 ft) downwind of the accident. DOE and the Department of State did not estimate the worker population dose due to accidents.

Table 4-19 Frequency and Consequences of Accidents at the Savannah River Site

	Frequency (per yr)	Consequences							
		MEI		NPAI		Population		Worker	
		(mrem)	(LCF)	(mrem)	(LCF)	(person-rem)	(LCF)	(mrem)	(LCF)
Dry Storage Accidents[a]									
Spent Nuclear Fuel Assembly Breach	0.16	0.24	1.2×10^{-7}	0.068	3.4×10^{-8}	9.2	0.0046	28	0.000011
Dropped Spent Nuclear Fuel Cask	0.0001	0.018	9.0×10^{-9}	0.00034	1.7×10^{-10}	0.55	0.00028	0.28	1.1×10^{-7}
Aircraft Crash w/Fire	1×10^{-6}	40	0.00002	0.29	1.5×10^{-7}	1300	0.65	120	0.000048
Wet Storage Accidents - RBOF									
Spent Nuclear Fuel Assembly Breach	0.16	0.0070	3.5×10^{-9}	0.00039	2.0×10^{-10}	0.23	0.00012	0.14	5.6×10^{-8}
Accidental Criticality	0.0031	130	0.000065	44	0.000022	4,800	2.4	16,000	0.0064
Aircraft Crash	1×10^{-6}	4.1	0.0000021	0.98	4.9×10^{-7}	150	0.075	400	0.00016
Wet Storage Accidents - L-Reactor Basin									
Spent Nuclear Fuel Assembly Breach	0.16	0.0093	4.7×10^{-9}	0.00097	4.9×10^{-10}	0.14	0.00007	0.11	4.4×10^{-8}
Accidental Criticality	0.0031	170	0.000085	120	0.000060	3,000	1.5	14,000	0.0056
Aircraft Crash	1×10^{-6}	4.2	0.0000021	2.6	0.0000013	93	0.047	70	0.000028

[a] *New Dry Storage Facility*

Table 4-20 Frequency and Consequences of Accidents at the Idaho National Engineering Laboratory

	Frequency (per yr)	Consequences							
		MEI		NPAI		Population		Worker	
		(mrem)	(LCF)	(mrem)	(LCF)	(person-rem)	(LCF)	(mrem)	(LCF)
Dry Storage Accidents[a]									
Spent Nuclear Fuel Assembly Breach	0.16	1.3	6.5×10^{-7}	0.67	3.4×10^{-7}	15	0.0075	28	0.000011
Dropped Spent Nuclear Fuel Cask	0.0001	0.074	3.7×10^{-8}	0.0033	1.7×10^{-9}	0.83	0.00042	0.12	4.8×10^{-8}
Aircraft Crash w/Fire	1×10^{-6}	180	0.00009	2.9	0.0000015	2,000	1.0	120	0.000048
Wet Storage Accidents									
Spent Nuclear Fuel Assembly Breach	0.16	0.0016	8.0×10^{-10}	0.0036	1.8×10^{-9}	0.43	0.00022	0.14	5.6×10^{-8}
Accidental Criticality	0.0031	28	0.000014	30	0.000015	140	0.070	1800	0.00072
Aircraft Crash	1×10^{-6}	22	0.000011	9.8	0.0000049	250	0.13	400	0.00016

[a] *New Dry Storage Facility at IFSF/CPP-749*

Table 4-21 Frequency and Consequences of Accidents at the Hanford Site

	Frequency (per yr)	Consequences							
		MEI		NPAI		Population		Worker	
		(mrem)	(LCF)	(mrem)	(LCF)	(person-rem)	(LCF)	(mrem)	(LCF)
Dry Storage Accidents[a]									
Spent Nuclear Fuel Assembly Breach	0.16	3.0	0.0000015	0.57	2.9×10^{-7}	42	0.021	50	0.000020
Dropped Spent Nuclear Fuel Cask	0.0001	0.26	1.3×10^{-7}	0.0085	4.3×10^{-9}	3.0	0.0015	0.22	8.8×10^{-8}
Aircraft Crash w/Fire[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dry Storage Accidents at FMEF									
Spent Nuclear Fuel Assembly Breach[c]	0.16	4.7	0.0000024	2.1	0.0000011	46	0.023	0.99	4.0×10^{-7}
Dropped Spent Nuclear Fuel Cask[c]	0.0001	0.2	1.0×10^{-7}	0.032	1.6×10^{-8}	3.2	0.0016	0.0049	2.0×10^{-9}
Aircraft Crash w/Fire[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA

[a] *New Dry Storage Facility*

[b] *Aircraft Crash accidents are not applicable to the Hanford Site because their frequency of occurrence is less than one every ten million years.*

[c] *Emissions would be released through a tall stack, so workers would receive low doses.*

NA = Not applicable

Table 4-22 Frequency and Consequences of Accidents at the Oak Ridge Reservation

	Frequency (per yr)	Consequences							
		MEI		NPAI		Population		Worker	
		(mrem)	(LCF)	(mrem)	(LCF)	(person-rem)	(LCF)	(mrem)	(LCF)
Dry Storage Accidents[a]									
Spent Nuclear Fuel Assembly Breach	0.16	22	0.000011	42	0.000021	55	0.028	140	0.000056
Dropped Spent Nuclear Fuel Cask	0.0001	1.4	7.0×10^{-7}	0.18	9.0×10^{-8}	15	0.0075	0.61	2.4×10^{-7}
Aircraft Crash w/Fire	1×10^{-6}	2300	0.0012	180	0.000090	2900	1.5	610	0.00024

[a] *New Dry Storage Facility*

Table 4-23 Frequency and Consequences of Accidents at the Nevada Test Site

	Frequency (per yr)	Consequences							
		MEI		NPAI		Population		Worker	
		(mrem)	(LCF)	(mrem)	(LCF)	(person-rem)	(LCF)	(mrem)	(LCF)
Dry Storage Accidents[a]									
Spent Nuclear Fuel Assembly Breach	0.16	1.7	8.5×10^{-7}	0.31	1.6×10^{-7}	1.5	0.00075	20	0.0000080
Dropped Spent Nuclear Fuel Cask	0.0001	0.11	5.5×10^{-8}	0.0014	7.0×10^{-10}	0.40	0.00020	0.089	3.6×10^{-8}
Aircraft Crash w/Fire	1×10^{-6}	180	0.000090	1.2	6.0×10^{-7}	250	0.13	87	0.000035

[a] *E-MAD and New Dry Storage Facility*

The analyses were performed for a generic dry storage at the five potential foreign research reactor spent nuclear fuel management sites, as well as for site-specific locations (i.e., FMEF at the Hanford Site, E-MAD at the Nevada Test Site, L-Reactor Basin and RBOF at the Savannah River Site).

Multiplying the frequency of each accident times its consequences at each site and converting the radiation doses to LCF yields the annual risks associated with each potential accident at each candidate management site. These annual risk estimates are presented in Tables 4-24 through 4-28.

Table 4-24 Annual Risks of Accidents at the Savannah River Site

	Risks			
	MEI (LCF/yr)	NPAI (LCF/yr)	Population (LCF/yr)	Worker (LCF/yr)
Dry Storage Accidents[a]				
Spent Nuclear Fuel Assembly Breach	1.9×10^{-8}	5.5×10^{-9}	0.00075	0.0000018
Dropped Spent Nuclear Fuel Cask	9.0×10^{-13}	1.7×10^{-14}	2.8×10^{-8}	1.1×10^{-11}
Aircraft Crash w/Fire	2.0×10^{-11}	1.5×10^{-13}	6.5×10^{-7}	4.8×10^{-11}
Wet Storage Accidents at RBOF				
Spent Nuclear Fuel Assembly Breach	5.5×10^{-10}	3.1×10^{-11}	0.000019	8.8×10^{-10}
Accidental Criticality	2.0×10^{-7}	7.0×10^{-8}	0.0074	0.000020
Aircraft Crash	2.1×10^{-12}	4.9×10^{-13}	7.5×10^{-8}	1.6×10^{-10}
Wet Storage Accidents at L-Reactor Basin				
Spent Nuclear Fuel Assembly Breach	7.4×10^{-10}	8.0×10^{-11}	0.000011	7.1×10^{-9}
Accidental Criticality	2.6×10^{-7}	1.9×10^{-7}	0.0047	0.000017
Aircraft Crash	2.1×10^{-12}	1.3×10^{-12}	4.7×10^{-8}	2.8×10^{-11}

[a] *New Dry Storage Facility.*

Table 4-25 Annual Risks of Accidents at the Idaho National Engineering Laboratory

	Risks			
	MEI (LCF/yr)	NPAI (LCF/yr)	Population (LCF/yr)	Worker (LCF/yr)
Dry Storage Accidents[a]				
Spent Nuclear Fuel Assembly Breach	1.1×10^{-7}	5.5×10^{-8}	0.0012	0.0000018
Dropped Spent Nuclear Fuel Cask	3.7×10^{-12}	1.7×10^{-13}	4.2×10^{-8}	4.8×10^{-12}
Aircraft Crash w\Fire	9.0×10^{-11}	1.5×10^{-12}	0.0000010	4.8×10^{-11}
Wet Storage Accidents[b]				
Spent Nuclear Fuel Assembly Breach	1.3×10^{-10}	2.9×10^{-10}	0.000035	8.8×10^{-9}
Accidental Criticality	4.4×10^{-8}	4.7×10^{-8}	0.00022	0.0000022
Aircraft Crash	1.1×10^{-11}	4.9×10^{-12}	1.3×10^{-7}	1.6×10^{-10}

[a] *IFSF/CPP-749 or New Dry Storage Facility*

[b] *FAST Facility*

The highest annual MEI or NPAI risk among the potential Phase 1 sites (Tables 4-24 and 4-25) is 2.6×10^{-7} LCF per year, which is the annual risk to the MEI from accidental criticality at L-Reactor Basin. Assuming some foreign research reactor spent nuclear fuel is stored in RBOF for the entire 10 years of Phase 1 plus 3 years to transfer it to a Phase 2 site, the Phase 1 component of this MEI risk would be 0.0000034 LCF. The highest annual MEI or NPAI risk due to dry storage facility accidents at the potential Phase 2 sites (Tables 4-24 through 4-28) is 0.0000034 LCF per year, which is the annual risk to the NPAI from an assembly breach accident during handling at the Oak Ridge Reservation. Assuming that foreign research reactor spent nuclear fuel could be received at the Oak Ridge Reservation for as long as 3 years, the Phase 2 component of this MEI/NPAI risk would be 0.000010 LCF. This is higher than any other

Table 4-26 Annual Risks of Accidents at the Hanford Site

	Risks			
	MEI (LCF/yr)	NPAI (LCF/yr)	Population (LCF/yr)	Worker (LCF/yr)
Dry Storage Accidents[a]				
Spent Nuclear Fuel Assembly Breach	2.4×10^{-7}	4.6×10^{-8}	0.0034	0.0000032
Dropped Spent Nuclear Fuel Cask	1.3×10^{-11}	4.3×10^{-13}	1.5×10^{-7}	8.8×10^{-12}
Aircraft Crash w\Fire[b]	NA	NA	NA	NA
Dry Storage Accidents at FMEF				
Spent Nuclear Fuel Assembly Breach[c]	3.7×10^{-7}	1.7×10^{-7}	0.0037	6.4×10^{-8}
Dropped Spent Nuclear Fuel Cask[c]	8.0×10^{-12}	1.6×10^{-12}	1.6×10^{-7}	2.5×10^{-13}
Aircraft Crash with Fire[b]	NA	NA	NA	NA

[a] *New Dry Storage Facility*

[b] *Aircraft crash accidents are not applicable to the Hanford Site because their frequency of occurrence is less than one every ten million years.*

[c] *Emissions would be released through a tall stack.*

NA = Not applicable

Table 4-27 Annual Risks of Accidents at the Oak Ridge Reservation

	Risks			
	MEI (LCF/yr)	NPAI (LCF/yr)	Population (LCF/yr)	Worker (LCF/yr)
Dry Storage Accidents[a]				
Spent Nuclear Fuel Assembly Breach	0.0000018	0.0000034	0.0044	0.0000088
Dropped Spent Nuclear Fuel Cask	7.0×10^{-11}	9.0×10^{-12}	7.5×10^{-7}	2.4×10^{-11}
Aircraft Crash w\Fire	1.2×10^{-9}	9.0×10^{-11}	0.0000015	2.4×10^{-10}

[a] *New Dry Storage Facility*

Table 4-28 Annual Risks of Accidents at the Nevada Test Site

	Risks			
	MEI (LCF/yr)	NPAI (LCF/yr)	Population (LCF/yr)	Worker (LCF/yr)
Dry Storage Accidents[a]				
Spent Nuclear Fuel Assembly Breach	1.4×10^{-7}	2.5×10^{-8}	0.00012	0.0000013
Dropped Spent Nuclear Fuel Cask	5.5×10^{-12}	7.0×10^{-14}	2.0×10^{-8}	3.6×10^{-12}
Aircraft Crash w\Fire	9.0×10^{-11}	6.0×10^{-13}	1.3×10^{-7}	3.5×10^{-11}

[a] *E-MAD and New Dry Storage Facility*

combination of Phase 2 annual accident risks and associated durations. Taking the maximum of the Phase 1 and Phase 2 MEI risks yields 0.000010 LCF for the maximum MEI risk due to accidents. This means that the MEI has one chance in one hundred thousand of incurring an LCF due to accidents.

The highest annual population risk among the potential Phase 1 sites (Tables 4-24 and 4-25) is 0.0074 LCF per year, which is the annual population risk from an accidental criticality at RBOF. Assuming some foreign research reactor spent nuclear fuel is stored in RBOF for the entire 10 years of Phase 1, plus 3 years to transfer it to a Phase 2 site, the Phase 1 component of this population risk would be 0.096 LCF. The highest annual population risk due to dry storage facility accidents at the potential Phase 2 sites (Tables 4-24 through 4-28) is 0.0044 LCF per year, which is the annual risk to the public from assembly breach accidents during handling at the Oak Ridge Reservation. Assuming that foreign research reactor spent nuclear fuel could be received at the Oak Ridge Reservation for as long as 3 years, the Phase 2

component of this population risk would be 0.013 LCF. This is higher than any other combination of Phase 2 annual accident risks and associated durations. Adding the Phase 1 and Phase 2 population risks yields 0.11 LCF for the total population risk due to accidents.

Impacts of Accidents on Close-in Workers

An evaluation has been made of the impacts to close-in workers involved in spent fuel handling and management operations. This evaluation focuses on the radiological consequences of the accident. Clearly, a limited number of fatalities could occur which would be related to spent nuclear fuel handling only in an indirect or secondary manner (e.g., the worker who happened to be in the facility might be killed due to an aircraft crash).

Wet Storage Accidents

Fuel Assembly Breach in Wet Storage: No fatalities of nearby workers would be expected due to radiological consequences. This is because the release of the radionuclides would be underwater. Attenuation by the water would occur for most of the release products; release of the noble gases from the pool would, however, cause a direct radiation exposure to workers in the area. If radiation is released from the surface of the water pool, radiation alarms would sound, prompting evacuation of nearby workers.

Dropped Fuel Cask in Wet Storage: No fatalities would be expected due to the radiological consequences of this accident. The operation of the crane is done using remote controls, so workers are not likely to be in the direct vicinity of the dropped cask.

Accidental Criticality: The accidental criticality could occur at a minimum of 3 m (10 ft) underwater. Based on the shielding provided by the water pool, it is likely that no fatalities would occur. Nearby workers would likely receive appreciable radiation exposures.

Aircraft Crash into the Water Pool: No fatalities to nearby workers would be expected due to radiological consequences. An aircraft crash into the water pool would prompt nearby workers not affected by the crash to evacuate the area immediately. The release of radiation products would be underwater, allowing sufficient time for evacuation before radiation products would reach the surface.

Dry Storage Accidents

Fuel Assembly Breach: Cropping of the fuel assembly would occur in a dry cell. Any release that would occur due to inadvertent cutting into the fuel would be confined to the storage cell, where the exhaust is away from the workers. No fatalities to nearby workers would be expected due to this scenario.

Dropped Fuel Cask: No fatalities would be expected due to the radiological consequences of this accident. The operation of the crane is done using remote controls, so workers are not likely to be in the direct vicinity of the dropped cask. In addition, the workers would promptly leave the area.

Aircraft Crash with Fire: If an aircraft crashes into a dry storage facility and catches fire, large amounts of radioactive material could be released into the atmosphere. If the facility is occupied at the time of the crash, any surviving workers could receive a substantial radiation dose from the released radioactive material.

Secondary Impacts of Accidents

Impacts of accidents on resources other than human health and safety (secondary impacts), have been addressed in Section F.4 for each management site. The general conclusion is that no measurable secondary impacts to land uses, cultural resources, water quality, ecological resources, national defense, or local economies are expected from the postulated accidents involving foreign research reactor spent nuclear fuel at the management sites.

4.2.4.2 Topics Not Discussed in Detail

This section summarizes the potential impacts for the environmental topics not covered in Section 4.2.4.1, namely land use, socioeconomics, cultural resources, aesthetic and scenic resources, geology, air quality, water quality, ecology, noise, utilities and energy, and waste management. The detailed analysis of these topics presented in Appendix F, Section F.4 showed that none of these topics clearly differentiated among the potential foreign research reactor spent nuclear fuel management sites nor had any major environmental impact. The discussion of each topic generally concentrates on management sites and alternatives that have the largest estimated impacts, and demonstrates that the environmental impacts for that topic are not of sufficient magnitude to be given strong consideration in the decision making process.

4.2.4.2.1 Land Use

The basic implementation of Management Alternative 1 would only result in minor land use impacts at any of the potential foreign research reactor spent nuclear fuel management sites. The largest land use impact would be 16 ha (40 acres) at the Oak Ridge Reservation to construct a new dry storage facility. This represents less than 0.1 percent of the total size of the Oak Ridge Reservation. A description of the land use impacts at the other potential foreign research reactor spent nuclear fuel management sites is contained in Appendix F.4. For all of the potential foreign research reactor spent nuclear fuel management sites, new foreign research reactor spent nuclear fuel storage facilities would be built on land previously disturbed or designated for industrial use. No additional land outside of the existing sites would be required for foreign research reactor spent nuclear fuel management. It should be noted that land use and other environmental impacts associated with the construction activities would be minimal, under the implementation alternatives that use refurbishment of existing facilities for interim storage (i.e., BNFP at the Savannah River Site and E-MAD at the Nevada Testing Site). All environmental impacts from the refurbishment and operation of these facilities would be bounded by the impacts associated with the construction and operation of new generic storage facilities. Land use impacts are discussed in more detail in Appendix F, Section F.4.

4.2.4.2.2 Socioeconomics

The basic implementation of Management Alternative 1 would only result in minor socioeconomic impacts at any of the potential foreign research reactor spent nuclear fuel management sites. Socioeconomic impacts are defined for purposes of this analysis in terms of direct effects, which include changes in site employment and expenditures from foreign research reactor spent nuclear fuel-related construction and operation and indirect effects, such as changes that result from regional purchases, nonpayroll expenditures, and payroll spending by site employees.

No construction personnel would be needed for existing facilities, and not more than 240 workers per year (peak) would be needed to build a new dry storage facility. The annual staffing requirements for operations would be about 30 and 8 full-time employees during receipt and storage, respectively, for a new dry storage facility. This would represent 0.15 to 0.9 percent of the existing work force at any of the potential foreign research reactor spent nuclear fuel management sites. No new hiring would be expected because most positions would be filled by reassignments of the existing work force. Even if all operational positions were filled by new hires, this would represent about an even smaller increase in regional employment. The secondary effects would be even lower.

4.2.4.2.3 Cultural Resources

The basic implementation of Management Alternative 1 would only result in minor cultural impacts at any of the potential foreign research reactor spent nuclear fuel management sites. Cultural, archaeological, historic, and architectural resources are defined as prehistoric and historic sites, districts, structures, and evidence of human use that are considered to be important to a culture, subculture, or a community for scientific, traditional, religious, or other reasons.

Although most of the potential foreign research reactor spent nuclear fuel management sites contain areas of archaeological, cultural, or historical interest, little or no direct impacts on cultural resources would be expected because of the location of the foreign research reactor spent nuclear fuel storage facilities. Specific site surveys have not been completed; however, based on existing information, no known cultural resources would be affected by construction or operation of foreign research reactor spent nuclear fuel facilities. Prior to construction, specific site surveys would be conducted. In the event that cultural resources were encountered during construction, the State Historic Preservation Officer would be contacted immediately. Similarly, Tribal leaders would be notified if any Native American resources were found.

4.2.4.2.4 Aesthetic and Scenic Resources

The basic implementation of Management Alternative 1 would only result in minor impacts to aesthetic and scenic resources at any of the potential foreign research reactor spent nuclear fuel management sites. Foreign research reactor spent nuclear fuel storage facilities would be located far from public view in areas previously disturbed or designated for industrial use. Construction activities would generate fugitive dust that could temporarily affect visibility. However, best management practices would be implemented to minimize such conditions. Furthermore, facility operations would not produce emissions that would adversely impact visibility.

4.2.4.2.5 Geology

The basic implementation of Management Alternative 1 would only result in minor geologic impacts at any of the potential foreign research reactor spent nuclear fuel management sites. Except for the potential existence of gold, tungsten, and molybdenum at the Nevada Test Site, geologic resources consist only of surficial sand, gravel, or clay deposits, all of which have low economic value. Construction activities would disturb these surface deposits, but because of the large volume of these materials on the potential foreign research reactor spent nuclear fuel management sites, the impact would be expected to be small.

4.2.4.2.6 Air Quality

The basic implementation of Management Alternative 1 would only result in minor impacts on air quality at any of the potential foreign research reactor spent nuclear fuel management sites. The projected emissions from foreign research reactor spent nuclear fuel storage at the potential management sites would not contribute to Federal or State nonattainment standards. Construction activities would be expected to cause only temporary, minor increases in fugitive dust emissions, but the use of standard dust suppression techniques would be expected to mitigate this problem. Particulate emissions could temporarily affect visibility in localized areas, but would not adversely affect Federal or State attainment standards.

4.2.4.2.7 Water Quality

The basic implementation of Management Alternative 1 would have only minor impacts on water resources at the potential foreign research reactor spent nuclear fuel management sites. Water consumption during construction would require very small amounts of water when compared to daily water usage at the potential management sites.

During operations, the greatest amount of water consumed annually would be about 2.1 million liters (550,000 gal) per year. This amount represents no more than 0.2 percent of the annual water consumption at any of the potential foreign research reactor spent nuclear fuel management sites. At the Nevada Test Site, where available water is limited, a cumulative water supply impact could be important from activities other than foreign research reactor spent nuclear fuel management, but the foreign research reactor spent nuclear fuel management contribution would be very small. Further study of the Ash Meadows sub-basin would be required to specify the exact impact on aquifer yield and integrity.

Under normal operations there would be no direct discharge of effluent to ground or surface waters from a new dry storage facility.

4.2.4.2.8 Ecology

The basic implementation of Management Alternative 1 would only result in minor ecological impacts at the potential foreign research reactor spent nuclear fuel management sites. Under any construction of new facilities, individual or small populations of some wildlife species could be disturbed, displaced, or destroyed. However, the size of the areas affected would be small in relation to the size of the potential foreign research reactor spent nuclear fuel management sites and the size of remaining natural habitats. The type of habitats affected could vary but would be typical of the regional area in which the foreign research reactor spent nuclear fuel storage facility is located. For this reason, any such habitat losses would probably not affect any threatened or endangered species or critical habitats in the area. Habitat fragmentation is not expected because new storage facilities would be constructed on land that has been previously disturbed or designated for industrial purposes. Mitigation plans would be developed in consultation with the appropriate agencies if any threatened or endangered species were identified.

DOE has begun or has completed consultations with the U.S. Fish and Wildlife Service regarding threatened and endangered species for the proposed construction site of foreign research reactor spent nuclear fuel storage facilities at the five potential sites, as required by the Endangered Species Act.

4.2.4.2.9 Noise

The basic implementation of Management Alternative 1 would only result in minor noise impacts at the potential foreign research reactor spent nuclear fuel management sites. Construction activities would generate noise levels consistent with light industrial activity. Based on existing studies these noises would not be expected to propagate offsite at levels that would affect the general population. Noises generated during operations would be less than those during construction.

4.2.4.2.10 Materials, Utilities, and Energy

The basic implementation of Management Alternative 1 would only result in minor impacts on materials, utilities, and energy at the potential foreign research reactor spent nuclear fuel management sites. For existing facilities, incremental increases in materials, utilities, and energy would be very small. New dry storage facilities would result in increased demands on water, power, and sewage. The increased water usage during construction would add no more than 0.2 percent to existing sitewide levels. Increased annual electricity requirements would be about 800 to 1,000 megawatt hours per year and the increased sewage generation would be no more than 1.59 million liters per year (420,000 gal per year), which is less than one percent above existing sitewide levels. At the Nevada Test Site, a central sewage treatment system would have to be constructed for spent nuclear fuel management activities, which would include the foreign research reactor spent nuclear fuel storage facilities. However, all other existing system capacities could manage the estimated increases for materials, utilities, and energy.

4.2.4.2.11 Waste Management

The basic implementation of Management Alternative 1 would only result in minor waste management impacts at the potential foreign research reactor spent nuclear fuel management sites. At all potential management sites the amount of waste generated from foreign research reactor spent nuclear fuel storage is very small when compared to the annual waste projection for each site.

4.2.4.3 Key Cumulative Impacts at the Potential Foreign Research Reactor Spent Nuclear Fuel Management Sites

All of the potential foreign research reactor spent nuclear fuel management sites contain facilities unrelated to foreign research reactor spent nuclear fuel that may continue to operate throughout the foreign research reactor spent nuclear fuel program (approximately 40 years). Impacts from both construction and operation of foreign research reactor spent nuclear fuel facilities would be cumulative with the impacts of existing and planned facilities or actions such as environmental restoration and waste management activities unrelated to foreign research reactor spent nuclear fuel and impacts from the management of DOE's spent nuclear fuel inventory.

This section compares the impacts of the basic implementation of Management Alternative 1 and of the implementation alternatives presented in Section 4.3 to the cumulative impacts at each site. The site-specific cumulative impacts are discussed in more detail in Appendix F.

4.2.4.3.1 Key Cumulative Impacts at the Savannah River Site

Table 4-29 presents the key cumulative impacts from ongoing actions and reasonably foreseeable actions at the Savannah River Site, including:

Table 4-29 Key Cumulative Impacts at the Savannah River Site

Environmental Impact Parameter	*FRR SNF Receipt and Storage Contribution*	*FRR SNF Receipt and Chemical Separation Contribution*	*Current Activities*[a]	*Other Activities*[b]	*Cumulative Impact*
Occupational and Public Health and Safety:					
• MEI Dose (mrem/yr)	0.00036	0.66	0.25	4.1	5.0
LCF (per year)	1.8×10^{-10}	3.3×10^{-7}	1.25×10^{-7}	0.000002	0.0000025
• Population Dose (person-rem/yr)	0.022	27	9.1	295	331
LCF (per year)	0.000011	0.014	0.0045	0.15	0.17
• Worker Collective Dose (person-rem/yr)	10[c]	21	263	1,418	1700
LCF (per year)	0.004	0.0084	0.10	0.57	0.68
Waste Generation:					
• High-Level (canisters/yr)	0	6.5	(d)	190[e]	190[e]
• Saltstone (m^3/yr)	0	370	(d)	60,000	60,000
• Transuranic (m^3/yr)	0	0	(d)	1,038	1,038
• Mixed/Hazardous (m^3/yr)	0	8	(d)	2,561	2,569
• Low-Level (m^3/yr)	22	5,700	(d)	35,600	41,300

FRR SNF = Foreign Research Reactor Spent Nuclear Fuel

[a] *Based on 1993 site data*

[b] *Other activities include: interim management of nuclear materials, spent nuclear fuel management, Vogtle plant operation, defense waste processing facility, stabilization of plutonium-solutions, site-wide waste management activities, tritium accelerator facility, disposition of surplus HEU, storage and disposition of weapons-usable fissile materials, and the stockpile stewardship and management program activities.*

[c] *The dose is due to the handling of the FRR SNF during receipt and transfer between facility, averaged over 40 years.*

[d] *Included in "other activities"*

[e] *Expected Defense Waste Processing Facility canister production rate (DOE, 1995b).*

- The operation of the Vogtle Electric Generating Plant located approximately 16 km (10 mi) south west of the center of the Savannah River Site.
- The implementation of the preferred alternative in the Management of Nuclear Materials EIS.
- Shipment of aluminum-based spent nuclear fuel to the Savannah River Site for storage and disposal discussed in Appendix C of the Programmatic SNF & INEL Final EIS.
- Completion of the construction and operation of the Defense Waste Processing Facility.
- Processing of F-Canyon plutonium solutions to metal.
- Treatment and minimization of radioactive and hazardous wastes at the site as identified in the Savannah River Site Waste Management Final EIS.
- Construction of an accelerator for tritium production at the Savannah River Site, along with associated support facilities.
- Disposition of Surplus Highly Enriched Uranium at the site.
- Storage and Disposition of Weapons-Usable Fissile Materials.

- Stockpile Stewardship and Management Program.
- Current Savannah River Site projects (based on 1993 data).

Table 4-29 also shows the impacts of receipt and near-term chemical separation at the Savannah River Site, from Implementation Alternative 6 of Management Alternative 1 in Section 4.3.6. These impacts are sufficiently distinct from those of the other alternatives that they are presented separately. These impacts would occur only while the chemical separation facilities are operating.

The results in Table 4-29 show that the contribution of foreign research reactor spent nuclear fuel to the cumulative impacts at the Savannah River Site would be minimal.

4.2.4.3.2 Key Cumulative Impacts at the Idaho National Engineering Laboratory

Table 4-30 presents the key cumulative impacts from ongoing actions and reasonably foreseeable actions at the Idaho National Engineering Laboratory, including the proposed construction and operation of an accelerator facility for tritium production (along with associated support facilities), the management of DOE-owned spent nuclear fuel discussed in Appendix B of the Programmatic SNF&INEL Final EIS, and the storage and disposition of weapons-usable fissile materials at the Idaho National Engineering Laboratory site.

Table 4-30 Key Cumulative Impacts at the Idaho National Engineering Laboratory

Environmental Impact Parameter	*FRR SNF Receipt and Storage Contribution*	*FRR SNF Receipt and Chemical Separation Contribution*	*Current Activities*[a]	*Other Activities*[a]	*Cumulative Impact*
Occupational and Public Health and Safety:					
• MEI Dose (mrem/yr)	0.00056	0.048	0.056	0.0057	0.11
LCF (per year)	2.8×10^{-10}	2.4×10^{-8}	2.8×10^{-8}	2.8×10^{-9}	5.5×10^{-8}
• Population Dose (person-rem/yr)	0.0045	0.39	0.34	32	33
LCF (per year)	2.3×10^{-6}	0.00020	0.00017	0.016	0.016
• Worker Collective Dose (person-rem/yr)	10[b]	18	30	344	392
LCF (per year)	0.004	0.0072	0.012	0.137	0.16
Waste Generation:					
• High-Level (canisters/yr)	0	7.5	0	327[c]	327[c]
• Grout (m^3/yr)	0	167	0	875[d]	875[d]
• Transuranic (m^3/yr)	0	0	712	46	758
• Mixed/Hazardous (m^3/yr)	0	8	243	8	259
• Low-Level (m^3/yr)	22	5,700	4,795	2,800	13,300

FRR SNF = Foreign Research Reactor Spent Nuclear Fuel

[a] *Other activities include: DOE-owned spent nuclear fuel management, construction and operation of a tritium accelerator facility, and the disposition of weapons-usable fissile materials.*

[b] *The dose is due to the handling of FRR SNF during receipt and transfer, averaged over 40 years.*

[c] *Assumed canister production rate (DOE, 1995b).*

[d] *Design capacity of the proposed Waste Immobilization Facility, which is not funded.*

Table 4-30 also shows the impacts of receipt and near-term chemical separation at the Idaho National Engineering Laboratory, from Implementation Alternative 6 of Management Alternative 1 in Section 4.3.6. These impacts are sufficiently distinct from those of the other alternatives that they are presented separately. These impacts would occur only while the chemical separation facilities are operating.

The results in Table 4-30 show that the contribution of foreign research reactor spent nuclear fuel management to the cumulative impacts at the Idaho National Engineering Laboratory would be minimal.

4.2.4.3.3 Key Cumulative Impacts at the Hanford Site

Table 4-31 presents the key cumulative impacts from ongoing actions and reasonably foreseeable actions at the Hanford Site, including those discussed in the Programmatic SNF&INEL Final EIS, the Management of Spent Nuclear Fuel from the K Basins Draft EIS, and the Safe Interim Storage of Hanford Tank Wastes Final EIS.

Table 4-31 Key Cumulative Impacts at the Hanford Site

Environmental Impact Parameter	*FRR SNF Contribution*	*Other Activities*[a]	*Cumulative Impact*
Occupational and Public Health and Safety:			
• MEI Dose (mrem/yr)	0.00025	0.0036	0.0036
LCF (per year)	1.3×10^{-10}	1.5×10^{-9}	1.5×10^{-9}
• Population Dose (person-rem/yr)	0.015	0.22	0.235
LCF (per year)	0.0000075	0.00011	0.00011
• Worker Collective Dose (person-rem/yr)	8.9[b]	116.5	125.4
LCF (per year)	0.0035	0.0466	0.05
Waste Generation:			
• High-Level (canisters/yr)	0	320[c]	320[c]
• Transuranic (m^3/yr)	0	240	240
• Mixed/Hazardous (m^3/yr)	0	402	402
• Low-Level (m^3/yr)	22	33,310	33,332

FRR SNF = Foreign Research Reactor Spent Nuclear Fuel

[a] *Other activities include: DOE-owned spent nuclear fuel management, construction and operation of a Laser Interferometer Gravitational-Wave Observatory, decommissioning of unused facilities, site restoration activities, interim storage and tank wastes, management of spent nuclear fuel from the K basins, and current activities.*

[b] *The dose is due to the handling of FRR SNF during receipt, averaged over 30 years.*

[c] *Assumed canister production rate (DOE, 1995b).*

The results in Table 4-31 show that the contribution from management of foreign research reactor spent nuclear fuel to the cumulative impacts at the Hanford Site would be minimal.

4.2.4.3.4 Key Cumulative Impacts at the Oak Ridge Reservation

Table 4-32 presents the key cumulative impacts from ongoing actions and reasonably foreseeable actions at the Oak Ridge Reservation, including those discussed in the programmatic SNF&INEL Final EIS, the Tritium Supply and Recycling Final EIS, and the Disposition of Surplus Highly Enriched Uranium Draft EIS. Other activities considered for the Oak Ridge Reservation which could affect the site environment have not been determined sufficiently at this time to allow impact evaluation. They include activities associated with the waste management at the site, storage and disposition of weapons-usable fissile materials, and stockpile stewardship and management program.

Table 4-32 Key Cumulative Impacts at the Oak Ridge Reservation

Environmental Impact Parameter	*FRR SNF Contribution*	*Other Activities*[a]	*Cumulative Impact*
Occupational and Public Health and Safety:			
• MEI Dose (mrem/yr)	0.09	15.5	15.6
LCF (per year)	4.5×10^{-8}	0.0000077	0.0000078
• Population Dose (person-rem/yr)	0.085	94.5	94.6
LCF (per year)	0.000043	0.047	0.047
• Worker Collective Dose (person-rem/yr)	8.9[b]	261.3	270.2
LCF (per year)	0.0036	0.104	0.108
Waste Generation:			
• High-Level (canisters/yr)	0	0	0
• Transuranic (m^3/yr)	0	16	16
• Mixed/Hazardous (m^3/yr)	0	119,411	119,411
• Low-Level (m^3/yr)	22	34,989	35,011

FRR SNF = Foreign Research Reactor Spent Nuclear Fuel

[a] *Other activities include: DOE-owned spent nuclear fuel management, construction and operation of the Expended Core Facility, the construction and operation of the Advanced Neutron Source Facility, construction and operation of a Tritium production facility, and surplus highly-enriched uranium management activities at the site.*

[b] *The dose is due to the handling of FRR SNF during receipt, averaged over 30 years.*

The results in Table 4-32 show that the contribution from storage of foreign research reactor spent nuclear fuel to the cumulative impacts at the Oak Ridge Reservation would be minimal.

4.2.4.3.5 Key Cumulative Impacts at the Nevada Test Site

Table 4-33 presents the key cumulative impacts from ongoing actions and reasonably foreseeable actions at the Nevada Test Site, including those discussed in the Programmatic SNF&INEL Final EIS and the Tritium Supply and Recycling Final EIS. The Programmatic SNF&INEL Final EIS includes the quantitative impacts from a proposed Expended Core Facility at the Site. The Nevada Test Site is also considered in the storage and disposition of weapons-usable fissile materials program which could affect the site environment. The impacts from this program have not been determined sufficiently at this time to allow impact evaluation.

The results in Table 4-33 show that the contribution from storage of foreign research reactor spent nuclear fuel to the cumulative impacts at the Nevada Test Site would be minimal.

4.2.4.4 Waste Minimization and Mitigation Measures at the Potential Foreign Research Reactor Spent Nuclear Fuel Management Sites

Although environmental impacts at the potential foreign research reactor spent nuclear fuel management sites would be minimal in all environmental media and mitigation measures would not be necessary, the sites would implement measures in some areas to minimize impacts. Mitigation measures would be taken in the areas of pollution control, socioeconomics, cultural resources, air and water resources, occupational and public health and safety, and accident prevention. Appendix F provides details on these issues.

Table 4-33 Key Cumulative Impacts at the Nevada Test Site

Environmental Impact Parameter	*FRR SNF Contribution*	*Other Activities*[a]	*Cumulative Impact*
Occupational and Public Health and Safety:			
• MEI Dose (mrem/yr)	0.00076	0.31	0.31
LCF (per year)	3.8×10^{-10}	1.55×10^{-7}	1.55×10^{-7}
• Population Dose (person-rem/yr)	0.00093	0.095	0.095
LCF (per year)	4.7×10^{-7}	0.00047	0.000047
• Worker Collective Dose (person-rem/yr)	8.9[b]	81	89.9
LCF (per year)	0.0036	0.032	0.035
Waste Generation:			
• High-Level (canisters/yr)	0	0	0
• Transuranic (m^3/yr)	0	16	16
• Mixed/Hazardous (m^3/yr)	0	252	252
• Low-Level (m^3/yr)	22	44,578	44,600

FRR SNF = Foreign Research Reactor Spent Nuclear Fuel

[a] *Other activities include existing activities, DOE-owned spent fuel management activities, construction and operation of an Expended Core Facility, and construction and operation of a tritium production facility.*

[b] *The dose is due to the handling of foreign research reactor spent nuclear fuel during receipt, averaged over 30 years.*

4.2.4.5 Environmental Justice at the Potential Foreign Research Reactor Spent Nuclear Fuel Management Sites

Under incident-free foreign research reactor spent nuclear fuel management site activities associated with receipt and storage of the spent nuclear fuel, the dominant radiological impacts would be the exposures received by the site workers in the immediate vicinity of the spent nuclear fuel container. These individuals are principally those working within the spent nuclear fuel storage facility. As discussed in Section 4.2.4.1, under incident-free operating conditions, no radiological fatalities would be expected among radiation workers or the general public.

Section 4.2.4.1 also discusses radiological effects due to accidents for both wet storage and dry storage. As shown in Tables 4-24 through 4-28, the dominant radiological risks due to accidents are estimated to occur during breach of a spent nuclear fuel assembly. No LCF are expected to result from the basic implementation of Management Alternative 1.

Appendix A describes minority populations and low-income households residing near candidate management sites. Table 4-34 summarizes this description. Calculations for incident-free and accident conditions demonstrate that for the general population the impacts would be very low. Minority or low-income populations living near the potential management sites would not be subjected to any greater impacts. Therefore, these populations would not receive disproportionately high and adverse impacts. They would be subject to very low impacts, as would the general population.

Table 4-34 Summary Description of Minority Populations and Low-Income Households Residing Within 80 km (50 mi) of Candidate Management Sites

Candidate Management Site	*Total Population*	*Minority Population*	*Total Households*	*Low-Income Households*
Savannah River Site	566,823	214,016	197,937	82,930
Idaho National Engineering Laboratory	176,311	15,449	55,109	22,452
Hanford Site	383,934	95,042	136,496	57,667
Oak Ridge Reservation	863,758	53,185	335,589	147,537
Nevada Test Site	12,421	2,005	4,194	2,024

Characterization of the number and location of minority and low-income populations is dependent on how these populations are defined and what assumptions are used in conducting the analysis. As discussed in Appendix A, at the time this Final EIS and the Programmatic SNF&INEL Final EIS were prepared, the Federal Interagency Working Group on Environmental Justice had not issued final guidance on the definitions of minority and low-income populations, or the approach to be used in analyzing environmental justice, as directed by the Executive Order. Final internal DOE guidance on environmental justice has also not been adopted. As a result, both the definitions and assumptions used by and within agencies for conducting environmental justice analyses can vary, and the resulting demographic results can differ on a case-by-case basis. For example, this Final EIS and the Programmatic SNF&INEL Final EIS present demographic characterizations derived from the same United States Census Bureau data base, but these documents used different definitions and assumptions. Several of the same candidate interim spent nuclear fuel management sites were evaluated in both documents. As discussed in Appendix A, variations in these definitions and assumptions led to differences in the characterization of minority and low-income populations surrounding these potential spent nuclear fuel management sites. Nevertheless, although the characterizations differ, the radiological impacts resulting from the proposed action under all alternatives present very low risk to the population as a whole. Therefore, no disproportionately high and adverse effects would be expected for any particular segment of the population, including minority and low-income populations, regardless of which set of definitions and assumptions were applied.

Implementation of the proposed action would have extremely low nonradiological effects on the environment at interim management sites, including the social and economic status of the general population, minority populations, and the low-income population surrounding interim management sites. Economic benefits that would result from increased cargo handling, transportation, and storage at interim management sites would be extremely small for the general population or any particular segment of the population residing near interim management sites.

4.2.4.6 Mitigation Measures at the Potential Foreign Research Reactor Spent Nuclear Fuel Management Sites

Based on the analyses of the environmental consequences for each potential foreign research reactor spent nuclear fuel management site included in Section F.4 of Appendix F, no mitigation measures would be necessary since all potential environmental impacts are substantially below acceptable levels or promulgated standards. However, each potential site would follow operation practices that would minimize the impacts in such areas as pollution prevention, cultural and ecological resources, ground and surface water quality, air quality, noise, traffic, operational and public health and safety, and accident prevention and mitigation. Descriptions of these practices are included in Appendix F, under Mitigation Measures for each site.

4.2.5 Short-Term Uses and Long-Term Productivity

Short-term impacts would be those associated with construction and operation of the storage facilities. No land would be used for the marine or ground transportation of foreign research reactor spent nuclear fuel. The use of land at the potential foreign research reactor spent nuclear fuel management sites would be in conformity with the land use policy of each site. The construction of new storage facility would lead to the loss of small acreage of terrestrial habitat. After adoption of an overall strategy for interim storage of all DOE-owned spent nuclear fuel (including spent fuel from foreign research reactors), some of the areas currently used for interim storage of spent nuclear fuel may be released for other productive uses

(DOE, 1995c). Ecological resources would be directly affected at the area of construction by land clearing. These resources would be limited to small mammals, reptiles, and songbirds. Given the small area that would be used, the overall effect would be of limited impacts on local populations and resources.

4.2.6 Irreversible and Irretrievable Commitments of Resources

The only irreversible use of resources during the marine and ground transportation of foreign research reactor spent nuclear fuel would be the use of petroleum fuel. Irreversible and irretrievable commitment to resources associated with management site activities are discussed below.

4.2.6.1 Management Site Resources

The irreversible and irretrievable commitment of resources resulting from the construction and operation of foreign research reactor spent nuclear fuel management site facilities would involve materials that could not be recovered or recycled, or resources that would be consumed or reduced to unrecoverable forms, including electrical energy, fuel, construction materials, and miscellaneous chemicals. Some construction materials are recyclable. Some of the resources would be irretrievable because of the nature of the commitment or the cost of reclamation. For example, human resources used for the construction and operation of the potential foreign research reactor spent nuclear fuel storage facilities would be irretrievably lost since these resources would be unavailable for use in other work activity areas. On the whole, foreign research reactor spent nuclear fuel management would not be particularly resource-intensive. The quantities of irreversible and irretrievable resources for each site are included in Appendix F, Section F.4.

4.2.6.2 Energy Resources

Under the basic implementation of Management Alternative 1, about 4.6 metric tons (5.1 tons) of highly-enriched uranium would be accepted into the United States. The energy content of this uranium would be equal to about 1.5 million megawatt-days or over 20 million barrels of No. 2 fuel oil if the conversion efficiency were 100 percent.

4.2.7 Impacts of Ultimate Disposition

Ultimate disposition of DOE's spent nuclear fuel, including foreign research reactor spent nuclear fuel, is a high priority. For planning purposes, DOE has determined that its spent nuclear fuel that is not otherwise managed (e.g., chemically separated, with the high-level waste being converted into a vitrified glass for repository disposal) is authorized for disposal in a geologic repository. Decisions regarding the actual disposition of DOE's spent nuclear fuel will follow appropriate review under the National Environmental Policy Act (NEPA).

It is possible that the foreign research reactor spent nuclear fuel could be accepted intact in a geologic repository. If DOE determines that geologic disposal of intact foreign research reactor spent nuclear fuel is possible, then there would be no onsite impacts beyond those associated with storage and packaging of the foreign research reactor spent nuclear fuel.

It is also possible that some form of processing could be necessary to convert the foreign research reactor spent nuclear fuel into a more stable form prior to its ultimate disposal. This processing could be a near-term new treatment technology, conventional chemical separation, or a new treatment technology that is implemented after an interim period of storage. DOE expects that any new treatment technology would produce no greater impacts than historical chemical separation activities. Therefore, the impacts of

near-term treatment of the foreign research reactor spent nuclear fuel would be expected to be no greater than the impacts of chemically separating the same material as discussed in Section 4.3.6. If a new treatment technology is implemented after an interim period of storage and technology development, DOE expects that it would provide a substantial improvement over conventional chemical separation.

When disposal space is available, DOE would transport the intact or processed foreign research reactor spent nuclear fuel to a repository. This transportation would produce impacts similar to the ground transportation impacts discussed in Section 4.4.2.3. Handling and emplacement in the repository would produce impacts similar to those due to handling the spent nuclear fuel or processed waste at the DOE site because similar equipment and procedures would be used and the same regulatory limits on radiation doses would apply.

Yucca Mountain is the candidate site for a geologic repository for both spent nuclear fuel and high-level waste. Under the Nuclear Waste Policy Act, Congress found that a national problem had been created by the accumulation of spent nuclear fuel from commercial reactors and the accumulation of high-level waste. The Nuclear Waste Policy Act assigned to DOE the responsibility for managing the disposal of this spent nuclear fuel and high-level waste, specified the siting process, and authorized the construction of one geologic repository. Under the Nuclear Waste Policy Act Amendments Act of 1987, the process for selecting this repository was streamlined, and the Yucca Mountain site in Nevada was selected as the candidate site for a geologic repository.

Because the environmental documentation process for geologic disposal was established by the Nuclear Waste Policy Act, this EIS does not analyze environmental impacts of disposal at Yucca Mountain or alternative locations. After emplacement in a geologic repository, however, DOE expects there would be no more impacts to workers, the public, or the environment because the radioactive material would be effectively isolated.

In the event that a geologic repository were to be delayed, DOE assumed for purposes of this analysis that it would continue to manage the foreign research reactor spent nuclear fuel, or the high-level radioactive waste resulting from the chemical separation or other processing of such spent nuclear fuel, at the management sites until a geologic repository becomes available. The risk associated with this continued management is low and would not exceed the annual risk discussed in Section 4.2.4.1.

4.2.8 Summary of the Impacts of the Basic Implementation of Management Alternative 1

The principal impacts under the basic implementation of Management Alternative 1 would be occupational and public health and safety impacts. These are presented in Table 4-35 in terms of the risk of death due to cancer for each segment of the affected environment. It also shows, in the bottom rows, the highest of the individual risks and the total of the population risks. Each individual risk expresses the probability that the one individual with the maximum exposure in each situation would incur an LCF. The population risk expresses the estimated number of additional LCF among the entire exposed population.

Table 4-35 shows that the greatest radiological risks would occur during ground transport or site activities. These results are based on conservative assumptions, including: (1) every package of foreign research reactor spent nuclear fuel produces a dose rate equal to the regulatory limit, (2) truck shipments expose people at highway rest stops for times about equal to the actual driving times, and (3) one individual at the DOE site receives the maximum dose allowed by DOE regulation (5,000 mrem) every year.

Table 4-35 Maximum Estimated Radiological Health Impacts of the Basic Implementation of Management Alternative 1

	Risks (LCF)		
	Maximally Exposed Worker, MEI, or NPAI	Population	
		General Public	Workers
Marine Transport			
Incident-Free	0.00052	0	0.034
Accidents	5×10^{-10}	much less than 0.000029	---
Port Activities			
Incident-Free	0.00052	0	0.012
Accidents	2×10^{-10}	0.000029	---
Ground Transport			
Incident-Free	0.00052	0.22	0.071
Accidents	1.4×10^{-11}	0.00028	---
Site Activities			
Incident-Free	0.026	0.00027	0.21
Accidents	0.000010	0.11	---
Highest Individual Risk			
Incident-Free	0.026	----	---
Accidents	0.000010	----	----
Total Population Risk			
Incident-Free	----	0.22	0.33
Accidents	----	0.11	----

The highest estimated incident-free individual risk is 0.026 LCF, which would apply to an onsite radiation worker. This individual would have a 2.6 percent chance of incurring an LCF. DOE and the Department of State believe the actual risk would be much lower due to administrative procedures such as worker rotation. The highest estimated incident-free individual risk for members of the public is much lower than the maximally exposed worker risk. DOE estimates this risk to be approximately 1.4×10^{-7} LCF.

The highest estimated accident MEI risk is 0.000010 LCF, which applies to a hypothetical member of the public who lives at the site boundary. This individual's chance of incurring an LCF due to this alternative would be one in one hundred thousand. The accident risk to workers is discussed qualitatively in Section 4.2.4.1 under the heading, "Impacts of Accidents to Close-in Workers."

As shown in Table 4-35, the total incident-free population risk would be 0.22 LCF for the potentially exposed public, while the corresponding risk would be 0.33 LCF for workers. Thus, there would be an estimated 22 percent chance of incurring one additional LCF among the exposed general public, and a 33 percent chance of incurring one additional LCF among workers. The chance of incurring two additional LCFs among each population group would be even lower.

Deaths due to traffic accident trauma and LCF due to vehicle emissions are not included in Table 4-35. DOE and the Department of State estimate there could be about a 14 percent chance that a truck driver or member of the public could die in a traffic accident associated with the basic implementation of Management Alternative 1. This death would result from the traffic accident trauma and would be unrelated to the radioactive nature of the cargo.

4.3 Implementation Alternatives of Management Alternative 1

As discussed in Chapter 2, a policy of managing foreign research reactor spent nuclear fuel in the United States could be implemented by various means. These variations on the basic implementation of Management Alternative 1 of the proposed action have been grouped into seven implementation alternatives. This section discusses their policy considerations and environmental impacts. For convenience, the seven implementation alternatives are listed briefly below:

1. Acceptance of amounts of material different from the amount in the basic implementation of Management Alternative 1,
2. Acceptance of foreign research reactor spent nuclear fuel for periods of time different from the period of time in the basic implementation of Management Alternative 1,
3. Implementation through financial arrangements different from those identified in the basic implementation of Management Alternative 1,
4. Taking title to the foreign research reactor spent nuclear fuel at locations different from the location in the basic implementation of Management Alternative 1,
5. Use of wet storage technology for the interim period instead of dry storage technology as in the basic implementation of Management Alternative 1,
6. Near term conventional chemical separation of the foreign research reactor spent nuclear fuel instead of interim storage as in the basic implementation of Management Alternative 1, and
7. Development and use of a new processing technology instead of interim storage as in the basic implementation of Management Alternative 1.

4.3.1 Implementation Alternative 1: Alternative Amounts of Spent Nuclear Fuel to be Accepted

DOE and the Department of State have evaluated the policy considerations and environmental impacts for different amounts of spent nuclear fuel and target materials under this implementation alternative.

4.3.1.1 Implementation Subalternative 1a: Accept Foreign Research Reactor Spent Nuclear Fuel Only From Developing Nations

Policy Considerations

Under this implementation subalternative, up to 1.9 MTHM and about 5,000 elements of foreign research reactor spent nuclear fuel would be accepted into the United States from developing nations (defined by the World Bank as nations with other-than-high-income economies). Up to about 238 kg (525 lb) of HEU would be removed from international commerce. By excluding developed countries, which generally share our nuclear weapons nonproliferation goals, but do not necessarily share our belief in the necessity for removing HEU from use in civil programs, this subalternative would have adverse consequences for U.S. nuclear weapons nonproliferation policy.

Because the United States has been unable to accept shipments of HEU spent nuclear fuel since 1988, several foreign research reactor operators have run out of storage capacity or face safety and regulatory problems associated with the presence of spent nuclear fuel at their sites. If the United States is unable to

accept any near term shipments of spent nuclear fuel from developed countries, some reactor operators will be forced to either shut down their reactors or ship their spent nuclear fuel for reprocessing to the United Kingdom Atomic Energy Authority facility in Dounreay, United Kingdom, which is the only facility currently able and willing to reprocess foreign research reactor spent nuclear fuel. Operators in Belgium and Germany have already sent spent nuclear fuel elements to Dounreay for reprocessing. Since neither Dounreay nor any other facility is currently accepting aluminum-based research reactor spent nuclear fuel containing LEU for reprocessing, the only way a reactor operator can use reprocessing to control his spent nuclear fuel inventory is by using HEU for fuel. This could lead reactor operators to delay or cancel plans to convert to LEU, or, in some cases, to reconvert from LEU to HEU fuels.

The net result of reduced reliance on the United States is that foreign research reactor operators would be compelled to withdraw from the Reduced Enrichment for Research and Test Reactors (RERTR) program and continue operations on the HEU fuel cycle, with its lower costs and enhanced performance. Since the United States is barred from exporting HEU to virtually all foreign research reactors under the Energy Policy Act of 1992, operators would be forced to seek alternative suppliers of HEU, such as Russia and China. This could lead to renewed international commerce in weapons-usable HEU and undermine the U.S. nuclear weapons nonproliferation policy goal of seeking to minimize the civil use of HEU. Further, those countries that participated in the RERTR program considered U.S. acceptance of their spent nuclear fuel as a condition for incurring the substantial costs and technical difficulties of converting to LEU fuels. Failure to accept their spent nuclear fuel would jeopardize the nuclear weapons nonproliferation goals of the RERTR program and the reputation of the United States as a reliable partner in the conduct of international nuclear materials management.

There is another way this subalternative could undercut the RERTR program. The developing countries generally assess their technical capabilities by comparing themselves with the developed states of North America, Western Europe, and Japan. As noted above, one probable result of this subalternative is that more developed states will continue to use HEU-fueled research reactors, due to difficulty in reprocessing LEU spent nuclear fuel. If that happens, developing countries are likely to regard use of HEU-fueled reactors as more advanced and prestigious than LEU-fueled reactors, increasing the demand for such reactors as well as for HEU itself. Again, this would encourage increased stockpiles of HEU in various developed and developing countries, contrary to U.S. nuclear weapons nonproliferation policy.

If some countries are forced to shut down their reactors and thereby forego the medical and scientific benefits of these reactors, such a situation may lead to criticism that the United States is not a dependable nuclear partner. Some countries, including those in the developing world that have characterized the Treaty on the Non-Proliferation of Nuclear Weapons as a discriminatory bargain between the nuclear "haves" and the nonnuclear "have-nots," may be inclined to accuse the United States, fairly or unfairly, of having failed to comply with its Article IV Treaty pledge to facilitate "the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy." Actions that foster such negative perceptions would undoubtedly complicate the conferences which are scheduled to monitor compliance with the Non-Proliferation Treaty, and may complicate United States diplomatic efforts to attain other arms control and nuclear weapons nonproliferation objectives.

Marine Transport Impacts

Impacts of Incident-Free Marine Transport

The impacts of incident-free marine transportation were analyzed in the same manner as the basic implementation of Management Alternative 1. The incident-free transportation of spent nuclear fuel was estimated to result in total LCF that ranged from 0.008 to 0.009 over the entire duration of the program. These fatalities are the sum of the estimated number of radiation-related LCF to the ships' crews.

The range of impacts result from the analysis of shipment of the spent nuclear fuel on regularly scheduled commercial breakbulk vessels and on chartered container vessels and would be the same as for vessels analyzed in the evaluation of the basic implementation of Management Alternative 1. As in the basic implementation of Management Alternative 1, the difference between the two estimates is a result of the shorter vessel journey time for chartered vessels due to the intermediate port stops associated with the regularly scheduled commercial transport of the spent nuclear fuel.

Impacts of Accidents During Marine Transport

The consequences of the at-sea accidents for Implementation Subalternative 1a are no different than the consequences of at-sea accidents associated with the basic implementation of Management Alternative 1. For an accident involving the loss of a transportation cask in coastal waters, the maximum exposure to an individual is estimated to be 114 mrem per year. Due to the reduced number of cask shipments, the likelihood of such an accident would be reduced. Under this subalternative, 23 percent of the total number of cask shipments required under the basic implementation of Management Alternative 1 would be needed. The highest estimated risks due to an accident during marine transport would therefore be 0.00004 mrem per year peak dose to a human from the loss of a damaged cask in the deep ocean. This corresponds to an MEI risk of 1×10^{-10} LCF. This individual would have a chance of less than one in a billion of incurring an LCF due to an accident during marine transport.

Port Activity Impacts

Impacts of Incident-Free Port Activities

In the analysis of the basic implementation of Management Alternative 1, the radiological impact of port activities was estimated on a per-shipment basis. Implementation Subalternative 1a, accepting spent nuclear fuel from developing nations only, results in 23 percent of the total number of cask shipments that are required under the basic implementation of Management Alternative 1. The incident-free impacts of the port activities would be proportionally reduced. The estimated number of LCF associated with this subalternative range from 0.0008 to 0.003. As in the marine incident-free analysis, this range of impacts is the result of the analysis of two modes of spent nuclear fuel shipment, regularly scheduled commercial breakbulk vessels and chartered container vessels.

Impacts of Accidents During Port Activities

Port accident risks were calculated based on the per-shipment risks determined in the analysis of the basic implementation of Management Alternative 1. The analysis examined the impact of using a wide range of ports of entry based on the population around the port city, from high density population ports such as Elizabeth, NJ, to low-density ports such as the MOTSU terminal in North Carolina. The analysis also considered the impact of chartered shipments (no intermediate port stops before the vessel reaches the spent nuclear fuel port of entry) versus regularly scheduled commercial shipments with up to two

intermediate ports of call before the spent nuclear fuel port of entry. The port accident risks over the entire program are estimated to range from 5×10^{-8} to 0.000004 LCF from radiation. The range of fatality estimates is due to both the differences in port city populations and the number of intermediate port stops.

The consequences of the maximum foreseeable port accident are identical to those of the basic implementation of Management Alternative 1. The frequency is lower due to the reduced number of shipments, so the MEI risk is reduced to 5×10^{-11} LCF.

Ground Transport Impacts

Impacts of Incident-Free Ground Transport

Radiological impacts of incident-free ground transportation were analyzed in the same manner for Implementation Subalternative 1a as for the basic implementation of Management Alternative 1. The results are presented in Figures 4-6 through 4-9. Incident-free transportation of spent nuclear fuel was estimated to result in total latent fatalities that ranged from 0.002 to 0.06 over the entire duration of the program. These fatalities are the sum of the estimated number of radiation-related LCF to the public and the crew.

The range of fatality estimates is caused by two factors: the option of using truck or rail to transport spent nuclear fuel and combinations of Phase 1 and Phase 2 potential foreign research reactor spent nuclear fuel management sites that created varying shipment numbers and distances.

The estimated number of radiation-related LCF for transportation workers ranged from 0.001 to 0.015. The estimated number of radiation-related LCF for the general population ranged from 0.0006 to 0.045, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.0002 to 0.01.

Impacts of Accidents During Ground Transport

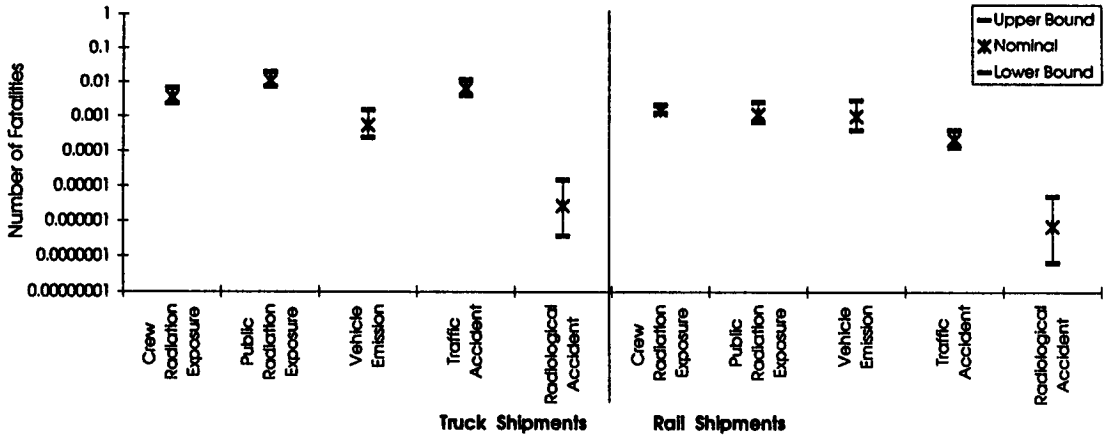
The transportation accident population risks over the entire program are estimated to range from 0.0000001 to 0.00006 LCF from radiation and from 0.0001 to 0.028 traffic fatalities, depending on the transportation mode and the potential foreign research reactor spent nuclear fuel management sites that might be selected. The reason for the range of fatality estimates is the same as those described for incident-free transportation.

The maximum foreseeable offsite transportation accident is identical to that for the basic implementation of Management Alternative 1. The risk is reduced to 2.7×10^{-12} LCF due to the reduced amount of ground transport.

Management Site Impacts

Impacts of Incident-Free Management Site Activities

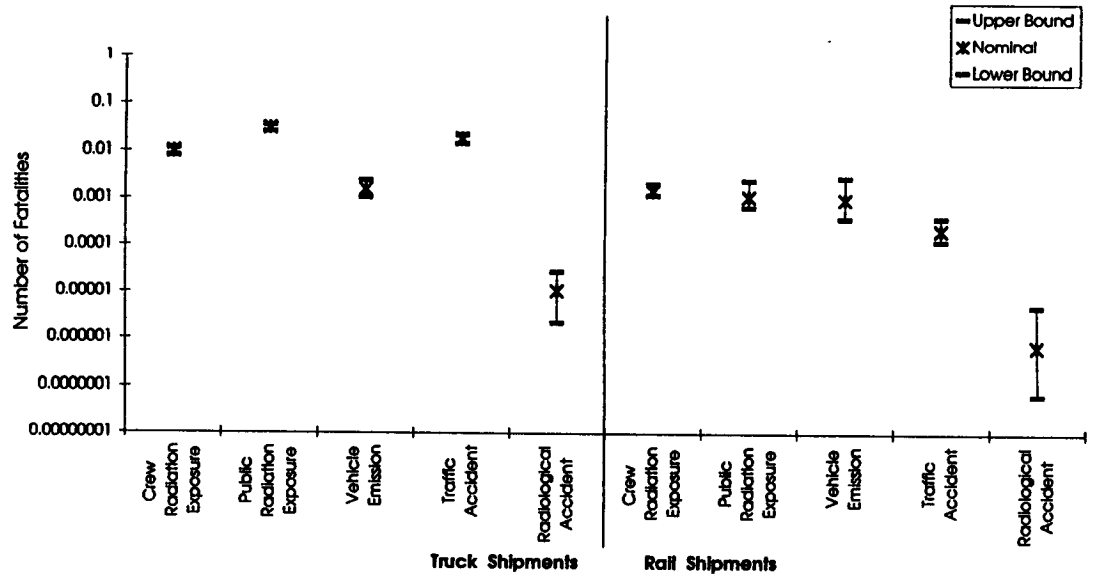
Impacts of incident-free site activities from Implementation Subalternative 1a are covered by the impacts from the basic implementation of Management Alternative 1. The maximally exposed worker radiation dose depends upon the duration of the receipts, not the amount of foreign research reactor spent nuclear fuel involved, and the duration in this subalternative is identical to the basic implementation of Management Alternative 1 (13 years). Thus, the maximally exposed worker dose is conservatively



- Same values apply to Programmatic SNF&INEL EIS 1992/1993 Planning Basis and INEL/SRS Regionalization alternatives

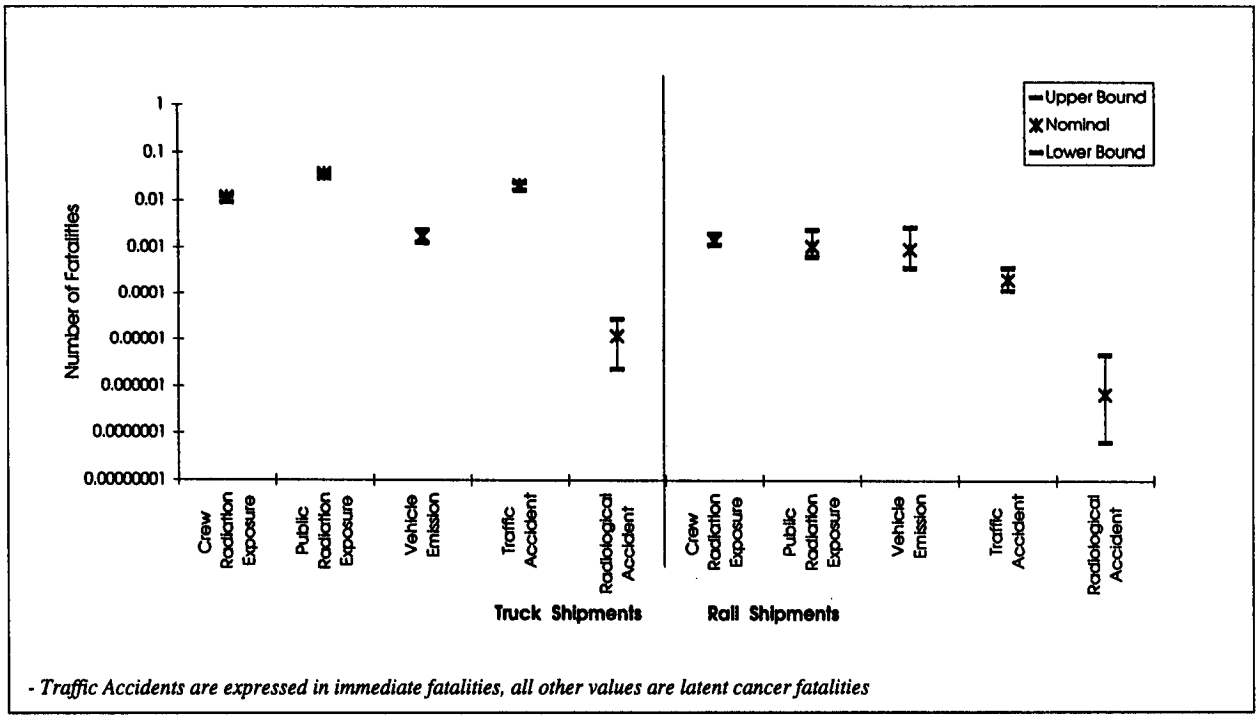
- Traffic Accidents are expressed in immediate fatalities, all other values are latent cancer fatalities

Figure 4-6 Range of Estimated Fatalities (Latent and Immediate) Under Implementation Subalternative 1a and the Programmatic SNF&INEL Final EIS Decentralization Alternative



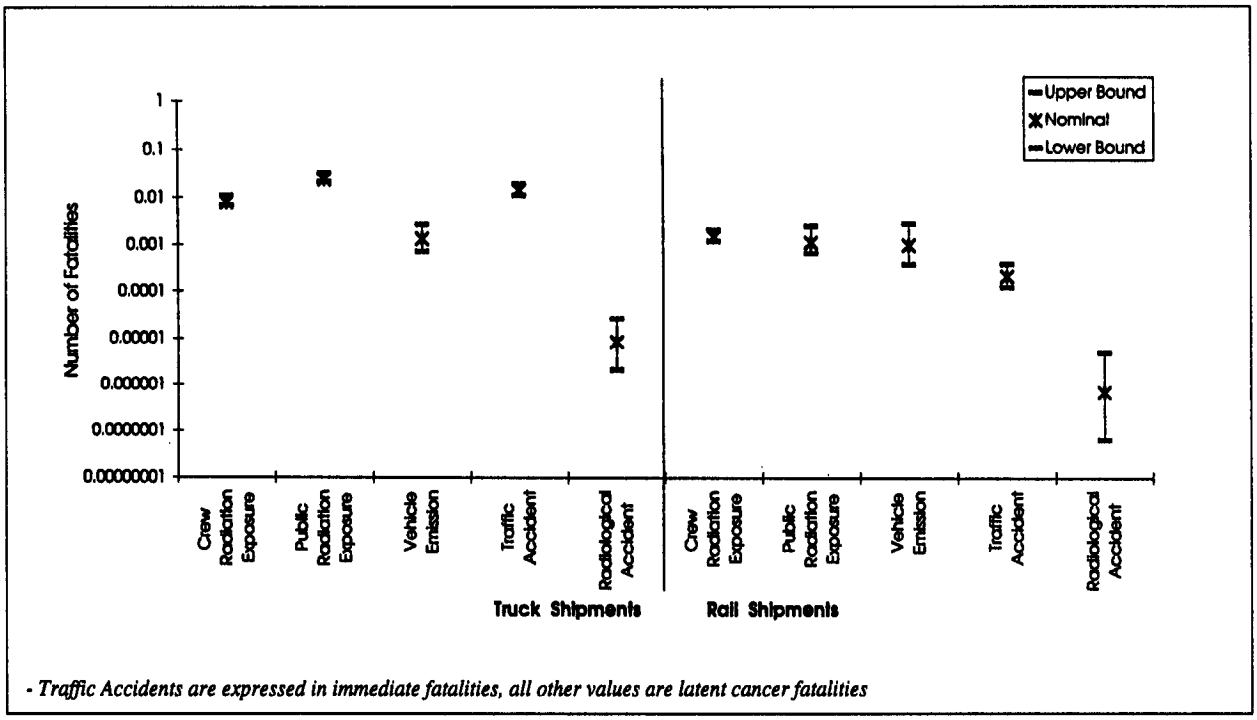
- Traffic Accidents are expressed in immediate fatalities, all other values are latent cancer fatalities

Figure 4-7 Range of Estimated Fatalities (Latent and Immediate) Under Implementation Subalternative 1a and the Programmatic SNF&INEL Final EIS Regionalization by Fuel Type Alternative



- Traffic Accidents are expressed in immediate fatalities, all other values are latent cancer fatalities

Figure 4-8 Range of Estimated Fatalities (Latent and Immediate) Under Implementation Subalternative 1a and the Programmatic SNF&INEL Final EIS Centralization to the Savannah River Site Alternative



- Traffic Accidents are expressed in immediate fatalities, all other values are latent cancer fatalities

Figure 4-9 Range of Estimated Fatalities (Latent and Immediate) Under Implementation Subalternative 1a and the Programmatic SNF&INEL Final EIS Centralization to the Idaho National Engineering Laboratory Alternative

assumed to be the same as in the basic implementation of Management Alternative 1. This would produce the maximally exposed worker risk identical to that in the basic implementation of Management Alternative 1 of 0.026 LCF.

The amount of foreign research reactor spent nuclear fuel that would be received and managed is 5,000 elements or approximately 22 percent of the number of elements in the basic implementation of Management Alternative 1. Thus, it is expected that the worker population risks at each management site would be approximately 22 percent of those calculated for the basic implementation of Management Alternative 1. The highest estimate of this risk under the basic implementation of Management Alternative 1 is 0.21 LCF, so the corresponding risk for this subalternative is 0.05, LCF, which is much less than one LCF.

Similarly, some of the incident-free public risk depends on the amount of foreign research reactor spent nuclear fuel involved and some depends on the duration of each activity. The risk that accrues during receipt and handling can be scaled down by the factor of 22 percent, while the risk that accrues during storage is dependent only on the duration of the storage. The highest estimated incident-free MEI risk in the basic implementation of Management Alternative 1 (1.4×10^{-7} LCF) is due to receipt and handling, so it is reduced by a factor of 22 percent to yield the corresponding risk of 3.1×10^{-8} LCF for this subalternative.

The highest estimated incident-free public population risk in Phase 1 of the basic implementation of Management Alternative 1 (0.00014 LCF) is due to storage, so it is not reduced in this subalternative. The corresponding Phase 2 risk (0.00013 LCF) is due to receipt and handling, so this component of the risk is reduced to 0.000029 LCF for this subalternative. The sum of the Phase 1 and Phase 2 risks is 0.00017 LCF.

Impacts of Accidents Onsite

The highest estimated MEI risk due to accidents in the basic implementation of Management Alternative 1 (0.0000034 LCF) is due to an accidental criticality in RBOF. This MEI risk is greater than any of the potential Phase 2 MEI risks, when those due to receipt/handling are reduced by the factor of 22 percent. Thus, the highest MEI risk due to accidents is 0.0000034 LCF.

The highest estimated population risk due to Phase 1 accidents in the basic implementation of Management Alternative 1 (0.096 LCF) is due to an accidental criticality in RBOF. The same facility could be used for the same period of time in this subalternative, so this component of the risk is unchanged. The corresponding Phase 2 risk (0.013 LCF) is due to receipt and handling, so it is reduced by the factor of 22 percent to 0.0029 LCF for this subalternative. The sum of the Phase 1 and Phase 2 risks is 0.099 LCF.

Summary of the Impacts of Implementation Subalternative 1a

The principal impacts under this subalternative would be occupational and public health and safety impacts. These are presented in Table 4-36 in terms of the risk of death due to cancer during each of the four segments of the affected environment. It also shows, in the bottom rows, the highest of the individual risks and the total of the population risks. Each individual risk expresses the probability that one individual with the maximum exposure in each situation would incur an LCF. The population risk expresses the estimated number of additional LCF among the entire exposed population.

Table 4-36 Maximum Estimated Radiological Health Impacts of Implementation Subalternative 1a (Developing Nations Only)

	Risks (LCF)		
	Maximally Exposed Worker, MEI, or NPAI	*Population*	
		General Public	*Workers*
Marine Transport			
Incident-Free	0.00052	0	0.009
Accidents	1×10^{-10}	much less than 0.000004	---
Port Activities			
Incident-Free	0.00052	0	0.003
Accidents	5×10^{-11}	0.000004	---
Ground Transport			
Incident-Free	0.00052	0.045	0.015
Accidents	2.7×10^{-12}	0.00006	---
Site Activities			
Incident-Free	0.026	0.00017	0.05
Accidents	0.0000034	0.099	---
Highest Individual Risk			
Incident-Free	0.026	----	----
Accidents	0.0000034	----	---
Total Population Risk			
Incident-Free	----	0.045	0.077
Accidents	----	0.099	----

Table 4-36 shows that the greatest radiological risks would occur during ground transport or management site activities. These results are based on conservative assumptions, including: (1) every package of foreign research reactor spent nuclear fuel produces a dose rate equal to the regulatory limit, (2) truck shipments exposes people at highway rest stops for times about equal to the actual driving times, and (3) one individual at the DOE management site receives the maximum dose allowed by DOE regulation (5,000 mrem) every year.

The highest estimated incident-free individual risk is 0.026 LCF, which would apply to an onsite radiation worker. This individual would have a 2.6 percent chance of incurring an LCF. DOE and the Department of State believe the actual risk would be much lower due to administrative procedures such as worker rotation. The highest estimated indicent-free individual risk for members of the public is much lower than the maximally exposed worker risk. DOE estimates this risk to be approximately 3.1×10^{-8} LCF.

The highest estimated accident MEI risk is 0.0000026 LCF, which applies to a hypothetical member of the public who lives at the site boundary. This individual's chance of incurring an LCF due to this alternative would be less than one in one hundred thousand. The accident risk to workers is discussed qualitatively in Section 4.2.4.1 under the heading, "Impacts of Accidents to Close-in Workers."

As shown in Table 4-36, the total incident-free population risk would be 0.045 LCF for the potentially exposed public, and the corresponding risk would be 0.077 LCF for workers. Thus, there would be less than a five percent chance of incurring one additional LCF among the general public, and a 7.7 percent chance of incurring one additional LCF among workers. The chance of incurring two additional LCFs among each population group would be even lower.

Deaths due to traffic accident trauma and LCF due to vehicle emissions are not included in Table 4-36. There is about a three percent chance that a truck driver or member of the public could die in a traffic accident associated with this subalternative. This death would result from the traffic accident trauma and would be unrelated to the radioactive nature of the cargo.

4.3.1.2 Implementation Subalternative 1b: Accept Only Foreign Research Reactor Spent Nuclear Fuel that Contains HEU

Policy Considerations

Under this implementation subalternative, up to about 4.6 MTHM and 11,200 elements of foreign research reactor spent nuclear fuel would be accepted into the United States. All of this foreign research reactor spent nuclear fuel would contain HEU that was enriched in the United States.

Although this implementation subalternative would remove up to about 4.6 metric tons (5.1 tons) of HEU from international commerce, it almost certainly would result in the end of the RERTR program. As discussed in Chapter 1, the foreign research reactor operators have stated that they would not participate in the RERTR program unless the United States accepts their spent nuclear fuel, including LEU spent nuclear fuel. Otherwise, many research reactor operators would be likely to insist on using HEU fuel in their reactors in the future, which would increase international commerce in HEU. The most likely suppliers of this HEU would be Russia and China. DOE and the Department of State believe that in the long run, this subalternative would be contrary to the broader U.S. policy of nuclear weapons nonproliferation. Therefore, this subalternative is not analyzed in detail for environmental impacts in this EIS.

Summary of the Impacts of Implementation Subalternative 1b

Since the number of elements in this subalternative is about half the number of elements in the basic implementation of Management Alternative 1, the impacts would be roughly half of those calculated for the basic implementation of Management Alternative 1 (see Section 4.2.8).

4.3.1.3. Implementation Subalternative 1c: Accept Target Material in Addition to Foreign Research Reactor Spent Nuclear Fuel

Policy Considerations

This implementation subalternative would entail the shipment to the United States of not only HEU and LEU spent nuclear fuel, but of residual material from the production of molybdenum-99 for medical purposes. Molybdenum-99 is produced by the irradiation of targets in a research reactor. The targets are physically similar to the fuel for foreign research reactors. After being irradiated in a reactor, the targets are dissolved in acid to recover the molybdenum, leaving residual material containing enriched uranium. The United States has supplied HEU to Canada, Belgium, Argentina, and Indonesia for use as targets in the production of medical isotopes. The NRU reactor in Canada produces nearly all radioisotopes used in nuclear medicine in the United States.

This subalternative involves the acceptance of the following amounts of target material from these countries:

Canada	0.525 MTHM
Belgium	0.029 MTHM
Argentina	0.0011 MTHM
Indonesia	0.0014 MTHM
Total	0.5565 MTHM

This total has been rounded up to 0.6 MTHM for the purpose of analysis in this EIS. Under this subalternative, about 216 kg (476 lb) of HEU from target material would be removed from international commerce. This would be in addition to the estimated 4.6 metric tons (5.1 tons) of HEU that would be removed from international commerce under the basic implementation of Management Alternative 1.

Because the residual material contains weapons-usable HEU, there is a strong nuclear weapons nonproliferation rationale for including it in the scope of the management policy. This course of action would be desirable from a nuclear weapons nonproliferation standpoint, since it would leave the United States in control of the disposition of foreign research reactor spent nuclear fuel containing HEU, as well as residuals from the production of molybdenum-99, thereby minimizing the risk that such material might be diverted to a nuclear weapons program. This subalternative removes the most HEU from international civil commerce and provides the most support to U.S. nuclear weapons nonproliferation policy.

Furthermore, this subalternative would give the molybdenum-99 producers an incentive to switch from HEU targets to LEU targets. Appropriate LEU targets are currently under development as part of the RERTR program, and this target material would be accepted under this subalternative subject to the same conditions as the LEU foreign research reactor spent nuclear fuel in the basic implementation of Management Alternative 1.

The target material may be transported in one of two solid powder forms—as a calcine or an oxide. The calcine form would require about 140 cask shipments, while the oxide form would require about 57 cask shipments. The incident-free and accident risks are different for each form. The calcine material would produce an estimated 2.5 times more incident-free risk, but an estimated 10 times less accident risk than the oxide material. Furthermore, for transporting target material (unlike spent nuclear fuel), the accident risks would be greater than the incident-free risks. Therefore, to estimate conservative radiological risks, DOE and the Department of State assumed the target material would be transported as an oxide powder.

Marine Transport and Port Activities Impacts

The acceptance of target material would cause a very minor change in the marine and port incident-free impacts calculated for the basic implementation of Management Alternative 1. Up to only 7 cask shipments of oxide target material (6 from Belgium and 1[1] from Argentina or Indonesia), excluding the shipments from Canada, are estimated to be needed. This is less than one percent of the marine cask shipments of all foreign research reactor spent nuclear fuel in the basic implementation of Management Alternative 1. The incident-free impact per shipment is also reduced because the dose rate resulting from a cask loaded with the target material is expected to be much lower than that resulting from a cask loaded with foreign research reactor spent nuclear fuel.

For accident conditions, DOE and the Department of State estimated the risk due to an accident in an east coast port. The risk during marine transport would be much lower than the risk during port activities. The population risk due to accidents during port activities with seven casks of oxide target material is estimated to be 3.2×10^{-9} LCF. This is much lower than the population risk due to accidents with the foreign research reactor spent nuclear fuel.

The MEI risk is estimated to be 2.9×10^{-10} LCF, which is somewhat higher than the corresponding risk for the foreign research reactor spent nuclear fuel, but still very low.

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1 *Argentina or Indonesia would not produce enough target material to fill a transportation cask. In all likelihood, the target material from these countries would be shipped along with research reactor spent nuclear fuel elements.*

Ground Transport Impacts

Impacts of Incident-Free Ground Transport

The impacts of incident-free ground transportation of target material were analyzed in the same manner as for the basic implementation of Management Alternative 1, except that, based on the low activity of the target material, the maximum dose rate at a distance of 2 m (6.6 ft) from the vehicle is estimated to be 0.1 mrem per hour. The risks calculated in this section could be added to those associated with foreign research reactor spent nuclear fuel transport. The incident-free transportation of target material was estimated to result in total latent fatalities that ranged from 0.0002 to 0.003 over the entire duration of the program. These fatalities are the sum of the estimated number of radiation-related LCF to the public and the crew. When the risks of transporting target material are added to the risks of transporting the foreign research reactor spent nuclear fuel, the highest estimate of the population risk is 0.30 LCF.

The range of fatality estimates was due to two factors: the option of using truck or rail to transport target material and combinations of Phase 1 and Phase 2 sites that created varying shipment numbers and distances.

The estimated number of radiation-related LCF for transportation workers ranged from 0.00007 to 0.00074. The estimated number of radiation-related LCF for the general population ranged from 0.00015 to 0.0023, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.0001 to 0.004.

The impacts of transportation related to target material are summarized in Figures 4-10 through 4-13 and are described in more detail in Appendix E.

Impacts of Accidents During Ground Transport

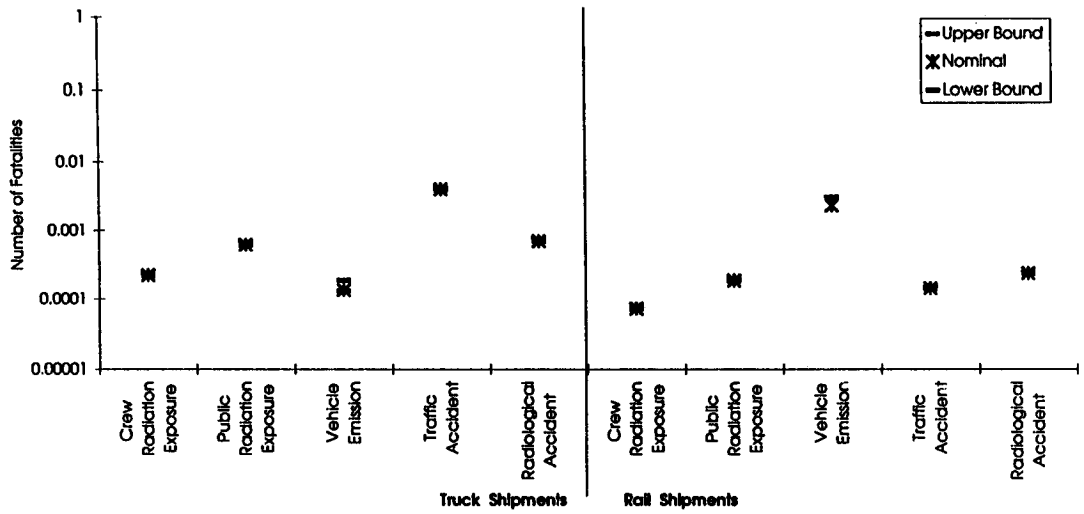
Cumulative transportation accident risks for the target material program are estimated to range from 0.0002 to 0.0054 LCF from radiation and from 0.0001 to 0.013 for traffic fatality, depending on the transportation mode and the potential foreign research reactor spent nuclear fuel management sites that might be selected. The reason for the range of fatality estimates is the same as those described for incident-free transportation. The highest estimate of the population risk due to accidents involving target material (0.0054 LCF) is higher than the same risk involving foreign research reactor spent nuclear fuel (0.00028 LCF). This difference is due to the physical/chemical forms of the two substances. Adding these two risks together yields the population risk due to accidents under Implementation Subalternative 1c, 0.0057 LCF.

The maximum foreseeable offsite transportation accident involves a cask shipment of powderized target material in a suburban population zone, and the risk is estimated to be 9.3×10^{-11} LCF to the MEI.

The impacts of transportation accidents are summarized in Figures 4-10 through 4-13, as described in the previous section, and are described in more detail in Appendix E. These tables can be used to assess the bounded absolute and relative risk of this subalternative under each representative Programmatic SNF&INEL Final EIS alternative.

Management Site Impacts

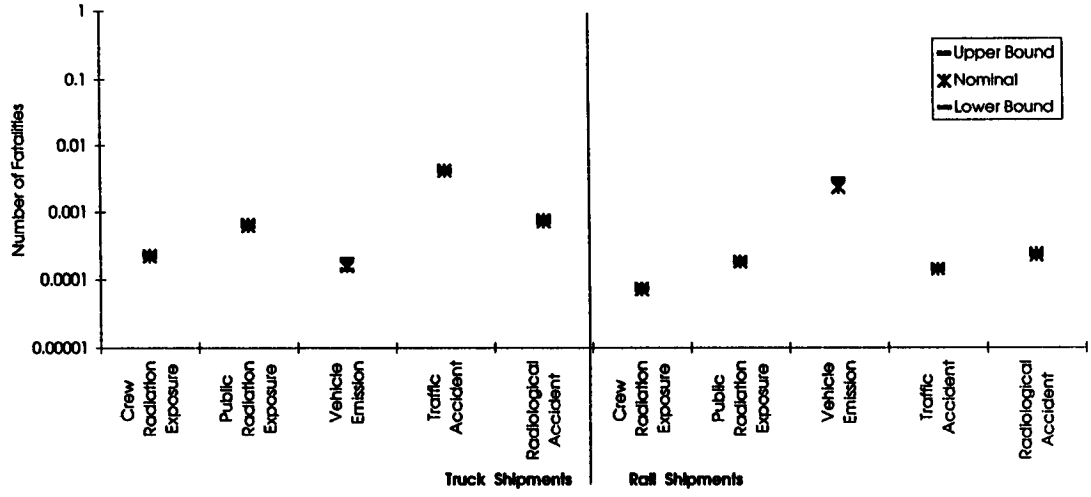
There are two methods of preparing target material for transport. The first is calcining and canning the material with the aluminum included, and the second is to remove the aluminum from the solution, then oxidize and can the residue. Canned material from the first process has similar behavior as that of



- Same values apply to Programmatic SNF&INEL EIS 1992/1993 Planning Basis and INEL/SRS Regionalization alternatives

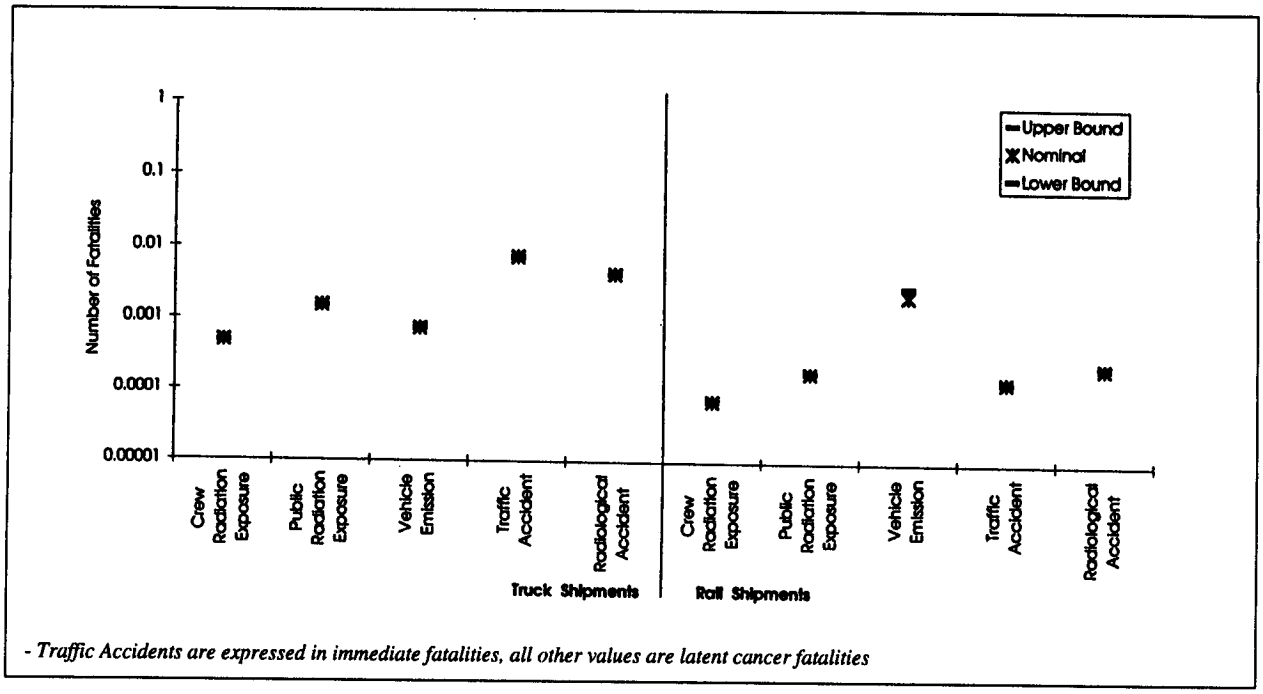
- Traffic Accidents are expressed in immediate fatalities, all other values are latent cancer fatalities

Figure 4-10 Range of Estimated Fatalities (Latent and Immediate) Under Implementation Subalternative 1c and the Programmatic SNF&INEL Final EIS Decentralization Alternative



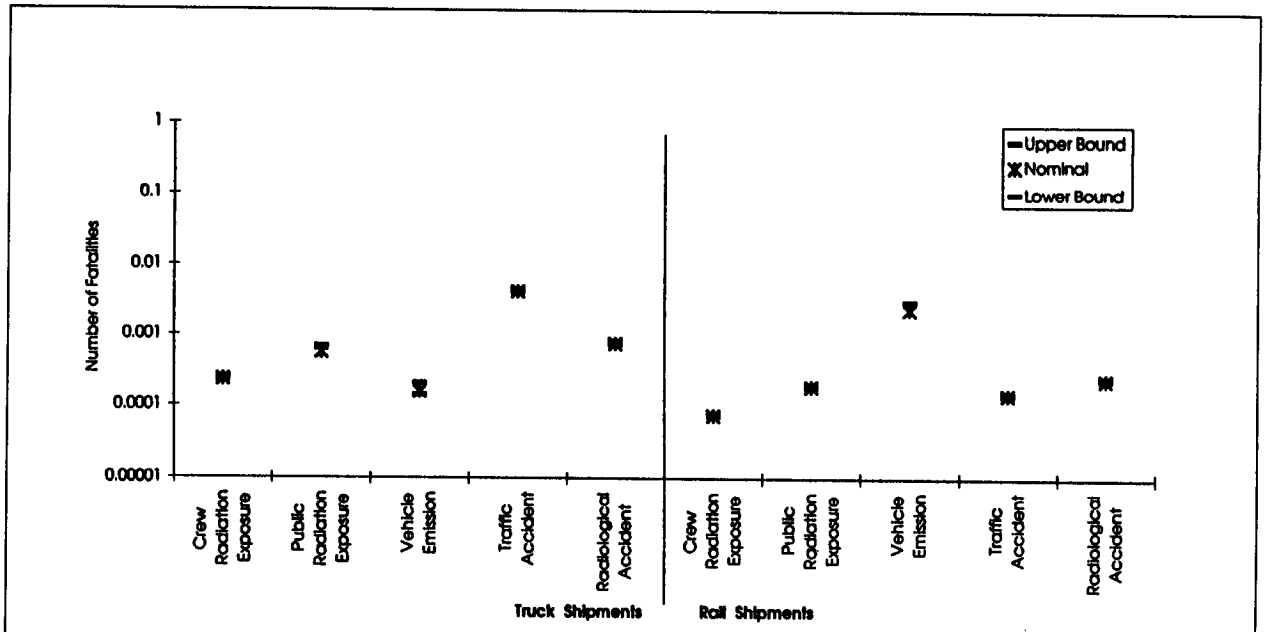
- Traffic Accidents are expressed in immediate fatalities, all other values are latent cancer fatalities

Figure 4-11 Range of Estimated Fatalities (Latent and Immediate) Under Implementation Subalternative 1c and the Programmatic SNF&INEL Final EIS Regionalization by Fuel Type Alternative



- Traffic Accidents are expressed in immediate fatalities, all other values are latent cancer fatalities

Figure 4-12 Range of Estimated Fatalities (Latent and Immediate) Under Implementation Subalternative 1c and the Programmatic SNF&INEL Final EIS Centralization to the Savannah River Site Alternative



- Traffic Accidents are expressed in immediate fatalities, all other values are latent cancer fatalities

Figure 4-13 Range of Estimated Fatalities (Latent and Immediate) Under Implementation Subalternative 1c and the Programmatic SNF&INEL Final EIS Centralization to the Idaho National Engineering Laboratory Alternative

aluminum-based foreign research reactor spent nuclear fuel containing about 40 g of uranium per can. The second process allows a higher amount of uranium, about 200 g, to be packed in the same size can. Use of the first process would result in 6,750 cans representing approximately 140 cask shipments. The second process would result in 1,350 cans representing approximately 57 cask shipments.

Target material cans would be stored like foreign research reactor spent nuclear fuel elements. The storage space required is a function of volume rather than the nuclear or thermal characteristics of the target material. On average, four cans of target material could be stored in the same space as one foreign research reactor spent nuclear fuel element. Therefore, the maximum storage required for target material (in the 40-gram cans) would be equivalent to 1,700 foreign research reactor spent nuclear fuel elements or approximately 7.4 percent of the space required for the foreign research reactor spent nuclear fuel elements under the basic implementation of Management Alternative 1. The storage facilities analyzed for the basic implementation of Management Alternative 1 include this margin in the sizing.

Impacts of Incident-Free Management Site Activities

Radioactive emissions would not be expected from the target material receipt or storage because this material contains no gaseous fission products. Therefore, the incident-free radiological impacts to the public would be the same as in the basic implementation of Management Alternative 1.

The collective dose to the crews that would handle the cask shipments would be 70 person-rem, assuming that the cans from 140 cask shipments would be placed in dry storage casks. The associated worker population risk would be 0.03 LCF. Adding this risk to the worker population risk of the basic implementation of Management Alternative 1 yields 0.24 LCF for the total incident-free worker population risk for Implementation Subalternative 1c.

Impacts of Accidents Onsite

The process by which target material is prepared for shipment (i.e., drying and canning of the solutions, see Appendix B, Section B.1.5) releases all gaseous fission products. In addition, the cans do not require any trimming when they arrive at a storage facility. A review of the hypothetical accident scenarios in the basic implementation of Management Alternative 1 indicates that only the aircraft crash with fire accident scenario would be applicable to target material. The cans are never cut, and there are no gaseous fission products, so the foreign research reactor spent nuclear fuel elements breach scenario would not be applicable. In addition, should an aircraft crash into the wet storage pool where the target material is stored, or if an accidental criticality in the pool were to occur, the radioactivity releases would be bounded by those of the spent nuclear fuel analyzed for these accidents. This is because the radioactive inventory per can is very small compared to that in the bounding foreign research reactor spent nuclear fuel.

A scenario involving an aircraft crash into a dry storage facility with an ensuing fire was analyzed for the target material. The scenario assumptions are similar to those described in Appendix F, Section F.6. Because of the size of each can, it was assumed that the transfer cask involved in the accident would contain 40 cans of target material containing maximum radionuclide inventories, i.e., that of 40 cans of 200 g of uranium per can cooled for at least 3 years.

The frequency of this event is estimated to be 3 percent of the 1×10^{-6} per year used in the accident analysis of the basic implementation of Management Alternative 1. This is because the number of transfer casks involving target material is less than 3 percent of that used for the approximately 22,700 elements in the basic implementation of Management Alternative 1. Therefore, the frequency of this scenario is less

than 10^{-7} per year, and is considered to be non-foreseeable. Nonetheless, this accident was analyzed and its frequency is set conservatively at 10^{-7} per year. The analytical procedure was the same as that used in the basic implementation of Management Alternative 1.

The highest estimate of the MEI/NPAI accident risk with target material is 2.0×10^{-10} LCF, which would occur at the Oak Ridge Reservation (Table F-118, Appendix F). This risk is lower than the highest MEI/NPAI risk in the basic implementation of Management Alternative 1 (0.000010 LCF), so the risk for this subalternative is the same as in the basic implementation of Management Alternative 1. This hypothetical individual would still have one chance in one hundred thousand of incurring an LCF due to an accident on a site.

The highest estimate of the population risk with target material is 1.9×10^{-7} LCF, which also would occur at the Oak Ridge Reservation (Table F-118, Appendix F). To obtain the total population risk for this subalternative, this risk must be added to the corresponding risk from the basic implementation of Management Alternative 1 (0.11 LCF). The population risk due to accidents with target material is so small compared to the risk due to the foreign research reactor spent nuclear fuel that it makes essentially no contribution to the population risk for this subalternative. The population risk due to accidents under this subalternative would be the same as that under the basic implementation of Management Alternative 1.

Summary of the Impacts of Implementation Subalternative 1c

The principal impacts under this subalternative would be occupational and public health and safety impacts. These are presented in Table 4-37 in terms of the risk of death due to cancer during each of the four segments of this subalternative. It also shows, in the bottom rows, the highest of the individual risks and the total of the population risks. The impacts of the basic implementation of Management Alternative 1 (Table 4-35) are added to the impacts of managing the target material to obtain the impacts of this subalternative. Each individual risk expresses the probability that the one individual with the maximum exposure in each situation would incur an LCF. The population risk expresses the estimated number of additional LCF among the entire exposed population.

Table 4-37 shows that the greatest radiological risks would occur during ground transport or management site activities. These results are based on conservative assumptions, including: (1) every package of foreign research reactor spent nuclear fuel producing a dose rate equal to the regulatory limit; (2) every truck shipment exposing people at highway rest stops for times about equal to the actual driving times; and (3) one individual at the DOE site receiving the maximum dose allowed by DOE regulation (5,000 mrem) every year.

The highest estimated incident-free individual risk is 0.026 LCF, which would apply to an onsite radiation worker. This individual would have a 2.6 percent chance of incurring an LCF. DOE and the Department of State believe the actual risk would be much lower due to administrative procedures such as worker rotation. The highest estimated incident-free individual risk for members of the public is much lower than the maximally exposed worker risk. DOE estimates this risk to be approximately 1.4×10^{-7} LCF.

The highest estimated accident MEI risk is 0.000010 LCF, which applies to a hypothetical member of the public who lives at the site boundary. This individual's chance of incurring an LCF due to this alternative would be less than one in ten thousand. The accident risk to workers is discussed qualitatively in Section 4.2.4.1 under the heading, "Impacts of Accidents to Close-in Workers."

Table 4-37 Maximum Estimated Radiological Health Impacts of Implementation Subalternative 1c (Target Material)

	Risks (LCF)		
	Maximum Exposed Worker, MEI, or NPAI	Population	
		General Public	Workers
Marine Transport			
Incident-Free	0.00052	0	0.034
Accidents	5×10^{-10}	much less than 0.000029	---
Port Activities			
Incident-Free	0.00052	0	0.012
Accidents	2.9×10^{-10}	0.000029	---
Ground Transport			
Incident-Free	0.00052	0.22	0.072
Accidents	9.3×10^{-11}	0.0057	---
Site Activities			
Incident-Free	0.026	0.00027	0.24
Accidents	0.000010	0.11	---
Highest Individual Risk			
Incident-Free	0.026	----	---
Accidents	0.000010	----	----
Total Population Risk			
Incident-Free	----	0.22	0.36
Accidents	----	0.12	----

As shown in Table 4-37, the total incident-free population risk would be 0.22 LCF for the potentially exposed public, while the corresponding risk would be 0.36 LCF for workers. Thus, there would be an estimated 22 percent chance of incurring one additional LCF among the exposed general public, and a 36 percent chance of incurring one additional LCF among workers. The chance of incurring two additional LCFs among each population group would be even lower.

Deaths due to traffic accident trauma and LCF due to vehicle emissions are not included in Table 4-37. There is about a 15 percent chance that a truck driver or member of the public could die in a traffic accident associated with this subalternative. This death would be unrelated to the radioactive nature of the cargo.

4.3.2 Implementation Alternative 2: Alternative Policy Durations

DOE and the Department of State evaluated the impacts for two different policy durations under this implementation alternative: reducing the policy duration to 5 years and continuing the policy for HEU indefinitely.

4.3.2.1 Implementation Subalternative 2a: Five-Year Policy

Policy Considerations

Under this implementation subalternative, DOE would accept up to about 13 MTHM and about 18,800 elements of foreign research reactor spent nuclear fuel. This subalternative would reduce the number of foreign research reactor spent nuclear fuel elements that would be accepted by the United States to about 83 percent of the amount covered by the basic implementation of Management Alternative 1, and

would accelerate the time at which the foreign research reactor operators and the governments of their host countries would become responsible for disposal of their own spent nuclear fuel. Up to about 4.1 metric tons (4.5 tons) of HEU would be removed from international commerce, which is about 0.5 metric tons (0.6 tons) less than under the basic implementation of Management Alternative 1.

This subalternative probably would not provide enough time for the foreign countries, especially the developing countries, to make arrangements for alternate means of managing their spent nuclear fuel. This could pressure various foreign research reactor operators to switch their reactors back to HEU fuel. In addition, it would probably, in effect, force many of the foreign research reactors with lifetime cores to shut down prematurely because it would be very difficult for them to find any means to dispose of their foreign research reactor spent nuclear fuel, other than to have DOE accept it.

Marine Transport Impacts

Impacts of Incident-Free Marine Transport

The impacts of incident-free marine transportation in the 5-year acceptance case were analyzed in the same manner as for the basic implementation of Management Alternative 1. The analysis was performed using the dose rates based on the exclusive-use regulatory limit for the shipment of spent nuclear fuel casks. The incident-free transportation of spent nuclear fuel was estimated to result in total latent fatalities that ranged from 0.025 to 0.028 over the entire duration of the program. These fatalities are the sum of the estimated number of radiation-related LCF to the ships' crews.

The range of impacts results from the analysis of shipment of the spent nuclear fuel on regularly scheduled commercial breakbulk vessels and on chartered container vessels, and would be the same as for vessels analyzed in the basic implementation of Management Alternative 1. As in the basic implementation of Management Alternative 1, the difference between the two estimates is a result of the shorter vessel journey time for chartered vessels due to the intermediate port stops associated with the regularly scheduled commercial transport of the spent nuclear fuel.

The maximally exposed worker risk would be lower than that in the basic implementation of Management Alternative 1 due to the reduced acceptance period. The highest estimated maximally exposed worker risk would be 0.00032 LCF.

Impacts of Accidents During Marine Transport

The consequences of the at-sea accidents for Implementation Subalternative 2a are no different than the consequences of at-sea accidents associated with the basic implementation of Management Alternative 1. For an accident involving the loss of a transportation cask in coastal waters the maximum exposure to an individual is estimated to be 14,000 mrem per year. DOE and the Department of State would mitigate this impact, however, by recovering the cask. Due to the reduced number of cask shipments, the likelihood of such an accident would be reduced. Under this subalternative, approximately 81 percent of the total number of cask shipments required under the basic implementation of Management Alternative 1 would be needed. The highest risk to a human, expressed in terms of peak dose rate, would be 0.00015 mrem per year from the loss of a damaged cask in the deep ocean. Assuming an individual receives this dose for 5 years, the total MEI risk would be about 4×10^{-10} LCF.

Port Activity Impacts

Impacts of Incident-Free Port Activities

In the analysis of the basic implementation of Management Alternative 1, the radiological impact of port activities was estimated on a per-shipment basis. Implementation Subalternative 2a results in approximately 81 percent of the total number of cask shipments that are required in the basic implementation of Management Alternative 1. The incident-free impacts of the port activities would be proportionally reduced. The estimated number of LCF associated with this subalternative ranges from 0.0027 to 0.0098. As in the marine incident-free analysis, this range of impacts is the result of the analysis of two modes of spent nuclear fuel shipment, regularly scheduled commercial breakbulk vessels and chartered container vessels.

The maximally exposed worker risk would be lower than that in the basic implementation of Management Alternative 1 due to the reduced acceptance period. The estimated maximally exposed worker risk would be 0.00032 LCF.

Impacts of Accidents During Port Activities

Port accident risks were calculated based on the per-shipment risks determined in the analysis of the basic implementation of Management Alternative 1. The analysis examined the impact of using a wide range of ports based on the population around the port city, from high density population ports such as Elizabeth, NJ, to low-density ports such as the MOTSU terminal in North Carolina. The analysis also considered the impact of chartered shipments (no intermediate port stops before the vessel reaches the spent nuclear fuel port of entry) versus regularly scheduled commercial shipments with up to two intermediate ports of call before the spent nuclear fuel port of entry. The port accident risks over the entire program are estimated to range from 3×10^{-7} to 0.00002 LCF from radiation. The range of fatality estimates is due to both the differences in port city populations and the number of intermediate port stops.

The MEI risk would be lower than that of the basic implementation of Management Alternative 1 due to the reduced number of cask shipments. The highest estimated MEI risk is 1.6×10^{-10} LCF.

Ground Transport Impacts

Impacts of Incident-Free Ground Transport

The impacts of incident-free ground transportation were analyzed in the same manner as for the basic implementation of Management Alternative 1. The incident-free transportation of spent nuclear fuel was estimated to result in total latent fatalities that ranged from 0.010 to 0.27 over the entire duration of the program. These fatalities are the sum of the estimated number of radiation-related LCF to the public and the crew.

The range of fatality estimates was due to two factors: the option of using truck or rail to transport spent nuclear fuel and combinations of Phase 1 and Phase 2 management sites that created varying shipment numbers and distances.

The estimated number of radiation-related LCF for transportation workers ranged from 0.005 to 0.064. The estimated number of radiation-related LCF for the general population ranged from 0.005 to 0.20, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.001 to 0.041.

The maximally exposed worker risk would be lower than that in the basic implementation of Management Alternative 1 due to the reduced acceptance period. The highest estimated MEI risk would be 0.00032 LCF.

The impacts of transportation are summarized in Figures 4-14 through 4-17 and are described in more detail in Appendix E.

Impacts of Accidents During Ground Transport

The cumulative transportation accident risks over the entire program are estimated to range from 0.000003 to 0.00026 LCF from radiation and from 0.001 to 0.13 for traffic fatality, depending on the transportation mode and the potential foreign research reactor spent nuclear fuel management sites that might be selected. The reason for the range of fatality estimates is the same as described for incident-free transportation.

The consequences of the maximum foreseeable offsite transportation accident are identical to those of the basic implementation of Management Alternative 1. The frequency is lower due to the reduced amount of ground transport, so the MEI risk is reduced to 1.1×10^{-11} LCF.

The impacts of transportation accidents are summarized in Figures 4-14 through 4-17, as described in the previous section, and are described in more detail in Appendix E. These tables can be used to assess the bounded absolute and relative risks of this subalternative under each representative Programmatic SNF&INEL Final EIS alternative.

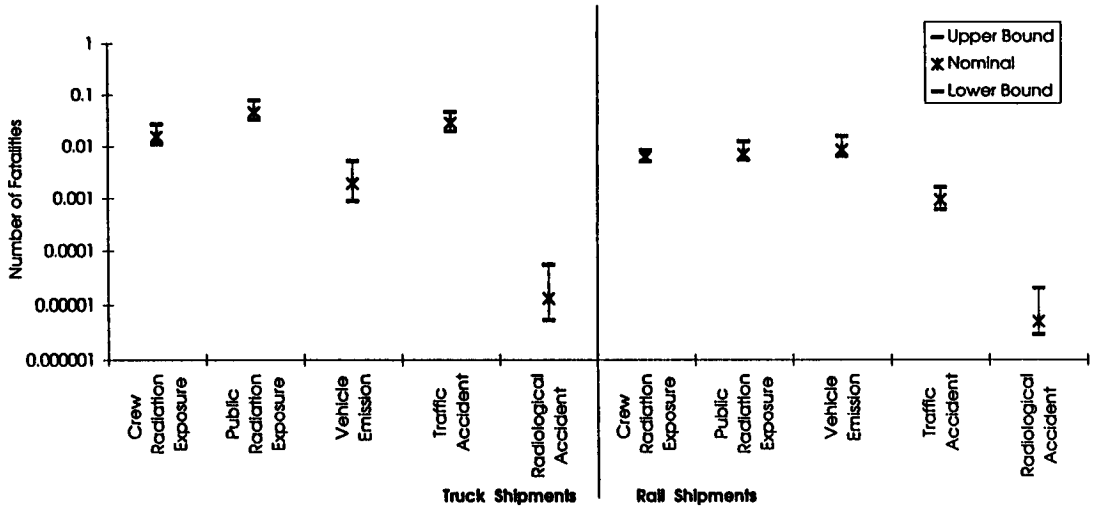
Management Site Impacts

As discussed in Chapter 2 of this EIS, Implementation Subalternative 2a reduces the quantity of foreign research reactor spent nuclear fuel to be managed to approximately 18,800 elements (compared to approximately 22,700 in the basic implementation of Management Alternative 1), but increases the rate of receipt to about 2,350 elements per year for an 8-year receipt period. This rate could challenge the capability of handling the incoming foreign research reactor spent nuclear fuel at a single site and could necessitate the use of both the Idaho National Engineering Laboratory and the Savannah River Site as near term foreign research reactor spent nuclear fuel management sites.

Incident-Free Impacts

Based on the reduced number of foreign research reactor spent nuclear fuel elements that would be accepted under this subalternative, the worker population risk would be about 83 percent of that calculated for the basic implementation of Management Alternative 1. The maximally exposed worker risk was calculated in the same way as for the basic implementation of Management Alternative 1, with reduced handling time. If one worker received the maximum dose every year for eight years, his increased risk would be 0.016 LCF.

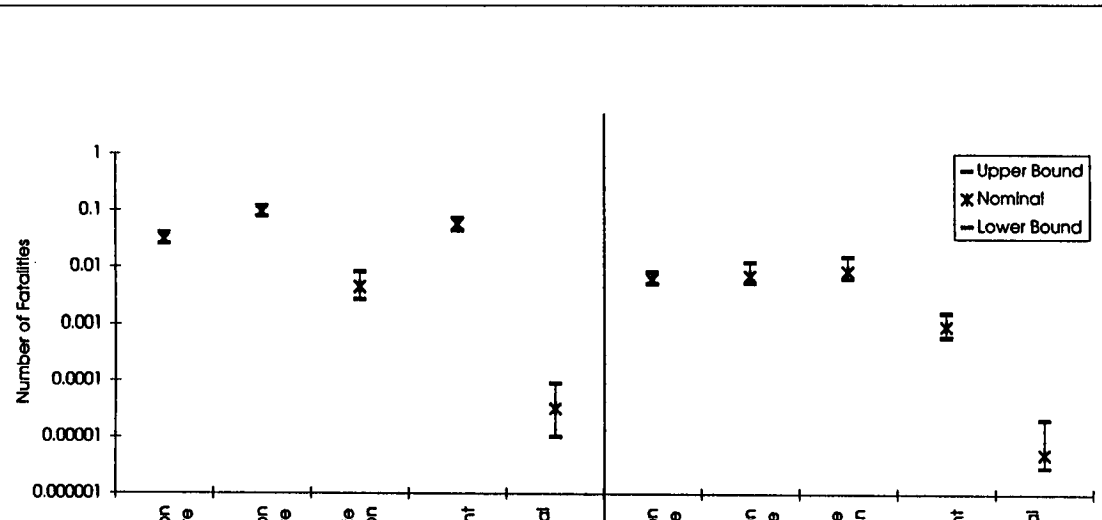
Some of the incident-free public risk depends on the amount of foreign research reactor spent nuclear fuel involved and some depends on the duration of each activity. The risk that accrues during receipt and handling can be scaled down by the factor of 83 percent from the basic implementation of Management Alternative 1, while the risk that accrues during storage is dependent only on the duration of the storage. The highest estimated incident-free public MEI risk in the basic implementation of Management Alternative 1 (1.4×10^{-7} LCF) is due to receipt and handling, so it is reduced by the factor of 83 percent to yield the corresponding risk for this subalternative (1.2×10^{-7} LCF).



- Same values apply to Programmatic SNF&INEL EIS 1992/1993 Planning Basis and INEL/SRS Regionalization alternatives

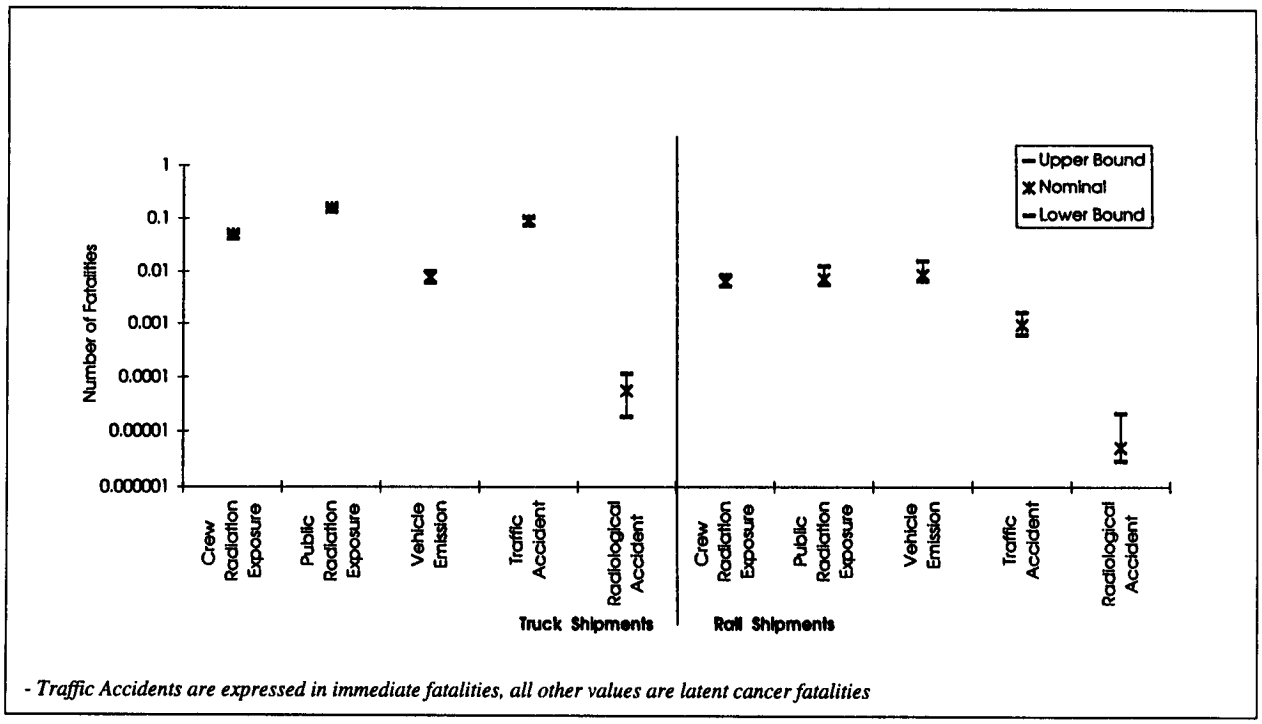
- Traffic Accidents are expressed in immediate fatalities, all other values are latent cancer fatalities

Figure 4-14 Range of Estimated Fatalities (Latent and Immediate) Under Implementation Subalternative 2a and the Programmatic SNF&INEL Final EIS Decentralization Alternative



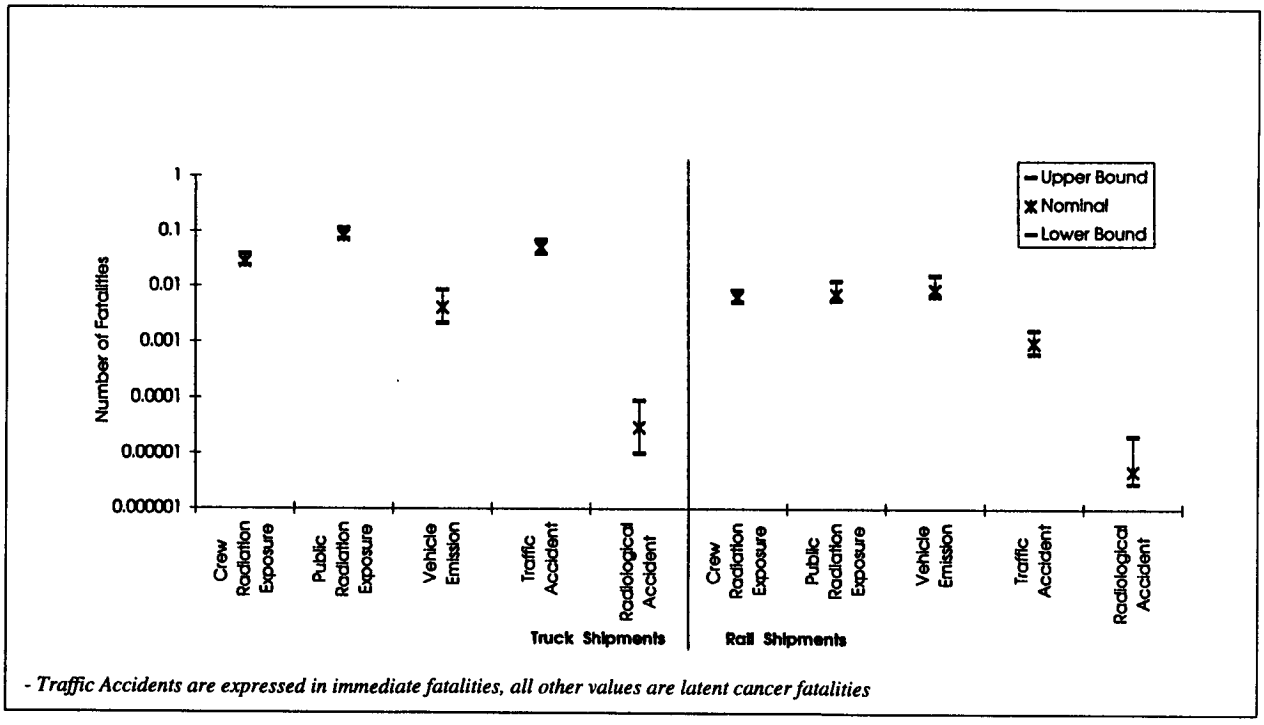
- Traffic Accidents are expressed in immediate fatalities, all other values are latent cancer fatalities

Figure 4-15 Range of Estimated Fatalities (Latent and Immediate) Under Implementation Subalternative 2a and the Programmatic SNF&INEL Final EIS Regionalization by Fuel Type Alternative



- Traffic Accidents are expressed in immediate fatalities, all other values are latent cancer fatalities

Figure 4-16 Range of Estimated Fatalities (Latent and Immediate) Under Implementation Subalternative 2a and the Programmatic SNF&INEL Final EIS Centralization to the Savannah River Site Alternative



- Traffic Accidents are expressed in immediate fatalities, all other values are latent cancer fatalities

Figure 4-17 Range of Estimated Fatalities (Latent and Immediate) Under Implementation Subalternative 2a and the Programmatic SNF&INEL Final EIS Centralization to the Idaho National Engineering Laboratory Alternative

The highest estimated incident-free public population risk in Phase 1 of the basic implementation of Management Alternative 1 (0.00014 LCF) is due to 13 years of storage in L-Reactor Basin. The Phase 1 storage time in this subalternative would be slightly lower, and the estimated risk could be reduced, but for simplicity and to be conservative, DOE and the Department of State did not reduce this component of the risk estimate compared to the basic implementation. The corresponding Phase 2 risk (0.00013 LCF) is due to receipt and handling, so this component of the risk is reduced to 0.00011 LCF for this subalternative. The sum of the Phase 1 and Phase 2 risks is 0.00025 LCF.

Impacts of Accidents Onsite

The highest estimated public MEI risk due to accident conditions in the basic implementation of Management Alternative 1 (0.000010 LCF) is due to receipt and handling, so it is reduced by the factor of 83 percent to yield the corresponding risk for this subalternative (0.0000083 LCF). This is higher than any other combination of Phase 1 or Phase 2 annual risk and duration.

The highest estimated population risk due to Phase 1 accidents in the basic implementation of Management Alternative 1 (0.096 LCF) is due to an accidental criticality in RBOF. This facility would be used for less time in this subalternative and the estimated risk could be reduced, but for simplicity and to be conservative, DOE and the Department of State did not reduce this component of the risk estimate compared to the basic implementation. The corresponding Phase 2 risk (0.013 LCF) is due to receipt and handling, so this component of the risk is reduced by the factor of 83 percent, down to 0.011 LCF for this subalternative. The sum of the Phase 1 and Phase 2 risks is 0.11 LCF.

Summary of the Impacts of Implementation Subalternative 2a

The principal impacts under this subalternative would be occupational and public health and safety impacts. These are presented in Table 4-38 in terms of the risk of death due to cancer during each of the four segments of this subalternative. It also shows, in the bottom rows, the highest of the individual risks and the total of the population risks. Each individual risk expresses the probability that the one individual with the maximum exposure in each situation would incur an LCF. The population risk expresses the estimated number of additional LCF among the entire exposed population.

Table 4-38 shows that the greatest radiological risks would occur during ground transport or management site activities. These results are based on conservative assumptions, including: (1) every package of foreign research reactor spent nuclear fuel producing a dose rate equal to the regulatory limit; (2) every truck shipment exposing people at highway rest stops for times about equal to the actual driving times; and (3) one individual at the DOE site receiving the maximum dose allowed by DOE regulation (5,000 mrem) every year.

The highest estimated incident-free individual risk is 0.016 LCF, which would apply to an onsite radiation worker. This individual would have a 1.6 percent chance of incurring an LCF. DOE and the Department of State believe the actual risk would be much lower due to administrative procedures such as worker rotation. The highest estimated incident-free individual risk for members of the public is much lower than the maximally exposed worker risk. DOE estimates this risk to be approximately 1.2×10^{-7} LCF.

The highest estimated accident MEI risk is 0.0000083 LCF, which applies to a hypothetical member of the public who lives at the site boundary. This individual's chance of incurring an LCF due to this alternative would be less than one in one hundred thousand. The accident risk to workers is discussed qualitatively in Section 4.2.4.1 under the heading, "Impacts of Accidents to Close-in Workers."

Table 4-38 Maximum Estimated Radiological Health Impacts of Implementation Subalternative 2a (Five-Year Policy)

	Risks (LCF)		
	Maximum Exposed Worker, MEI, or NPAI	Population	
		General Public	Workers
Marine Transport			
Incident-Free	0.00032	0	0.028
Accidents	4×10^{-10}	much less than 0.00002	---
Port Activities			
Incident-Free	0.00032	0	0.0098
Accidents	1.6×10^{-10}	0.00002	---
Ground Transport			
Incident-Free	0.00032	0.20	0.064
Accidents	1.1×10^{-11}	0.00026	---
Site Activities			
Incident-Free	0.016	0.00025	0.17
Accidents	0.0000083	0.11	---
Highest Individual Risk			
Incident-Free	0.016	---	---
Accidents	0.0000083	---	---
Total Population Risk			
Incident-Free	---	0.20	0.27
Accidents	---	0.11	---

As shown in Table 4-38, the total incident-free population risk would be 0.20 LCF for the potentially exposed public, while the corresponding risk would be 0.27 LCF for workers. Thus, there would be an estimated 20 percent chance of incurring one additional LCF among the exposed general public, and a 27 percent chance of incurring one additional LCF among workers. The chance of incurring two additional LCFs among each population group would be even lower.

Deaths due to traffic accident trauma and LCF due to vehicle emissions are not included in Table 4-38. There is about a 13 percent chance that a truck driver or member of the public could die in a traffic accident associated with this subalternative. This death would be unrelated to the radioactive nature of the cargo.

4.3.2.2 Implementation Subalternative 2b: Indefinite HEU/10-Year LEU Policy

Policy Considerations

The only difference between Implementation Subalternative 2b and the basic implementation of Management Alternative 1 would be to allow the acceptance of HEU spent nuclear fuel indefinitely from reactors with long-term lifetime cores, or from reactors whose operators for some reason (e.g., political) refuse to send their HEU spent nuclear fuel to the United States at this time. The exclusion of foreign research reactors that could be converted, but are not converted would be the same as in the basic implementation of Management Alternative 1. The amount of HEU spent nuclear fuel involved would also be the same as in the basic implementation of Management Alternative 1—only the timing would be different. The amount of HEU spent nuclear fuel that would be accepted after the policy period cannot be quantified because DOE and the Department of State do not know with certainty which countries would refuse to send their foreign research reactor spent nuclear fuel to the United States during the policy period

of the basic implementation of Management Alternative 1. Nevertheless, this subalternative would provide a mechanism whereby DOE and the Department of State could increase the amount of U.S. origin HEU that could be recovered.

Impacts

The environmental impacts would be the same as, or slightly less than, those of the basic implementation of Management Alternative 1. Delaying the acceptance of a small fraction of the total amount of foreign research reactor spent nuclear fuel accepted would have a miniscule effect on the results presented in Section 4.2.

4.3.3 Implementation Alternative 3: Alternative Financing Arrangements

Under the basic implementation of Management Alternative 1, DOE and the Department of State would subsidize developing nations and charge developed nations a competitive rate. As discussed in Chapter 2, DOE and the Department of State have identified three potential financial arrangements:

- Subsidize all nations,
- Charge all nations the full cost of managing their spent nuclear fuel, and
- Subsidize developing nations and charge developed nations the full cost of managing their spent nuclear fuel.

Policy Considerations

Subsidizing all countries would be the most expensive for the United States. All the costs of transport, handling, storage, preparation for disposal, and disposal would be borne by the United States. The amount of HEU that would be accepted under this arrangement would likely be the same as under the basic implementation of Management Alternative 1.

Charging all countries the full cost of foreign research reactor spent nuclear fuel management would be the least expensive for the United States. All the costs would be borne by the foreign countries. Many developing countries probably would be unable to pay these high costs and this could lead to large quantities of HEU foreign research reactor spent nuclear fuel remaining in the countries least able to protect it. This could also lead to charges, rightly or wrongly, that the United States was not complying with its obligations under Article IV of the Non-Proliferation Treaty. Even some developed countries might refuse to pay a full cost recovery fee, thus broadening the scope of problems this arrangement could cause.

Subsidizing developing countries and charging developed countries full cost of spent nuclear fuel management would be somewhat less expensive for the United States than the basic implementation of Management Alternative 1. Developing countries would be treated the same as in the basic implementation of Management Alternative 1, but developed countries would be charged more than in the basic implementation of Management Alternative 1. It is not clear how much more because the amount of a full cost recovery fee cannot be determined accurately at this time. Nevertheless, this increase over the internationally competitive rate could lead those nations which can reprocess to do so and perhaps to switch back to HEU fuel. Those nations in which reprocessing is not a viable option might force their reactors to shut down, and then charge, rightly or wrongly, that the United States was not complying with its obligations under Article IV of the Non-Proliferation Treaty.

Impacts

The different financial arrangements under this implementation alternative would have no direct effect on the environmental impacts of accepting and managing foreign research reactor spent nuclear fuel. Indirect effects are possible because, if the price is too high, some reactor operators may choose not to ship their spent nuclear fuel to the United States. This would reduce the amount of spent nuclear fuel accepted and thereby reduce the environmental impacts. It would be speculative, at best, to estimate the amount of spent nuclear fuel that might be excluded under this implementation alternative compared to the basic implementation of Management Alternative 1, so the changes in the environmental impacts cannot be quantified. It is clear however, that these changes would reduce overall environmental impacts in the United States during the policy period.

4.3.4 Implementation Alternative 4: Alternative Locations for Taking Title

Policy Considerations

The Price-Anderson Act applies to the shipments, independent of who holds title to the spent nuclear fuel. Thus, there is no change in the liability protection provided to the citizens of the United States, no matter where DOE takes title to the foreign research reactor spent nuclear fuel. Hence, there would be no change in the physical mode of shipping nor in the cost of shipping. Nevertheless, DOE and the Department of State are considering the following arrangements regarding the location for taking title to the foreign research reactor spent nuclear fuel:

- Taking title prior to shipment [i.e., at the foreign research reactor(s)],
- Taking title at the port(s) of entry, and
- Taking title at the DOE management site(s).

If DOE were to take title to the foreign research reactor spent nuclear fuel at the foreign research reactors, the liability protection afforded the citizens of the United States would not change, and the shipping arrangements would still be the same. However, DOE would then be liable for any mishaps that might occur in the foreign nations, or on the high seas. Thus, the potential liability to the United States might exceed the liability under the basic implementation of Management Alternative 1.

Taking title at the port(s) of entry would leave title in the hands of the foreign research reactor operators for the distance from the U.S. territorial waters limit to the port, thus potentially causing public concern about who would be liable to respond to any accident that might occur during that portion of the shipment. Similarly, taking title at the DOE management site would leave title in the hands of the foreign research reactor operators for an even greater distance within the United States, leading to even greater public concerns. These potential concerns would be borne of a misunderstanding because ownership does not affect shipping arrangements and precautions or liability protection. Nevertheless, it is likely that such concerns would exist.

Impacts

The environmental impacts (if any) of spent nuclear fuel shipments are not affected by the identity of the owner of the spent nuclear fuel. Therefore, the point of transfer of title is not a factor in determining environmental impacts.

4.3.5 Implementation Alternative 5: Wet Storage Technology for New Construction

Wet storage technology for new construction was considered instead of the dry storage technology contained in the basic implementation of Management Alternative 1, for all five potential foreign research reactor spent nuclear fuel management sites. The impacts during marine transport, port activities, and ground transport would be the same as in the basic implementation of Management Alternative 1. As in the basic implementation of Management Alternative 1, the analysis examined environmental topics including land use, socioeconomics, cultural resources, aesthetic and scenic resources, geology, air quality, water quality, ecology, occupational health and safety, noise, utilities and energy, and waste management.

The means by which this alternative would be implemented at each management site are presented in Sections 2.6.5.3.1 through 2.6.5.3.5. The environmental impact analysis assumes that a new wet storage facility, which is described in Section 2.6.5.1.2, would be constructed at the sites to receive and store foreign research reactor spent nuclear fuel after the Phase 1 period. At the Savannah River Site, the alternative could also be implemented at the Barnwell Nuclear Fuels Plant (BNFP) and at the Hanford Site by the addition of facilities to the WNP-4 Spray Pond. These facilities are described in Appendix F, Section F.3. The analysis parallels in all respects the impact analysis performed for the new dry storage facility of the basic implementation of Management Alternative 1. It is presented in detail in Appendix F, Section F.4, with methodology and assumptions for radiological impacts given in Sections F.5 and F.6.

As in the basic implementation of Management Alternative 1, the analysis showed that this implementation alternative would not cause any major environmental impacts. Further, none of the environmental topics would clearly differentiate among the potential foreign research reactor spent nuclear fuel management sites.

4.3.5.1 Occupational and Public Health and Safety

As in the basic implementation of Management Alternative 1 (see Section 4.2.4.1) radiological exposures are presented as emissions-related impacts, handling-related impacts, and accident-related impacts.

Impacts to the Public of Incident-Free Management Site Activities

Table 4-39 summarizes the annual emission-related doses to the public and the associated risks for the MEI and population at each Phase 2 site. Integrated doses for the duration of a specific implementation period can be obtained by multiplying the annual dose by the number of years in the period.

The highest estimated Phase 1 public MEI and population risks for this alternative are identical to those for the basic implementation of Management Alternative 1. All possible Phase 1 MEI risks are lower than the highest estimated Phase 2 MEI risk in the next paragraph, so they will drop out. The highest Phase 1 component of the population risk is 0.00014 LCF in the basic implementation.

Among all the potential Phase 2 foreign research reactor spent nuclear fuel management sites, the maximum annual dose to the public from emissions is 0.06 mrem per year and 0.06 person-rem per year at the Oak Ridge Reservation for the MEI dose and the population dose, respectively. If it is assumed that receipt of foreign research reactor spent nuclear fuel at the Oak Ridge Reservation could take place over a period of 3 years, the total MEI dose would be 0.18 mrem and the total population dose would be 0.18 person-rem. If it is further assumed that storage will continue for 30 years after the beginning of the receipt period, the total MEI dose from storage would be 1.4×10^{-5} mrem and the total population dose from storage would be 1.5×10^{-5} person-rem. The risks due to receipt and unloading would be much

Table 4-39 Annual Public Impacts for Receipt and Management of Foreign Research Reactor Spent Nuclear Fuel Under Implementation Alternative 5 (Wet Storage)

	MEI Dose (mrem/yr)	*MEI Risk (LCF/yr)*	*Population Dose (person-rem/yr)*	*Population Risk (LCF/yr)*
Savannah River Site				
Receipt/Unloading at:				
• BNFP	0.00065	3.3×10^{-10}	0.0045	0.0000023
• New Wet Storage Facility	0.00011	5.5×10^{-11}	0.0057	0.0000028
Storage at:				
• BNFP	7.5×10^{-9}	3.8×10^{-15}	4.8×10^{-8}	2.4×10^{-11}
• New Wet Storage Facility	1.2×10^{-9}	6.0×10^{-16}	6.2×10^{-8}	3.1×10^{-11}
Idaho National Engineering Laboratory				
Receipt/Unloading at:				
• New Wet Storage Facility	0.00038	1.9×10^{-10}	0.0031	0.0000016
Storage at:				
• New Wet Storage Facility	3.8×10^{-9}	1.9×10^{-15}	3.1×10^{-8}	1.6×10^{-11}
Hanford Site				
Receipt/Unloading at:				
• WNP-4 Spray Pond	0.00022	1.1×10^{-10}	0.0058	0.0000029
• New Wet Storage Facility	0.00020	1.0×10^{-10}	0.012	0.0000060
Storage at:				
• WNP-4 Spray Pond	5.9×10^{-10}	3.0×10^{-16}	1.6×10^{-8}	8.0×10^{-12}
• New Wet Storage Facility	8.8×10^{-10}	4.4×10^{-16}	6.9×10^{-8}	3.5×10^{-11}
Oak Ridge Reservation				
Receipt/Unloading at:				
• New Wet Storage Facility	0.060	3.0×10^{-8}	0.061	0.000031
Storage at:				
• New Wet Storage Facility	4.6×10^{-7}	2.3×10^{-13}	5.0×10^{-7}	2.5×10^{-10}
Nevada Test Site				
Receipt/Unloading at:				
• New Wet Storage Facility	0.00052	2.6×10^{-10}	0.00052	2.6×10^{-7}
Storage at:				
• New Wet Storage Facility	4.0×10^{-9}	2.0×10^{-15}	4.7×10^{-9}	2.4×10^{-12}

higher than those due to storage, so the maximum risk would be 0.18 mrem for the MEI and the sum of population doses would be 0.18 person-rem. The associated probabilities for incurring one LCF would be 9×10^{-8} LCF for the Phase 2 MEI risk and 0.00009 LCF for the Phase 2 population risk.

The maximum of the Phase 1 and Phase 2 incident-free public MEI risks is 9×10^{-8} LCF for this alternative. The sum of the Phase 1 and Phase 2 incident-free public population risks is 0.00023 LCF.

Impacts to Workers of Incident-Free Management Site Activities

As in the basic implementation of Management Alternative 1, workers would receive radiation doses during handling operations, such as receiving and unloading foreign research reactor spent nuclear fuel transportation casks at the site or transferring foreign research reactor spent nuclear fuel from one facility to another within the site. The methodology and assumptions for the analysis of this implementation alternative parallel that for the basic implementation of Management Alternative 1 as presented in Section 4.2.4.1 and Appendix F, Section F.5.

Table 4-40 presents the collective doses and risks that would be received by the members of the working crew, if that crew handled the total number of casks at the site.

Table 4-40 Handling-Related Impacts to Workers at Each Management Site Under Implementation Alternative 5 (Wet Storage)

Site	Worker Population Dose (person-rem)	Worker Population Risk (LCF)
Savannah River Site		
Phase 1: RBOF/L-Reactor Basin	250	0.10
Phases 1 and 2: New Wet Storage Facility	360	0.14
Phase 1: RBOF/L-Reactor Basin	250	0.10
Phases 1 and 2: BNFP	360	0.14
Phase 1: RBOF/L-Reactor Basin	250	0.10
Phases 1 and 2: BNFP[a]	310	0.12
Idaho National Engineering Laboratory		
Phase 1: IFSF/CPP-749	257	0.10
Phases 1 and 2: New Wet Storage Facility	367	0.15
Phase 1: FAST	250	0.10
Phases 1 and 2: New Wet Storage Facility	360	0.14
Hanford Site		
Phase 2: New Wet Storage Facility or WNP-4 Spray Pond	109	0.04
Oak Ridge Reservation		
Phase 2: New Wet Storage Facility	109	0.04
Nevada Test Site		
Phase 2: New Wet Storage Facility	109	0.04

[a] *Assumes that BNFP would be ready in 5 years instead of 10 years.*

As seen from Table 4-40, the maximum total collective dose to workers handling foreign research reactor spent nuclear fuel at a single site would be 367 person-rem for the case analyzed at the Idaho National Engineering Laboratory, which assumes that all foreign research reactor spent nuclear fuel is in dry storage during Phase 1 and is transferred to a new wet storage facility for Phase 2. The associated probability for one LCF among the working crew would be 0.15. The highest dose to working crews for both phases in more than one site is 366 person-rem: 109 person-rem at one of the three Phase 2 sites plus 257 person-rem at the Idaho National Engineering Laboratory as the Phase 1 site. The associated probability for developing one LCF among the working crews of the two sites is 0.15.

Accident-Related Impacts

The accident scenarios analyzed for this implementation alternative are the same as those analyzed for the basic implementation of Management Alternative 1.

Table 4-41 presents the frequency and consequences of the accidents analyzed for each management site for this implementation alternative. Multiplying the frequency of each accident times its consequences at each site and converting the radiation doses to LCF yields the annual risks associated with each potential accident at each candidate management site. Table 4-42 presents the annual risk estimates for wet storage.

The highest MEI or NPAI risk for Phase 1 would be the same as under the basic implementation of Management Alternative 1 (2.6×10^{-6} LCF). The highest annual MEI or NPAI risk for Phase 2 would be 0.000005 LCF per year, which is the annual risk to the NPAI from an accidental criticality at the Oak Ridge Reservation. Assuming that foreign research reactor spent nuclear fuel could be managed at the Oak Ridge Reservation for as long as 30 years, the Phase 2 component of this MEI/NPAI risk would

Table 4-41 Frequency and Consequences of Accidents at Each Management Site Under Implementation Alternative 5 (Wet Storage)

Site	Frequency (per yr)	Consequences							
		MEI		NPAI		Population		Worker	
		(mrem)	(LCF)	(mrem)	(LCF)	(person-rem)	(LCF)	(mrem)	(LCF)
Savannah River Site									
New Wet Storage Facility									
• Spent Nuclear Fuel Assembly Breach	0.16	0.0070	3.5×10^{-9}	0.00039	2×10^{-10}	0.23	0.00012	0.14	5.6×10^{-8}
• Accidental Criticality	0.0031	17	0.0000085	9.5	0.0000048	370	0.19	1,600	0.00064
• Aircraft Crash	1×10^{-6}	4.1	0.0000021	0.98	4.9×10^{-7}	150	0.075	400	0.00016
BNFP									
• Spent Nuclear Fuel Assembly Breach[a]	0.16	0.018	9×10^{-9}	0.00099	5×10^{-10}	0.028	0.000014	0.00080	3.2×10^{-10}
• Accidental Criticality[a]	0.0031	80	0.000040	75	0.000038	44	0.022	75	0.000030
• Aircraft Crash	1×10^{-6}	92	0.000046	31	0.000016	23	0.012	70	0.000028
Idaho National Engineering Laboratory									
New Wet Storage Facility									
• Spent Nuclear Fuel Assembly Breach	0.16	0.0016	8×10^{-10}	0.0036	1.8×10^{-9}	0.43	0.00022	0.14	5.6×10^{-8}
• Accidental Criticality	0.0031	28	0.000014	30	0.000015	140	0.070	1,800	0.00072
• Aircraft Crash	1×10^{-6}	22	0.000011	9.8	0.0000049	250	0.13	400	0.00016
Hanford Site									
New Wet Storage Facility									
• Spent Nuclear Fuel Assembly Breach	0.16	0.13	6.5×10^{-8}	0.0033	1.7×10^{-9}	1.6	0.00080	0.25	1.0×10^{-7}
• Accidental Criticality	0.0031	64	0.000032	14	0.000007	740	0.37	3,600	0.0014
• Aircraft Crash[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
WNP-4 Spray Pond									
• Spent Nuclear Fuel Assembly Breach[a]	0.16	0.15	7.5×10^{-8}	0.0033	1.7×10^{-9}	1.3	0.00065	0.00024	9.6×10^{-11}
• Accidental Criticality[a]	0.0031	97	0.000049	76	0.000038	620	0.31	120	0.000048
• Aircraft Crash[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oak Ridge Reservation									
New Wet Storage Facility									
• Spent Nuclear Fuel Assembly Breach	0.16	0.71	3.6×10^{-7}	0.20	1.0×10^{-7}	16	0.0080	0.68	2.7×10^{-7}
• Accidental Criticality	0.0031	1,500	0.00075	3,300	0.0017	1,400	0.70	6,800	0.0027
• Aircraft Crash	1×10^{-6}	380	0.00019	600	0.00030	2,900	1.5	1,900	0.00076
Nevada Test Site									
New Wet Storage Facility									
• Spent Nuclear Fuel Assembly Breach	0.16	0.054	2.7×10^{-8}	0.0016	8×10^{-10}	0.33	0.00017	0.10	4.0×10^{-8}
• Accidental Criticality	0.0031	88	0.000044	15	0.0000075	54	0.027	1,300	0.00052
• Aircraft Crash	1×10^{-6}	29	0.000015	4.2	0.0000021	61	0.031	290	0.00012

[a] *Emissions would be released through a tall stack, so workers would receive low doses.*

[b] *Aircraft crash accidents are not applicable to the Hanford Site because their frequency of occurrence is less than one every ten million years.*

NA = Not applicable

Table 4-42 Annual Risks of Accidents at Each Management Site Under Implementation Alternative 5 (Wet Storage)

	Risks			
	MEI (LCF/yr)	NPAI (LCF/yr)	Population (LCF/yr)	Worker (LCF/yr)
Savannah River Site				
New Wet Storage Facility				
• Spent Nuclear Fuel Assembly Breach	5.5×10^{-10}	3.1×10^{-11}	0.000019	8.8×10^{-10}
• Accidental Criticality	2.7×10^{-7}	1.5×10^{-8}	0.00060	0.0000020
• Aircraft Crash	2.1×10^{-12}	4.9×10^{-13}	7.5×10^{-8}	1.6×10^{-10}
BNFP				
• Spent Nuclear Fuel Assembly Breach[a]	2.8×10^{-9}	8.0×10^{-11}	0.0000023	5.2×10^{-11}
• Accidental Criticality[a]	1.3×10^{-7}	1.2×10^{-7}	0.000070	9.2×10^{-8}
• Aircraft Crash	4.6×10^{-10}	1.6×10^{-11}	1.2×10^{-8}	2.8×10^{-10}
Idaho National Engineering Laboratory				
New Wet Storage Facility				
• Spent Nuclear Fuel Assembly Breach	1.3×10^{-10}	2.9×10^{-10}	0.000035	8.8×10^{-9}
• Accidental Criticality	4.4×10^{-8}	4.7×10^{-8}	0.00022	0.0000022
• Aircraft Crash	1.1×10^{-11}	4.9×10^{-12}	1.3×10^{-7}	1.6×10^{-10}
Hanford Site				
New Wet Storage Facility				
• Spent Nuclear Fuel Assembly Breach	1.1×10^{-8}	2.7×10^{-10}	0.00013	1.6×10^{-8}
• Accidental Criticality	1.0×10^{-7}	2.2×10^{-8}	0.0012	0.0000044
• Aircraft Crash[b]	NA	NA	NA	NA
WNP-4 Spray Pond				
• Spent Nuclear Fuel Assembly Breach[a]	1.2×10^{-8}	2.7×10^{-10}	0.00011	1.5×10^{-11}
• Accidental Criticality[a]	1.5×10^{-7}	1.2×10^{-7}	0.00096	1.5×10^{-7}
• Aircraft Crash[b]	NA	NA	NA	NA
Oak Ridge Reservation				
New Wet Storage Facility				
• Spent Nuclear Fuel Assembly Breach	5.5×10^{-8}	1.6×10^{-8}	0.0013	4.4×10^{-8}
• Accidental Criticality	0.0000024	0.000005	0.0022	0.0000084
• Aircraft Crash	1.9×10^{-10}	3.0×10^{-10}	0.0000015	7.6×10^{-10}
Nevada Test Site				
New Wet Storage Facility				
• Spent Nuclear Fuel Assembly Breach	4.2×10^{-9}	1.3×10^{-10}	0.000026	6.4×10^{-9}
• Accidental Criticality	1.4×10^{-7}	2.3×10^{-8}	0.000084	0.000016
• Aircraft Crash	1.5×10^{-11}	2.1×10^{-12}	3.1×10^{-8}	1.2×10^{-10}

[a] *Emissions would be released through a tall stack, so workers would receive low doses.*

[b] *Aircraft crash accidents are not applicable to the Hanford Site because their frequency of occurrence is less than one every ten million years.*

NA = Not applicable

be 0.00015 LCF. This is higher than any other combination of Phase 2 annual accident risks and associated durations in this implementation alternative. Taking the maximum of the Phase 1 and Phase 2 MEI risks yields 0.00015 LCF for the maximum MEI risk due to accidents.

The highest population risk for Phase 1 would be the same as under the basic implementation of Management Alternative 1, 0.096 LCF. The highest annual population risk for Phase 2 would be 0.0022 LCF per year, which is the annual risk to the public from an accidental criticality at the Oak Ridge Reservation. Assuming that foreign research reactor spent nuclear fuel could be managed at the

Oak Ridge Reservation for as long as 30 years, the Phase 2 component of this population risk would be 0.066 LCF. This is higher than any other combination of Phase 2 annual accident risks and associated durations in this implementation alternative. Adding the Phase 1 and Phase 2 population risks yields 0.16 LCF for the total population risk due to accidents.

4.3.5.2 Topics Not Discussed in Detail

Nonradiological impacts associated with the wet storage implementation alternative are similar to those for dry storage considered in the basic implementation of Management Alternative 1. They are discussed in detail in Appendix F, Section F.4.

Impacts at each management site typically associated with construction activities such as land use, socioeconomics, cultural resources, aesthetic and scenic resources, air quality, ecology, and noise are similar because: (1) both dry and wet storage facilities could be constructed at the same locations at each site; and (2) both facilities are approximately the same size. As indicated in Section 2.6.5.1, the construction of the wet storage facility would disturb approximately 2.8 ha (7 acres) of land while the construction of the dry storage facility would disturb 3.6 to 4.5 ha (9 to 11 acres). Specifically for the Savannah River Site, if the wet storage alternative is implemented using the BNFP facility there would be no impacts associated with construction activities.

Impacts at each management site typically associated with the operation of the facilities such as air quality, water quality, socioeconomics, utilities, and waste generation are also very similar as indicated in Section 2.6.5.1. The only notable difference is indicated in water use. The wet storage facility would use 1.5 million liters (409,000 gal) per year during the storage mode of the operation (over 30 years) compared to 0.9 million liters (238,000 gal) per year used by the dry storage facility over the same period. This difference, however, is small compared to typical water consumption rates at the sites: 1.14 billion liters (300 million gal) per year at the Nevada Test Site to 88 billion liters (23.2 billion gal) per year at the Savannah River Site.

4.3.5.3 Summary of the Impacts of Implementation Alternative 5

The principal impacts under this implementation alternative would be occupational and public health and safety impacts. These are presented in Table 4-43 in terms of the risk of death due to cancer during each of the four segments of the affected environment. It also shows, in the bottom rows, the highest of the individual risks and the total population risks. Each individual risk expresses the probability that the one individual with the maximum exposure in each situation would incur an LCF. The population risk expresses the estimated number of additional LCF among the entire exposed population.

Table 4-43 shows that the greatest radiological risks would occur during ground transport or management site activities. These results are based on conservative assumptions, including: (1) every package of foreign research reactor spent nuclear fuel producing a dose rate equal to the regulatory limit; (2) every truck shipment exposing people at highway rest stops for times about equal to the actual driving times; and (3) one individual at the DOE site receiving the maximum dose allowed by DOE regulation (5,000 mrem) every year.

Table 4-43 Maximum Estimated Radiological Health Impacts of Implementation Alternative 5 (Wet Storage)

	Risks (LCF)		
	Maximally Exposed Worker, MEI, or NPAI	Population	
		General Public	Workers
Marine Transport			
Incident-Free	0.00052	0	0.034
Accidents	5×10^{-10}	much less than 0.000029	---
Port Activities			
Incident-Free	0.00052	0	0.012
Accidents	2×10^{-10}	0.000029	---
Ground Transport			
Incident-Free	0.00052	0.22	0.071
Accidents	1.4×10^{-11}	0.00028	---
Site Activities			
Incident-Free	0.026	0.00023	0.15
Accidents	0.00015	0.16	---
Highest Individual Risk			
Incident-Free	0.026	---	---
Accidents	0.00015	---	---
Total Population Risk			
Incident-Free	---	0.22	0.27
Accidents	---	0.16	---

The highest estimated incident-free individual risk is 0.026 LCF, which would apply to an onsite radiation worker. This individual would have approximately a 2.6 percent chance of incurring an LCF. DOE and the Department of State believe the actual risk would be much lower due to administrative procedures such as worker rotation. The highest estimated incident-free individual risk for members of the public is much lower than the maximally exposed worker risk. DOE estimates this risk to be approximately 9×10^{-8} LCF.

The highest estimated accident MEI risk is 0.00015 LCF, which applies to a hypothetical member of the public who lives at the site boundary. This individual's chance of incurring an LCF due to this alternative would be less than two in ten thousand. The accident risk to workers is discussed qualitatively in Section 4.2.4.1 under the heading, "Impacts of Accidents to Close-in Workers."

As shown in Table 4-43, the total incident-free population risk would be 0.22 LCF for the potentially exposed public, while the corresponding risk would be 0.27 LCF for workers. Thus, there would be an estimated 22 percent chance of incurring one additional LCF among the exposed general public, and a 27 percent chance of incurring one additional LCF among workers. The chance of incurring two additional LCFs among each population group would be even lower.

Deaths due to traffic accident trauma and LCF due to vehicle emissions are not included in Table 4-43. There is about a 14 percent chance that a truck driver or member of the public could die in a traffic accident associated with this implementation alternative. This death would be unrelated to the radioactive nature of the cargo.

4.3.6 Implementation Alternative 6: Near Term Chemical Separation in the United States

As discussed in Section 2.2.2.6, this implementation alternative involves conventional chemical separation in existing facilities at either the Savannah River Site or the Idaho National Engineering Laboratory. The facilities at the Savannah River Site are limited to chemically separating the aluminum-based foreign

research reactor spent nuclear fuel. After some upgrading, the facilities at the Idaho National Engineering Laboratory would have the capability to chemically separate all the foreign research reactor spent nuclear fuel.

4.3.6.1 Implications of Chemical Separation for U.S. Nonproliferation Policy

As a matter of policy, the United States does not currently engage in reprocessing or chemical separation to extract plutonium for civilian or military purposes. U.S. policy is also not to encourage the civilian use of plutonium and to explore means to limit the stockpiling of plutonium from civil nuclear programs. This alternative nonetheless considers scenarios whereby the United States might engage in future chemical separation of foreign research reactor spent nuclear fuel. If a decision were made pursuant to this EIS to chemically separate some or all of the foreign research reactor spent nuclear fuel, the limited amount of plutonium in the spent fuel would not be separated. Rather it would be left in, and disposed of with, the high-level radioactive wastes produced during the chemical separation operation.

Two alternatives are evaluated for handling the highly enriched uranium in the spent fuel, either to blend it down to low enriched uranium (the preferred alternative, if any chemical separation is undertaken), or to separate it as HEU and place it in safe, secure storage. Chemical separation of foreign research reactor spent nuclear fuel, with blending down of the separated uranium, would, in fact, result in a reduction in the amount of HEU – a major goal of the U.S. Nuclear Weapons Nonproliferation Policy announced in September 1993. Despite this fact, there is a concern that other states may perceive only that the U.S. has restarted reprocessing.

For example, the potential exists that other states (e.g., Iran), might use the restart of reprocessing in the United States as an excuse to continue current programs or begin new ones – activities that would run counter to U.S. nuclear weapons nonproliferation interests. The implications in North Korea, where the United States has been actively working to create a nonreprocessing zone, as well as in other states, could complicate current U.S. nonproliferation activities.

4.3.6.2 General Assumptions and Analytic Approach

Potential impacts at the Savannah River Site and the Idaho National Engineering Laboratory were estimated separately. The impacts due to chemical separation and associated onsite activities would be in addition to those due to marine transport, port activities, and ground transport.

As discussed in Section 2.2.2.6, DOE and the Department of State have analyzed four possible chemical separation subalternatives under this implementation alternative. These four subalternatives, with spent nuclear fuel amounts and estimated facility run durations are:

	Amount (MTHM)	*Duration (Years)*
Savannah River Site (only aluminum-based spent nuclear fuel)		
• Foreign research reactor spent nuclear fuel only	18.2	13
• Foreign research reactor spent nuclear fuel plus other spent nuclear fuel	51	13
Idaho National Engineering Laboratory (aluminum-based and TRIGA spent nuclear fuel)		
• Foreign research reactor spent nuclear fuel only	19.2	12
• Foreign research reactor spent nuclear fuel plus other spent nuclear fuel	65	12

The duration of chemical separation operations dedicated to foreign research reactor spent nuclear fuel is driven by the rate of foreign research reactor spent nuclear fuel receipt at the Savannah River Site or the Idaho National Engineering Laboratory. The facility run durations at Savannah River Site are both up to 13 years, whether the facilities would be chemically separating only the 18.2 MTHM of foreign research reactor spent nuclear fuel or the 51 MTHM of spent nuclear fuel. Because the additional spent nuclear fuel would be chemically separated at the same time as the foreign research reactor spent nuclear fuel in a parallel process, only the combined impacts will be used to determine the risks associated with the overall operations. There are other nuclear materials, such as the Mark-31 targets currently stored at the Savannah River Site, which could also be chemically separated. These nuclear materials are not included in this implementation alternative, but they are covered under cumulative impacts. The impacts of running the facilities are based on conservative assumptions regarding incident-free annual emissions and possible accident releases which cover this range of throughputs.

The facility run durations at the Idaho National Engineering Laboratory are estimated to be up to 12 years. Furthermore, the same type of conservative assumptions regarding incident-free emissions and accidental releases are applied to calculate the environmental impacts.

As discussed in Section 2.2.2.6, the implementation component of uranium disposition has policy implications. The separated LEU could be returned to the commercial sector for reuse as reactor fuel. The HEU could be blended down to LEU or it could be processed directly to an oxide and stored. If a decision is made to chemically separate this spent nuclear fuel, it would be DOE's preference to blend down the HEU to LEU and thus preclude the possibility of this material ever being used in a nuclear weapon.

4.3.6.3 Marine Transport Impacts

The marine transport impacts of this implementation alternative would be identical to those of the basic implementation of Management Alternative 1, as discussed in Section 4.2.1.

4.3.6.4 Port Activities Impacts

The port activities impacts of this implementation alternative would be identical to those of the basic implementation of Management Alternative 1, as discussed in Section 4.2.2.

4.3.6.5 Ground Transport Impacts

The impacts due to ground transport of foreign research reactor spent nuclear fuel in this implementation alternative would be slightly lower than those of the basic implementation of Management Alternative 1, because the Phase 2 intersite shipments would not occur.

If the aluminum-based foreign research reactor spent nuclear fuel were chemically separated at the Savannah River Site it could not then be transported to another management site as spent nuclear fuel. The high-level waste resulting from this chemical separation would be managed onsite for the duration of the 40-year program period. The TRIGA foreign research reactor spent nuclear fuel would be transported to either of the two sites for management and it would not be transported again for the duration of the 40-year program period.

Similarly, if all the foreign research reactor spent nuclear fuel were chemically separated at the Idaho National Engineering Laboratory, it could not then be transported to another management site as spent nuclear fuel. The high-level waste resulting from this chemical separation would be managed onsite for the duration of the 40-year program period.

Impacts of Incident-Free Ground Transport

The impacts of incident-free ground transportation were analyzed in the same manner as for the basic implementation of Management Alternative 1. The incident-free transportation of spent nuclear fuel was estimated to result in total latent fatalities that ranged from 0.020 to 0.27 over the entire duration of the program. These fatalities are the sum of the estimated number of radiation-related LCF to the public and the crew.

The range of fatality estimates was due to two factors: the option of using truck or rail to transport spent nuclear fuel and combinations of management sites that created varying cask shipment numbers and distances.

The estimated number of radiation-related LCF for transportation workers ranged from 0.009 to 0.065. The estimated number of radiation-related LCF for the general population ranged from 0.011 to 0.21, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.003 to 0.05.

Impacts of Accidents During Ground Transport

The cumulative transportation accident risks over the entire program are estimated to range from 0.000004 to 0.00014 LCF from radiation and from 0.002 to 0.13 for traffic fatality, depending on the transportation mode and the potential foreign research reactor spent nuclear fuel management sites that might be selected. The reason for the range of fatality estimates is the same as those described for incident-free transportation.

The consequences of the maximum foreseeable offsite transportation accident are identical to those of the basic implementation of Management Alternative 1. The frequency is lower due to the reduced amount of ground transport, so the MEI risk is reduced to 1.3×10^{-11} LCF.

4.3.6.6 Impacts at the Potential Foreign Research Reactor Spent Nuclear Fuel Management Sites

DOE and the Department of State evaluated near term chemical separation at the Savannah River Site and the Idaho National Engineering Laboratory for five key types of impacts: (1) Socioeconomics, (2) Air Quality, (3) Water Quality, (4) Occupational and Public Health and Safety, and (5) Waste Management. The other impacts are all the same as those described in the basic implementation of Management Alternative 1. The analytic approach was to use the results published in the Programmatic SNF&INEL Final EIS (DOE, 1995c) and the Interim Management of Nuclear Materials Final EIS (DOE, 1995a) whenever possible. Usually, these results can be adopted directly.

4.3.6.6.1 Socioeconomics

Savannah River Site

The chemical separation facilities at the Savannah River Site were last operated in 1992. The facilities are in a warm standby condition and are currently fully staffed. Use of these facilities would not have a notable net impact upon employment or the regional economy.

Idaho National Engineering Laboratory

The chemical separation facilities at the Idaho National Engineering Laboratory were last operated in 1990 and are currently in the process of being cleaned out in preparation for decommissioning. Some staff would need to be added eventually, but the use of these facilities would not have a notable net impact upon employment or the regional economy.

4.3.6.6.2 Air Quality

Savannah River Site

Incident-Free Nonradiological Emissions

DOE has analyzed the expected nonradiological emissions from its chemical separations facilities at the Savannah River Site in the Programmatic SNF&INEL Final EIS (DOE, 1995c). All estimated emissions would be small increases over baseline site-wide totals and within regulatory limits (DOE, 1995c).

Incident-Free Radiological Emissions

DOE has analyzed the expected airborne radiological emissions from the Savannah River Site chemical separations facilities in the Interim Management of Nuclear Materials EIS (DOE, 1995a). These radiological emissions are presented in Table 4-44 (Grainger, 1995). The health effects from these airborne emissions are discussed in Section 4.3.6.6.4 below.

Table 4-44 Annual Incident-Free Airborne Radiological Emissions at the Savannah River Site that Contribute to the Offsite Dose[a]

Element	*Ci/yr*
Tritium	57.8
Cesium-134	0.002
Cesium-137	0.12
Curium-242/244	0.12
Cerium-144	0.0059
Americium-241	0.016
Cobalt-60	0.000000053
Plutonium-238	0.078
Plutonium-239	0.020
Strontium-89/90	0.17
Iodine-131	0.0053
Uranium-235/238	0.039
Antimony-125	0.018
Ruthenium-106	0.20

[a] *Krypton-85 would be released at an estimated rate of 120,000 Ci/yr*

Source: Grainger, 1995

Krypton-85 emissions are not included in Table 4-44 because these releases are not normally measured or calculated. The health effects resulting from krypton-85 releases are very low compared to those resulting from other isotopes that are being measured. Krypton is an inert gas with no affinity for biological systems, so it does not adhere to the lungs if inhaled. The radioactive isotope of krypton would cause such a low level of harm to the population near the Savannah River Site because it remains in the human body for only very brief periods of time. The total amount of krypton-85 that would be contained in all of the

aluminum-based foreign research reactor spent nuclear fuel is conservatively estimated to be 1.5 x 10^6 curies. Assuming this is released gradually over the 12-year reprocessing period, the annual emission rate would be 1.2 x 10^5 curies per year.

Idaho National Engineering Laboratory

Incident-Free Nonradiological Emissions

DOE has analyzed the expected nonradiological emissions from its chemical separations facilities at the Idaho National Engineering Laboratory in the Programmatic SNF&INEL Final EIS (DOE, 1995c). All estimated emissions are within regulatory limits (DOE, 1995c).

Incident-Free Radiological Emissions

DOE has also analyzed the expected radiological emissions from the Idaho National Engineering Laboratory chemical separations facilities in the Programmatic SNF&INEL Final EIS (DOE, 1995c). These are presented in Table 4-45. The radiological emission rates were estimated using conservative engineering calculations based on knowledge of the proposed activity. These emission rates are representative of emissions that could occur during Implementation Alternative 6 at the Idaho National Engineering Laboratory. Human health consequences are discussed in Section 4.3.6.6.4.

Table 4-45 Annual Incident-Free Airborne Radiological Emissions at the Idaho National Engineering Laboratory

Element	*Ci/yr*
Tritium + Carbon-14	3,100
Cesium-134 + Cesium-137	0.18
Cobalt-60	0.0000019
Plutonium	0.0077
Strontium-90 + Yttrium-90	0.058
Krypton-85	500,000
Antimony-125	16
Iodine-129 + Iodine-131	0.44
Others	0.21

Source: DOE, 1995b

4.3.6.6.3 Water Quality

Savannah River Site

DOE has analyzed the expected liquid radiological releases from the Savannah River Site chemical separations facilities in the Interim Management of Nuclear Materials EIS (DOE, 1995a). These releases are presented in Table 4-46 (Grainger, 1995). The health effects from these liquid releases are discussed in Section 4.3.6.6.4 below.

Idaho National Engineering Laboratory

Chemical separation activities at the Idaho National Engineering Laboratory would not affect water quality because the facility designs would prevent any accidental or incident-free discharge of liquid effluents (DOE, 1995c).

Table 4-46 Annual Incident-Free Liquid Radiological Releases at the Savannah River Site

Element	Ci/yr
Tritium	1.29
Strontium-89/90	0.013
Ruthenium-103/106	0.012
Cesium-137	0.033
Promethium-147	0.045

4.3.6.6.4 Occupational and Public Health and Safety

Potential exposures to workers and the public due to chemical separation activities were analyzed at both the Savannah River Site and the Idaho National Engineering Laboratory (DOE, 1995c). To estimate health effects, this analysis defined three receptor groups:

- onsite workers assigned to operations involving spent nuclear fuel,
- 1994 offsite population residing within an 80-km (50-mi) radius of the chemical separation facilities (exposure via air), and
- offsite population whom management site surface-water emissions could affect.

Each of these three receptor groups would receive an annual maximum individual dose and an annual population dose. The maximally exposed worker dose would be limited by regulation to 5,000 mrem per year, as in the basic implementation of Management Alternative 1.

Savannah River Site

Incident-Free Impacts at the Savannah River Site

The highest estimated incident-free dose rates for conventional chemical separation operations at the Savannah River Site are presented in Table 4-47 (DOE, 1995a). These chemical separation operations could include activities related to blending the separated HEU down to LEU and converting all LEU into an oxide suitable for long-term storage. Values in Table 4-47 represent the estimated dose rates due to these activities, including actual chemical separation, blending down, and conversion to oxide. Multiplying these values by the estimated program duration of 13 years yields the doses presented in Table 4-48. These doses are converted into risks of LCF by applying the appropriate conversion factors and these results are also presented in Table 4-48. If the HEU were not blended down, but rather converted directly to oxide, the worker population dose would be higher because the conversion to oxide would take place in the Uranium Solidification Facility. In this facility, the workers would be closer to the uranium.

Table 4-47 Incident-Free Radiation Dose Rates Due to Chemical Separation at the Savannah River Site

	Maximum Individual Dose Rate (mrem/yr)	Population Dose Rate (person-rem/yr)
Public		
Via Air	0.66	27
Via Water	0.0098	0.033
Workers	5,000[a]	21

[a] *Assumed to be equal to the regulatory limit*

Table 4-48 Radiological Health Impacts Due to Incident-Free Chemical Separation Operations at the Savannah River Site

	Maximum Individual Dose (mrem)	*Maximum Individual Risk (LCF)*	*Population Dose (person-rem)*	*Population Risk (LCF)*
Public				
Via Air	8.6	0.0000043	351	0.18
Via Water	0.13	6.4×10^{-8}	0.43	0.00021
Workers	65,000	0.026	273	0.11

These risks must be combined with the risks of receiving/unloading the casks. Risks to the public were presented earlier in this chapter in Table 4-8. The risks of storage at RBOF are also presented, but they are very low compared to those of receipt/unloading. Assuming the foreign research reactor spent nuclear fuel would be received at RBOF for the full 13 years, the public MEI and population risks would be 7.1×10^{-10} LCF and 0.000036 LCF, respectively. These risks are much lower than the corresponding values in Table 4-48.

The handling-related risks to workers were presented earlier in this chapter. Under the conservative assumptions in the basic implementation of Management Alternative 1, the maximally exposed worker risk due to handling could be as high as 0.026 LCF which is equal to the 0.026 LCF in Table 4-48.

For the public, the estimated MEI risk from incident-free chemical separation activities would be 0.0000043 LCF. This risk means that an individual who lives at the Savannah River Site boundary would have an additional chance of less than one in one hundred thousand of incurring an LCF.

The handling-related worker population risk at RBOF is 0.10 LCF (see Table 4-14). This must be added to the 0.11 LCF from Table 4-48 to obtain the estimate of worker population risk due to chemical separation of foreign research reactor spent nuclear fuel. The estimated population risk for workers, including the handling-related risk, is 0.21 LCF, so there would be an approximately 21 percent chance of one additional LCF among the radiation workers.

The estimated total public population risk from chemical separation activities would be 0.18 LCF (see Table 4-48), which means that there would be an approximately 18 percent chance of one additional LCF among the population residing around the Savannah River Site due to incident-free chemical separation activities.

Impacts of Chemical Separations Accidents at the Savannah River Site

DOE has analyzed the impacts of reasonably identifiable accidents due to chemical separation activities at the Savannah River Site (DOE, 1995a), including a hydrogen explosion in a high-level waste tank, an unpropagated fire in a solution vessel, two kinds of inadvertent transfers of solutions, a coil and tube failure in the cooling system, a nuclear criticality, a "red oil" explosion, a severe earthquake, and a tornado. The annual risks for the accident with the highest estimated combination of frequency and consequence are presented in Table 4-49. The most severe accident scenario is an unpropagated fire in a solution vessel. Multiplying these results by the estimated program duration of 13 years yields the risks presented in Table 4-50.

Table 4-49 Annual Impacts of Chemical Separation Accidents at the Savannah River Site

	Accident Frequency (per year)	Consequences (LCF)		Risks (LCF/yr)	
		Maximum Individual	Population	Maximum Individual	Population
Unpropagated Fire					
• Public	0.02	0.00018	1.3	0.0000036	0.026
• Workers	0.02	0.00086	---	0.000017	---

Table 4-50 Impacts of Accidents During Chemical Separation Operations at the Savannah River Site

	Maximum Individual Risk (LCF)	Population Risk (LCF)
Public	0.000047	0.34
Workers	0.00022	---

These results indicate that the estimated public MEI risk due to the chemical separation accidents is 0.000047 LCF. The estimated public population risk due to chemical separation accidents is 0.34 LCF. These risks must be combined with the risks of receiving/unloading and temporarily storing the foreign research reactor spent nuclear fuel, which were presented in Table 4-24. Assuming the foreign research reactor spent nuclear fuel would be received/unloaded and stored at RBOF for 13 years, the public MEI and population risks would be 0.0000026 LCF and 0.096 LCF, respectively.

The maximum of the two estimated accident-related MEI risks is 0.000047 LCF. This means that this hypothetical individual would have an additional chance of incurring an LCF of less than one in ten thousand.

The sum of the two population risks is 0.43 LCF. This means there would be an approximately 43 percent chance that one additional LCF would occur in the public population near the Savannah River Site due to accident conditions.

Idaho National Engineering Laboratory

Incident-Free Impacts at Idaho National Engineering Laboratory

The incident-free radiation dose rates for chemical separation at the Idaho National Engineering Laboratory are presented in Table 4-51 (DOE, 1995c). Multiplying these values by the estimated program duration of 12 years yields the doses presented in Table 4-52. These doses are converted into risks of LCF by applying the appropriate conversion factors and these results are also presented in Table 4-52.

Table 4-51 Incident-Free Radiation Dose Rates due to Chemical Separation at the Idaho National Engineering Laboratory

	Maximum Individual Dose Rate (mrem/yr)	Population Dose Rate (person-rem/yr)
Public		
Via Air	0.048	0.39
Via Water	0.0	0.0
Workers	5,000[a]	18

[a] *Assumed to be equal to the regulatory limit*

Table 4-52 Radiological Health Impacts Due to Incident-Free Chemical Separation Operations at the Idaho National Engineering Laboratory

	Maximum Individual Dose (mrem)	*Maximum Individual Risk (LCF)*	*Population Dose (person-rem)*	*Population Risk (LCF)*
Public				
Via Air	0.58	2.9×10^{-7}	4.7	0.0024
Via Water	0.0	0.0	0.0	0.0
Workers	60,000	0.024	216	0.086

These risks must be combined with the risks of receiving/unloading the casks. Risks to the public were presented earlier in this chapter in Table 4-9. The risks of storage are also presented, but they are very low compared to those of receipt/unloading. Assuming the foreign research reactor spent nuclear fuel would be received at FAST for the full 13 years, the public MEI and population risks would be 2.5×10^{-9} LCF and 0.000021 LCF, respectively. These risks are much lower than the corresponding values in Table 4-52.

The handling-related risks to workers were presented earlier in this chapter. Under the conservative assumptions in the basic implementation of Management Alternative 1, the maximally exposed worker risk due to handling could be as high as 0.026 LCF which is higher than the 0.024 LCF in Table 4-52.

For the public, the estimated MEI risk due to incident-free chemical separation activities at the Idaho National Engineering Laboratory is less than one millionth of an LCF, which means that an individual who lives at the Idaho National Engineering Laboratory boundary would have an additional chance of less than one in a million of incurring an LCF.

The handling-related worker population risk at the Idaho National Engineering Laboratory is 0.10 LCF, from Table 4-15. This must be added to the 0.086 LCF from Table 4-52 to obtain the estimate of worker population risk due to incident-free chemical separation of foreign research reactor spent nuclear fuel, 0.19 LCF. This is near zero, so zero LCF would be expected among the radiation workers.

The estimated total public population risk at the Idaho National Engineering Laboratory is about 0.0024 LCF, which is much less than one LCF.

Impacts of Chemical Separation Accidents at the Idaho National Engineering Laboratory

DOE has analyzed the impacts of reasonably identifiable accidents due to chemical separation activities at the Idaho National Engineering Laboratory (DOE, 1995c). The accident with the highest estimated combination of frequency and consequence would be an inadvertent nuclear criticality during chemical separation. The accident frequency, consequences, and annual risks for this accident are presented in Table 4-53. Multiplying these results by the estimated program duration of 12 years yields the risks presented in Table 4-54.

Table 4-53 Annual Impacts of Chemical Separation Accidents at the Idaho National Engineering Laboratory

	Accident Frequency (per/yr)	*Consequences (LCF)*		*Risks (LCF/yr)*	
		Maximum Individual	*Population*	*Maximum Individual*	*Population*
Inadvertent Criticality					
Public	0.001	0.000025	0.0028	2.5×10^{-8}	0.0000028
Workers	0.001	0.0036	---	0.0000036	---

Table 4-54 Impacts of Accidents During Chemical Separation Operations at the Idaho National Engineering Laboratory

	Maximum Individual Risk (LCF)	*Population Risk (LCF)*
Public	3.0×10^{-7}	0.000034
Workers	0.000044	---

The highest estimated public MEI risk is 3.0×10^{-7} LCF, which means that an individual living at the management site boundary would have an additional chance of incurring an LCF of less than one in a million.

The highest estimated public population risk is 0.000034 LCF, which is much less than one LCF.

4.3.6.6.5 Waste Management

Savannah River Site

DOE has analyzed the wastes that would be generated from the aluminum-based foreign research reactor spent nuclear fuel and from an additional inventory of aluminum-based spent nuclear fuel during chemical separation activities. High-level waste, saltstone, transuranic waste, hazardous/mixed waste, and low-level waste would be generated under this implementation subalternative. All these wastes would be managed along with similar wastes at the Savannah River Site. The alternatives for managing all DOE wastes have been evaluated in the Draft Waste Management Programmatic EIS (DOE, 1995b).

The estimates of waste volumes that would be generated under this implementation subalternative are based on comparisons with similar operations on similar spent nuclear fuels. These aluminum-based spent nuclear fuel elements are similar to DOE's Mark 16/22 spent nuclear fuel elements at the Savannah River Site.

High-level liquid waste would be transferred to the F/H-Area Tank Farm for volume reduction and then to the Defense Waste Processing Facility for conversion into a borosilicate glass form suitable for prolonged storage. The high-level glass waste that would result from chemically separating the 18.2 MTHM (approximately 17,800 elements) of foreign research reactor spent nuclear fuel in this implementation subalternative would fill about 72 canisters (Dupont, 1996). Scaling this result up to include the total inventory of 51 MTHM yields an estimate of about 200 canisters. These canisters would be managed with the estimated 5,717 canisters that the Savannah River Site expects to produce from the existing onsite inventory of liquid high-level waste (WSRC, 1995). Each canister will contain approximately 40,000 curies of radioactivity (DOE, 1994a). The representative radionuclide composition of the waste glass is presented in Table 2.11 of the Integrated Data Base Report-1993 (DOE, 1994a). The radionuclides that contribute most of the radioactivity would be cesium-137, strontium-90, and their daughters. DOE expects that this waste form would be acceptable for disposal in a geologic repository.

Saltstone would be produced during the vitrification of high-level waste at the Defense Waste Processing Facility. An estimated 4,000 m^3 (140,000 ft^3) would be generated from the 18.2 MTHM of foreign research reactor spent nuclear fuel and would be disposed of onsite (Dupont, 1996). Scaling this result up to include the total inventory of 51 MTHM yields an estimate of about 11,300 m^3 (400,000 ft^3). This is much less than the maximum estimated cumulative saltstone to be generated at the Savannah River Site during the 10-year period from 1995 through 2004, which would be 625,211 m^3 (about 22,000,000 ft^3) (DOE, 1994b). The saltstone would contain far less radioactivity than the high-level waste glass: approximately 0.1 curie per cubic meter (DOE, 1994a). The approximate composition of the saltstone in

terms of specific radionuclides is presented in Table C.5 of the Integrated Data Base Report-1993 (DOE, 1994a). The radionuclides that contribute most of the radioactivity would be promethium-147 until about 2000, then strontium-90 and its daughter thereafter.

Transuranic waste would not be generated during the chemical separation activities of foreign research reactor spent nuclear fuel (DOE, 1995a). The trace amounts of transuranic elements would not be removed from the waste stream, so they would be included in the high-level waste. If the Taiwan Research Reactor spent nuclear fuel (included in the total inventory of 51 MTHM) is chemically separated and the transuranic elements removed, then an estimated 832 m^3 (about 29,400 ft^3) of transuranic waste would be generated (DOE, 1995a). This is much less than the maximum estimated cumulative transuranic waste to be generated at the Savannah River Site during the 10-year period from 1995 through 2004, which would be 9,426 m^3 (about 333,000 ft^3) (DOE, 1994b).

Hazardous/mixed waste would also be produced under this implementation subalternative. An estimated 104 m^3 (about 3,700 ft^3) would be generated during 13 years of chemical separation operations (DOE, 1995a). This is much less than the maximum estimated cumulative mixed waste to be generated throughout the entire Savannah River Site during the 10-year period from 1995 through 2004, which would be 14,720 m^3 (about 520,000 ft^3) (DOE, 1994b).

Solid low-level waste would also be produced under this implementation subalternative. An estimated 74,000 m^3 (about 2,600,000 ft^3) would be generated during 13 years of chemical separation operations (DOE, 1995a) and would be disposed of onsite. This is much less than the maximum estimated cumulative low-level waste to be generated throughout the entire Savannah River Site during the 10-year period from 1995 through 2004, which would be 397,177 m^3 (about 14,000,000 ft^3) (DOE, 1994b).

Idaho National Engineering Laboratory

DOE has also analyzed the wastes that would be generated from the foreign research reactor spent nuclear fuel and from an additional inventory of spent nuclear fuel during chemical separations activities at the Idaho National Engineering Laboratory. High-level waste, low-level grout, transuranic waste, hazardous/mixed waste, and low-level waste would be generated under this implementation subalternative. All these wastes would be managed along with similar wastes at the Idaho National Engineering Laboratory. The alternatives for managing all DOE wastes have been evaluated in the Draft Waste Management Programmatic EIS (DOE, 1995b).

The estimates of waste volumes that would be generated under this implementation subalternative are based on comparisons with similar operations on similar spent nuclear fuels. For 12 MTHM of aluminum-based foreign research reactor spent nuclear fuel, 56 canisters of high-level waste glass would be generated (Denney, 1995). Scaling up to the 19.2 MTHM of foreign research reactor spent nuclear fuel yields 90 canisters. Scaling up further to the total inventory of 65 MTHM yields an estimate of about 300 canisters. These canisters would be managed along with the estimated 8,500 canisters Idaho National Engineering Laboratory expects to produce from the existing inventory of high-level waste onsite (DOE 1995b). Although the waste form has not been determined yet, each canister is estimated to contain approximately 22,000 curies of radioactivity (DOE, 1994a). The composition of the waste form in terms of specific radionuclides has not been determined yet, but it is reasonable to expect it to be similar to that of the glass at the Savannah River Site. DOE expects that the waste form would be acceptable for disposal in a geologic repository.

Another possibility exists if large quantities of nonaluminum-based spent nuclear fuels are being chemically separated in these facilities. Some aluminum is necessary to produce the stable waste form, and the 18.2 MTHM of aluminum-based foreign research reactor spent nuclear fuel could satisfy this requirement. In this case, the chemical separation of the aluminum-based spent nuclear fuel would not increase the number of canisters that would be generated at the Idaho National Engineering Laboratory.

The estimates of low-level waste grout that would be generated under this implementation subalternative are also based on comparisons with similar operations on similar spent nuclear fuels. For 12 MTHM of aluminum-based foreign research reactor spent nuclear fuel, 1,280 m^3 (about 45,000 ft^3) of low-level waste grout would be generated (Denney, 1995). Scaling up to the 19.2 MTHM of foreign research reactor spent nuclear fuel in this implementation subalternative yields about 2,000 m^3 (70,629 ft^3). Scaling up further to the total inventory of 65 MTHM yields an estimate of about 6,900 m^3 (about 245,000 ft^3). This grout would be managed along with the other grout the Idaho National Engineering Laboratory would produce onsite. The grout is expected to contain far less radioactivity than the high-level waste glass/ceramic: much less than one curie per cubic meter. The composition of the grout in terms of all the specific radionuclides has not been determined yet, but the major radioactive constituents would be cesium-137 and strontium-90. The cesium-137 and strontium-90 concentrations in the grout are expected to be about 0.034 and 0.0093 curies per cubic meter, respectively (Bendixsen, 1995).

Transuranic waste would not be generated during chemical separation of the foreign research reactor spent nuclear fuel. Furthermore, the Idaho National Engineering Laboratory would not separate the transuranic elements from the Taiwan Research Reactor spent nuclear fuel if it were transported there from the Savannah River Site. Therefore, no transuranic waste would be generated during chemical separation of the additional inventory of spent nuclear fuel. The estimated amount of cumulative transuranic waste for 10 years with minimum waste management at the Idaho National Engineering Laboratory is 67,000 m^3 (about 2,400,000 ft^3) (DOE, 1995c).

Hazardous/mixed waste would also be produced under this implementation subalternative. Assuming a waste generation rate about equal to the rate at the Savannah River Site, an estimated 96 m^3 (3,400 ft^3) would be generated during 12 years of chemical separation operations. This is much less than the estimated 29,000 m^3 (1,020,000 ft^3) of cumulative hazardous and mixed waste to be generated throughout the entire Idaho National Engineering Laboratory during the next 10 years with minimum waste management (DOE, 1995c).

Solid low-level waste would also be produced under this implementation subalternative. Assuming a waste generation rate about equal to the rate at the Savannah River Site, an estimated 68,300 m^3 (2,400,000 ft^3) would be generated during 12 years of chemical separation operations and would be disposed of onsite. This is more than the estimated 47,000 m^3 (1,660,000 ft^3) of low-level waste to be generated throughout the entire Idaho National Engineering Laboratory during the next 10 years with minimum waste management (DOE, 1995c). The Idaho National Engineering Laboratory would treat the waste at the Waste Experimental Reduction Facility and send it to the Radioactive Waste Management Complex for onsite disposal.

4.3.6.7 Summary of the Impacts of Implementation Alternative 6 (Near Term Conventional Chemical Separation)

The principal impacts under this implementation alternative would be occupational and public health and safety impacts. These are presented in Table 4-55 in terms of the risk of death due to cancer during each of the four segments of this implementation alternative. It also shows, in the bottom rows, the highest of the individual risks and the total of the population risks. The marine transport, port activities, and ground

transport impacts are identical to the basic implementation of Management Alternative 1. The management site activity impacts were derived by comparing, and summing as appropriate, the handling impacts of the basic implementation of Management Alternative 1 and the impacts of chemical separation dedicated to foreign research reactor spent nuclear fuel. Each individual risk expresses the probability that the one individual with the maximum exposure in each situation would incur an LCF. The population risk expresses the estimated number of additional LCF among the entire exposed population.

Table 4-55 shows that the greatest radiological risks would occur during ground transport or management site activities. These results are based on conservative assumptions, including: (1) every package of foreign research reactor spent nuclear fuel producing a dose rate equal to the regulatory limit; (2) every truck shipment exposing people at highway rest stops for times about equal to the actual driving times; and (3) one individual at the DOE site receiving the maximum dose allowed by DOE regulation (5,000 mrem) every year.

The highest estimated incident-free individual risk is 0.026 LCF, which would apply to an onsite radiation worker. This individual would have approximately a 2.6 percent chance of incurring an LCF. DOE and the Department of State believe the actual risk would be much lower due to administrative procedures such as worker rotation. The highest estimated incident-free individual risk for members of the public is much lower than the maximally exposed worker risk. DOE estimates this risk to be approximately 0.0000043 LCF.

The highest estimated accident MEI risk is 0.000047 LCF, which applies to a hypothetical member of the public who lives at the site boundary. This individual's chance of incurring an LCF due to this alternative would be less than one in ten thousand. The accident risk to workers is discussed qualitatively in Section 4.2.4.1 under the heading, "Impacts of Accidents to Close-in Workers."

The population risks were calculated by summing the appropriate spent nuclear fuel handling risks from the basic implementation of Management Alternative 1 with the risks of chemical separation at each management site and selecting the largest value. For example, the incident-free worker population risk of 0.21 LCF is the largest sum of the risks from that estimated for spent nuclear fuel handling operations under Phase 1 of the basic implementation of Management Alternative 1 and the estimated risk due to chemical separation dedicated to foreign research reactor spent nuclear fuel at the Savannah River Site or the Idaho National Engineering Laboratory. The sum of the above risks at the Idaho National Engineering Laboratory is 0.19 LCF [0.10 LCF from Phase 1 of the basic implementation (Table 4-15) and 0.086 LCF from chemical separation], and the corresponding value at the Savannah River Site is 0.21 LCF [0.10 LCF from Phase 1 of the basic implementation (Table 4-14) and 0.11 LCF from chemical separation].

As shown in Table 4-55, the total incident-free population risk would be 0.39 LCF for the potentially exposed public, while the corresponding risk would be 0.32 LCF for workers. Thus, there would be an estimated 39 percent chance of incurring 1 additional LCF among the exposed general public, and a 32 percent chance of incurring 1 additional LCF among workers. The chance of incurring two additional LCFs among each population group would be even lower.

Deaths due to traffic accident trauma and LCF due to vehicle emissions are not included in Table 4-55. DOE and the Department of State estimate there could be about a 13 percent chance that a truck driver or member of the public could die in a traffic accident associated with this implementation alternative. This death would be unrelated to the radioactive nature of the cargo.

Table 4-55 Maximum Estimated Radiological Health Impacts of Implementation Alternative 6 (Near Term Conventional Chemical Separation)

	Risks (LCF)		
	Maximally Exposed Worker, MEI, or NPAI	Population	
		General Public	Workers
Marine Transport			
Incident-Free	0.00052	0	0.034
Accidents	5×10^{-10}	much less than 0.000029	---
Port Activities			
Incident-Free	0.00052	0	0.012
Accidents	2×10^{-10}	0.000029	---
Ground Transport			
Incident-Free	0.00052	0.21	0.065
Accidents	1.3×10^{-11}	0.00014	---
Site Activities			
Incident-Free	0.026	0.18	0.21
Accidents	0.000047	0.43	---
Highest Individual Risk			
Incident-Free	0.026	----	---
Accidents	0.000047	----	----
Total Population Risk			
Incident-Free	----	0.39	0.32
Accidents	----	0.43	----

4.3.7 Implementation Alternative 7: New Developmental Treatment and/or Packaging Technologies

The environmental impacts of the developmental treatment and/or packaging technologies cannot be estimated with confidence at this time because the technologies and procedures are still under development. Implementation of certain of these technologies would require new facilities and thus would generate all the impacts associated with construction. Appropriate NEPA documentation would be prepared to support a decision on implementation of a new technology. The developmental treatment and/or packaging technologies are described in Chapter 2, Section 2.2.2.7.

The date at which a new facility would be operational is highly uncertain. A fairly simple technology implemented in existing facilities could be operational by 2000. On the other hand, the technology development, NEPA analysis, facility construction, and startup could take about 15 years for a complex technology. Thus, DOE could choose to implement one of the accept-and-store alternatives, in parallel with this alternative to prepare the foreign research reactor spent nuclear fuel for disposal. This may be necessary because foreign research reactor spent nuclear fuel may not be accepted in a geologic repository without some form of chemical processing or treatment. The repository acceptance criteria will not be final until a repository has been licensed.

Any new facilities would be designed to meet modern standards. The new design would minimize air and water emissions and the public and worker radiation doses at least as well as existing facilities, so DOE and the Department of State expect these impacts would be somewhat lower than those presented above for the conventional chemical separation technologies.

Some rough quantitative estimates are possible on the number of canisters that would be produced by some of the developmental technologies for disposal. Table 4-56 compares these estimates to the number of canisters that would be generated by chemical separation. The estimates of numbers of canisters that would be generated by the developmental treatment and/or packaging technologies do not depend on which DOE site performs the treatment and/or packaging.

Table 4-56 Comparison of Geologic Disposal Canisters for Various Technologies

Technology	*Approximate Number of Canisters*
Conventional Chemical Separation	
at the Savannah River Site	72
at the Idaho National Engineering Laboratory	90
Developmental Packaging Technologies	
Direct Disposal in Small Packages	140
Can-in-Canister	240
Developmental Treatment Technologies	
Melt and Poison	25
Chop and Poison	25
Melt and Dilute	180
Dissolve and Poison	950
Chop and Dilute	4,900
Dissolve and Dilute	11,800

The can-in-canister concept was recently introduced (Leventhal and Lyman, 1995), but it could be possible to implement it quickly at the Savannah River Site. Most of the foreign research reactor spent nuclear fuel elements would fit in cans of approximately 10 cm diameter and 85 cm length. If all of the approximately 22,700 elements were placed in these cans, the total canned volume would be about 150 m^3. Using the can-in-canister technology, this volume of glass would be displaced from high-level waste canisters to be produced in the Defense Waste Processing Facility. Since each canister has an internal volume of 0.625 m^3, displacing 150 m^3 of glass would require the production of approximately 240 additional high-level waste glass canisters at the Defense Waste Processing Facility.

The rest of the estimates of numbers of canisters that would be generated by the developmental technologies are scaled from a study (WSRC, 1994a) of the disposition of 7.3 MTHM of aluminum-based spent nuclear fuel, up to the 18.2 MTHM of aluminum-based foreign research reactor spent nuclear fuel. The melt and poison or chop and poison technologies could produce the fewest canisters, as low as 25 canisters. The consolidate and poison technology could produce the next lowest number of canisters (about 140) among the developmental technologies analyzed. The can-in-canister, melt and dilute, dissolve and poison, chop and dilute, and dissolve and dilute technologies would produce increasing numbers of canisters, in that order. The most canisters would be produced by the dissolve and dilute technology: over 11,000 canisters. This uncertainty in the number of canisters translates into a large uncertainty in the cost of disposal. Furthermore, it is not clear which, if any, of these waste forms would be acceptable in a geologic repository.

4.4 Management Alternative 2: Facilitate the Management of Foreign Research Reactor Spent Nuclear Fuel Overseas

The basic implementation of Management Alternative 1 of the proposed action and the seven implementation alternatives to the basic implementation of Management Alternative 1 are all based on acceptance of foreign research reactor spent nuclear fuel into the United States. As discussed in Chapter 2, the two subalternatives under Management Alternative 2 facilitate overseas management of foreign

research reactor spent nuclear fuel. This section discusses their policy considerations and environmental impacts. For convenience, the two subalternatives under Management Alternative 2 are defined briefly below:

1. Subalternative 1a - Overseas storage of the foreign research reactor spent nuclear fuel with U.S. technical and/or financial assistance, and

2. Subalternative 1b - Overseas reprocessing of the foreign research reactor spent nuclear fuel with U.S. nontechnical assistance.

Under these subalternatives, no foreign research reactor spent nuclear fuel would be accepted into the United States. The United States would negotiate some form of technical assistance and/or financial incentives in return for maintaining some measure of control over the spent nuclear fuel containing uranium enriched in the United States.

4.4.1 Subalternative 1a: Overseas Storage with U.S. Assistance

Policy Considerations

The foreign research reactor spent nuclear fuel could remain in interim storage overseas. The number of foreign research reactor spent nuclear fuel management sites involved would be greater and the quality of storage technology in some countries might be lower than if the basic implementation of Management Alternative 1, or one of its seven implementation alternatives, was adopted.

The cost of this subalternative might be greater than the cost of the basic implementation of Management Alternative 1 because it might not take advantage of economies of scale. To set up a secure area and a nuclear material handling infrastructure, purchase a storage cask, transfer the spent nuclear fuel to the cask, and maintain the secure area and nuclear infrastructure for 40 years would cost tens of millions of dollars. To repeat this in several dozen countries could potentially push the total cost up into the range of hundreds of millions of dollars. Furthermore, after incurring this expense, all of the U.S. origin HEU would still be located in foreign countries where a change in government could reverse any commitment to withhold the material from production of nuclear weapons.

This subalternative would be economically attractive only in countries that already have nuclear infrastructures. In these cases, the addition of the spent nuclear fuel from research reactors to existing spent nuclear fuel inventories in storage would involve only incremental costs without all the startup costs.

If the United States does not accept any near term foreign research reactor spent nuclear fuel shipments, provision of U.S. technical and/or financial assistance for the development of safe and secure storage capabilities would help to alleviate some of the problems posed by a lack of sufficient storage capacity. However, this subalternative presents several drawbacks from a nuclear weapons nonproliferation policy standpoint. The accumulation overseas of ever larger amounts of spent nuclear fuel containing HEU poses a risk that such weapons-usable material might be illicitly diverted to a weapons program. Although U.S. assistance in maintaining adequate physical security for foreign research reactor spent nuclear fuel repositories may lessen the potential for diversion, the proliferation risks would still be greater than under the basic implementation of Management Alternative 1. As the foreign research reactor spent nuclear fuel ages, it would become less radioactive and thus a more attractive target for illicit diversion.

For countries that will not allow the indefinite storage in their territories of increasing quantities of spent nuclear fuel, this subalternative is not a viable option. Under this scenario, reactor operators in these countries, in order to avoid shutting down, might be forced to consider storing their spent nuclear fuel in other countries, where safe and secure management and material accountancy problems could exist and the risk of illicit diversion could be a concern. For example, Austria was reportedly approached by commercial interests from Belarus with an offer to store spent nuclear fuel from the ASTRA reactor for hard currency. (Since the "Offsite Fuels Policy" for HEU spent nuclear fuel expired in 1988, the Austrian government has required that for fresh fuel to enter the country, an equivalent quantity of spent nuclear fuel must be shipped out of the country.) The offer, which was rejected in support of nuclear weapons nonproliferation policies, is indicative of the scenarios that may develop as pressure builds on reactor operators to close the back end of their nuclear fuel cycle.

Impacts

There would be no environmental impacts on U.S. territory for the duration of the interim period.

4.4.2 Subalternative 1b: Overseas Reprocessing with United States Non-Technical Assistance

4.4.2.1 Overview and Policy Considerations

Foreign research reactor spent nuclear fuel could be reprocessed in foreign facilities and the resulting high-level waste vitrified or cemented. No U.S. reprocessing technology would be used in this subalternative. The inventory and conditions for management of foreign research reactor spent nuclear fuel under Subalternative 1b are the same as those under basic implementation of Management Alternative 1. The amount of HEU that would be removed from international commerce is the same as under basic implementation of Management Alternative 1 [4.6 metric tons (5.1 tons)]. To be consistent with U.S. nuclear weapons nonproliferation policy, however, bilateral agreements would have to be established with one or more foreign governments before DOE and the Department of State could consider implementation of such a subalternative.

The advantages and disadvantages of the technology used for reprocessing overseas would be essentially the same as those described for chemical separation in the United States as discussed in Section 2.2.2.6.

There are four sites in Europe at which reprocessing is conducted for commercial customers: the Marcoule and La Hague sites in France, and the Dounreay and Sellafield sites in the United Kingdom. The companies that operate these sites are strictly regulated by their government agencies. The facilities at La Hague and Sellafield are dedicated to oxide spent nuclear fuel from commercial reactors and are not likely candidates for reprocessing the metallic foreign research reactor spent nuclear fuel. All four of these sites routinely release small quantities of radionuclides into the environment and produce radioactive wastes. For example, in 1993 the releases from the Dounreay facility to the North Sea included 2.7 Ci of total alpha activity, 220 Ci of beta activity excluding tritium, and 27 Ci of beta activity from tritium. These releases represented 13 percent, 7.2 percent, and 0.8 percent of the applicable regulatory limits (Jones et al., 1994). The radionuclides released into the atmosphere and into a river or sea would flow across international boundaries. These releases would cause a small, unmeasurable increase in world-wide natural background radiation levels. The transport of vitrified high-level waste away from the reprocessing facility would also produce environmental impacts on foreign territory and possibly in international waters.

Since the United States does not encourage the development of reprocessing capabilities overseas, DOE and the Department of State would only consider this subalternative in France or the United Kingdom where the capability already exists. Reprocessing would most likely take place (as it already has in several instances) at the Dounreay facility—the sole facility currently willing and able to reprocess foreign research reactor spent nuclear fuel. France's facility in Marcoule does reprocess spent nuclear fuel from French research reactors, but does not currently accept such spent nuclear fuel from other nations for reprocessing.

The British and French regulatory agencies require the customer to accept the wastes as a condition of reprocessing spent nuclear fuel, so this option would be unavailable to those countries lacking the technical or legal capability to store or dispose of high-level waste. Alternatively, the United States might consider accepting the wastes from reprocessing.

4.4.2.2 Waste Generation at the Foreign Reprocessing Site

Reprocessing the foreign research reactor spent nuclear fuel would produce two distinct streams: the uranium and the waste products.

For spent nuclear fuel containing HEU, the HEU would be blended down to LEU at the reprocessing facility. If the LEU were then shipped to the United States, the resulting environmental impacts would be no greater than for ordinary nonhazardous cargo because LEU produces such a small radiation dose rate.

The British and French have decades of experience in conditioning nuclear waste at their four reprocessing facilities. In recent years, they have greatly reduced the volumes of wastes that require disposal. Both nations use the same technology for vitrifying their high-level waste, and both nations produce the same size high-level waste glass canister: 0.15 m^3 (5.3 ft^3). These canisters of high-level waste glass are expected to be suitable for disposal in geologic repositories. As of September 1993, France and the United Kingdom had filled more than 2,100 and 350 canisters with high-level waste glass, respectively (Masson, et al., 1994).

As a general rule, European reprocessing and vitrification of about 8 to 10 MTHM of spent nuclear fuel would generate about 1 m^3 (35.3 ft^3) of high-level waste in glass form (UKAEA, 1994; Masson, et al., 1994). Thus, if all 19.2 MTHM of the foreign research reactor spent nuclear fuel were reprocessed and vitrified overseas, DOE and the Department of State estimate that the total volume of vitrified high-level waste would be only about 2.4 m^3 (85 ft^3). DOE and the Department of State estimate that the high-level waste from reprocessing all the foreign research reactor spent nuclear fuel would fill about 16 European-sized canisters. For reference, this volume of glass waste would fill four American-sized canisters.

4.4.2.3 Removal of Waste from the Reprocessing Site(s)

The British and French governments do not accept responsibility for ultimate disposal of the high-level waste glass canisters for foreign customers. Both nations require that disposal of the high-level waste glass canisters and any other wastes generated during reprocessing of their spent nuclear fuel, including low-level waste, be the responsibility of the nation(s) hosting the reactors. At the Dounreay Site, however, only small amounts of low-level waste have been generated during reprocessing of spent nuclear fuel from research reactors. Many nations with foreign research reactors, however, do not have any capabilities to accept the high-level waste glass canisters. The United States may accept the intact foreign research reactor spent nuclear fuel from these nations while simultaneously encouraging the nations which can

accept the canisters to reprocess their foreign research reactor spent nuclear fuel under the conditions noted in Section 4.4.2.1. This would be a combination of the basic implementation of Management Alternative 1 and Subalternative 1b (overseas reprocessing) of Management Alternative 2.

As another option under this subalternative, if the host nations cannot accept this responsibility, the United States would commit to accept the high-level waste glass canisters. This could provide the incentive necessary to convince reactor operators to cooperate with the RERTR program and to use LEU in their reactors. Some nations may refuse to reprocess or require the United States to take title to the foreign research reactor spent nuclear fuel prior to reprocessing.

DOE and the Department of State could begin accepting canisters into the United States within the first 10 years, or DOE and the Department of State could specify that they be stored at the reprocessing facility for decades. If the canisters were accepted in the near term, they would most likely be stored at the Savannah River Site because this site has already built a new storage facility with a capacity of 2,286 canisters. If the canisters were stored overseas for decades, then they would be transported directly to the geologic repository.

Marcoule produces vitrified waste, similar to U.S. vitrified waste. In the United Kingdom on the other hand, as a result of a different regulatory structure, the wastes from reprocessing of research reactor spent nuclear fuel are classified as intermediate-level radioactive wastes. (In the United States, these same materials would be classified as high-level radioactive wastes.) In the United Kingdom, the intermediate-level wastes are mixed with a special cement and poured into steel drums, which can then be buried. This waste form is dissimilar to the vitrified borosilicate glass high-level waste form that is expected to be produced in the United States, and is incompatible with United States radioactive waste disposal standards. The government of the United Kingdom might allow an exchange of vitrified commercial waste from Sellafield for cemented waste from Dounreay, which might allow the United States to accept vitrified high-level waste from the United Kingdom.

Transportation of vitrified high-level waste must conform to U.S. Department of Transportation (49 CFR Part 173) and NRC (10 CFR 71) regulations. Under this option, the European-sized glass canisters would be transported in "Type B" casks, which provide a high degree of assurance that cask integrity will be maintained with essentially no loss of radioactive contents or serious impairment of the shielding capability provided by the cask, even in severe accidents. DOE has prepared initial designs for a defense high-level waste cask for truck transportation of the Savannah River Site high-level waste. As initially designed, the defense high-level waste cask uses a solid body concept to absorb energy during an accident and normal transportation conditions. To minimize the exposure to gamma radiation, shielding would be provided by a depleted uranium liner inside the cask body. (Gamma radiation is high-energy, short wavelength electromagnetic radiation with properties similar to x-rays.) The regulatory limit for radiation dose rate outside the cask is 10 mrem per hour at 2 m (6.6 ft) from the edge of the vehicle. Casks transported under this option are assumed to emit this level of radiation. Currently, however, no casks for shipping high-level waste canisters by truck or rail have been certified by the NRC.

Each of these "Type B" casks would be large enough to hold two European-sized glass canisters. Thus, the option of overseas reprocessing with acceptance of approximately 16 high-level waste glass canisters would require about 8 cask shipments into the United States (versus 721 cask shipments by sea and 116 by land under the basic implementation of Management Alternative 1). Vitrified high-level waste shipments would use the same East Coast port(s) identified in Chapter 2 for foreign research reactor spent nuclear fuel. The same procedures and representative overland routes analyzed for foreign research reactor spent

nuclear fuel would apply to these shipments of vitrified high-level waste. The management site for these canisters would be the Savannah River Site. Alternatively, they might be transported directly to the candidate geologic repository at Yucca Mountain, NV.

Each of the eight casks is assumed to contain the waste products associated with one-eighth of the foreign research reactor spent nuclear fuel under the basic implementation of Management Alternative 1.

Marine Transport Impacts

Risks under Subalternative 1b were assessed using the same methodology used to evaluate risks associated with the transport of the foreign research reactor spent nuclear fuel. The major differences in the analysis are the number of cask shipments and the isotopic content within each transportation cask.

Impacts of Incident-Free Marine Transport

As with the shipment of foreign research reactor spent nuclear fuel, the primary impact of incident-free marine shipping of vitrified waste would be upon the crews of the ships. Most of the assumptions used in the analysis of the crew exposure to the spent nuclear fuel (see Section 4.2.2.2) have been used to analyze the impact of the shipment of vitrified waste. The primary contribution to the crew dose would come from the daily cargo inspection activities. Three crew members have been modeled as performing the inspections and the same three crew members are assumed to perform this task for the entire voyage. For the purposes of this analysis it has been assumed that the vitrified waste would be transported on a chartered vessel, there would be no intermediate port calls, and the shipment would originate in Europe (either the United Kingdom or France.)

As in the spent nuclear fuel analysis, either two or eight casks are assumed to be on each single voyage. This assumption results in exposure to two radiation fields during all activities that bring crew members into the vicinity of the transportation casks. Should all the casks be shipped at once, this assumption is equivalent to assuming that this single voyage is made with two casks per hold in one vessel. The crew risk would be the same for this single voyage as for four voyages with two casks per vessel.

Results of the marine incident-free risk analysis are presented in Table 4-57. Due to the reduced number of cask shipments, compared to the approximately 721 marine cask shipments of foreign research reactor spent nuclear fuel under the basic implementation of Management Alternative 1, the risks to the crew would be approximately 2 orders of magnitude lower than those calculated in Section 4.2.2.2 for the basic implementation of Management Alternative 1. The doses to the crew, including the maximally exposed worker, would be well below the DOE and NRC limits for public exposure of 100 mrem per year. If, however, all the casks were shipped in 1 year (perhaps all on one ship), then the maximally exposed worker dose would exceed the limit of 100 mrem per year. In this case, new inspectors would be used to keep each individual's dose below the limit.

Table 4-57 Incident-Free Marine Transport Impacts (Subalternative 1b)

	Maximally Exposed Worker Dose (mrem)	*Maximally Exposed Worker Risk (LCF)*	*Population Dose to Crew (person-rem)*	*Population Crew Risk (LCF)*
Per voyage (2 casks)	53	0.000021	0.19	0.00007
Entire program	210	0.000084	0.74	0.00030

Impacts of Accidents During Marine Transport

If the ship carrying a cask of vitrified waste were to catch fire at sea and the cask was sufficiently damaged by fire to release its contents, members of the ship's crew near the fire would be exposed to the released radioactive material. Any resulting plume carrying radioactive particles would disperse over the ocean, where there is no human population. Therefore, the ship's crew would be the only people exposed to the released radioactive material. The number of ship's crew members is considerably smaller than the population modeled within a short distance of an accident that occurs in the port. Therefore, consequences of a shipboard accident resulting in the release of radioactive material in a plume would be covered by the consequences of the accidents considered in the port analysis. As discussed below, because the oceans are a very dilute system, effects on marine biota would not be discernible.

If a collision or other accident (e.g., loss of a cask over the side in a storm) occurred in which an intact cask fell overboard, the fact that the cask would be immersed would not necessarily result in a release of its contents. Spent nuclear fuel casks are designed to withstand at least a 15-m (50-ft) immersion, and it has been demonstrated that the cask seals will remain intact at much greater depths (IAEA, 1990). Spent nuclear fuel casks, damaged or undamaged, can be recovered from water up to 200 m (660 ft) deep: well beyond the range typical of coastal and port depths. (Recovery at great depths, e.g., more than 2,000 m or 6,600 ft, is possible, but would be costly). It is reasonable to believe that a cask would be recovered in any incident involving the immersion of a cask in waters up to 200 m (660 ft) in depth.

The Nuclear Energy Agency of the Organization for Economic Cooperation and Development, Paris, France, estimated the impacts of various accident scenarios involving shipment of reprocessed commercial spent nuclear fuel. The Nuclear Energy Agency estimated that a damaged and unrecovered cask of high-level waste in coastal waters would result in a peak individual human dose of 6.5 mrem per year per MTHM (NEA, 1988). Dose and exposure estimates that follow are based on the estimates generated in the Nuclear Energy Agency study and are modified to take into account the content of the casks based on the shipment of all material from the foreign research reactor spent nuclear fuel program in eight cask shipments.

In the most extreme situation, where the accident occurs in coastal waters, the spent nuclear fuel is not recovered, and the cask is damaged, the peak dose to an individual human is estimated to be 19 mrem per year. The individual is assumed to reside near the shore and ingest seafood (fish, mollusk, and seaweed) harvested from the area in the immediate vicinity of the vitrified waste transportation cask. (For an initially intact cask, the dose would be expected to be considerably lower, approximately 0.3 mrem per year.) Peak biota doses are estimated at 0.8 mrad per year for fish, 0.9 mrad per year for crustaceans, and 19 mrad per year for mollusks, if the cask were damaged and not retrieved from coastal waters. With cask retrieval, both the peak dose to an individual and the biotic impacts would be considerably smaller. The results for the loss and failure of a single cask are lower than the peak impacts for the loss and failure of a single spent nuclear fuel cask (see Section 4.2.1.3), principally due to the lower leach rate for vitrified waste (see Appendix C).

In deep waters, the radioactive constituents of the vitrified waste would be released slowly over time into the surrounding waters if the cask were not recovered. Some of the radioactive material would be removed from the water by adhesion to suspended sediments. Assuming a damaged cask of vitrified high-level waste were submerged on the deep ocean bottom, the peak human individual dose to an individual residing along the coast and ingesting seafood harvested from the general area in which the breached submerged cask is located is estimated to be 0.000015 mrem per year.

Humans would not be the principally exposed species in a deep ocean accident involving vitrified waste casks. Using the Nuclear Energy Agency estimates and assuming that the damaged waste cask lay on the ocean floor where it slowly released its radioactive inventory, the peak doses to biota residing on the ocean floor in or near the uppermost sediment layer would be 0.9 rad per year for fish, 1.2 rad per year for crustaceans, and 41 rad per year for mollusks (NEA, 1988).

Harmful effects of chronic irradiation have not been observed in natural aquatic populations at dose rates less than 365 rad per year (NCRP, 1991). At doses an order of magnitude below this, as would be the case in an accident involving the vitrified waste from the foreign research reactor spent nuclear fuel, it is unlikely that either a population of marine biota or individual members of that population would be harmed by the radiation resulting from a spent nuclear fuel accident. Furthermore, no chemical hazard would be expected from the release of the contents of the vitrified waste canisters into the open ocean.

Using the same accident probabilities used in the marine transport analysis of the basic implementation of Management Alternative 1, risk estimates were developed for this subalternative. The MEI risk due to the loss of a vitrified high-level waste cask in the ocean is very low for the shipment of up to eight casks. The highest estimated risk to a human would occur in the accident scenario in which a cask is sunk and not recovered from coastal waters. This scenario would result in an MEI risk on the order of 1×10^{-10} mrem per year, which corresponds to about 2.7×10^{-15} LCF. This means that the chance of the MEI incurring one LCF due to this subalternative would be about one in one quadrillion.

Port Activity Impacts

Impacts of Incident-Free Port Activities

As with the shipment of the foreign research reactor spent nuclear fuel, the primary impact of incident-free port activities required to unload the vitrified waste casks is upon the workers: port handlers, inspectors, and port staging personnel. Most of the assumptions used in the analysis of the port worker exposure to the foreign research reactor spent nuclear fuel (see Section 4.2.2.2) have been used to analyze the impact of the shipment of vitrified waste.

Results of the port activities' incident-free risk analysis are presented in Table 4-58. Due to the reduced number of cask shipments, compared to the approximately 721 marine cask shipments of foreign research reactor spent nuclear fuel under the basic implementation of Management Alternative 1, the risks to the port workers are approximately 2 orders of magnitude lower than those calculated in Section 4.2.2.2 for the basic implementation of Management Alternative 1. The doses to the crew, including the maximally exposed worker, are well below the DOE and NRC limits for public exposure of 100 mrem per year.

Impacts of Accidents During Port Activities

The methodology used to evaluate the accident consequences and risks associated with port accidents is identical to that used to assess these items for the shipment of foreign research reactor spent nuclear fuel under the basic implementation of Management Alternative 1 (Section 4.2.2.3). The MACCS code was used with site-specific population and meteorology data to determine the consequences of an accident. The inventory (radionuclide content) of the transportation casks was determined by combining the radionuclide content of all of the vitrified waste to be returned to the United States under this subalternative and equally dividing it among the eight casks. In this analysis it was assumed that the Canadian spent nuclear fuel, which was assumed to be sent to the United States via truck in the analysis documented in Section 4.2.2.3, would be sent to Europe and reprocessed. The vitrified waste from this spent nuclear fuel is included in this analysis.

Table 4-58 Incident-Free Port Activity Impacts (Subalternative 1b)

Impacts Per Shipment				
	Maximally Exposed Worker Dose (mrem)	*Maximally Exposed WorkerRisk (LCF)*	*Population Dose (person-rem)*	*Population Risk (LCF)*
Inspectors	1.3	5.2×10^{-7}	0.0053	0.0000021
Port Handlers	0.46	1.8×10^{-7}	0.0015	0.00000061
Port Staging Personnel	0.38	1.5×10^{-7}	0.0046	0.0000018
Maximum	**1.3**	**5.2×10^{-7}**	----	----
Total	----	----	**0.011**	**0.0000042**
Impacts for the Entire Subalternative 1b				
	Maximally Exposed WorkerDose (mrem)	*Maximally Exposed Worker Risk (LCF)*	*Population Dose to Workers (person-rem)*	*Population Risk to Workers (LCF)*
Inspectors	10	4.0×10^{-6}	0.04	0.000017
Port Handlers	4	1.6×10^{-6}	0.01	0.0000048
Port Staging Personnel	3	1.2×10^{-6}	0.04	0.000015
Maximum	**10**	**4.0×10^{-6}**	----	----
Total	----	----	**0.09**	**0.000036**

The amounts of material released from the glass in various accident scenarios, called release fractions, are based on information developed for accident analysis at the Savannah River Site (DOE, 1994k). These release fractions are the same for the three accident categories analyzed for the spent nuclear fuel port accidents (the accident categories included collisions and collisions followed by fires). Therefore, these three accident categories were combined to form a single category for this analysis. Accident probabilities were developed for this single accident category at both the dock and in the approach to the dock.

Since all of the vitrified waste would be transported to the United States from Europe, only East Coast ports were selected for port-specific analysis of the accident consequences. The port accident analysis was performed for three East Coast ports: Philadelphia, PA; Charleston, SC; and MOTSU in North Carolina. These three ports represent a wide range of port city populations. As in the port accident analysis discussed in Section 4.2.2.3, these ports are not necessarily the selected ports of entry for the vitrified waste. They are intended to be representative of the range of populations, and therefore consequences, associated with all of the potential ports of entry.

Results of this analysis are presented in Table 4-59. The consequences of an accident in port involving a cask of vitrified waste would be lower than for the category 5 and 6 accidents involving the foreign research reactor spent nuclear fuel casks. This is a result of the much lower release fractions associated with the vitrified waste compared to the release fractions for the metallic spent nuclear fuel. However, for the vitrified waste, category 4 accidents result in the release of the same amount of material from the vitrified waste as the category 5 and 6 accidents. (For foreign research reactor spent nuclear fuel, category 4 accidents result in much smaller consequences.) Because the frequency of this category of accidents is two orders of magnitude higher than that for category 5 and 6 accidents, the port accident risks per single-cask shipment are higher for vitrified waste than for foreign research reactor spent nuclear fuel. The port accident population risks would be about the same order of magnitude as those under the basic implementation of Management Alternative 1 because of these category 4 accidents.

Table 4-59 Port Accident Risks (Subalternative 1b)

Port	Risk per Single-Cask Shipment of Waste		Risk of the Entire Waste Acceptance Option	
	Population Dose (person-rem)	LCF	Population Dose (person-rem)	LCF
Philadelphia	0.006	0.000003	0.05	0.00002
Charleston	0.001	0.0000007	0.01	0.000005
MOTSU	0.0005	0.0000002	0.004	0.000002

The MEI doses calculated for these accidents have a rather small variance. The largest estimated MEI dose is 740 mrem. The largest probability of one LCF (given that the accident has occurred) was 0.00035. Combining these estimates with the probability of a severity category 4 accident per shipment and the number of shipments results in an MEI risk of 1.8×10^{-8} LCF.

Ground Transport Impacts

Under Subalternative 1b, DOE and the Department of State would transport eight casks of vitrified high-level waste overland from an East Coast port(s) to a candidate geologic repository (in Nevada for example). The shipments may go directly from the port(s) to the candidate geologic repository or they might go from the ports to the Savannah River Site for storage, then from the Savannah River Site to the candidate geologic repository. Results are displayed in Figures 4-18 and 4-19.

Impacts of Incident-Free Ground Transport (Ports to Repository)

Impacts of incident-free ground transportation were analyzed in the same manner as for the basic implementation of Management Alternative 1. The dose rate near vehicles carrying vitrified waste was assumed to equal the regulatory limit of 10 mrem per hour at 2 m (6.6 ft) from the vehicle. Incident-free transportation of vitrified high-level waste was estimated to result in total latent fatalities that ranged from 0.00023 to 0.0032 over the program. These fatalities are the sum of the estimated number of radiation-related LCF to the public and the crew.

The estimated number of radiation-related LCF for transportation workers ranged from 0.0001 to 0.0008. The estimated number of radiation-related LCF for the general population ranged from 0.00009 to 0.0024, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.0001 to 0.0005. The impacts of transportation of vitrified waste canisters are described in more detail in Appendix E.

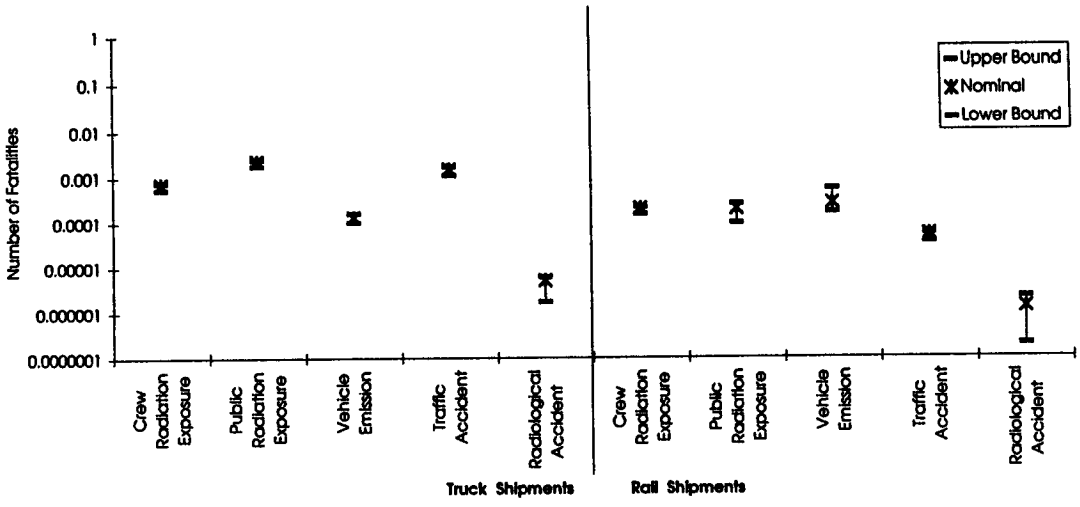
To estimate the maximally exposed ground transport worker risk, DOE and the Department of State assumed all the vitrified waste was transported during a 1-year period and one truck driver received his annual limit of 100 mrem during that year. This dose translates into a risk of 0.00005 LCF.

Impacts of Accidents During Ground Transport (Ports to Repository)

Cumulative transportation accident risks over the vitrified waste shipment program are estimated to range from 0.0000002 to 0.0000059 LCF from radiation and from 0.00003 to 0.0016 for traffic fatality, depending on the transportation mode and the port(s) selected.

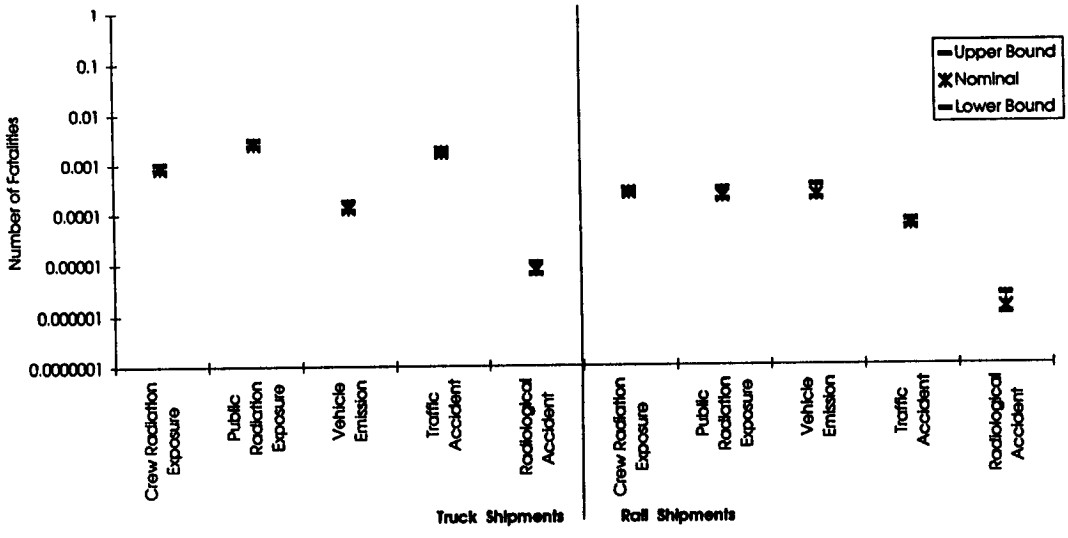
Impacts of Incident-Free Ground Transport (Ports to the Savannah River Site to Repository)

Impacts of incident-free ground transportation were analyzed in the same manner as for the basic implementation of Management Alternative 1. The dose rate from casks containing vitrified waste was assumed to equal the regulatory limit of 10 mrem per hour at 2 m (6.6 ft) from the vehicle. The



- Traffic Accidents are expressed in immediate fatalities, all other values are latent cancer fatalities

Figure 4-18 Range of Estimated Fatalities (Latent and Immediate) Under Management Alternative 2, Subalternative 1b (Ports to Repository)



- Traffic Accidents are expressed in immediate fatalities, all other values are latent cancer fatalities

Figure 4-19 Range of Estimated Fatalities (Latent and Immediate) Under Management Alternative 2, Subalternative 1b (Ports to Savannah River Site to Repository)

incident-free transportation of the vitrified high-level waste was estimated to result in total latent fatalities that ranged from 0.00041 to 0.004 over the program. These fatalities are the sum of the estimated number of radiation-related LCF to the public and the crew.

The estimated number of radiation-related LCF for transportation workers ranged from 0.00023 to 0.001. The estimated number of radiation-related LCF for the general population ranged from 0.00018 to 0.003, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.00011 to 0.00035. Impacts of transportation of vitrified waste canisters are described in more detail in Appendix E.

To estimate the maximally exposed worker risk, it was assumed that the two legs of ground transport would be separated by a long storage period. That is, the second leg (transport from the Savannah River Site to the repository) would occur at least 20 years after the first leg (transport from the ports to the Savannah River Site). Thus, one individual truck driver would probably not be involved in both legs. DOE and the Department of State further assumed that each leg would last no more than 1 year, so no individual truck driver could receive more than the annual regulatory limit of 100 mrem. This translates into a maximally exposed worker risk of 0.00005 LCF.

Impacts of Accidents During Ground Transport (Ports to the Savannah River Site to Repository)

Cumulative transportation accident risks over the vitrified waste shipment program are estimated to range from 0.000001 to 0.00001 LCF from radiation and from 0.00005 to 0.002 for traffic fatality, depending on the transportation mode and the port(s) selected.

The consequences of the maximum foreseeable offsite transportation accident are greater than those of the basic implementation of Management Alternative 1. The frequency, however, is lower due to the reduced amount of ground transport. Maximum estimated MEI risk is reduced to 7×10^{-12} LCF.

Management Site Impacts

Impacts of Incident-Free Management Site Activities

Environmental impacts associated with the receipt and storage of the vitrified high-level waste canisters under Subalternative 1b are limited to the exposure of the working crew that would handle the incoming canisters at the site. The 16 canisters of vitrified waste (approximately 0.15 m^3 or 5.3 ft^3 each) would be received in 8 shipping casks and stored at the Glass Waste Storage Building at the Savannah River Site. The facility, described in Appendix F, has been designed for vitrified waste and has space for 2,286 canisters. Vitrification of all existing liquid high-level waste at the Savannah River Site is expected to produce a total of approximately 5,717 canisters. The impact of this additional amount of glass waste on the operational characteristics of the facility would be very low.

Vitrified waste would not contain any gaseous fission products, so there is no mechanism for incident-free emissions of radioactive material. Thus, impacts to the public near the Savannah River Site under this subalternative would be equal to zero.

To estimate the maximally exposed worker dose, DOE and the Department of State assumed that all the canisters would be received during one year. This is reasonable because of the small number of cask shipments. Then DOE and the Department of State conservatively assumed that one of the workers involved in handling these shipments would receive the maximum annual dose of 5,000 mrem allowed by regulation. This dose translates into an increased risk of 0.002 LCF.

The population dose to workers handling the eight casks would be 2.6 person-rem, based on the methodology presented in Appendix F, Section F.5 for unloading and storing in a vault-type dry storage structure. This translates into a worker population risk of 0.001 LCF.

Impacts of Accidents Onsite

The addition of 16 European-sized canisters to the thousands of larger American-sized canisters is expected to increase the accident risk by a very small increment, so this increase in the risk was not specifically analyzed in this EIS. The accident analysis for the Defense Waste Processing Facility has been reported in its Final EIS (DOE, 1994e).

Since vitrified waste contains no gaseous fission products, however, it is clear that the spent nuclear fuel element breach accident scenarios are not applicable to this subalternative. Thus, the aircraft-crash-with-fire scenario would present the highest risks. The highest annual estimates of MEI/NPAI and population risks under the basic implementation of Management Alternative 1 for this accident scenario are 1.2×10^{-9} LCF and 0.0000015 LCF, respectively (see Section 4.2.4.1). DOE and the Department of State consider these estimates to cover the risks for vitrified waste because the vitrified waste is designed to be much more stable than spent nuclear fuel in all accidents. Multiplying these annual estimates by the number of years the accident might occur (30 years) yields the risks for this alternative: 3.6×10^{-8} LCF for the MEI/NPAI risk and 0.000045 LCF for the population risk.

4.4.2.4 Disposal Site Impacts

Whether the vitrified high-level waste canisters were managed at the Savannah River Site or in Europe, eventually they would be transported to a geologic repository for disposal under this subalternative. Current planning for the U.S. candidate geologic repository at Yucca Mountain in Nevada indicates that acceptance of high-level waste canisters would begin early enough that the high-level waste from foreign research reactor spent nuclear fuel could be shipped to and emplaced in the repository before the end of the interim period.

Impacts due to handling European-sized canisters at the repository would be similar to the impacts due to handling American-sized canisters. After emplacement in the disposal site, no more impacts are expected to workers, the public, or the environment for at least 10,000 years because the radioactive material would be extremely unlikely to escape from the repository.

4.4.2.5 Summary of the Impacts of Subalternative 1b

The principal impacts under Subalternative 1b would be occupational and public health and safety impacts. These impacts would be due to the acceptance of vitrified high-level waste into the United States from Europe. (If no high-level waste were accepted, then there would be no impacts on U.S. territory.) These impacts are presented in Table 4-60 in terms of the risk of death due to cancer during each of the four segments of the affected environment. It also shows, in the bottom rows, the highest of the individual risks and the total population risks. Each individual risk expresses the probability that the one individual with the maximum exposure in each situation would incur an LCF. The population risk expresses the estimated number of additional LCF among the entire exposed population.

Table 4-60 shows that the greatest radiological risks would occur during ground transport or management site activities. These results are based on conservative assumptions, including: (1) every package of high-level waste producing a dose rate equal to the regulatory limit; (2) every truck shipment exposing

Table 4-60 Maximum Estimated Radiological Health Impacts of Subalternative 1b

	Risks (LCF)		
	Maximally Exposed Worker, MEI, or NPAI	Population	
		General Public	Workers
Marine Transport			
Incident-Free	0.000084	0	0.0003
Accidents	2.7×10^{-15}	much less than 0.00002	---
Port Activities			
Incident-Free	0.000004	0	0.000036
Accidents	1.8×10^{-8}	0.00002	---
Ground Transport			
Incident-Free	0.00005	0.003	0.001
Accidents	7×10^{-12}	0.00001	---
Site Activities			
Incident-Free	0.002	0	0.001
Accidents	3.6×10^{-8}	0.000045	---
Highest Individual Risk			
Incident-Free	0.002	----	----
Accidents	3.6×10^{-8}	----	----
Total Population Risk			
Incident-Free	----	0.003	0.0027
Accidents	----	0.000075	----

people at highway rest stops for times about equal to the actual driving times; and (3) one individual at the DOE site receiving the maximum dose allowed by DOE regulation (5,000 mrem) during the 1 year of high-level waste acceptance.

The highest estimated incident-free individual risk is 0.002 LCF, which would apply to an onsite radiation worker. This individual would have a one in five hundred chance of incurring an LCF. DOE and the Department of State believe the actual risk would be much lower due to administrative procedures such as worker rotation. The highest estimated incident-free individual risk for members of the public is much lower than the maximally worker risk. DOE estimates this risk to be very nearly zero LCF.

The maximum estimated accident MEI risk is 3.6×10^{-8} LCF, which applies to a hypothetical member of the public who lives at the site boundary. This individual's chance of incurring an LCF due to this alternative would be less than one in ten million. The accident risk to workers is discussed qualitatively in Section 4.2.4.1 under the heading, "Impacts of Accidents to Close-in Workers."

The total incident-free population risk for both the general public and workers would be much less than one LCF.

Deaths due to traffic accident trauma and LCF due to vehicle emissions are not included in Table 4-60. There is about a 0.2 percent chance that a truck driver or member of the public could die in a traffic accident associated with this subalternative. This death would be unrelated to the radioactive nature of the cargo.

4.5 Management Alternative 3 - Combination of Elements from Management Alternatives 1 and 2 (Hybrid Alternative)

As discussed in Section 2.4, DOE and the Department of State could combine implementation elements from Management Alternatives 1 and 2. Analysis of this example Hybrid Alternative does not signify its preference over other possible Hybrid Alternatives.

Under this Hybrid Alternative, DOE and the Department of State would facilitate reprocessing of the foreign research reactor spent nuclear fuel at western European reprocessing facilities (i.e., Dounreay or Marcoule), as in Management Alternative 2. It is assumed that the foreign research reactor operators in countries that can accept the reprocessing waste would agree to this arrangement. DOE would accept and manage the remaining foreign research reactor spent nuclear fuel in the United States as in Management Alternative 1. (Refer to Section 2.4 for a more detailed description of this Hybrid Alternative).

Based on the current capabilities of overseas reprocessors, and for purposes of this analysis, only aluminum-based foreign research reactor spent nuclear fuel is assumed to be considered for reprocessing; all TRIGA spent nuclear fuel is assumed to be stored in the United States.

Under the Hybrid Alternative, the aluminum-based foreign research reactor spent nuclear fuel to be managed in the United States would be chemically separated at the Savannah River Site as in Implementation Alternative 6 to Management Alternative 1 (near term chemical separation in the United States), discussed in Sections 2.2.2.6 and 4.3.6. The uranium and waste products from this chemical separation would be managed as described in Sections 2.2.2.6 and 4.3.6, and the impacts of these activities would be covered by the impacts presented in those sections. The TRIGA spent nuclear fuel would be transported to the Idaho National Engineering Laboratory where it would be stored at existing storage facilities until ultimate disposition. This distribution of the spent nuclear fuel is consistent with the Programmatic SNF&INEL Final EIS (DOE, 1995c) Regionalization by Fuel Type alternative.

The environmental impacts associated with the foreign research reactor spent nuclear fuel that would be accepted into the United States, and the policy considerations of the Hybrid Alternative, are discussed below.

Policy Considerations

Under the Hybrid Alternative, up to 5.3 MTHM and about 5,600 elements of foreign research reactor spent nuclear fuel would be reprocessed overseas. The rest of the foreign research reactor spent nuclear fuel included in the basic implementation of Management Alternative 1, up to 13.9 MTHM and about 17,100 elements, would be accepted into the United States. Overall, the same amount of HEU as in the basic implementation of Management Alternative 1 would be removed from international commerce, up to about 4.6 metric tons (5.1 tons) of HEU.

4.5.1 Marine Transport Impacts

Impacts of Incident-Free Marine Transport

Impacts of incident-free marine transportation were analyzed in the same manner as for the basic implementation of Management Alternative 1. Incident-free transportation of spent nuclear fuel was estimated to result in total LCF that ranged from 0.021 to 0.024 over the 13-year duration of the acceptance program. These fatalities are the sum of the estimated number of radiation-related LCF to the ships' crews.

The range of impacts results from the analysis of shipment of the spent nuclear fuel on regularly scheduled commercial breakbulk vessels and on chartered container vessels and would be the same as for vessels analyzed under the basic implementation of Management Alternative 1. As in the basic implementation of Management Alternative 1, the difference between the two estimates is a result of the shorter vessel journey time for chartered vessels due to the intermediate port stops associated with the regularly scheduled commercial transport of the spent nuclear fuel.

The highest estimate of the incident-free maximally exposed worker risk is the same as for the basic implementation of Management Alternative 1 (0.00052 LCF for all the shipments combined).

Impacts of Accidents During Marine Transport

Population risks due to accidents under the Hybrid Alternative would be reduced from those associated with the basic implementation of Management Alternative 1 because of the reduced amount of marine transport. As before, the population risks of accidents at sea are bounded by the risk of accidents in port.

The maximum consequences of the at-sea accidents for the Hybrid Alternative are no different than those of at-sea accidents associated with the basic implementation of Management Alternative 1. For an accident involving the loss of a transportation cask in coastal waters, the maximum exposure to an individual is estimated to be 14,000 mrem per year. DOE and the Department of State would mitigate this impact, however, by recovering the cask. Due to the reduced number of cask shipments compared to the basic implementation of Management Alternative 1, the likelihood of such an accident would also be reduced. The Hybrid Alternative would require approximately 63 percent of the number of shipments required under the basic implementation of Management Alternative 1. The highest estimated risk due to an accident during marine transport would therefore be 0.00012 mrem per year peak dose to a human from the loss of a damaged cask in the deep ocean. This corresponds to an MEI risk of about 3×10^{-10} LCF. This means that this individual would have a chance of less than one in a billion of incurring an LCF due to an accident during marine transport.

4.5.2 Port Activity Impacts

Impacts of Incident-Free Port Activities

In the analysis of the basic implementation of Management Alternative 1, the radiological impact of port activities was estimated on a per-shipment basis. The Hybrid Alternative would require about 63 percent of the number of cask shipments required under the basic implementation of Management Alternative 1. The incident-free impacts of the port activities are proportionally reduced. The estimated number of LCF associated with this alternative range from 0.0021 to 0.0076. As in the marine incident-free analysis, this range of impacts is the result of the analysis of two modes of spent nuclear fuel shipment, regularly scheduled commercial breakbulk vessels and chartered container vessels.

The highest estimate of incident-free maximally exposed worker risk is the same as for the basic implementation of Management Alternative 1 (0.00052 LCF).

Impacts of Accidents During Port Activities

Port accident risks were calculated based on the per-shipment risks determined in the analysis of the basic implementation of Management Alternative 1. The analysis examined the impact of using a wide range of ports based on the population around the port city, from high density population ports such as Elizabeth, NJ, to low-density ports such as the MOTSU terminal in North Carolina. The analysis also considered the impact of chartered shipments (no intermediate port stops before the vessel reaches the spent nuclear fuel port of entry) versus regularly scheduled commercial shipments with up to two intermediate ports of call before the spent nuclear fuel port of entry. Port accident risks associated with the Hybrid Alternative are estimated to range from 2×10^{-7} to 0.00002 LCF from radiation. The range of fatality estimates is due to both the differences in port city populations and the number of intermediate port stops.

Consequences of the maximum foreseeable port accident are identical to those of the basic implementation of Management Alternative 1. The frequency is lower due to the reduced number of cask shipments, so the MEI risk is reduced to about 1×10^{-10} LCF.

4.5.3 Ground Transport Impacts

Impacts of Incident-Free Ground Transport

Radiological impacts of incident-free ground transportation were analyzed in the same manner as for the basic implementation of Management Alternative 1. The results are presented in Figure 4-20. The incident-free transportation of spent nuclear fuel was estimated to result in total latent fatalities that ranged from 0.011 to 0.15 over the 13-year duration of the acceptance program. These fatalities are the sum of the estimated number of radiation-related LCF to the public and the crew.

The range of fatality estimates is caused by two factors: the option of using truck or rail to transport spent nuclear fuel and the possibility of using different ports that created varying shipment distances.

The estimated number of radiation-related LCF for transportation workers ranged from 0.008 to 0.037. The estimated number of radiation-related LCF for the general population ranged from 0.010 to 0.11, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.0031 to 0.025. Since these risk numbers are much less than one, implementation of the Hybrid Alternative would be unlikely to result in one LCF.

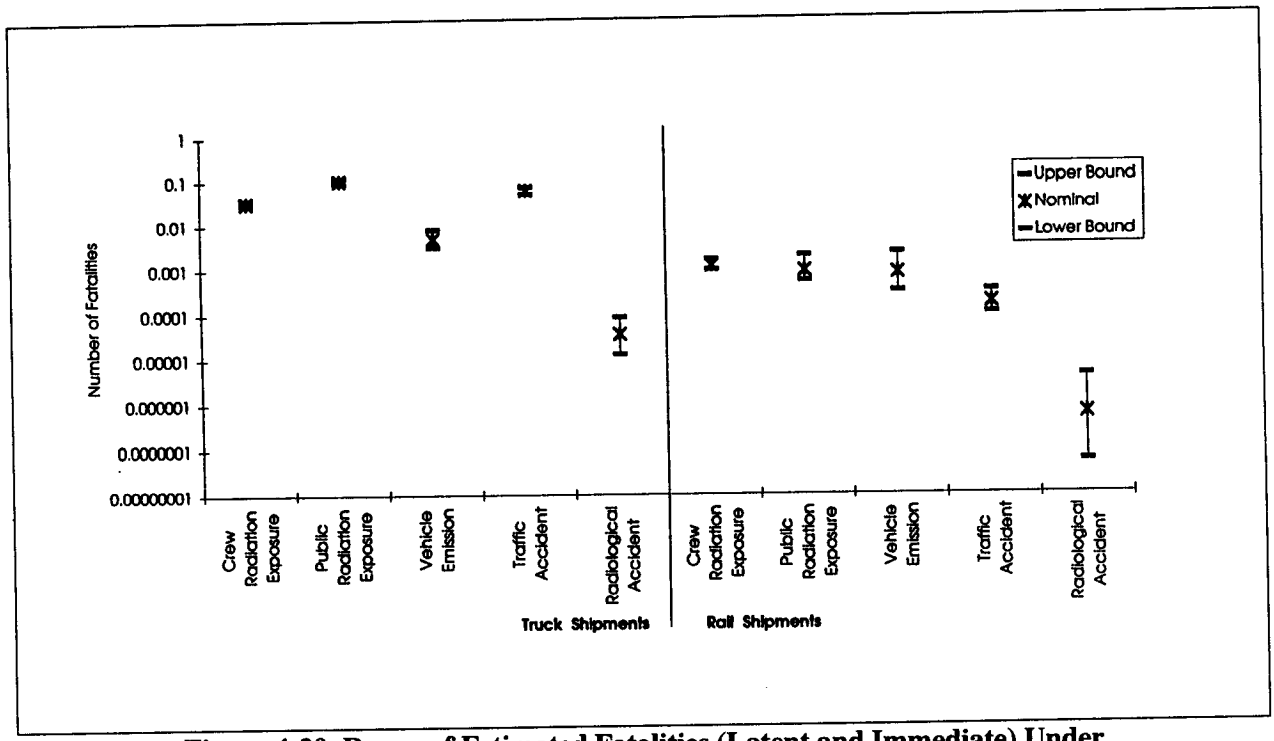


Figure 4-20 Range of Estimated Fatalities (Latent and Immediate) Under Management Alternative 3 (the Hybrid Alternative)

Impacts of Accidents During Ground Transport

Transportation accident population risks over the entire Hybrid Alternative are estimated to range from 0.000005 to 0.000081 LCF from radiation and from 0.002 to 0.069 for traffic fatality, depending on the transportation mode and the ports that might be selected. The reason for the range of fatality estimates is the same as those described for incident-free transportation.

The maximum foreseeable offsite transportation accident is identical to that for the basic implementation of Management Alternative 1. The risk is reduced to 7.1×10^{-12} LCF due to the reduced amount of ground transport.

4.5.4 Management Site Impacts

Under the Hybrid Alternative, the amount of foreign research reactor spent nuclear fuel that would be accepted into the United States is about 17,100 elements and 13.9 MTHM. All the TRIGA spent nuclear fuel, representing approximately 4,900 elements and 1.0 MTHM, would be received and stored in existing facilities at the Idaho National Engineering Laboratory. Aluminum-based spent nuclear fuel, representing approximately 12,200 elements and 12.9 MTHM, would be received and chemically separated at the Savannah River Site as described in Implementation Alternative 6 to Management Alternative 1 (near term chemical separation in the United States). Environmental impacts associated with the receipt and storage of the TRIGA spent nuclear fuel at existing facilities at the Idaho National Engineering Laboratory would be covered by the impacts presented for the basic implementation of Management Alternative 1 without construction of new facilities (Section 4.2). Environmental impacts associated with the receipt and chemical separation of the aluminum-based spent nuclear fuel at the Savannah River Site would be covered by the impacts presented for the near-term chemical separation alternative at the Savannah River Site (Section 4.3.6). The occupational and public health and safety impacts for both sites were estimated by combining the appropriate results from earlier analyses for the Idaho National Engineering Laboratory and the Savannah River Site.

Impacts to the Public of Incident-Free Management Site Activities

The approximately 4,900 elements that would be received and managed at the Idaho National Engineering Laboratory under this alternative represent about 22 percent of the number of elements that would be received and managed there under the basic implementation of Management Alternative 1. Annual public impacts due to incident-free emissions from both aluminum-based and TRIGA foreign research reactor spent nuclear fuel during receipt and management at the Idaho National Engineering Laboratory under the basic implementation of Management Alternative 1 are presented in Table 4-9. Applying these results to the Hybrid Alternative at the Idaho National Engineering Laboratory for only TRIGA spent nuclear fuel is conservative because the TRIGA spent nuclear fuel would produce less gaseous fission product emissions than the mixture of spent nuclear fuel in the basic implementation of Management Alternative 1. Multiplying the results in Table 4-9 by the maximum duration of each activity (13 years for receipt and 40 years for storage) yields the highest estimated risks for this part of the Hybrid Alternative. The receipt/unloading impacts are reduced by the factor of 22 percent. The highest estimated public MEI risk is 7.8×10^{-10} LCF and the highest estimated public population risk is 0.0000064 LCF.

The approximately 12,200 elements that would be received at the Savannah River Site under this alternative represent about 54 percent of the number of elements that would be received and temporarily stored there under the basic implementation of Management Alternative 1. Annual public impacts due to incident-free emissions during receipt at the Savannah River Site under the basic implementation of Management Alternative 1 are presented in Table 4-8. The impacts for storage in RBOF are much smaller

than those for receipt. Multiplying these results by 54 percent and the maximum duration of 13 years yields the highest estimated risks for this part of the Hybrid Alternative. The highest estimated public MEI risk is 3.9×10^{-10} LCF and the corresponding estimated public population risk is 0.000020 LCF.

The approximately 12.9 MTHM that would be chemically separated at the Savannah River Site under this alternative represents about 71 percent of the MTHM that would be chemically separated there under Implementation Alternative 6 dedicated to foreign research reactor spent nuclear fuel. Public impacts due to this implementation alternative were presented earlier in this chapter in Table 4-48. Multiplying these results by 71 percent yields the estimated impacts to the public near the Savannah River Site due to this part of the Hybrid Alternative. Using this procedure, the highest estimated incident-free public MEI risk at the Savannah River Site is 0.0000031 LCF. The highest estimated incident-free public population risk at the Savannah River Site (including both the air and water exposure pathways) is 0.13 LCF.

The maximum of the three onsite activities' estimated public incident-free MEI risks is equal to 0.0000031 LCF, which would result from chemical separation activities at the Savannah River Site (The three parts are receipt and management of TRIGA spent nuclear fuel at the Idaho National Engineering Laboratory, receipt and temporary management of aluminum-based spent nuclear fuel at the Savannah River Site, and chemical separation at the Savannah River Site). Thus, the chance of this individual incurring an LCF due to the Hybrid Alternative would be less than one in one hundred thousand.

The total of the three onsite activities' estimated public incident-free population risks is 0.13 LCF.

Impacts to Workers of Incident-Free Management Site Activities

Incident-free maximally exposed worker radiation dose depends upon the duration of the receipts, not the amount of spent nuclear fuel involved. The duration of this Hybrid Alternative is 13 years, the same as that in both the basic implementation of Management Alternative 1 and Implementation Alternative 6. Thus, the estimated maximally exposed worker dose is also the same. The maximally exposed worker risk is estimated to be 0.026 LCF.

Incident-free worker population impacts due to the basic implementation of Management Alternative 1 at the Idaho National Engineering Laboratory were presented in Section 4.2.4. Using the same evaluation process described in Appendix F, Section F.5, for the 162 casks of TRIGA foreign research reactor spent nuclear fuel that would be received and unloaded under this Hybrid Alternative yields a dose of 52 person-rem (dry storage in existing facilities). The associated worker population risk for this part of the Hybrid Alternative is 0.021 LCF.

Workers at the Savannah River Site would receive and unload 406 casks of aluminum-based foreign research reactor spent nuclear fuel in an existing wet facility under this alternative, receiving a population dose of 157 person-rem. The associated worker population risk for this part of the Hybrid Alternative is 0.063 LCF.

Incident-free worker population impacts due to Implementation Alternative 6 (chemical separation) were presented earlier in this chapter in Table 4-48. Multiplying these results by 71 percent yields the estimated incident-free impacts to the workers at the Savannah River Site due to the Hybrid Alternative. Using this procedure, the highest estimated incident-free worker population risk due to chemically separating this spent nuclear fuel at the Savannah River Site is 0.078 LCF.

The total of the three onsite activities' estimated incident-free worker population risks is 0.16 LCF.

Impacts of Accidents Onsite

Accident scenarios, frequencies, consequences, and annual risks for the Hybrid Alternative are derived from those for the basic implementation of Management Alternative 1 at the Idaho National Engineering Laboratory and Implementation Alternative 6 at the Savannah River Site.

Annual accident risks for receipt, unloading, and storage at the Idaho National Engineering Laboratory were presented earlier in this chapter in Table 4-25. Multiplying these by the duration of the activity (13 years for receipt and 40 years for storage) yields the risk due to accidents at the Idaho National Engineering Laboratory under this alternative. The receipt/unloading impacts are reduced by the factor of 22 percent. These estimates are conservative because the TRIGA spent nuclear fuel involved would release fewer fission products than would the mixture of TRIGA and aluminum-based spent nuclear fuel in the basic implementation of Management Alternative 1. The highest estimated accident MEI risk for this part of the Hybrid Alternative is 1.9×10^{-6} LCF, which is due to an accidental criticality in a wet storage facility. The highest estimated accident population risk for this part of the Hybrid Alternative is 0.0088 LCF, which is due to the same accident scenario.

Annual accident risks for receipt and unloading at the Savannah River Site were presented in Table 4-24. Multiplying these by the duration of the receipt activity (13 years) yields the risk due to receipt and temporary storage accidents under this alternative. The highest estimated accident MEI risk for this part of the Hybrid Alternative is 2.6×10^{-6} LCF, which is due to an accidental criticality in RBOF. The corresponding estimated accident population risk for this part of the Hybrid Alternative is 0.096 LCF.

The accident MEI and population impacts due to chemical separation were presented earlier in this chapter in Table 4-50. Multiplying these results by 71 percent yields the estimated impacts at the Savannah River Site due to accidents under the Hybrid Alternative. Using this procedure, the highest estimated public MEI risk due to accidents during chemical separation at the Savannah River Site is 0.000033 LCF. The highest estimated accident population risk at the Savannah River Site is 0.24 LCF.

The maximum of the three onsite activities' estimated accident public MEI risks is equal to 0.000033 LCF, which would occur at the Savannah River Site. (The three onsite activities are receipt and management of TRIGA spent nuclear fuel at the Idaho National Engineering Laboratory, receipt and temporary management of aluminum-based spent nuclear fuel at the Savannah River Site, and chemical separation at the Savannah River Site). Thus, the chance of this individual incurring an LCF due to this Hybrid Alternative would be less than one in ten thousand.

The total of the three onsite activities' estimated accident population risks is 0.34 LCF.

4.5.5 Summary of the Impacts of the Hybrid Alternative

Principal impacts of the Hybrid Alternative would be occupational and public health and safety impacts. These are presented in Table 4-61 in terms of the risk of death due to cancer during each of the four segments of this alternative. The table also shows, in the bottom rows, the highest of the individual risks and the total of the population risks. Each individual risk expresses the probability that one individual with the maximum exposure in each situation would incur an LCF. The population risk expresses the estimated number of additional LCF among the entire exposed population. In general, however, the implementation of the Hybrid Alternative would not pose higher risks than those determined for Management Alternative 1, assuming identical United States site management technology implementation. This is because the analyses in Management Alternative 1 aud its implementation alternatives considered the management of the maximum amount of foreign research reactor spent fuel in the United States.

Table 4-61 Maximum Estimated Radiological Health Impacts of the Hybrid Alternative

	Risks (LCF)		
	Maximally Exposed Worker, MEI, or NPAI	Population	
		General Public	Workers
Marine Transport			
Incident-Free	0.00052	0	0.024
Accidents	3×10^{-10}	much less than 0.00002	---
Port Activities			
Incident-Free	0.00052	0	0.0076
Accidents	1×10^{-10}	0.00002	---
Ground Transport			
Incident-Free	0.00052	0.11	0.037
Accidents	7.1×10^{-12}	0.000081	---
Site Activities			
Incident-Free	0.026	0.13	0.16
Accidents	0.000033	0.34	---
Highest Individual Risk			
Incident-Free	0.026	----	----
Accidents	0.000033	----	----
Total Population Risk			
Incident-Free	----	0.24	0.23
Accidents	----	0.34	----

Table 4-61 shows that the greatest radiological risks would occur during ground transport or management site activities. These results are based on conservative assumptions, including: (1) every package of foreign research reactor spent nuclear fuel producing a dose rate equal to the regulatory limit; (2) every truck shipment exposing people at highway rest stops for times about equal to the actual driving times; and (3) one individual at the DOE management site receiving the maximum dose allowed by DOE regulation every year.

The highest estimated incident-free individual risk is 0.026 LCF, which would apply to an onsite radiation worker. This individual would have a 2.6 percent chance of incurring an LCF. DOE and the Department of State believe the actual risk would be much lower due to administrative procedures such as worker rotation. The highest estimated incident-free individual risk for members of the public is much lower than the maximally exposed worker risk. DOE estimates this risk to be approximately 7.8×10^{-8} LCF.

The highest estimated accident MEI risk is 0.000033 LCF, which applies to a hypothetical member of the public who lives at the site boundary. This individual's chance of incurring an LCF due to this alternative would be less than one in ten thousand. The accident risk to workers is discussed qualitatively in Section 4.2.4.1 under the heading, "Impacts of Accidents to Close-in Workers."

As shown in Table 4-61, the total incident-free population risk would be 0.24 LCF for the potentially exposed public, while the corresponding risk would be 0.23 LCF for workers. Thus, there would be an estimated 24 percent chance of incurring one additional LCF among the exposed general public, and a 23 percent chance of incurring one additional LCF among workers. The chance of incurring two additional LCFs among each population group would be even lower.

Deaths due to traffic accident trauma and LCF due to vehicle emissions are not included in Table 4-61. There is about a seven percent chance that a truck driver or member of the public could die in a traffic accident associated with this Hybrid Alternative. This death would be unrelated to the radioactive nature of the cargo.

4.6 No Action Alternative

Under the No Action Alternative, no foreign research reactor spent nuclear fuel or high-level waste would be accepted into or managed by the United States. The United States would not provide any technical or financial assistance to foreign research reactor operators for the management of their spent nuclear fuel. The United States would rely on the foreign governments' compliance with existing international agreements to control the disposition of foreign research reactor spent nuclear fuel containing uranium enriched in the United States.

Policy Considerations

The No Action Alternative would have a major adverse impact on U.S. nuclear weapons nonproliferation policy. The No Action Alternative would not remove any of the approximately 4.6 metric tons of U.S. origin HEU from international commerce as considered under the proposed action. Under this alternative, the foreign research reactor owners would continue, or may revert back to, use of HEU fuel in their reactors. Countries that can reprocess might send their HEU spent nuclear fuel to be reprocessed and use the separated HEU to produce fresh HEU fuel. In addition, any new research reactors to be built would likely be designed to use HEU fuel. Thus, the No Action Alternative could cause an increase in the number of shipments of weapons-grade nuclear material in transit around the world. It would also damage, perhaps irreparably, the credibility of the RERTR program. Countries that cannot reprocess their research reactor spent nuclear fuel would have to store their fuel. As the spent nuclear fuel ages, it becomes less dangerous to handle (its radioactivity decreases with time), and could possibly become a target of theft and diversion. Hence, the No Action Alternative would undermine the U.S. nuclear weapons nonproliferation policy and the risk of weapons-grade nuclear material being diverted into a nuclear weapons program would increase markedly.

To demonstrate the risk of having reactor owners continue, or revert back to, use of HEU fuel, please see Tables B-3, B-4, and B-5 in Appendix B. These tables list the 104 foreign research reactors whose spent nuclear fuel is included under the proposed action, including 24 reactors that have been converted (fully or partially) or are in various stages of conversion (i.e., ordered, or anticipated to begin converting) from HEU to LEU fuel, and 30 reactors that could be converted, but are not being converted, because the owners of the research reactors are awaiting the outcome of this EIS before they make a decision. Under the No Action Alternative, it is possible that up to 48 foreign research reactor operators could choose to continue or revert back to using HEU fuel in their reactors. These tables also list 23 foreign research reactor operators who possess HEU spent nuclear fuel, even though their reactors are either already shut down or planned to be shutdown for various reasons. This HEU spent nuclear fuel would remain in the foreign research reactor host countries, if the No Action Alternative is selected.

On the other side of the ledger, the benefits obtained from research reactors, described briefly in Section 1.1 of the EIS, would be diminished. Since the No Action Alternative means no U.S. assistance to foreign research reactor operators for managing their spent nuclear fuel, additional research reactors may be forced to shut down, because of lack of funds and/or long term storage capabilities. DOE and the Department of State cannot estimate the number of reactors that would actually be shut down because this would depend on each country's regulations regarding spent nuclear fuel storage. Nevertheless, the medical, industrial and environmental services provided by the shutdown research reactors would be lost. For medical services in particular, foreign research reactors produce radioisotopes used in nuclear medicine in the United States (as discussed in Sections 1.1 and 4.3.1.3 of the EIS). If some of these reactors were forced to shut down, a shortage of medical radioisotopes could occur in the United States. Since the U.S. medical requirements for radioisotopes are not likely to decrease in the near future,

alternative sources would have to be found. This could involve an increased level of activity at existing U.S. research reactors or construction of a new reactor in the United States to supply the needed medical radioisotopes, with all the potential environmental impacts of these actions.

Environmental Impacts of Overseas Storage without U.S. Assistance

The material could remain in interim storage overseas. The number of storage sites involved might be greater and the quality of storage technology in some countries might be lower than if the U.S. was involved. Under this option, there would be environmental impacts in foreign countries, but none on U.S. territory, unless some of the material was diverted into nuclear weapons production.

Environmental Impacts of Overseas Reprocessing without U.S. Assistance

The material could be reprocessed and the resulting high-level waste could be vitrified or cemented in foreign facilities. Transport of spent nuclear fuel from the reactors to these facilities and the reprocessing activities would produce environmental impacts in foreign countries, but none on U.S. territory, except possibly in cases where some of the material was diverted into nuclear weapons production.

Under this option, the United States would not accept any shipments of vitrified high-level waste. The transport of vitrified high-level waste back to the country of origin and its storage and disposal would produce environmental impacts in foreign countries, but none on U.S. territory. The separated HEU would be more vulnerable to diversion into nuclear weapons production, and the increased reliance on HEU for fuel would increase the number of opportunities for diversion of this weapons grade material.

4.6.1 Overseas Storage Without U.S. Assistance

The material could remain in interim storage overseas. The number of storage sites involved would be greater and the quality of storage technology in some countries might be lower than under the other alternatives. In addition, as the spent nuclear fuel gets older, it becomes less dangerous to handle (its radioactivity decreases with time), and could more easily become a target of theft and diversion.

4.6.2 Overseas Reprocessing Without U.S. Assistance

The material could be reprocessed and the resulting high-level waste could be vitrified or cemented in foreign facilities. Transport of spent nuclear fuel from the reactors to these facilities and the reprocessing activities would produce environmental impacts only in foreign nations.

Under this option, the United States would not accept any shipments of vitrified high-level waste. The transport of vitrified high-level waste back to the country of origin and its storage and disposal would produce environmental impacts only in foreign nations.

4.7 Preferred Alternative

As discussed in detail in Section 2.9, the preferred alternative is to accept and manage the foreign research reactor spent nuclear fuel and target material in the United States. Under this alternative, the aluminum-based foreign research reactor spent nuclear fuel and target material would be transported to and managed at the Savannah River Site. The TRIGA foreign research reactor spent nuclear fuel would be transported to and managed at the Idaho National Engineering Laboratory.

The policy considerations, marine transport impacts, port activities impacts, ground transport impacts, and management site impacts of the preferred alternative presented in this section are based on analysis performed for the basic implementation of Management Alternative 1 (Section 4.2), Implementation Alternative 1c (Section 4.3.1.3), Implementation Alternative 6 (Section 4.3.6), and Implementation Alternative 7 (Section 4.3.7).

4.7.1 Policy Considerations

The policy considerations for the preferred alternative are similar to those described in Section 4.2 for Management Alternative 1. A critical result of implementing this preferred alternative would be the continued viability and vitality of the Reduced Enrichment for Research and Test Reactors (RERTR) Program, which has the goal of minimizing and eventually eliminating the use of HEU in civil nuclear programs by providing foreign research reactor operators with a continued incentive to participate. Similarly, the successful development of alternative fuels for research reactors and the expansion of the program to Russia, the other Newly Independent States, China, South Africa, and other countries, and the establishment of a world-wide norm discouraging the use of HEU, is dependent on a United States' commitment to action such as that embodied in this preferred alternative.

Another crucial consideration associated with the preferred alternative is the *Treaty on the Non-Proliferation of Nuclear Weapons*. The parties to the Non-Proliferation Treaty met in May of 1995 and agreed to extend the treaty indefinitely and without conditions. One key to the success of the 1995 Non-Proliferation Treaty Conference was the ability of the United States to convince other Non-Proliferation Treaty parties that the nuclear weapons states had complied with their obligations under Article IV of the Non-Proliferation Treaty to assist the non-nuclear weapons states with peaceful applications of nuclear energy.

Although the Non-Proliferation Treaty was extended indefinitely, the parties also agreed to review the treaty every five years to ensure that all parties are in compliance. Any country which has been compelled to shut down its research reactors could accuse the United States of not having complied with its treaty obligations. This accusation, however ill-founded, could be made not only by the affected countries, but by any country opposed to the interests of the United States.

Including target material as part of the preferred alternative maximizes the amount of HEU to be removed from international commerce. This includes all the HEU in the basic implementation of Management Alternative 1 [4.6 metric tons (5.1 tons) of heavy metal containing HEU] and all the HEU in the target material in Implementation Subalternative 1c [0.2 metric tons (0.2 tons) of heavy metal containing HEU]. The total amount that would be removed from international commerce is up to 4.8 metric tons (5.3 tons) of heavy metal containing HEU.

DOE's preferred alternative allows for the use of chemical separation under certain circumstances, such as when alternative technologies present higher safety risks, are more costly or are unavailable. If chemical separation is used to process the foreign research reactor spent nuclear fuel, the HEU would be blended down during the separation process to a low-enriched form that is unsuitable for nuclear weapons purposes (the blenddown is also required because the F-Canyon cannot safely process HEU beyond initial dissolution). No plutonium would be separated. Instead, the plutonium would be left in the waste stream with the high-level radioactive chemical separation wastes. In addition, the waste would be handled using technologies that are intended to be used for substantially larger quantities of preexisting wastes (e.g., vitrification of high-level liquid radioactive wastes, grouting for low-level wastes, and incineration for some supernatant).

This potential method of handling the foreign research reactor spent nuclear fuel would be consistent with United States nonproliferation policy, despite the use of chemical separation, because (1) it would reduce the worldwide stockpiles of this nuclear weapons material; (2) no plutonium would be separated; and (3) the chemical separation would not be taking place for either nuclear weapons or nuclear power purposes.

DOE is aware that the inclusion of chemical separation within the preferred alternative could be interpreted by some nations, organizations, and persons as a signal of endorsement of the use of chemical separation as a routine method of waste management for spent nuclear fuel or a reversal of United States policy on chemical separation. This would not be an accurate interpretation. The United States policy regarding chemical separation was established in Presidential Decision Directive 13, and DOE and the Department of State have determined that this preferred alternative is consistent with that policy. The draft version of this EIS indicated that chemical separation is a non-preferred technology. This final preferred alternative includes provision for possible chemical separation. DOE maintains a presumption that spent nuclear fuel would not be chemically separated unless there is an imminent health and safety risk, or other programmatic conditions, that cannot be addressed during the time period when no feasible alternative to chemical separation is available. These considerations will be addressed by the independent study described in Section 2.9.

4.7.2 Marine Transport Impacts

The marine transport impacts of the preferred alternative would be similar to those of the basic implementation of Management Alternative 1, with the addition of the target material shipments. As discussed in Section 4.3.1.3 and Appendix B, Section B.1.5, target material would be prepared for transport by changing it into either oxide or calcine form, and both forms might be accepted at some time during the proposed policy period. Even though it requires less marine transport, the oxide form presents a higher radiological risk under accident conditions because its smaller particle size is more easily dispersed in air. Therefore, to be conservative, the analysis of marine and port radiological accidents is based on the assumption that all the target material would be shipped as an oxide. The rest of the marine and port target material transport analysis is based on the assumption of 15 cask shipments, which is the maximum number of marine target material casks. This represents an increase of approximately two percent over the 721 marine cask shipments in the basic implementation of Management Alternative 1.

Marine transport to the West Coast of the United States would be limited to a maximum of approximately 38 casks, which slightly decreases the total number of days the ships would be at sea. Furthermore, DOE would strive to minimize the number of shipments necessary by coordinating shipments from several reactors at a time (i.e., by placing multiple casks [up to 8] on a ship). DOE currently estimates that approximately 5 shipments through the Naval Weapons Station at Concord, California would be necessary.

Impacts of Incident-Free Marine Transport

The highest estimated maximally exposed worker risk due to foreign research reactor spent nuclear fuel is 0.00052 LCF, which is based on the conservative assumption that one individual receives the maximum annual dose (100 mrem) every year for 13 years (Table 4-2). This means that the chance of this hypothetical individual incurring a latent cancer due to the preferred alternative would be less than one in a thousand.

The highest estimated population risk for all of the ships' crews involved in the marine transport of foreign research reactor spent nuclear fuel is about 0.034 LCF, as discussed in Section 4.2.1.2.

Target material contains far less radioactivity than foreign research reactor spent nuclear fuel. Each transportation cask of target material would produce a radiation dose rate far below the rate that was assumed for the foreign research reactor spent nuclear fuel. Thus, the rounded-off results of the incident-free radiological risk calculations for the basic implementation of Management Alternative 1 are not affected by the addition of up to 15 marine casks of target material.

Impacts of Accidents During Marine Transport

The risks associated with accidents at sea are bounded by the risks of the same accidents in ports because humans in the vicinity of accidents at sea are much fewer in number than even the least populated port.

Marine Transport Cumulative Impacts and Mitigation Measures

The marine transport cumulative impacts and mitigation measures for the preferred alternative would be the same as for the basic implementation of Management Alternative 1, which are discussed in Sections 4.2.1.4 and 4.2.1.5, respectively.

4.7.3 Port Activities Impacts

Although all of the candidate ports of entry presented in Section 3 are acceptable, based on the port selection criteria described in Appendix D, DOE would prefer to use military ports. All aluminum-based foreign research reactor spent nuclear fuel and target material from overseas would arrive at candidate ports on the East Coast of the United States, preferably the Naval Weapons Station at Charleston, South Carolina. Up to approximately 38 casks of TRIGA foreign research reactor spent nuclear fuel would arrive at candidate ports on the West Coast of the United States, preferably the Naval Weapons Station at Concord, California.

Impacts of Incident-Free Port Activities

As shown in Table 4-5, the highest maximally exposed worker risk is 0.00052 LCF, which is based on the conservative assumption that one individual receives the maximum annual dose (100 mrem) every year for 13 years. This means that the chance of this hypothetical individual incurring a latent cancer due to the preferred alternative would be less than one in a thousand.

The highest estimated population risk for port workers is about 0.012 LCF, as discussed in Section 4.2.2.3.

As discussed under *Impacts of Incident-Free Marine Transport* above, each transportation cask of target material would produce a radiation dose rate far below the rate that was assumed for the foreign research reactor spent nuclear fuel. Thus, the rounded-off results of the incident-free radiological risk calculations for the basic implementation of Management Alternative 1 are not affected by the addition of up to 15 cask shipments of target material.

Impacts of Accidents During Port Activities

The radiological risks due to port accidents were estimated in the same manner as for the basic implementation (Section 4.2.2.3) and Implementation Alternative 1c (Section 4.3.1.3) of Management Alternative 1. The highest estimated population risk for the entire preferred alternative program is 7.1×10^{-7} LCF. This risk estimate is lower than the earlier alternatives due to the use of military ports in the preferred alternative. These ports are located in areas of low population density, so the number of people potentially affected is much lower. The addition of target material causes a very small incremental increase (3×10^{-9} LCF) in the risk.

Port Activities Cumulative Impacts, Mitigation Measures, and Environmental Justice

The port activities cumulative impacts, mitigation measures, and environmental justice for the preferred alternative would be the same as for the basic implementation of Management Alternative 1, which are discussed in Sections 4.2.2.4, 4.2.2.5, and 4.2.2.6, respectively.

4.7.4 Ground Transport Impacts

The ground transport impacts were calculated under the assumption that only military ports would be used. DOE has selected military ports close to the management sites (the Charleston NWS in South Carolina and the Concord NWS in California) as the preferred ports of entry.

The risk estimates were maximized by assuming all target material would be oxide for radiological accident calculations and calcine for all other calculations. The calcine form could require up to 125 casks of target material to be shipped overland from Canada.

The preferred points of entry, destinations, and approximate numbers of cask shipments in the preferred alternative are presented in Table 4-62. Other shipment distributions would also be possible.

Table 4-62 Points of Entry, Destinations, and Numbers of Shipments in the Preferred Alternative

Cargo and Destination	*Point of Entry*			*Total Cask Shipments*
	East Coast	*West Coast*	*Canadian Border*	
Aluminum-Based Foreign Research Reactor Spent Nuclear Fuel to the Savannah River Site	559	0	116	675
TRIGA Foreign Research Reactor Spent Nuclear Fuel to the Idaho National Engineering Laboratory	124	38	0	162
Target Material to the Savannah River Site	up to 15	0	up to 125	up to 140
Total Cask Shipments	**up to 698**	**38**	**up to 241**	**up to 977**

Impacts of Incident-Free Ground Transport

The incident-free ground transport of foreign research reactor spent nuclear fuel and target material is estimated to result in a maximum of 0.089 LCF over the entire duration of the program. This is the sum of the estimated number of radiation-related LCF to the public and transportation workers.

The estimated maximum number of radiation-related LCF for transportation workers is 0.022. The estimated maximum number of radiation-related LCF for the general public is 0.067, and the estimated maximum number of non-radiation-related fatalities from vehicular emissions is 0.018.

Impacts of Accidents During Ground Transport

The total ground transport accident population risks for the preferred alternative are estimated to be less than 0.00072 LCF from radiation and 0.052 from traffic collisions.

The maximum foreseeable offsite transportation accident would involve a transportation cask of oxide target material in a suburban population zone under neutral (average) weather conditions, which could expose the MEI to 150 mrem. A similar event involving a transportation cask of spent nuclear fuel could expose the MEI to 2.4 mrem. These events are both in the highest accident severity category. Taking all

the possible consequences and frequencies of these accidents into account, and adding the foreign research reactor spent nuclear fuel risks with the target material risks yields the MEI risk of 2.7×10^{-11} LCF for the preferred alternative.

Ground Transport Cumulative Impacts, Mitigation Measures, and Environmental Justice

The ground transport cumulative impacts, mitigation measures, and environmental justice for the preferred alternative would be the same as for the basic implementation of Management Alternative 1, which are discussed in Sections 4.2.3.4, 4.2.3.5, and 4.2.3.7, respectively.

4.7.5 Management Site Impacts

As discussed in Section 2.9, all the TRIGA foreign research reactor spent nuclear fuel would be managed at the Idaho National Engineering Laboratory. The fuel would be received and stored in existing facilities. The environmental impacts of the preferred alternative at the Idaho National Engineering Laboratory can be estimated from the environmental impact analysis presented for the basic implementation of Management Alternative 1 (Section 4.2).

At the Savannah River Site, however, the impacts would vary depending on the specific outcome of the preferred management strategy at the site. Aluminum-based foreign research reactor spent nuclear fuel and target material would be managed at the Savannah River Site. The management of the foreign research reactor spent nuclear fuel is based on the schedule for successful implementation of a new treatment and/or packaging technology. If such a new technology could not be successfully demonstrated by the year 2000, chemical separation of a portion of the foreign research reactor spent nuclear fuel might be implemented. The foreign research reactor spent nuclear fuel and target material that is not chemically separated would be stored in existing facilities at the Savannah River Site until the new technology is operational.

Since the preferred alternative includes the construction and operation of an unspecified treatment and/or packaging technology at the Savannah River Site, the environmental impacts of this alternative at this site cannot be estimated with precision. DOE expects, however, that the radiological and nonradiological health and environmental effects from the construction and operation of facilities that would support a new technology would not exceed those estimated for construction of new dry storage facilities and operation of a conventional chemical separation facility evaluated in Sections 4.2.4.2 and 4.3.6 of this EIS. This expectation is based on the following general principles:

- New facilities would be constructed using current DOE design criteria which have evolved on the basis of increased protection of the public, workers, and the environment.
- The primary source of radiological releases from the chemical separation process is the front end dissolution of the spent nuclear fuel matrix. None of the new technologies considered involves a process that would produce greater releases.
- One of the reasons for the development of a new treatment and/or packaging technology is to reduce the volume and toxic nature of low-level and hazardous waste streams, an issue considered to be a disadvantage of the chemical separation process.

Nonradiological impacts from the construction of facilities that would support the new technology are expected to be typical to those assessed for the construction of new staging and storage facilities assessed for the basic implementation of Management Alternative 1 in Section 4.2.4.2. These include land use,

socioeconomics, cultural resources, aesthetic and scenic resources, geology, air and water quality, ecology, noise, materials and energy consumption, and non-radiological or non-toxic waste production during construction.

The occupational and public health and safety, waste management, and cumulative impacts presented below assume that the implementation of the preferred alternative at the Savannah River Site would result in radiological health effects equal to those presented in Sections 4.3.6 and 4.3.7 of this EIS.

4.7.5.1 Occupational and Public Health and Safety

Impacts to the Public of Incident-Free Management Site Activities

The approximately 4,900 foreign research reactor spent nuclear fuel elements that would be received and managed at the Idaho National Engineering Laboratory under the preferred alternative represent about 22 percent of the total number of elements that would be received and managed there under the basic implementation of Management Alternative 1. Annual public impacts due to incident-free emissions from both aluminum-based and TRIGA foreign research reactor spent nuclear fuel during receipt and management at the Idaho National Engineering Laboratory under the basic implementation of Management Alternative 1 are presented in Table 4-9. Applying these results to the preferred alternative at the Idaho National Engineering Laboratory for only TRIGA spent nuclear fuel is conservative because the TRIGA spent nuclear fuel would produce less gaseous fission product emissions than the mixture of spent nuclear fuel in the basic implementation of Management Alternative 1. Adjusting the figures from Table 4-9 to account for the reduced amount of material in the preferred alternative yields the highest estimated risks for this part of the preferred alternative. The highest estimated public MEI risk is 7.8×10^{-10} LCF and the highest estimated public population risk is 0.0000064 LCF.

Radioactive emissions would not be expected from the target material receipt or storage because this material contains no gaseous fission products. Therefore, the incident-free radiological impacts to the public would be zero.

The incident-free radiological public health impacts at the Savannah River Site due to the preferred alternative are assumed to be equal to those discussed in Section 4.3.6.6.4 under the subheading, *Incident-Free Impacts at the Savannah River Site*. The highest estimated public MEI risk is 0.0000043 LCF and the highest estimated public population risk is 0.18 LCF.

The maximum of the onsite activities' estimated public incident-free MEI risks is equal to 0.0000043 LCF, which would occur at the Savannah River Site. The chance of this hypothetical individual incurring an LCF due to the preferred alternative would be less than one in one hundred thousand.

The total of the onsite activities' estimated incident-free population risks to the people who live near both sites is equal to 0.18 LCF. This number means that there would be an approximately 18 percent chance of one additional LCF among the population residing around the two sites due to these incident-free activities.

Impacts to Workers of Incident-Free Management Site Activities

Incident-free maximally exposed worker radiation dose depends upon the duration of the receipts, not the amount of spent nuclear fuel involved. The duration of the receipts in the preferred alternative is 13 years, the same as that in the basic implementation, the target material alternative, and the chemical separation alternative of Management Alternative 1. Thus, the estimated maximally exposed worker dose is also the same. The highest maximally exposed worker risk is estimated to be 0.026 LCF.

The incident-free worker population risks of the basic implementation of Management Alternative 1 at the Idaho National Engineering Laboratory were presented in Section 4.2.4.1. Using the same evaluation process yields a dose of 52 person-rem (dry storage in existing facilities). The associated worker population risk for this part of the preferred alternative is 0.021 LCF.

The incident-free radiological worker health impacts at the Savannah River Site due to the preferred alternative are assumed to be equal to those discussed in Section 4.3.6.6.4 under the subheading, *Incident-Free Impacts at the Savannah River Site*. The highest estimated worker population risk is 0.21 LCF.

The total of the onsite activities' estimated incident-free worker population risks at both sites is 0.23 LCF, which means that there would be an approximately 23 percent chance of one additional LCF among the affected radiation workers at the two sites.

Impacts to the Public of Accidents Onsite

Accident scenarios, frequencies, consequences, and risks for the preferred alternative at the Idaho National Engineering Laboratory are the same as those for the basic implementation of Management Alternative 1. The estimated accident frequencies and consequences are presented in Table 4-20. The highest estimated public MEI/NPAI consequence is 0.000015 LCF and the highest estimated public population consequence is 1.0 LCF. Annual accident risks for receipt, unloading, and storage at the Idaho National Engineering Laboratory are presented in Table 4-25. Multiplying these figures by the appropriate duration of the activity (13 years for receipt and 40 years for storage) yields the risk due to accidents at the Idaho National Engineering Laboratory. These estimates are conservative because the TRIGA spent nuclear fuel involved would release fewer fission products than would the bounding radionuclide inventory presented in Appendix B, Table B-6 that was used for the evaluations in the basic implementation of Management Alternative 1. The highest estimated accident MEI/NPAI risk for this part of the preferred alternative is 0.0000019 LCF, which is due to a criticality event at an existing wet storage facility. The highest estimated accident population risk for this part of the preferred alternative is 0.016 LCF, which is due to an accidental fuel assembly breach.

The radiological public health impacts due to accidents at the Savannah River Site under the preferred alternative are assumed to be equal to those discussed in Section 4.3.6.6.4 under the subheading, *Impacts of Chemical Separations Accidents at the Savannah River Site*. The highest estimated public MEI risk is 0.000047 LCF and the highest estimated public population risk is 0.43 LCF.

The maximum of the onsite activities' estimated accident public MEI risks is equal to 0.000047 LCF, which would occur at the Savannah River Site. The chance of this hypothetical individual incurring an LCF due to the preferred alternative would be less than one in ten thousand.

The total of the onsite activities' estimated accident population risks at both sites is equal to 0.45 LCF. This means that there would be an approximately 45 percent chance that one additional LCF would be incurred among the people living near both sites due to accidents during these activities.

4.7.5.2 Waste Management

Implementation of the receipt and storage portions of the preferred alternative would introduce a very small increase in waste generation over current levels at both sites. Baseline site generation of waste is shown in Appendix F, Tables F-23 and F-46 for the Savannah River Site and the Idaho National Engineering Laboratory, respectively. It should be noted that the figures represent storage of more fuel elements, at both sites, than the amounts indicated by the preferred alternative. Implementation of a new technology would produce waste in the amounts presented in Table 4-56.

If the chemical separation portion of the preferred alternative is implemented, this would generate different wastes at the Savannah River Site in place of some of the waste from the new technology. As discussed in Section 4.3.6.6.5, the primary wastes generated during conventional chemical separation and vitrification operations are high-level waste glass in canisters and saltstone. Assuming the chemical separation portion of the preferred alternative could involve up to approximately one-third of the aluminum-based foreign research reactor spent nuclear fuel (6,000 elements), this waste generation would be about one-third of the amount generated under Implementation Alternative 6. Under the preferred alternative, DOE could generate up to approximately 24 high-level waste glass canisters and 1,350 cubic meters (47,700 cubic feet) of saltstone. These wastes would be managed along with much larger quantities of identical wastes in existing facilities at the Savannah River Site.

4.7.5.3 Cumulative Impacts

Cumulative impacts from the implementation of the preferred alternative at both the Idaho National Engineering Laboratory and the Savannah River Site are expected to be lower than those presented for the basic implementation of Management Alternative 1 in Sections 4.2.4.3.1 and 4.2.4.3.2 for the two sites, respectively. At both sites the cumulative impacts from the management of foreign research reactor spent nuclear fuel and impacts from other existing or planned activities or actions at the sites, as presented in Tables 4-29 and 4-30 for Savannah River Site and Idaho National Engineering Laboratory, respectively, including activities not related to the management of spent nuclear fuel, would not challenge or have detrimental effects on the public or environmental resources at the sites.

4.7.5.4 Mitigation Measures

Although environmental impacts at both the Savannah River Site and the Idaho National Engineering Laboratory for the implementation of the preferred alternative would be minimal in all environmental media and mitigation measures would not be necessary, the sites would implement measures in some areas to minimize impacts. Such measures would be taken in the areas of pollution control, socioeconomics, cultural resources, air and water resources, occupational and public health and safety, and accident prevention. Section 4.2.4.6 provides details on these issues.

4.7.5.5 Environmental Justice

The environmental justice conclusions for the management sites discussed in Section 4.2.4.5 for the implementation of Management Alternative 1 are valid for the preferred alternative. As discussed in Section 4.2.4.5, minority or low-income populations living near the Savannah River Site or the Idaho National Engineering Laboratory would not be subjected to any disproportionately high and adverse impacts.

4.7.6 Short Term Uses and Long Term Productivity

The use of land at the Savannah River Site for the potential construction of the new technology facilities would conform with the land use policy at the site. After adoption of an overall strategy for the management of all DOE-owned spent nuclear fuel (including spent nuclear fuel from foreign research reactors), some of the areas may be released for other productive uses.

4.7.7 Irreversible and Irretrievable Commitments of Resources

The operation of existing storage facilities at both sites would involve the consumption of some irretrievable amounts of electrical energy. The potential construction of new technology facilities at the Savannah River Site would consume irretrievable amounts of electrical energy, fuel, concrete, sand, and gravel. Other resources used in the construction would probably not be recoverable. These would include finished steel, aluminum, copper, plastics, and lumber. Most of this material would be incorporated in foundations, structures, and machinery.

4.7.8 Summary of the Impacts of the Preferred Alternative

The principal impacts of the preferred alternative would be occupational and public health and safety impacts. These are presented in Table 4-63 in terms of the risk of death due to cancer during each of the four segments of this alternative. The table also shows, in the bottom rows, the highest of the individual risks and the total of the population risks. Each individual risk expresses the probability that the one individual with the maximum exposure in each situation would incur an LCF due to the preferred alternative. The population risk expresses the estimated number of additional LCF among the entire potentially exposed population.

Table 4-63 shows that the greatest radiological risks would occur during ground transport or management site activities. These results are based on conservative assumptions, including: (1) every package of foreign research reactor spent nuclear fuel producing a dose rate equal to the regulatory limit; (2) every truck shipment exposing people at highway rest stops for times about equal to the actual driving times; and (3) one individual at the management site receiving the maximum dose allowed by DOE regulation every year.

The highest estimated incident-free individual risk is 0.026 LCF, which would apply to an onsite radiation worker. This individual would have a 2.6 percent chance of incurring an LCF. DOE and the Department of State believe the actual risk would be much lower due to administrative procedures such as worker rotation. The highest estimated incident-free risk for individual members of the public is much lower than the maximally exposed worker risk. DOE estimates this risk to be approximately 0.0000043 LCF.

The highest estimated accident MEI risk is 0.000047 LCF, which applies to a hypothetical member of the public who lives at the site boundary. This individual's chance of incurring an LCF due to an accident under this alternative would be less than one in ten thousand. The accident risk to workers is discussed qualitatively in Section 4.2.4.1 under the heading, "Impacts of Accidents to Close-in Workers."

As shown in Table 4-63, the total incident-free population risk would be 0.25 LCF for the potentially exposed public, while the corresponding risk would be 0.30 LCF for workers. Thus, there would be an estimated 25 percent chance of incurring one additional LCF among the exposed general public, and a 30 percent chance of incurring one additional LCF among workers. The chance of incurring two additional LCFs among each population group would be even lower.

Table 4-63 Maximum Estimated Radiological Health Impacts of the Preferred Alternative

	Risks (LCF)		
	Maximally Exposed Worker, MEI, or NPAI	Population	
		General Public	Workers
Marine Transport			
Incident-Free	0.00052	0	0.034
Accidents	5×10^{-10}	much less than 7.1×10^{-7}	---
Port Activities			
Incident-Free	0.00052	0	0.012
Accidents	2.9×10^{-10}	7.1×10^{-7}	---
Ground Transport			
Incident-Free	0.00052	0.067	0.022
Accidents	2.7×10^{-11}	0.00072	---
Site Activities			
Incident-Free	0.026	0.18	0.23
Accidents	0.000047	0.45	---
Highest Individual Risk			
Incident-Free	0.026	----	---
Accidents	0.000047	----	----
Total Population Risk			
Incident-Free	----	0.25	0.30
Accidents	----	0.45	----

Deaths due to traffic accident trauma and LCF due to vehicle emissions are not included in Table 4-63. There is approximately a five percent chance that a truck driver or member of the public could die in a traffic accident associated with the preferred alternative. This death would be unrelated to the radioactive nature of the cargo.

4.8 Comparison of the Alternatives

This chapter has identified the policy considerations and potential environmental impacts resulting from the proposed action, with all of its various alternatives, and the No Action Alternative. This section provides a comparison of the potential impacts of each alternative, with emphasis on key issues such as the amount of HEU removed from international commerce and risks to workers and the public.

4.8.1 Amount of HEU Removed from International Commerce

The purpose and need for Agency action is driven by the concern that HEU in civilian commerce might be diverted into a nuclear weapons program. Removal of HEU from international civilian commerce will greatly enhance the goals of the U.S. nuclear weapons nonproliferation policy. Figure 4-21 compares the quantities of HEU that would be removed from international civil commerce under the basic implementation of Management Alternative 1, the implementation alternatives, the Hybrid Alternative, the No Action Alternative, and the preferred alternative.

Basic Implementation of Management Alternative 1: The basic implementation of Management Alternative 1 would remove up to an estimated 4.6 metric tons (5.1 tons) of HEU from international commerce. By accepting this weapons-grade material into the United States for storage, the risk of material diversion would be eliminated. For comparison, the United States moved about 0.6 metric tons (0.7 tons) of HEU from Kazakhstan to the United States in November and December 1994 to ensure that it could not be diverted into a nuclear weapons program. The quantity of HEU involved in the basic

implementation of Management Alternative 1 is over seven times the amount removed from Kazakhstan. The HEU in foreign research reactor spent nuclear fuel, however, is mixed with fission products, so it would require more sophisticated chemical processing to convert it to uranium metal suitable for use in nuclear weapons.

Implementation Alternatives: Acceptance of amounts of foreign research reactor spent nuclear fuel different from the amounts identified in the basic implementation of Management Alternative 1 could have an impact on the amount of HEU in international civil commerce. As shown in Figure 4-21, the implementation alternative of accepting spent nuclear fuel only from developing nations would remove up to only about 0.24 metric tons (0.26 tons) of HEU from international commerce. The implementation alternative of accepting target material in addition to the foreign research reactor spent nuclear fuel in the basic implementation of Management Alternative 1 would remove the most HEU (up to 4.8 metric tons or 5.3 tons) from international commerce. If the acceptance policy lasted for only 5 years, then the amount of HEU involved would be only up to 4.1 metric tons (4.5 tons).

Implementation through financial arrangements different from those identified in the basic implementation of Management Alternative 1 could indirectly impact the amount of HEU removed from international commerce depending on whether those financial adjustments influence the amount of foreign research

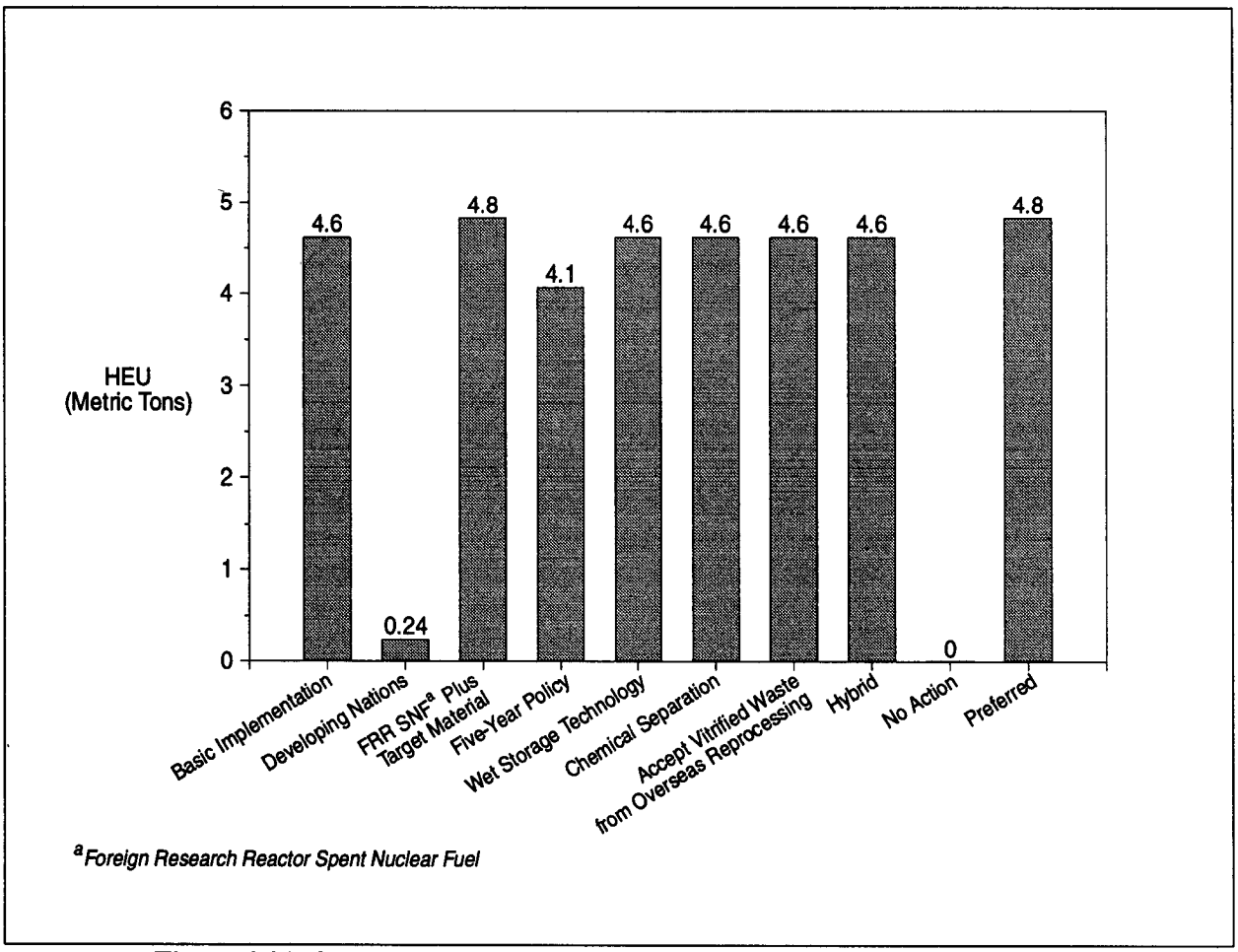


Figure 4-21 Quantities of HEU that Would Be Removed from International Commerce Under Each Alternative

reactor spent nuclear fuel transported to the United States. The final amount of HEU removed from international civil commerce through the application of different financial arrangements cannot be readily determined at this point.

Implementation by taking title to the foreign research reactor spent nuclear fuel at locations different from those identified in the basic implementation of Management Alternative 1 would not change the amount of HEU removed from international commerce, i.e., the action would still remove up to 4.6 metric tons (5.1 tons) of HEU. Similarly, the use of wet storage technology for the interim period instead of dry storage technology as identified in the basic implementation of Management Alternative 1 would not change the amount of HEU removed from international civil commerce, since the alternative relates to actions within the United States. Implementation by use of near term chemical separation in the United States instead of interim storage would also cause no change in the amount of HEU removed, again because the alternative involves actions in the United States.

Storing foreign research reactor spent nuclear fuel at one or more overseas sites would have a questionable effect on the amount of HEU removed from international commerce. Although this management alternative would provide the United States some limited measure of control over the foreign research reactor spent nuclear fuel, the prevention of material diversion into a nuclear weapons program would not be as fully ensured as if the foreign research reactor spent nuclear fuel was accepted into the United States. This alternative would leave HEU stockpiled around the world.

The implementation alternative of overseas reprocessing would remove the same amount of HEU from international commerce as would the basic implementation of Management Alternative 1, independent of decisions on the management of the resulting high-level waste.

Hybrid Alternative: The Hybrid Alternative chosen for analysis would remove the same amount of HEU from international commerce as would the basic implementation of Management Alternative 1, independent of decisions on the management of the resulting high-level waste.

No Action Alternative: Under this alternative, the United States would rely solely on the foreign governments' compliance with international agreements to control the foreign research reactor spent nuclear fuel. A policy of no action by DOE and the Department of State runs counter to U.S. nuclear weapons nonproliferation policy by causing continued reliance on HEU, thus not realizing the goal of eliminating civil commerce in HEU.

Preferred Alternative: The preferred alternative would remove the same amount of HEU (up to 4.8 metric tons or 5.3 tons) from international commerce as would Implementation Alternative 1c of Management Alternative 1. This amount is higher than for the other alternatives.

4.8.2 Radiological Risk to Individuals

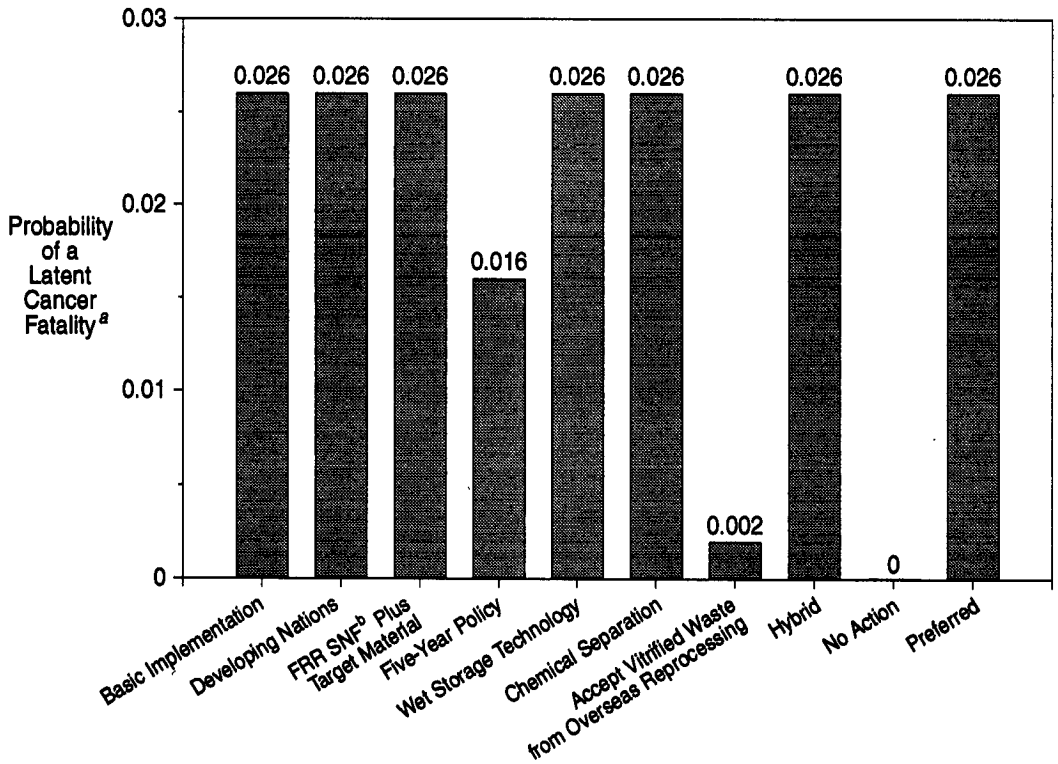
A maximally exposed worker or an MEI in the public is a hypothetical individual who records the highest possible exposure to radiation in a given situation, and the associated risks are different depending on the alternative considered. Figures 4-22 and 4-23 present comparisons of the estimated radiological risk to the maximally exposed worker and to the MEI under each alternative for incident-free and accident conditions, respectively. Alternatives involving the smallest number of cask shipments into the United States would produce the lowest individual risks. There would be no maximally exposed worker risk or MEI risk in the United States under the No Action Alternative.

The incident-free maximally exposed worker risk estimates are driven by the assumption that a radiation worker would receive the maximum radiation dose allowed by law for every year that foreign research reactor spent nuclear fuel is accepted. This risk depends only on the duration of the action, not on the number of casks or elements. Thus, the Five-Year Acceptance Alternative would present lower risk than the alternatives which last for 13 years.

The accident MEI risk estimates are dominated by onsite accident scenarios. This is because during marine transport, port activities, and ground transport, the foreign research reactor spent nuclear fuel would be inside transportation casks. During onsite activities, while spent nuclear fuel is outside of transportation casks, the probability of an incident that could release radioactive material is higher. The highest estimated accident MEI risk in the public is 0.00015 LCF, which means that this hypothetical individual's increased chance of incurring an LCF would be less than two in ten thousand.

4.8.3 Radiological Risk to Exposed Populations

Population risk is the risk of additional latent cancers occurring among people (both public and workers) who would be exposed to radiation. Risks vary with the alternative considered. Figures 4-24 and 4-25 present comparisons of the estimated incident-free radiological risks to the public and worker populations under each alternative. Alternatives involving the smallest number of cask shipments into the United



[a] *Impacts evaluated were those in the United States and on the Global Commons.*

[b] *Foreign Research Reactor Spent Nuclear Fuel*

Figure 4-22 Maximum Estimated Incident-Free Radiological Risk to the Maximally Exposed Worker Under Each Alternative

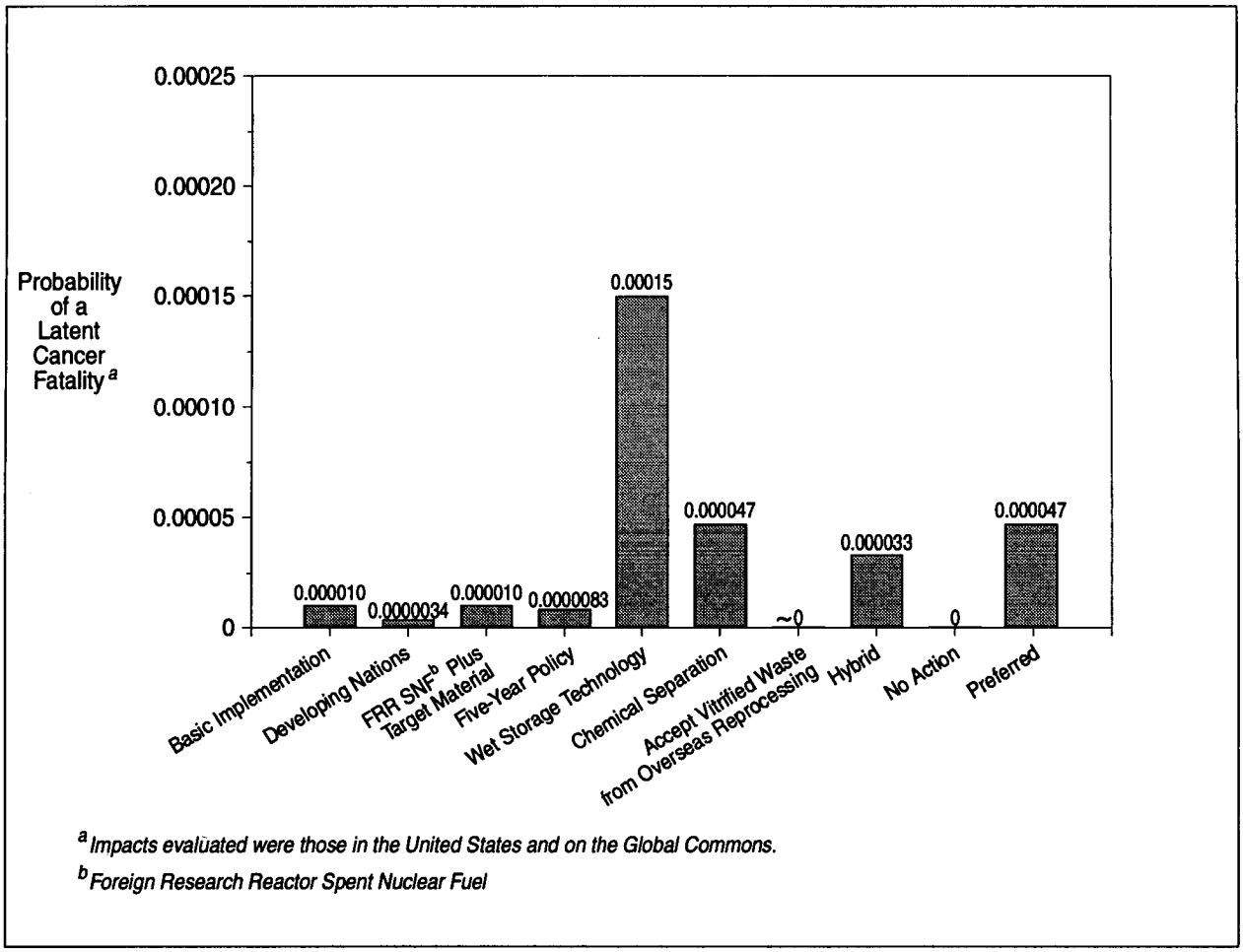
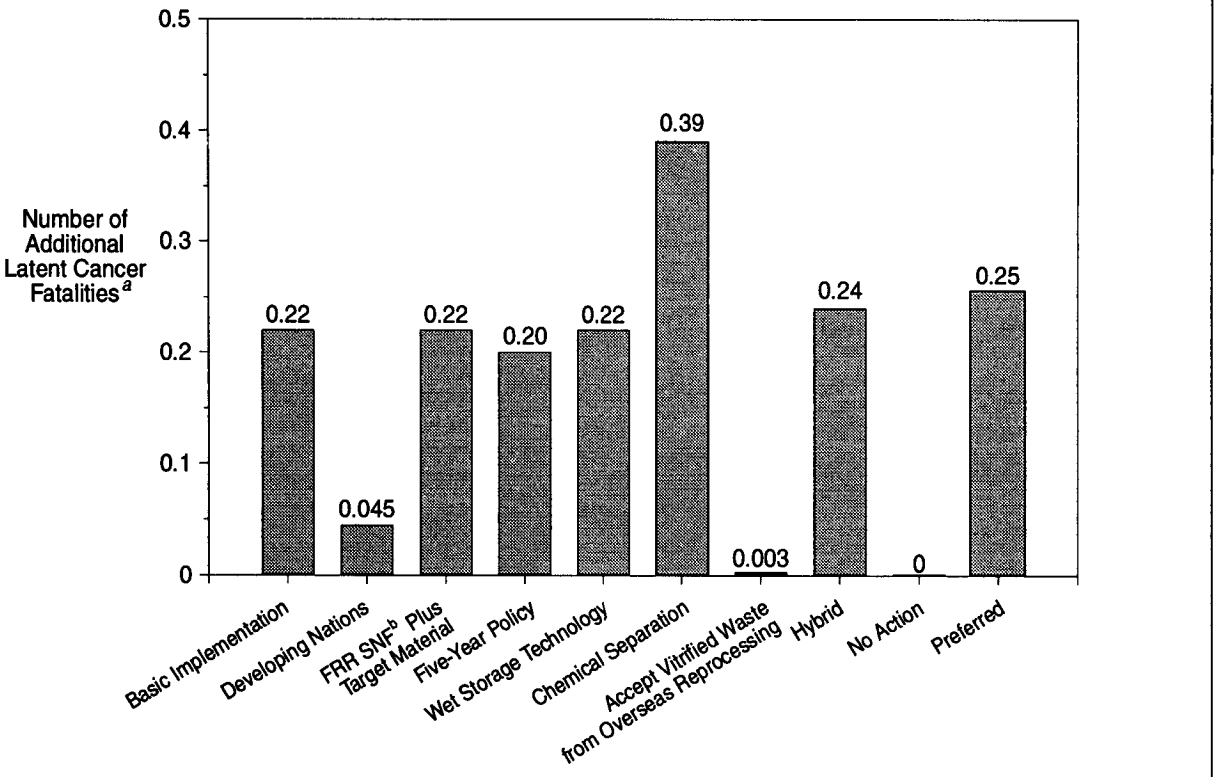


Figure 4-23 Maximum Estimated Accident Radiological Risk to the MEI in the Public Under Each Alternative

States would produce the lowest population risks. The chemical separation, overseas reprocessing, and preferred alternative are the alternatives in which the waste would be conditioned for disposal. Under the other alternatives, some form of processing may be required at some time in the future before disposal. There would be no population risk in the United States under the No Action Alternative. Under all the alternatives the estimated incident-free public and worker population risks would result in less than one-half additional LCF among each population group.

Figure 4-26 presents a comparison of the estimated accident radiological population risks to the public under each alternative. Those alternatives involving some form of processing in the United States would present the largest accident risks, but these risks would occur in the near term. Under the other alternatives, some form of processing may be required at some time in the future before disposal. Under all the alternatives, the estimated accident public population risks would result in less than one-half additional LCF.



[a] *Impacts evaluated were those in the United States and on the Global Commons.*

[b] *Foreign Research Reactor Spent Nuclear Fuel*

Figure 4-24 Maximum Estimated Incident-Free Radiological Population Risk to the General Public Under Each Alternative

4.8.4 Nonradiological Risks

The transport of foreign research reactor spent nuclear fuel from the ports to the sites would involve some risk of death due to traffic accidents for both the truck drivers and the public. Figure 4-27 presents a comparison of the estimated traffic accident risk to both the drivers and public combined under each alternative. Estimates include the risks associated with transporting the empty casks back to the ports.

Results are directly proportional to the number of highway miles over which casks would be transported under each alternative. The basic implementation of Management Alternative 1 and four of the implementation alternatives would have essentially the same risk, while the Developing Nations Subalternative and the Hybrid Alternative would have lower traffic accident risks.

Under the subalternative of accepting vitrified waste from overseas reprocessing, an estimated eight cask shipments would be accepted in the United States, so the traffic accident risk would be extremely low. There would be no population risk in the United States under the other overseas subalternative, as well as the No Action Alternative.

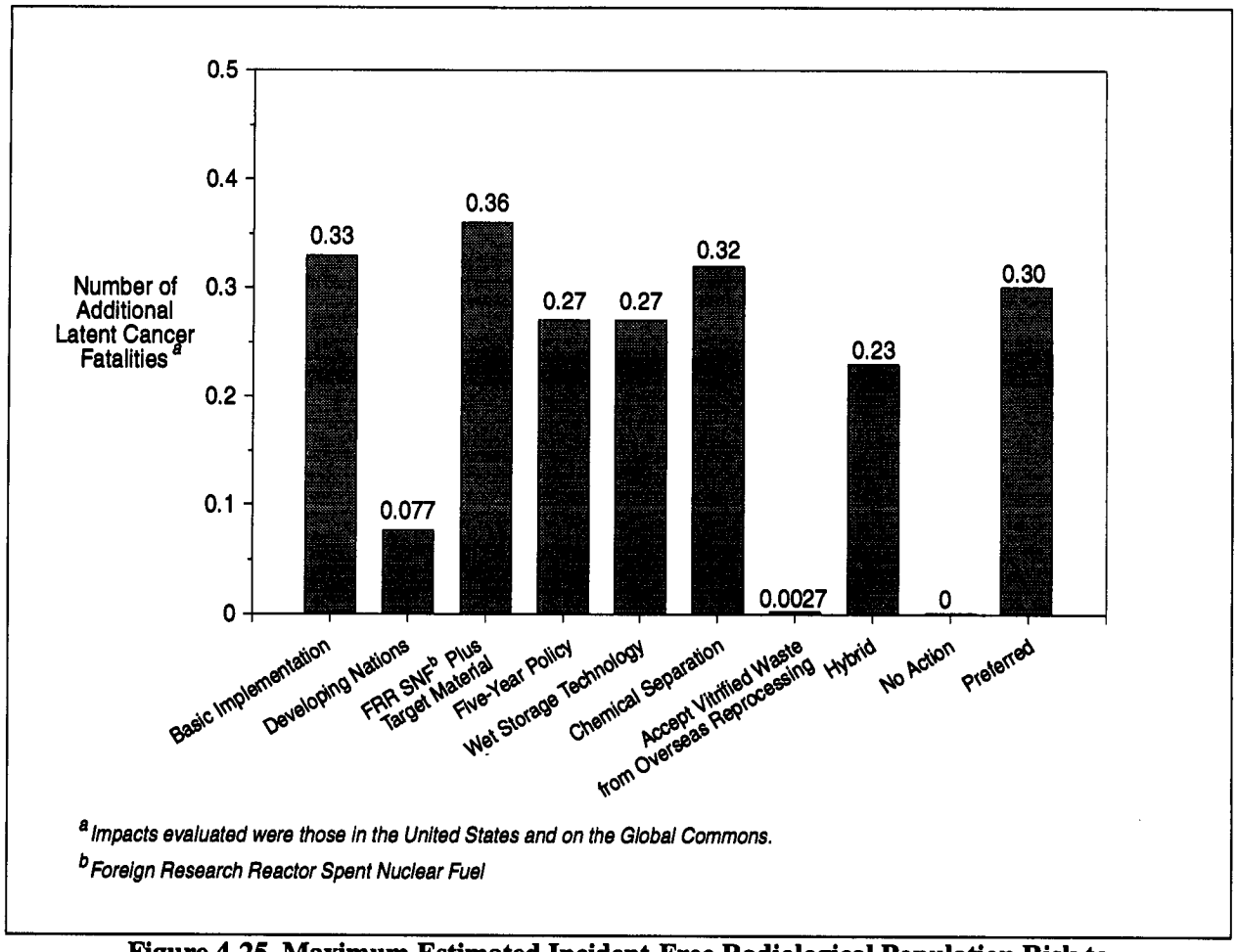


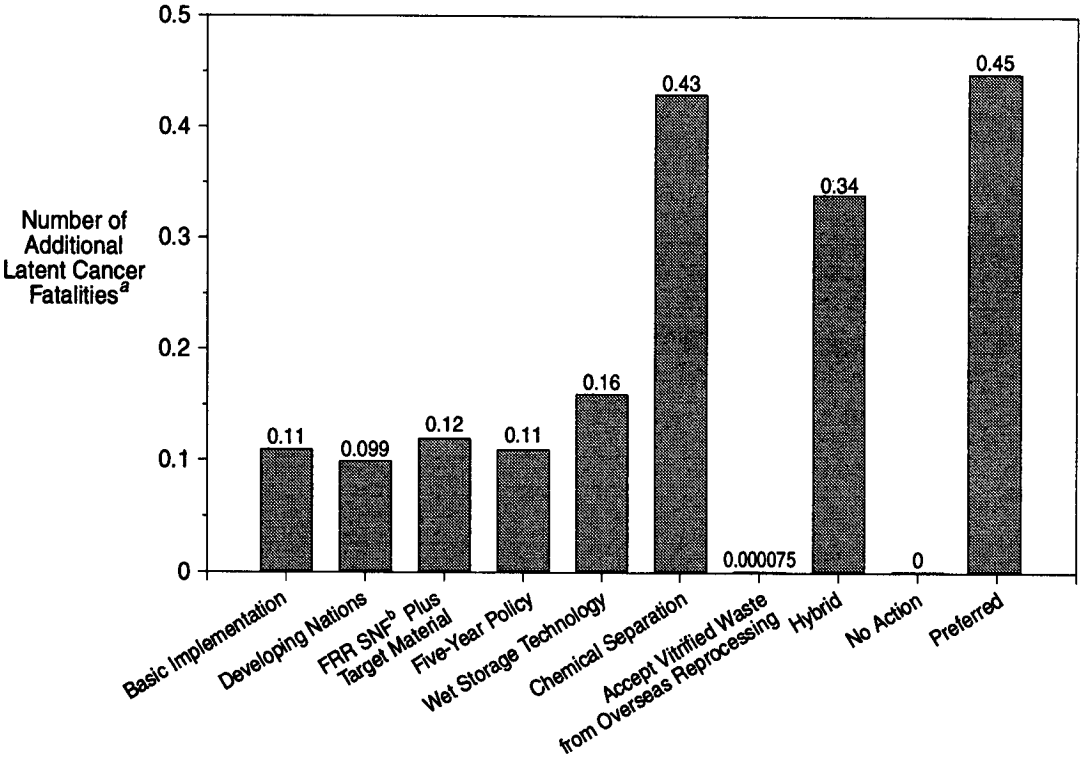
Figure 4-25 Maximum Estimated Incident-Free Radiological Population Risk to Workers Under Each Alternative

The traffic accident risk is also relatively low under the preferred alternative because all the cask shipments of aluminum-based foreign research reactor spent nuclear fuel would go through an east coast port or ports to the Savannah River Site. This effectively minimizes the ground transport risk by minimizing the number of highway miles required.

4.8.5 Land Use

Basic Implementation of Management Alternative 1: The basic implementation of Management Alternative 1 would not result in major land use issues at any of the potential foreign research reactor spent nuclear fuel management sites. If additional storage space were required for the foreign research reactor spent nuclear fuel, the space would be built on DOE-owned lands, inside the boundaries of the DOE management sites.

Implementation Alternatives: Acceptance of amounts of foreign research reactor spent nuclear fuel different from the amount identified in the basic implementation of Management Alternative 1 would not cause land use issues, even though storage needs may vary due to the United States receiving a larger (if target material is accepted in addition to spent nuclear fuel) or smaller (e.g., from developing nations only)



[a] *Impacts evaluated were those in the United States and on the Global Commons.*

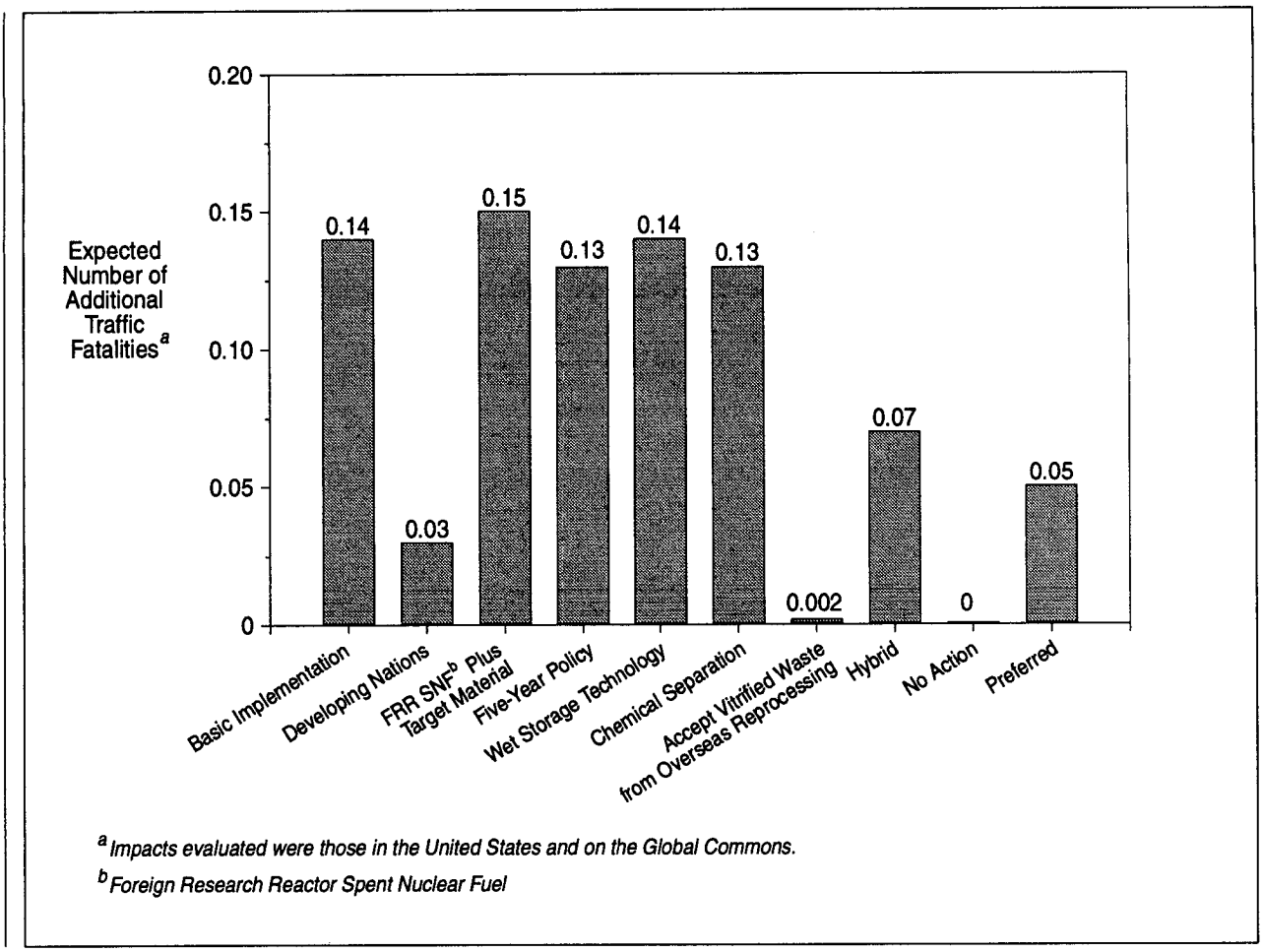
[b] *Foreign Research Reactor Spent Nuclear Fuel*

Figure 4-26 Maximum Estimated Accident Radiological Population Risk to the General Public Under Each Alternative

amount of material than identified in the basic implementation of Management Alternative 1. As mentioned above, additional storage space, if required, would be created on DOE-owned land, creating no outside land use issues.

Acceptance of foreign research reactor spent nuclear fuel for periods of time different from the time periods identified in the basic implementation of Management Alternative 1 would not cause any land use issues as the timeframe would not necessarily change the amount of foreign research reactor spent nuclear fuel received by the United States. If a policy of 5 years of acceptance was instituted, less spent nuclear fuel would be received by the United States, and if an indefinite HEU/10-year LEU policy were to be adopted, storage space would be created on DOE management sites, causing no issues in relation to outside lands.

Implementation through financial arrangements different from those identified in the basic implementation of Management Alternative 1 would have no impact on land use, as this alternative would have no effect on lands not owned by DOE.



[a] *Impacts evaluated were those in the United States and on the Global Commons.*

[b] *Foreign Research Reactor Spent Nuclear Fuel*

Figure 4-27 Maximum Estimated Traffic Accident Risk Under Each Alternative

Implementation by taking title to the foreign research reactor spent nuclear fuel at locations different from those identified in the basic implementation of Management Alternative 1 would cause no land use issues, as it would have no effect on the storage needs or the amount of foreign research reactor spent nuclear fuel received by the United States.

Use of wet storage technology for the interim period instead of dry storage technology as identified in the basic implementation of Management Alternative 1 would cause no land use issues, as the storage facilities (wet or dry) would be on DOE-owned land, and would have no effect on outside (non-DOE-owned) lands. If DOE decides to purchase the BNFP facility for interim wet storage, however, this would require adding some land to the Savannah River Site.

Implementation by use of near term chemical separation in the United States instead of interim storage would have no impact on land use, as the separation would be performed on DOE-owned land, with no effect on outside (non-DOE-owned) lands.

Similarly, there would be no land use concerns under either of the overseas subalternatives or the Hybrid Alternative presented in this EIS. A policy of no action (the No Action Alternative) regarding foreign research reactor spent nuclear fuel would cause no land use issues in the United States.

Land use for construction under the preferred alternative would be similar to the land use for construction under the basic implementation of Management Alternative 1.

4.8.6 Cultural Resources

Basic Implementation of Management Alternative 1: The basic implementation of Management Alternative 1 would not result in major impact to the cultural resources of the management sites being considered for the storage of the foreign research reactor spent nuclear fuel. Although the sites have not been evaluated and audited for cultural resources, surveys would be completed prior to any construction or other activity that would potentially disturb these areas. Areas of cultural or historical significance are protected by laws and acts (e.g., Native American Grave and Repatriation Act, National Historic Preservation Act, etc.), and the basic implementation of Management Alternative 1 is not likely to have an impact on areas of cultural or historical significance.

Implementation Alternatives: Since the safety of areas of cultural or historic significance is protected under the basic implementation of Management Alternative 1, these areas would not be impacted by any of the various implementation alternatives, the Hybrid Alternative, or the preferred alternative.

The overseas subalternatives would have no impact on cultural resources, as these subalternatives involve no use of DOE management sites. Similarly, the No Action Alternative would have no impact for the same reason.

4.8.7 Air Quality

While all possible precautions and safeguards would be utilized in an effort to conserve air quality, it would be impacted by U.S. acceptance of foreign research reactor spent nuclear fuel.

Basic Implementation of Management Alternative 1: The basic implementation of Management Alternative 1 would not be expected to have major impacts on air quality, and projected emissions from foreign research reactor spent nuclear fuel storage at management sites would not violate Federal or State standards. Dust from construction activities could be controlled with standard techniques. Particulate emissions could have temporary effects on localized visibility, but would not adversely affect Federal or State attainment standards.

Implementation Alternatives: Air quality would be most affected under Implementation Alternative 6, the Hybrid Alternative, or the preferred alternative, all of which involve the use of some form of processing in the United States. Chemical separation would yield a higher effect on air quality than any of the other implementation alternatives.

Since the two overseas subalternatives deal strictly with spent nuclear fuel management overseas, and the No Action Alternative involves no action on the part of DOE or the Department of State, air quality in the United States would not be affected under these alternatives.

4.9 Costs

The costs of implementing various scenarios of the proposed action, including the preferred alternative, plus disposal are presented in this section. Additional details pertaining to costs are provided in Appendix F, Section F.7. For the purpose of the cost analysis, the alternatives described in Section 2.1 were adjusted to reflect the Record of Decision on the Programmatic SNF&INEL Final EIS (DOE, 1995c) issued in May 1995. According to this Record of Decision, if foreign research reactor spent nuclear fuel is managed in

the United States, the aluminum-based portion would be managed at the Savannah River Site and the TRIGA portion would be managed at the Idaho National Engineering Laboratory. DOE selected six scenarios, including the preferred alternative, for cost analysis. The costs of disposal were estimated for each scenario and are included in the analysis. The cost analysis also considers the financing arrangements discussed in Sections 2.2.1.2 and 2.2.2.3 that would affect the cost to the United States.

All costs are presented in two parts: 1) minimum discounted costs (base case) for the well-defined program components and integration approaches, and 2) "other cost factors" that are likely but sufficiently uncertain that they cannot be directly included in the minimum discounted costs. For the preferred alternative, however, a wide range of costs is presented because of the uncertainty associated with the new technology development program. An example of an item covered by "other cost factors" would be the cost growth caused by adverse weather that extends the time required to make shipments of the foreign research reactor spent nuclear fuel. The costs are shown as net present values in a consistent accounting framework.

4.9.1 Scenarios Analyzed

For the purpose of the cost analysis, six scenarios were analyzed. The scenarios reflect the alternatives that affect cost directly, and are consistent with the Record of Decision of the Programmatic SNF&INEL Final EIS (DOE, 1995c). The six cost scenarios are:

1. *Management Alternative 1 (Storage)* — Storage of aluminum-based foreign research reactor spent nuclear fuel at the Savannah River Site in new dry or wet storage facilities; storage of TRIGA foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory in existing wet or dry storage facilities.

2. *Management Alternative 1 (revised to incorporate chemical separation)* — Chemical separation of aluminum-based foreign research reactor spent nuclear fuel at the Savannah River Site; storage of TRIGA foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory.

3. *Target Material* — Storage of target material at the Savannah River Site. This scenario provides the cost differential that can be used to assess the cost of managing target material in addition to the foreign research reactor spent nuclear fuel in Management Alternative 1 storage and chemical separation scenarios.

4. *Management Alternative 2* — Management of all foreign research reactor spent nuclear fuel overseas. This scenario reflects a combination of reprocessing and dry storage overseas. Countries with the capability to accept the waste from reprocessing are assumed to have their spent nuclear fuel reprocessed. The rest use dry storage.

5. *Management Alternative 3* — Chemical separation of a portion of the aluminum-based foreign research reactor spent nuclear fuel at the Savannah River Site; reprocessing of the remainder of aluminum-based foreign research reactor spent nuclear fuel overseas; storage of TRIGA foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory.

6. *Preferred Alternative* - Implementation of a new treatment and/or packaging technology for aluminum-based foreign research reactor spent nuclear fuel and target material at the Savannah River Site; storage of TRIGA foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory.

By varying the quantities of material managed in different ways in the United States and overseas, different cost scenarios can be generated. The costs of these variations are bounded by the costs of the scenarios described above. For instance, a management alternative that includes acceptance of target material into the United States would be represented by a combination of Scenarios 1 and 3 or 2 and 3.

The implementation alternatives under Management Alternative 1 related to alternative amounts of foreign research reactor spent nuclear fuel eligible under the policy (Section 2.2.2.1), and alternative policy durations (Section 2.2.2.2), were not considered separately in the cost analysis because they are bounded by the cost scenarios analyzed. These implementation alternatives reduce the amount of foreign research reactor spent nuclear fuel eligible under the policy.

The implementation alternative under Management Alternative 1 related to alternative locations for taking title to the foreign research reactor spent nuclear fuel (Section 2.2.2.4) was not considered because it does not affect the cost analysis.

4.9.2 Minimum Program Costs

Table 4-64 shows the minimum discounted program costs (base case) for the six scenarios defined above. These costs cover all foreign research reactor spent nuclear fuel shipments, management over 40 years, and geologic disposal. Uncertainties (risks) and escalation are zero. Costs to manage target material (Scenario 3) could be added to the costs of Scenarios 1, 2, 4, and 5 to produce a minimum program cost. Costs to manage target material are included in the preferred alternative (Scenario 6).

Table 4-64 Minimum Program Costs (Net Present Value, Millions of 1996 Dollars in 1996)

Scenario	*Net Present Value*
1. Management Alternative 1 (Storage)	725/775[a]
2. Management Alternative 1 (revised to incorporate Chemical Separation)	625
3. Target Material	35
4. Management Alternative 2	1,250
5. Management Alternative 3	675
6. Preferred Alternative[b]	625-950

[a] *Dry/Wet new storage facilities*

[b] *Includes target material*

The schedule for activities in Europe under Scenario 5 is similar to that in the United States but not exactly the same. Reprocessing takes place over 13 years at Dounreay (the same timespan used for chemical separation at the Savannah River Site) although it could be completed at Dounreay in 9 or 10 years. Dounreay's charges for reprocessing are based on 1996 costs, not costs for 1996 through 2008 averaged over the 13 year period (as was done for the Savannah River Site). Geologic disposal takes place in 2025 through 2030 in Europe and 2030 through 2035 in the United States.

Costs are discounted at 3 percent for the portion to be managed overseas and at 4.9 percent for the portion to be managed in the United States. These net present values imply that all funds required to pay for the program over its 40-year life are received and placed in a trust fund accruing interest at a 4.9 percent real rate of return. This rate of return is required by the Office of Management and Budget for the year ending February, 1996.

Because of the uncertainties involved with the implementation of the new technology, the cost for Scenario 6 (preferred alternative) is presented as a range as discussed in Appendix F, Section F.7.2.9. Also, the shipping costs in Scenario 6 include the assumption that only 38 cask shipments would be accepted on the West Coast.

4.9.3 Other Cost Factors

There are four important sources of cost risk (excluding escalation) that are not part of the minimum costs in Table 4-64. Table 4-65 shows the likely values (risks) for these factors, taking into account the absolute values of the uncertainties and their probability of occurrence.

Table 4-65 Other Cost Factors (Net Present Value, Millions of 1996 Dollars in 1996)

Scenario	Cost Factors				
	Systems Integration & Logistics	*Component Risks*	*Non-program Risks*	*3% Discount Rate*	*Range*
1. Management Alternative 1 (Storage)	100	75	35	175	385
2. Management Alternative 1 (revised to incorporate Chemical Separation)	100	±15	10	125	200-250
3. Target Material	5	5	0	25	35
4. Management Alternative 2	100	±500	1000	250	350-1850
5. Management Alternative 3	100	±10	150	75	315-335
6. Preferred Alternative[b,c]	100	75	35	225	435

[a] *It is assumed that risks are the same for dry or wet storage options.*

[b] *Includes target material*

[c] *It is assumed that risk factors are the same as Management Alternative 1 (Storage)*

The other cost factors summarized in Table 4-65 are as follows:

1. *Systems Integration and Logistics Risks* - Significant risks exist in the details of the policy implementation. The implementation of the policy would involve up to 41 foreign countries, 13 years of possible receipts, dozens of foreign ports, up to ten domestic ports, two U.S. management sites, and possibly several new facilities. Technical and procedural bottlenecks could arise in several areas.

2. *Component Risks* - Significant risks exist for specific components of the foreign research reactor spent nuclear fuel program, e.g., the comprehensiveness of the acceptance criteria for aluminum-clad spent nuclear fuel characterization for dry storage, the methods of spent nuclear fuel disposal, the cost allocation at existing and new facilities, and development of new technology.

3. *Non-Program Risks* - Significant risks exist for components of other programs that affect the implementation of the foreign research reactor spent nuclear fuel EIS, (e.g., escalating repository costs, adoption of monitored retrievable storage, and differences in facility utilization plans between this EIS and those of other EISs affecting the Savannah River Site and the Idaho National Engineering Laboratory). For Scenario 5, the risks are that no spent nuclear fuel infrastructure exists in more than half of the eligible countries and that no geologic disposal program exists in most of the eligible countries.

4. *Discount Rate Risks* - Significant risks exist that the current discount rate required by the Office of Management and Budget for the year ending February, 1996 (4.9 percent real) will be reduced to a more historically representative level (e.g., 3 percent) in some future annual update. The base case costs for management outside the United States are discounted at a 3 percent rate. The use of a high discount rate is particularly risky because 1) revenues are likely to be fixed (in $/kgTM) early in the program while expenses are variable and uncertain, and 2) revenues received from the reactor operators during the 1996 through 2008 shipping period will almost certainly exceed the costs of management activities during that period. Mathematically, the excess revenues are placed in a trust fund that compounds interest at the discount rate. If the discount rate exceeds the rate at which funds are actually likely to compound, then outyear program costs (e.g., disposal) could not be met from the principal and accrued interest in the trust fund. A reduction in the discount rate from 4.9 percent to 3.0 percent has a larger impact on the program than any of the technical or systems integration risks.

4.9.4 Potential Total Costs

Table 4-66 combines the base case costs with the "other cost factors" to provide a realistic expectation of the potential total costs of the program, excluding escalation. The "other cost factors" are divided into technical factors and discount rate-related factors. This table also shows the cumulative percentage effect on the minimum discounted program costs of real escalation at a rate of 1 percent per year over 40 years.

Table 4-66 Potential Total Costs (Net Present Value, Millions of 1996 Dollars in 1996)

Scenario	Minimum Program Cost	Other Cost Factors (Technical)	Other Cost Factors (Discount Rate)	Potential Total Cost, No Escalation	1% Real Escalation, Cumulative
1. Management Alternative 1 (Storage)	725/775[a],	210	175	~1,100	+11%
2. Management Alternative 1 (revised to incorporate Chemical Separation)	625	85-145	125	~900	+9%
4. Management Alternative 2	1,250	600-1,600	250	2,100-3,100	+13%
5. Management Alternative 3[c]	675	225-275	75	~1000	+9%
6. Preferred Alternative[b]	625-950	210	225	~1,050-1,400	+10%-11%

[a] *Dry/Wet new storage facilities*

[b] *Includes target material*

[c] *The total cost risk to the United States is less than 1/2 the total cost risk because a large portion of the*

Table 4-66 shows that the net present value of the potential total costs of implementing the program completely in the United States, including an estimate of program risks but excluding escalation, range from about $900 million for Scenario 2, to $1.4 billion for Scenario 6. Scenario 5 has similar total program costs as Scenario 2 but higher risks for geologic disposal.

In Scenario 4, costs for storing foreign research reactor spent nuclear fuel overseas are highly speculative. In addition, the overseas storage costs are always higher than the more centralized management alternatives because of the extremely high cost of safely and securely managing and disposing of small quantities of spent nuclear fuel in dozens of countries.

The program costs presented in Tables 4-64, 4-65, and 4-66 are in constant 1996 dollars, discounted to 1996. This implies that funds required to cover these costs are received in 1996 and explicitly or implicitly placed in a trust fund. If payments into the trust fund are deferred, then they must be larger than if they had been received on January 1, 1996. For example, if payments are made in 13 equal annual installments every December 31 over the 1996 through 2008 shipping and receiving period, then the constant-dollar payments must increase by 37 percent. A composite of payment schedules, e.g., 13 years for high-income-economy country reactor operators and pay-as-you-go (for the United States) for all other costs, including other-than-high-income-economy country costs, has the effect of increasing the required constant-dollar payments by as much as 25 to 50 percent.

4.9.5 Cost to the United States

The cost of the proposed policy to the United States depends directly on the type of financing arrangement that DOE would adopt in implementing the policy and the discount rate at which revenues from reactor operators accrue interest. Alternative financing arrangements are discussed in Sections 2.2.1.2 and 2.2.2.3 of the EIS. Briefly, the financing arrangements considered are:

1. United States bears the full cost of the program for countries with other-than-high-income economies and charges a *competitive* fee to high-income-economy countries. This is the financial arrangement in the preferred alternative.

2. United States bears the full cost for all countries (*no* fee).

3. United States charges a *full-cost-recovery* fee to all countries.

4. United States bears the full cost of the program for countries with other-than-high-income economies and charges a *full-cost-recovery* fee to high-income-economy countries.

From a practical standpoint, the U.S. cost under financing arrangement 3 above would be zero. The issue would be whether any foreign countries would participate in the program if full-cost recovery exceeded a competitive fee. The first and fourth arrangements are functionally similar, the U.S. cost resulting from the difference in the *competitive* versus the *full-cost-recovery* fee. The U.S. cost under the second arrangement (*no* fee) would be the total program cost as discussed earlier. Any fees established by the United States will take place pursuant to a Federal Register notice after the Record of Decision for this EIS.

Table 4-67 shows costs to the United States for the minimum program in each of the cost scenarios analyzed (except Scenario 3) under a variety of fee schedules. Adding target material to Scenarios 1, 2, 4 or 5 would increase its costs by 3 to 4 percent. Fees of $2,000/kgTM, $5,000/kgTM, $7,500/kgTM, and $10,000/kgTM, including a pass-through of shipping charges (all levelized over 13 years), are used to provide a range of estimates for the cost to the United States. These fees do not imply that reactor operators would pay them for management in Europe or the United States, or that the fee established by the United States will be one of these values. They are used for illustration only and suggest a bounding range, exclusive of technical risk factors, discount rate adjustments, and escalation.

The cost to the United States is the sum of: 1) the cost of managing the foreign research reactor spent nuclear fuel from the other-than-high-income-economy countries, including shipping, and 2) the difference between the revenues received for management of high-income-economy country foreign research reactor spent nuclear fuel and the total program cost of managing high-income-economy country foreign research reactor spent nuclear fuel, including shipping. Including shipping in the U.S. management costs allows management costs for the United States and the United Kingdom to be presented on a comparable basis.

Table 4-67 Costs to the United States for Minimum Program Under Various Scenarios and Fee Structures (Millions of 1996 Dollars, Net Present Value of Costs in 1996, Fees Levelized over 1996-2008 Period)

Scenario[a]	Full-Cost Recovery[b]	Levelized Shipping Fee $/kgTM	Levelized Management Fee (excluding shipping) $/kgTM	Net Present Value For Levelized Fee[c] (developed countries only)				No Fee[d]	
				$2,000/ kgTM	$5,000/ kgTM	$7,500/ kgTM	$10,000/ kgTM	Developed Countries	Total (excluding shipping)
1. Management Alternative 1 (Storage)	100	1,500	6,500	325	100	(75)	(250)	475	575
2. Management Alternative 1 (revised to incorporate Chemical Separation)	90	1,500	5,800	275	50	(125)	(300)	425	525
4. Management Alternative 2[f]	500+							1,250 +	1,750+
5. Management Alternative 3[g]	85	1,500	6,000	225	75	(50)	(175)	300	375
6. Preferred Alternative[e]	90-110	1,700	5,600-9,200	275-550	50-325	(150)-125	(325)-(50)	425-700	500-800

[a] *The total mass (kgTM) of foreign research reactor spent nuclear fuel in the various scenarios is approximately as follows: Aluminum-based plus TRIGA: 115,000 kgTM; from other-than-high-income-economy countries: 15,000 kgTM; from high-income-economy countries: 100,000kgTM; to Dounreay in Scenario 5: 37,000 kgTM. The total mass of target material is approximately 3,400 kgTM, essentially all from high-income-economy countries.*

[b] *Full-cost recovery from high-income-economy countries only. The United States bears the costs of the other-than-high-income-economy countries in these cases.*

[c] *Payable in 13 equal annual installments on December 31 of the years 1996 through 2008. Add costs in column labeled "Full-Cost Recovery" to generate total cost to the United States.*

[d] *As above, implicitly paid by the taxpayers in 13 equal annual installments (to maintain consistency with the payment period of the reactor operators), excluding shipping. The net present value of shipping in Scenarios 1 and 2 is $140 Million. The net present value of shipping to the U.S. only in Scenario 5 is $90 Million. The net present value of shipping in Scenario 6 is $160 million. Adding shipping to the net present value for Scenario 2 and Scenario 5 shows that the total program costs for Scenario 5 are slightly lower.*

[e] *Includes target material*

[f] *There is no defined basis for the charges to the United States for non-U.S. management. Costs to the United States under Scenario 4 assume that the United States absorbs the cost to construct and operate independent foreign research reactor spent nuclear fuel storage installations (including all supporting safety, security, transport, health physics, etc. infrastructure) for the 22 countries with no commercial nuclear power programs and that the United States partially subsidizes the other countries, depending on their income-economy status, commercial nuclear power infrastructure, and other factors.*

[g] *Revenues paid to the United States include pass-through of shipping charges. Costs to the United States for management in Europe include the cost of blending down the HEU to LEU ($20 million).*

Table 4-67 shows that for minimum discounted program costs and fees charged to high-income-economy country reactor operators levelized over 13 years, costs to the United States for the scenarios could range from several hundred million dollars at a fee of $2,000/kgTM to a profit for fees of $7,500/kgTM to $10,000/kgTM. The cost of managing the spent nuclear fuel from the other-than-high-income-economy countries (including shipping) adds roughly $100 million more to the cost borne by the United States.

If fees in the $2,000 to $10,000 per kgTM range are established and charged over 13 years, the costs to the United States would be as estimated in Table 4-67 plus any additional cost factors not incorporated in the minimum program costs. These additional cost factors are: 1) technical risks, 2) discount rate-related risks, and 3) escalation. Table 4-66 shows that technical risks could add roughly $100 to $200 million to the costs borne by the United States. Discount rate-related risks are of a similar size. Escalation risks are uncertain but could be in the same range.

4.10 Foreign Research Reactor Spent Nuclear Fuel Risks and Common Risks

This section compares foreign research reactor spent nuclear fuel program risks to those of common activities, such as smoking, flying, receiving a medical X-ray, and so forth.

4.10.1 Risks in the Proposed Action

Preceding sections in Chapter 4 evaluated the risks from radiological and nonradiological activities and accidents in four segments: marine transport, port activities, ground transport, and site activities.

The highest estimated accident MEI risk to the general public from any of the foreign research reactor spent nuclear fuel implementation alternatives is 0.00015 LCF, as shown earlier in Figure 4-23. This would be an individual who lives at the Oak Ridge Reservation boundary under Implementation Alternative 5, Wet Storage Technology for New Construction. This hypothetical individual's chance of incurring a fatal cancer would be increased by less than two in ten thousand.

The highest estimated incident-free population risk to the general public living near any of the DOE management sites from any of the implementation alternatives is less than one-half LCF, as shown earlier in Figure 4-24. This risk occurs under Implementation Alternative 6, Near Term Chemical Separation in the United States, at the Savannah River Site. This risk would be spread among the roughly 600,000 people who live within 80 km (50 miles) of the Savannah River Site, so the average risk among these people would be less than one in a million.

The population risk to the general public due to radiation exposure during ground transport could be as high as 0.22 LCF, as discussed earlier under several of the implementation alternatives to Management Alternative 1.

Nonradiological fatalities are also unlikely. As a practical matter, the only source of nonradiological fatalities to the public is through a traffic accident with a truck or a train. Since truck or train shipments are about 100 or fewer per year, the likelihood of a crash is not high.

4.10.2 Common Radiological Risks

Table 4-68 presents several typical sources of exposure to radiation from everyday life (DOE, 1993e). The average person in the United States receives about 300 mrem each year from natural sources of radiation and about another 50 mrem from manmade sources of radiation. For example, the largest dose listed in Table 4-68 is the 200 mrem/yr from exposure to naturally-occurring radon gas. This is twice the

100 mrem/yr regulatory limit that would apply to marine workers, port workers, and truck drivers under the proposed action. It is also much higher than the dose any member of the general public would be likely to receive.

Table 4-68 Typical Sources of Radiation, Exposures, and Risks

Source	*Dose Rate (mrem/yr)*	*Risk (LCF/yr)*
Radon	200	0.0001
Internal	39	0.000020
Diagnostic X-rays	39	0.000020
Soil, rocks	28	0.000014
Cosmic rays	27	0.000014
Nuclear medicine	14	0.000007
Nuclear fuel cycle	less than 1	less than 5×10^{-7}
Fallout	less than 0.01	less than 5×10^{-9}

There are also large variations in radiation dose to which people are routinely exposed. For example, people who live at high altitudes receive more radiation dose than people who live at sea level. People who live or work in brick, granite, or marble buildings receive more radiation dose than people who live or work in wooden structures. People who live in well-insulated houses receive more radiation dose from trapped radon gas than people who live in well-ventilated houses. Taking all the various factors into account, the annual U.S. dose from background radiation can easily range from 100 mrem for people who live in well-ventilated wooden houses on sandy soil at sea level to about 1000 mrem for people who live in well-insulated houses in the Denver area (de Planque, 1994). Thus, in addition to the average annual radiation dose, routine variations in annual radiation dose are also much larger than the dose any member of the general public would be likely to receive under the proposed action.

4.10.3 Risks from Common Activities

Every activity carries some risk. Table 4-69 shows risks estimated to increase an individual's chance of death in any year by one in one million (Slovic, 1986). For example, a single airline flight across the United States would increase each passenger's radiation dose by about 4 mrem (de Planque, 1994). Most of these voluntary activities would not be considered unusually risky actions, and they can be compared to the risks presented earlier in this chapter for perspective.

Table 4-69 Risks Estimated to Increase Chance of Death in Any Year by One Chance in a Million

Activity	*Cause of Death*
Smoking 1.4 cigarettes	Cancer; heart disease
Living 2 days in New York or Boston	Air pollution
Traveling 16 km (10 mi) by bicycle	Accident
Flying 1,600 km (1,000 mi) by jet	Accident
Living 2 months in Denver on vacation from New York	Cancer caused by cosmic radiation
One chest X-ray taken in a good hospital	Cancer caused by radiation
Drinking 30 12-oz cans of diet soda	Cancer caused by saccharin

5. Applicable Laws, Regulations, and Other Requirements

5.1 Consultation

Certain Federal laws, such as the Endangered Species Act, the Fish and Wildlife Coordination Act, and the National Historic Preservation Act, require consultation and coordination by the United States Department of Energy (DOE) with other governmental entities. These consultation and coordination requirements will commence and be completed as site-specific spent nuclear fuel management projects and decisions are proposed. Any site-specific required consultations will be addressed in the site-specific Environmental Impact Statement (EIS) and/or in Volume I of DOE Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Draft EIS (Table 5-1).

5.2 Laws and Other Requirements

This section identifies and summarizes the major laws, regulations, Executive Orders, and DOE Orders that may apply to the receipt and management of spent nuclear fuel from foreign research reactors.

Section 5.2.1 discusses the major Federal statutes that impose environmental protection and compliance requirements upon DOE. In addition, there may be other State and local measures applicable to the foreign research reactor spent nuclear fuel because Federal law delegates enforcement or implementation authority to State or local agencies. These state- and local-specific requirements are addressed in the site-specific appendices. Section 5.2.2 addresses environmentally-related Executive Orders that clarify issues of national policy and set guidelines under which Federal agencies, including DOE, must act. DOE implements its responsibilities for protection of public health, safety, and the environment through a series of Departmental Orders that are mandatory for operating contractors of DOE-owned facilities. Section 5.2.3 discusses those DOE orders related to environmental, health, and safety protection. Hazardous and radioactive materials transportation regulations are summarized in Section 5.4.2.

5.2.1 Federal Environmental Statutes and Regulations

National Environmental Policy Act (NEPA) of 1969, as amended (42 USC §4321 et seq.)

NEPA establishes a national policy promoting awareness of the environmental consequences of the activity of humans on the environment and also promoting consideration of the environmental impacts during the planning and decision making stages of a project. This Act requires all Federal agencies to prepare a detailed statement on the environmental effects of proposed major Federal actions that may significantly affect the quality of the human environment.

This EIS has been prepared in response to these NEPA requirements and policies. It discusses reasonable alternatives and their potential environmental consequences, and has been prepared in accordance with the Council on Environmental Quality and DOE regulations for implementing the procedural provisions of the NEPA Implementing Procedures (40 CFR Parts 1500 through 1508) and DOE NEPA Implementing Procedures (10 CFR Part 1021).

Table 5-1 Agency Consultations

Subject Area	*Legislation*	*Agency*
Endangered Species	Endangered Species Act of 1973, as amended; State laws	U.S. Fish and Wildlife Service, State agencies
Migratory birds	Migratory Bird Treaty Act	U.S. Fish and Wildlife Service
Bald and Golden eagles	Bald and Golden Eagle Protection Act	U.S. Fish and Wildlife Service
Archaeological, historical, and cultural preservation	National Historic Preservation Act of 1966, Archaeological Resources Protection Act, Antiquities Act, American Indian Religious Freedom Act of 1978, Native American Grave Protection and Repatriation Act of 1990	State Historic Preservation Office, President's Advisory Council, Tribes
Discharge of pollutants to water	Clean Water Act, Safe Drinking Water Act	U.S. Environmental Protection Agency, State agencies
Work in navigable U.S. waters	Clean Water Act, Rivers and Harbors Act, Coastal Management Act	U.S. Army Corps of Engineers
Prime and unique farmlands	Farmland Protection Policy Act of 1981	Soil Conservation Service
Floodplains	Executive Order 11988, Fish and Wildlife Coordination Act	U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, State agencies
Wetlands	Executive Order 11990, Fish and Wildlife Coordination Act, Clean Water Act	U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, State agencies
Environmental justice	Executive Order 12898	U.S. Environmental Protection Agency
Water body alteration	Fish and Wildlife Coordination Act	U.S. Fish and Wildlife Service, State agencies
River status	Wild and Scenic Rivers Act, Anadromous Fish Conservation Act, Hanford Reach Study Act	U.S. Department of the Interior
Air pollution	Clean Air Act	U.S. Environmental Protection Agency, State and local agencies
Water use and availability	Water Resources Planning Act of 1965, Safe Drinking Water Act, and others	U.S. Environmental Protection Agency, Office of Water Policy, State agencies
Noise	Noise Pollution and Abatement Act of 1970, Noise Control Act of 1972	U.S. Environmental Protection Agency, State agencies
Siting and planning	State siting acts, county zoning regulations	State and County agencies
Waste management and transportation	Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act and the Hazardous and Solid Waste Amendments of 1984; Comprehensive Environmental Response, Compensation, and Liability Act; Emergency Planning and Community Right to Know Act; Hazardous Materials Transportation Act	U.S. Environmental Protection Agency, U.S. Department of Transportation, U.S. Coast Guard, State agencies
Emergency Management & Response	Defense Production Act of 1950, Robert T. Stafford Disaster Relief and Emergency, Assistance Act, National Security Act of 1947	Federal Emergency Management Agency, U.S. Environmental Protection Agency, U.S. Department of Transportation, U.S. Coast Guard, State and local agencies

Atomic Energy Act of 1954, as amended (42 USC §2011 et seq.)

The Atomic Energy Act of 1954 authorizes DOE to establish standards to protect health or minimize dangers to life or property with respect to activities under its jurisdiction. Through a series of DOE Orders, DOE has established an extensive system of standards and requirements to ensure safe operation of its facilities.

Clean Air Act, as amended (42 USC §7401 et seq.)

The Clean Air Act, as amended, is intended to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population." Section 118 of the Clean Air Act, as amended, requires that each Federal agency, such as DOE, with jurisdiction over any property or facility that might result in the discharge of air pollutants, comply with "all Federal, State, interstate, and local requirements" with regard to the control and abatement of air pollution.

The Act requires the Environmental Protection Agency to establish National Ambient Air Quality Standards as necessary to protect public health, with an adequate margin of safety, from any known or anticipated adverse effects of a regulated pollutant (42 USC §7409). The Act also requires establishment of national standards of performance for new or modified stationary sources of atmospheric pollutants (42 USC §7411) and requires specific emission increases to be evaluated so as to prevent a significant deterioration in air quality (42 USC §7470). Hazardous air pollutants, including radionuclides, are regulated separately (42 USC §7412). Air emissions are regulated by the Environmental Protection Agency in 40 CFR Parts 50 through 99. In particular, radionuclide emissions are regulated under the National Emission Standard for Hazardous Air Pollutants Program (see 40 CFR Part 61).

Safe Drinking Water Act, as amended [42 USC §300 (F) et seq.]

The primary objective of the Safe Drinking Water Act, as amended, is to protect the quality of the public water supplies and all sources of drinking water. The implementing regulations, administered by the Environmental Protection Agency unless delegated to the States, establish standards applicable to public water systems. They promulgate maximum contaminant levels (including those for radioactivity), in public water systems, which are defined as water systems that serve at least 15 service connections used by year-round residents or regularly serve at least 25 year-round residents. Safe Drinking Water Act requirements have been promulgated by the Environmental Protection Agency in 40 CFR Parts 100 through 149. For radioactive material, the regulations specify that the average annual concentration of manmade radionuclides in drinking water as delivered to the user by such a system shall not produce a dose equivalent to the total body or an internal organ greater than four mrem per year beta activity. Other programs established by the Safe Drinking Water Act include the Sole Source Aquifer Program, the Wellhead Protection Program, and the Underground Injection Control Program.

Clean Water Act, as amended (33 USC §1251 et seq.)

The Clean Water Act, which amended the Federal Water Pollution Control Act, was enacted to "restore and maintain the chemical, physical and biological integrity of the Nation's water." The Clean Water Act prohibits the "discharge of toxic pollutants in toxic amounts" to navigable waters of the United States. Section 313 of the Clean Water Act, as amended, requires all branches of the Federal Government engaged in any activity that might result in a discharge or runoff of pollutants to surface waters to comply with Federal, State, interstate, and local requirements.

In addition to setting water quality standards for the Nation's waterways, the Clean Water Act supplies guidelines and limitations for effluent discharges from point-source discharges and provides authority for the Environmental Protection Agency to implement the National Pollutant Discharge Elimination System permitting program. The National Pollutant Discharge Elimination System program is administered by the Water Management Division of the Environmental Protection Agency pursuant to regulations in 40 CFR Part 122 et seq. Idaho has not applied for National Pollutant Discharge Elimination System authority from

the Environmental Protection Agency. Thus, all National Pollutant Discharge Elimination System permits required for the Idaho National Engineering Laboratory are obtained by DOE through Environmental Protection Agency Region 10 (40 CFR Part 122 et seq.).

Sections 401 and 405 of the Water Quality Act of 1987 added Section 402(p) to the Clean Water Act. Section 402(p) requires that the Environmental Protection Agency establish regulations for issuing permits for stormwater discharges associated with industrial activity. Although any stormwater discharge associated with industrial activity requires a National Pollutant Discharge Elimination System permit application, regulations implementing a separate stormwater permit application process have not yet been adopted by the Environmental Protection Agency.

Resource Conservation and Recovery Act, as amended (Solid Waste Disposal Act) (42 USC §6901 et seq.)

The treatment, storage, or disposal of hazardous and nonhazardous waste is regulated under the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act and the Hazardous and Solid Waste Amendments of 1984. Pursuant to Section 3006 of the Act, any State that seeks to administer and enforce a hazardous waste program pursuant to the Resource Conservation and Recovery Act may apply for Environmental Protection Agency authorization of its program. The Environmental Protection Agency regulations implementing the Resource Conservation and Recovery Act are found in 40 CFR Parts 260 through 280. These regulations define hazardous wastes and specify hazardous waste transportation, handling, treatment, storage, and disposal requirements.

The regulations imposed on a generator or a treatment, storage, and/or disposal facility vary according to the type and quantity of material or waste generated, treated, stored, and/or disposed of. The method of treatment, storage, and/or disposal also impacts the extent and complexity of the requirements.

Current Status of Spent Nuclear Fuel under the Resource Conservation and Recovery Act

Historically, DOE chemically reprocessed spent nuclear fuel to recover valuable products and fissionable materials, and as such, the spent nuclear fuel was not a solid waste under the Resource Conservation and Recovery Act.

World events have resulted in significant changes in DOE's direction and operations. In particular, in April 1992, DOE announced the phase-out of reprocessing for the recovery of special nuclear materials. With these changes, DOE's focus on most of its spent nuclear fuel has changed from reprocessing and recovery of materials to storage and ultimate disposition. This in turn has created uncertainty regarding the regulatory status of some of DOE's spent nuclear fuel relative to the Resource Conservation and Recovery Act.

DOE has initiated discussion with the Environmental Protection Agency on the potential applicability of the Resource Conservation and Recovery Act to spent nuclear fuel. Further discussions with Environmental Protection Agency Headquarters and regional offices and State regulators are ongoing to develop a strategy for meeting any the Resource Conservation and Recovery Act requirements that might apply.

Federal Facility Compliance Act (42 USC §6921 et seq.)

The Federal Facility Compliance Act, enacted on October 6, 1992, waives sovereign immunity for fines and penalties for Resource Conservation Recovery Act violations at Federal facilities. However, a provision postpones fines and penalties after 3 years for mixed waste storage prohibition violations at

DOE sites and requires DOE to prepare plans for developing the required treatment capacity for mixed waste stored or generated at each facility. Each plan must be approved by the host State or the Environmental Protection Agency, after consultation with other affected States, and a consent order must be issued by the regulator requiring compliance with the plan. The Federal Facility Compliance Act further provides that DOE will not be subject to fines and penalties for land disposal restriction storage prohibition violations for mixed waste as long as it is in compliance with such an approved plan and consent order and meets all other applicable regulations. This would only apply to foreign research reactor spent nuclear fuel if the Resource Conservation and Recovery Act would apply to storage and treatment of foreign research reactor spent nuclear fuel.

National Historic Preservation Act, as amended (16 USC §470 et seq.)

The National Historic Preservation Act, as amended, provides that sites with significant national historic value be placed on the *National Register of Historic Places*. There are no permits or certifications required under the Act. However, if a particular Federal activity may impact a historic property resource, consultation with the Advisory Council on Historic Preservation will usually generate a Memorandum of Agreement, including stipulations that must be followed to minimize adverse impacts. Coordination with the State Historic Preservation officer is also undertaken to ensure that potentially significant sites are properly identified and appropriate mitigative actions are implemented.

Archaeological Resource Protection Act, as amended (16 USC §470aa et seq.)

This Act requires a permit for any excavation or removal of archaeological resources from public or Native American lands. Excavations must be undertaken for the purpose of furthering archaeological knowledge in the public interest, and resources removed are to remain the property of the United States. Consent must be obtained from the Indian Tribe owning lands on which a resource is located before a permit is issued, and the permit must contain terms or conditions requested by the Tribe.

Native American Grave Protection and Repatriation Act of 1990 (25 USC §3001)

This law directs the Secretary of Interior to assume responsibilities for repatriation of Federal archaeological collections and collections held by museums receiving Federal funding that are culturally affiliated with Native American Tribes. Major actions to be taken under this law include (a) establishing a review committee with monitoring and policy-making responsibilities, (b) developing regulations for repatriation, including procedures for identifying lineal descent or cultural affiliation needed for claims, (c) oversight of museum programs designed to meet the inventory requirements and deadlines of this law, and (d) developing procedures to handle unexpected discoveries of graves or grave goods during activities on Federal or tribal land.

American Indian Religious Freedom Act of 1978 (42 USC §1996)

This Act reaffirms Native American religious freedom under the First Amendment, and sets U.S. policy to protect and preserve the inherent and constitutional right of Native Americans to believe, express, and exercise their traditional religions. The Act requires that Federal actions avoid interfering with access to sacred locations and traditional resources that are integral to the practice of religions.

Religious Freedom Restoration Act of 1993 (42 USC §2000bb et seq.)

This Act prohibits the Government, including Federal Departments, from substantially burdening the exercise of religion unless the Government demonstrates a compelling governmental interest, and the action furthers a compelling Government interest and is the least restrictive means of furthering that interest.

Endangered Species Act, as amended (16 USC §1531 et seq.)

The Endangered Species Act, as amended, is intended to prevent the further decline of endangered and threatened species and to restore these species and their habitats. The Act is jointly administered by the United States Departments of Commerce and the Interior. Section 7 of the Act requires consultation with the U.S. Fish and Wildlife Service to determine whether endangered and threatened species or their critical habitats are known to be in the vicinity of the proposed action. The Idaho National Engineering Laboratory has commenced the consultation process with the U.S. Fish and Wildlife Service (DOE, 1995c). The Savannah River Site, the Hanford Site, the Oak Ridge Reservation, and the Nevada Test Site have also commenced consultations with the U.S. Fish and Wildlife Service.

Migratory Bird Treaty Act, as amended (16 USC §703 et seq.)

The Migratory Bird Treaty Act, as amended, is intended to protect birds that have common migration patterns between the United States and Canada, Mexico, Japan, and Russia. It regulates the harvest of migratory birds by specifying things such as the mode of harvest, hunting seasons, and bag limits. The Act stipulates that it is unlawful at any time, by any means, or in any manner to "kill . . . any migratory bird." Although no permit for this project is required under the Act, DOE is required to consult with the U.S. Fish and Wildlife Service regarding impacts to migratory birds and to evaluate ways to avoid or minimize these effects in accordance with the U.S. Fish and Wildlife Service Mitigation Policy.

Bald and Golden Eagle Protection Act, as amended (16 USC §668-668d)

The Bald and Golden Eagle Protection Act makes it unlawful to take, pursue, molest, or disturb bald (American) and golden eagles, their nests, or their eggs anywhere in the United States (Sections 668, 668c). A permit must be obtained from the U.S. Department of the Interior to relocate a nest that interferes with resource development or recovery operations.

Wild and Scenic Rivers Act, as amended (16 USC 1271 et seq. 71:8301 et seq.)

The Wild and Scenic Rivers Act, as amended, protects certain selected rivers of the Nation that possess outstanding scenic, recreational, geological, fish and wildlife, historical, cultural, or other similar values. These rivers are to be preserved in a free-flowing condition to protect water quality and other vital national conservation purposes. The purpose of the Act is to institute a national wild and scenic rivers system, to designate the initial rivers that are a part of that system, and to develop standards for the addition of new rivers in the future.

Occupational Safety and Health Act of 1970, as amended (29 USC §651 et seq.)

The Occupational Safety and Health Act establishes standards to enhance safe and healthful working conditions in places of employment throughout the United States. The Act is administered and enforced by the Occupational Safety and Health Administration, a U.S. Department of Labor agency. While the Occupational Safety and Health Administration and Environmental Protection Agency both have a mandate to reduce exposures to toxic substances, the Occupational Safety and Health Administration's

jurisdiction is limited to safety and health conditions that exist in the workplace environment. In general, under the Act, it is the duty of each employer to furnish all employees a place of employment free of recognized hazards likely to cause death or serious physical harm. Employees have a duty to comply with the occupational safety and health standards and all rules, regulations, and orders issued under the Act. the Occupational Safety and Health Administration regulations (29 CFR) establish specific standards telling employers what must be done to achieve a safe and healthful working environment. DOE places emphasis on compliance with these regulations at its facilities and prescribes through DOE Orders the Occupational Safety and Health Act standards that contractors shall meet, as applicable to their work at Government-owned, contractor-operated facilities (DOE Order 5480.1B, 5483.1A). DOE keeps and makes available the various records of minor illnesses, injuries, and work-related deaths as required by the Occupational Safety and Health Administration regulations.

Noise Control Act of 1972, as amended (42 USC §4901 et seq.)

Section 4 of the Noise Control Act of 1972, as amended, directs all Federal agencies to carry out "to the fullest extent within their authority" programs within their jurisdictions in a manner that furthers a national policy of promoting an environment free from noise that jeopardizes health and welfare.

5.2.2 Executive Orders

Executive Order 11514 (Protection and Enhancement of Environmental Quality)

Executive Order 11514 requires Federal agencies to continually monitor and control their activities to protect and enhance the quality of the environment and to develop procedures to ensure the fullest practicable provision of timely public information and understanding of the Federal plans and programs with environmental impact to obtain the views of interested parties. The DOE has issued regulations (10 CFR 1021) and DOE Order 5440.1E for compliance with this Executive Order.

Executive Order 11988 (Floodplain Management)

Executive Order 11988 requires Federal agencies to establish procedures to ensure that the potential effects of flood hazards and floodplain management are considered for any action undertaken in a floodplain and that floodplain impacts be avoided to the extent practicable.

Executive Order 11990 (Protection of Wetlands)

Executive Order 11990 requires Governmental agencies to avoid any short- and long-term adverse impacts on wetlands wherever there is a practicable alternative.

Executive Order 12856 (Right-to-Know Laws and Pollution Prevention Requirements)

Executive Order 12856 requires all Federal agencies to reduce the toxic chemicals entering any waste stream. This order also requires Federal agencies to report toxic chemicals entering waste streams; improve emergency planning, response, and accident notification; and encourage clean technologies and testing of innovative prevention technologies.

Executive Order 12898 (Environmental Justice)

Executive Order 12898 requires Federal agencies to identify and address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

Table 5-2 DOE Orders Relevant to the DOE Spent Nuclear Fuel Management Program

DOE Order	Subject
1300.2A	Department of Energy Technical Standards Program (5-19-92)
1360.2B	Unclassified Computer Security Program (5-18-92)
1540.2	Hazardous Material Packaging for Transport-Administrative Procedures (9-30-86; Chg. 1. 12-19-88)
3790.1B	Federal Employee Occupational Safety and Health Program (1-7-93)
4330.4A	Maintenance Management Program (10-17-90)
4700.1	Project Management System (3-6-87)
5000.3B	Occurrence Reporting and Utilization of Operations Information (4-9-92)
5400.1	General Environmental Protection Program (11-9-88; Chg. 1, 6-29-90)
5400.2A	Environmental Compliance Issue Coordination (Errata 1-31-89)
5400.4	Comprehensive Environmental Response, Compensation, and Liability Act Requirements (10-6-89)
5400.5	Radiation Protection of the Public and the Environment (2-8-90; Chg. 2, 1-7-93)
5440.1E	National Environmental Policy Act Compliance Program (11-10-92)
5480.1B	Environmental, Safety and Health Program for DOE Operations (9-23-86; Chg. 4, 3-27-90)
5480.3	Environmental Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances, and Hazardous Wastes (7-9-85)
5480.4	Environmental Protection, Safety, and Health Protection Standards (5-15-84; Chg. 4, 1-7-93)
5480.6	Safety of Department of Energy-Owned Nuclear Reactors (9-23-86)
5480.7A	Fire Protection (2-17-93)
5480.8A	Contractor Occupational Medical Program (6-26-92)
5480.9	Construction Safety and Health Program (11-18-87)
5480.10	Contractor Industrial Hygiene Program (6-26-85)
5480.11	Radiation Protection for Occupational Workers (12-21-88; Chg. 2, 6-29-90)
5480.15	Department of Energy Laboratory Accreditation Program for Personnel Dosimetry (12-14-87)
5480.17	Site Safety Representatives (10-05-88))
5480.18A	Accreditation of Performance-Based Training for Category A Reactors and Nuclear Facilities (07-19-91)
5480.19	Conduct of Operations Requirements for DOE Facilities (7-9-90; Chg. 1, 5-18-92)
5480.20	Personnel Selection, Qualification, Training, and Staffing Requirements at DOE Reactor and Nonreactor Nuclear Facilities (2-20-91)
5480.21	Unreviewed Safety Questions (12-24-91)
5480.22	Technical Safety Requirements (2-25-92; Chg. 1, 9-15-92)
5480.23	Nuclear Safety Analysis Reports (4-10-92)
5480.24	Nuclear Criticality Safety (8-12-92)
5480.27	Equipment Qualification for Reactor and Nonreactor Nuclear Facilities (1-15-93)
5480.28	Natural Phenomena Hazards Mitigation (1-15-93)
5480.31	Startup and Restart of Nuclear Facilities (9-15-93)
5481.1B	Safety Analysis and Review System (9-23-86; Chg. 1, 5-19-87)
5482.1B	Environment, Safety, and Health Appraisal Program (9-23-86; Chg. 1, 11-18-91)
5483.1A	Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned, Contractor-Operated Facilities (6-22-83)
5484.1	Environmental Protection, Safety, and Health Protection Information Reporting Requirements (2-21-81; Chg. 7, 10-17-90)
5500.1B	Emergency Management System (4-30-91; Chg. 1, 4-30-91)
5500.2B	Emergency Categories, Classes, and Notification and Reporting Requirements (4-30-91; Chg. 1, 2-27-92)
5500.3A	Planning and Preparedness for Operational Emergencies (4-30-91; Chg. 1, 2-27-92)
5500.4A	Public Affairs Policy and Planning Requirements for Emergencies (6-8-92)
5500.7B	Emergency Operating Records Protection Program (10-23-91)
5500.10	Emergency Readiness Assurance Program (4-30-91; Chg. 1, 2-27-92)
5530.3	Radiological Assistance Program (01-14-92; Change 1, 4-10-92)
5530.5	Federal Radiological Monitoring and Assessment Center (7-10-92)
5630.11A	Safeguards and Security Program (12-7-92)
5630.12A	Safeguards and Security Inspection and Evaluation Program (6-23-92)
5700.6C	Quality Assurance (8-21-91)
5820.2A	Radioactive Waste Management (9-26-88)
6430.1A	General Design Criteria (4-6-89)

5.2.3 DOE Regulations and Orders

Through the authority of the Atomic Energy Act, DOE is responsible for establishing a comprehensive health, safety, and environmental program for its facilities. The regulatory mechanisms through which DOE manages its facilities are the promulgation of regulations and the issuance of DOE Orders.

The DOE regulations are generally found in 10 CFR. These regulations address such areas as energy conservation, administrative requirements and procedures, nuclear safety, and classified information. For the purposes of this EIS, relevant regulations include 10 CFR Part 834, Radiation Protection of the Public and the Environment; 10 CFR Part 835, Occupational Radiation Protection; 10 CFR Part 1021, Compliance with NEPA; and 10 CFR Part 1022, Compliance with Floodplains/Wetlands Environmental Review Requirements. DOE has enacted occupational radiation protection standards to protect DOE and its contractor employees. These standards are set forth in 10 CFR Part 83b, Occupational Radiation Protection. The rules in this part establish radiation protection standards, limits, and program requirements for protecting individuals from ionizing radiation resulting from the conduct of DOE activities, including those conducted by DOE contractors. The activity may be, but is not limited to, design, construction, or operation of DOE facilities. These regulations would be in effect for the construction and operation of any facilities associated with the management of foreign research reactor spent nuclear fuel.

DOE Orders generally set forth policy and the programs and internal procedures for implementing those policies. The major DOE Orders pertaining to the eventual construction and operation of spent nuclear fuel facilities within the DOE Complex are listed in Table 5-2.

5.2.4 Nuclear Regulatory Commission (NRC) Licensing Standards

DOE is proceeding with actions to implement safe, efficient, and cost-effective interim storage of its spent nuclear fuel before final disposition. The need for interim storage has led DOE to evaluate storage technologies and alternative management strategies to provide an optimum solution to storage challenges. Several commercial storage technologies under evaluation for DOE-owned spent nuclear fuel have been licensed and regulated by NRC. In addition, DOE-owned spent nuclear fuel could eventually come under the jurisdiction of NRC if it is to be disposed of in a geological repository. Therefore, DOE is considering having any new interim storage facilities reviewed to determine whether they could meet NRC licensing standards. This approach, if implemented, would provide a testing ground for the development of the technical and administrative protocols between NRC and DOE in the event that some type of NRC regulatory oversight occurs in the future.

5.3 International Regulations

Regulations of the International Atomic Energy Agency

The International Atomic Energy Agency is an agency of the United Nations headquartered in Vienna, Austria. The International Atomic Energy Agency establishes standards for radioactive materials transportation. These are published as model regulations (Safety Series No. 6) that may be adopted by individual nations. These model regulations are regularly revised and updated. Safety Series 6 was revised in 1990 (IAEA, 1990). To the extent considered feasible, the U.S. Nuclear Regulatory Commission (NRC) and the Department of Transportation both periodically review and revise their regulations to bring them into general accord with the International Atomic Energy Agency regulations.

The emphasis of the International Atomic Energy Agency model regulations is on package integrity. To that end, packagings must be shown to survive a hypothetical accident sequence that includes impact, crush, puncture, fire, and immersion. The level of protection is defined by the nature of the contents. The intent of the regulations is to maximize the shipper's contribution to safety, and the shipper (consignor) must certify "that the contents of this consignment are properly described by name; are properly packaged, marked and labeled; and are in proper condition for transport ... " (IAEA, 1990a). The carrier is responsible for following rules for stowage and for segregation from persons.

International Maritime Organization Regulations

The International Maritime Organization publishes the International Maritime Dangerous Goods Code (IMO, 1994), which was developed to supplement the provisions of the 1960 International Convention on the Safety of Life at Sea, as amended, (IMO, 1992) to which the United States is a signatory. Included are regulations that deal with carriage of radioactive material (Class 7 materials). They are based on the International Atomic Energy Agency regulations and deal with segregation of radioactive materials packages from other dangerous goods and other aspects of stowage.

5.4 Domestic Regulations for Radioactive Material Packaging and Transportation

Hazardous and Radioactive Materials Transportation Regulations

Transportation of hazardous and radioactive materials, substances, and wastes are governed by the Department of Transportation, NRC, and the Environmental Protection Agency regulations. These regulations may be found in 49 CFR Parts 171 through 178, 49 CFR Parts 383 through 397, 10 CFR Part 71, and 40 CFR Parts 262 and 265, respectively.

Department of Transportation regulations contain requirements for identifying a material as hazardous or radioactive. These regulations interface with NRC or the Environmental Protection Agency regulations for identifying material, but the Department of Transportation hazardous material regulations govern the hazard communication (such as marking, hazard labeling, vehicle placarding, and emergency response telephone number) and shipping requirements (such as required entries on shipping papers or the Environmental Protection Agency waste manifests).

NRC regulations applicable to radioactive materials transportation are found in 10 CFR Part 71, which includes detailed packaging design requirements and package certification testing requirements. Complete documentation of design and safety analysis and results of the required testing are submitted to the NRC to certify the package for use. This certification testing involves the following components: heat, physical drop onto an unyielding surface, water submersion, puncture by dropping package onto a steel bar, and gas tightness. The recent revision of 10 CFR Part 71, issued on September 28, 1995 (60 CFR 50248), is intended primarily to bring this regulation into conformance with current International Atomic Energy Agency regulations. Revised regulations applicable to the transportation of spent nuclear fuel from foreign research reactors are essentially unchanged.

The Environmental Protection Agency regulations pertaining to hazardous waste transportation are found in 40 CFR Parts 262 and 265. These regulations address labeling and record keeping requirements, including the use of the Environmental Protection Agency waste manifest, which is the required shipping paper for transporting the Resource Conservation and Recovery Act hazardous waste.

5.4.1 NRC Packaging Certification

An NRC certificate is issued as evidence that a packaging and its contents meet applicable Federal regulations. The certificate is issued on the basis of a Safety Analysis Report on the packaging design. Type B packaging must survive certain severe hypothetical accident conditions of impact, puncture, fire, and immersion. The tests are not intended to duplicate accident environments, but rather to produce damage equivalent to extreme accidents. The complete accident sequence is described in 10 CFR, Part 71.73.

Test Sequence for Type B Packagings

The effects of the tests on a package may be evaluated either by subjecting a scale model sample package to the test or by other methods acceptable to the NRC. NRC Regulatory Guide 7.9 allows assessment of package performance by analysis, prototype testing, model testing, or comparison to a similar package. To be judged as surviving, the packaging must not exceed allowable releases defined in 10 CFR 71.51. The dose rate outside the packaging must not exceed 1 rem per hour at a distance of 1 m (3.3 ft) from the packaging surface. The first three tests must be performed on the same package in this order: drop test, puncture test, and thermal test (with an immersion test following for fissile material packagings only).

The drop test consists of a 9-m (30-ft) drop onto a flat, essentially unyielding, horizontal surface, striking the package surface in the position for which maximum damage is expected. An essentially unyielding surface is one that absorbs very little of the energy of impact, which means that the energy of impact is absorbed almost entirely by the package. Unyielding surfaces are constructed of a monolithic concrete base, reinforced by Rebar and covered with a plate of battleship armor. The puncture test consists of a 1-m (40-in) drop onto the upper end of a 15-cm (6-in) solid, vertical, cylindrical bar of mild steel mounted on an essentially unyielding surface. The top of the bar must be horizontal and its edge rounded to a radius of not more than 6 mm (0.25 in).

In the thermal test, the packaging must be exposed for not less than 30 minutes to a heat flux not less than that of a radiation environment of 800°C (1,475°F) with an emissivity coefficient of a least 0.9. The surface absorptivity must be either the value that the package may be expected to possess if exposed to a fire or 0.8, whichever is greater. When it might be significant, convective heat input must be included on the basis of still, ambient air. The packaging may not be artificially cooled after external heat input ceases, and any combustion of materials of construction must be allowed to proceed until it terminates naturally.

Fissile materials packagings for which water in leakage has not been assumed for criticality analysis must be subjected to submersion under a head of water of at least 0.9 m (3 ft) for not less than 8 hours and in the attitude for which the maximum leakage is expected. All packages must be subjected to a separate test in which an undamaged cask is submerged under a head of water of at least 15 m (50 ft) for not less than 8 hours.

Although spent fuel casks have been involved in several accidents, their integrity has never been compromised. The regulatory tests are structured to place an upper bound on the kinds of damage seen in actual severe transportation accidents. Furthermore, after completion of this series of performance qualification tests, Type B packagings are further subjected to a post-accident leak-rate performance test (10 CFR 71.51). In this test, no escape of radioactive material is allowed that exceeds an A2 amount in a week. The A2 amount of an isotope is the maximum activity of that isotope in a potentially dispersible form that is allowed to be shipped in a Type A packaging, which is nonaccident resistant. Safety Series No. 6 lists A2 values for all commonly transported isotopes.

The NRC revised 10 CFR Part 7 regulations governing the transportation of radioactive materials on September 28, 1995 (60 FR 50248). These regulations become effective on April 1, 1996 (NRC, 1995). The revised regulations conform with those of the International Atomic Energy Agency and current legislative requirements. The revised regulations affecting "Type B" casks require that a spent nuclear fuel transportation cask with activity greater than 106 curies be designed and constructed so that its undamaged containment system would withstand an external water pressure of 290 psi, or immersion in 200 meters (656 ft) of water, for a period of not less than one hour without collapse, buckling, or allowing water to leak into the cask.

The use of an essentially unyielding target makes the regulatory certification tests extremely demanding. Real targets are much more yielding. For example, a lead-shield steel cask was dropped 610 m (2,000 ft) from a helicopter onto undisturbed soil (NRC, 1977). Impact velocity was 396 km per hour (235 mph). The cask penetrated 2.4 m (8 ft) into the hard soil but suffered no measurable deformation. An identical cask dropped 9 m (30 ft) onto an essentially unyielding surface during regulatory testing suffered considerably more deformation (Jefferson and Yoshimura, 1978). More recent research has expanded the study of yielding targets (e.g., concrete surfaces) and their comparison with the regulatory surface (Gonzalez et al., 1986).

5.4.2 Transportation Regulations

To assure that the transportation cask is properly prepared for transportation, trained technicians perform numerous inspections and tests (10 CFR §71.87). These tests are designed to ensure that the cask components are properly assembled and meet leak-tightness, thermal, radiation, and contamination limits. The tests and inspections are clearly identified in the Safety Analysis Report for Packaging and/or the Certificate of Compliance for each cask. Casks can only be operated by registered users who conduct operations in accordance with documented and approved quality assurance programs meeting the requirements of the regulatory authorities. Records must be maintained that document proper cask operations in accordance with the quality requirements of 10 CFR §71.91. Reports of defects or accidental mishandling must be submitted to NRC.

Communications

Proper communication assists in assuring safe preparation and handling of transportation casks. Communication is provided by labels, markings, placarding, and shipping papers or other documents. Labels (49 CFR §172.403) applied to the cask document the contents and the amount of radiation emanating from the cask exterior (transport index). The transport index lists the ionizing radiation level (in mrem/hr) at a distance of 1 m (3.3 ft) from the cask surface.

In addition to the label requirements, markings (49 CFR Subpart D and §173.471) should be placed on the exterior of the cask to show the proper shipping name and the consignor and consignee in case the cask is separated from its original shipping documents (40 CFR §172.203). Transportation casks are required to be permanently marked with the designation "Type B," the owner's (or fabricator's) name and address, the Certificate of Compliance number, and the gross weight (10 CFR §71.83).

Placards (49 CFR §172.500) are applied to the transport vehicle or freight container holding the transportation cask. The placards indicate the radioactive nature of the contents. In the United States, spent nuclear fuel is a Highway Route Controlled Quantity which must be placarded according to 49 CFR §172.507. Placards provide the first responders to a traffic or transportation accident with initial information about the nature of the contents.

Shipping papers should have entries identifying the following: the name of the shipper, emergency response telephone number, description of spent nuclear fuel, and the shipper's certificate as described in 49 CFR §172 Subpart C.

In addition, drivers of motor vehicles transporting spent nuclear fuel must have training in accordance with the requirements of 49 CFR §172.700. The training requirements include: familiarization with the regulations, emergency response information, and the spent nuclear fuel communication programs required by the Occupational Safety and Health Administration. Drivers are also required to have training on the procedures necessary for safe operation of the vehicle used to transport the spent nuclear fuel.

Except for exclusive-use shipments, requirements relating to transport indexes state that:

> ". . . the number of freight containers with packages of radioactive materials contained therein must be limited so that the total sum of the transport indexes in the containers in any hold or defined deck area does not exceed 200, and:
>
> (1) The sum of transport indexes for any individual freight container, or group of freight containers, does not exceed 50; and,
>
> (2) Each freight container or group of freight containers is (are) handled and stowed in such a manner that groups are separated from each other by a distance of at least six m (20 ft)," [49 CFR §176.704(c)].

Section 176.76(a) includes provision for freight containers with hazardous materials to be carried onboard a vessel in accordance with the following:

> " (1) The material must be in proper condition for transportation according to the requirements of this subchapter;
>
> (2) All packages in the transport vehicle or container must be secured to prevent movement in any direction. However, vertical restraint is not required if the shape of the packages and the stuffing pattern precludes shifting of the load;
>
> (3) Bulkheads made of dunnage which extend to the level of the cargo must be provided unless the packages are stowed flush with the sides or ends;
>
> (4) Dunnage must be secured to the floor when the cargo consists of dense materials or heavy packages."

Each freight container must be placarded as required by 49 CFR §172 Subpart F of the Hazardous Materials Regulations [49 CFR 176.76(f)].

Section 49 CFR 176.80 requires that radioactive materials be segregated from other hazardous materials so that they do not interact dangerously in an accident, or alternatively, requires that the radioactive material be in separate holds when stored under deck. In 49 CFR 176.83(b), a table is provided (Table II) that specifies the minimum separation distances for different classes of hazardous materials onboard a vessel. A minimum horizontal separation distance of 3 m (10 ft) projected vertically from the reference package is required. For specified hazardous materials, the "separate from" requirement means that the materials must be placed in separate holds when stowed under deck.

Marine Transport

Relevant regulations applying to transport of spent nuclear fuel by vessel are found in 10 CFR Parts 71 and 73, and 49 CFR Part 176. The USCG, part of the Department of Transportation, inspects vessels for compliance with applicable regulations and requires 24-hour prenotification (33 CFR 160.207, 211, and 213).

Section 49 CFR 171.12 (d) states that: "Radioactive materials being imported into or exported from the United States, or passing through the United States in the course of being shipped between places outside the U.S., may be offered and accepted for transportation when packaged, marked, labeled, and otherwise prepared for shipment in accordance with the IAEA 'Regulations for the Safe Transport of Radioactive Materials, Safety Series No. 6, 1985 Edition' including 'Supplement 1988.'" Certain specified conditions of this section must be complied with. For example, highway-route-controlled quantities of radioactive material must be shipped in accordance with appropriate provisions of the hazardous materials regulations and a Certificate of Competent Authority must be obtained, with any necessary revalidations. A Certificate of Competent Authority fulfills the International Atomic Energy Agency requirement for multilateral approval for a shipment of Type B packages in international commerce (IAEA, 1990a).

Section 49 CFR 176.5 details the application of the regulations to vessels: "...this subchapter applies to each domestic or foreign vessel when in the navigable waters of the United States, regardless of its character, tonnage, size or service, and whether self-propelled or not, whether arriving or departing, underway, moored, anchored, aground, or while in drydock." Exempted from the regulations are vessels not engaged in commercial service, a vessel used exclusively for pleasure, a vessel of 500 gross tons or smaller, engaged in fisheries, etc. Section 49 CFR 176.15 provides for enforcement of 40 CFR Subchapter C:

> "(a) An enforcement officer of the U.S. Coast Guard may at any time and at any place, within the jurisdiction of the United States, board any vessel for the purpose of enforcement of this subchapter and inspect any shipment of hazardous materials as defined in this subchapter."

Provision is also made in this section to detain a vessel that is in violation of the hazardous materials regulations.

The USCG may accept a certificate of loading issued by the National Cargo Bureau, Inc., as evidence that the cargo is stowed in conformity with law and regulatory requirements. The National Cargo Bureau, Inc., is a non-profit organization directed by government and industry representatives (49 CFR 176.18 authorizes inspectors of the National Cargo Bureau, Inc., to assist the USCG in administering the hazardous materials regulations). Their functions are as follows:

> "(1) Inspection of vessels for suitability for loading hazardous materials; (2) Examination of stowage of hazardous materials; (3) Making recommendations for stowage requirements of hazardous materials cargo; and, (4) Issuance of certificates of loading setting forth that the stowage of hazardous materials is in accordance with the requirements of 46 U.S.C. 170 and its subchapter."

Detailed requirements for shipping radioactive material are located in Part 176 Subpart M of the hazardous materials regulations. General radioactive materials stowage requirements of 49 CFR 176.700 state that: "(b) A package of radioactive materials which in still air has a surface temperature more than 5°C (9°F) above the ambient air may not be overstowed with any other cargo. If the package is stowed under the deck, the hold or compartment in which it is stowed must be ventilated."

Except for exclusive-use shipments, requirements of 176.704 (c) relating to transport indexes state that:

> "the number of freight containers with packages of radioactive materials contained therein must be limited so that the total sum of the transport indexes in the containers in any hold or defined deck area does not exceed 200, and: (1) The sum of transport indexes for any individual freight container, or group of freight containers, does not exceed 50; and, (2) Each freight container or group of freight containers is handled and stowed in such a manner that groups are separated from each other by a distance of at least six meters (20 feet)."

Section 176.76(a) includes provision for freight containers with hazardous materials to be carried on board a vessel in accordance with the following:

> "(1) The material must be in proper condition for transportation according to the requirements of this subchapter; (2) All packages in the transport vehicle or container must be secured to prevent movement in any direction. Vertical restraint is not required if the shape of the packages, loading pattern, and horizontal restraint preclude vertical movement of the load within the freight container or transport vehicle; (3) Bulkheads made of dunnage which extend to the level of the cargo must be provided unless the packages are stowed flush with the sides or ends; (4) Dunnage must be secured to the floor when the cargo consists of dense materials or heavy packages."

Each freight container must be placarded as required by Subpart F of Part 172 of the hazardous materials transportation regulations [49 CFR 176.76(f)].

Section 49 CFR 176.80 requires that radioactive materials be segregated from other hazardous materials so that they do not interact dangerously in an accident or, alternatively, requires that the radioactive material be in separate holds when stored under deck. In 49 CFR 176.83(b), a table is provided (Table II) that specifies the minimum separation distances for different classes of hazardous materials on board a vessel. A minimum horizontal separation distance of 3 m (10 ft) projected vertically from the reference package is required. For specified hazardous materials, the "separate from" requirement means that the materials must be placed in separate holds when stowed under deck.

Ground Transport

Overland shipments (by rail car or by truck) are regulated by a variety of the Department of Transportation and NRC regulations dealing with packaging, notification, escorts and communication. In addition, there are specific regulations for carriage by truck and carriage by rail.

When provisions are made to secure a package so that its position within the transport vehicle remains fixed during transport, with no loading or unloading between the beginning and end of transport, a package shipped overland in exclusive-use closed transport vehicles may not exceed the following radiation levels as provided in 49 CFR 173.441(b):

1. 200 millirem per hour on the external surface of the package unless the following conditions are met, in which case the limit is 1,000 millirem per hour;
    i. The shipment is made in a closed transport vehicle;
    ii. The package is secured within the vehicle so that its position remains fixed during transportation; and
    iii. There are no loading or unloading operations between the beginning and end of the transportation;

2. 200 millirem per hour at any point on the outer surface of the vehicle, including the top and underside of the vehicle; or in the case of a flat-bed style vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load (or enclosure is used), and on the lower external surface of the vehicle;

3. 10 millirem per hour at any point 2 m (6.6 ft) from the outer lateral surfaces of the vehicle (excluding the top and underside of the vehicle); or in the case of a flat-bed style vehicle, at any point 2 m (6.6 ft) from the vertical planes projected by the outer edges of the vehicle (excluding the top and underside of the vehicle); and

4. 2 millirem per hour in any normally occupied space.

The shipper of record must comply with the requirements of 10 CFR 71.5 and 73.37. Section 71.5 provides that all overland shipments must be in compliance with Department of Transportation and NRC regulations, which provide for security of irradiated reactor fuel. General requirements include:

- Provide notification to NRC in advance of each shipment,
- Develop a shipping plan,
- Provide escort instructions
- Establish a communication center to be staffed 24 hours a day,
- Make arrangements with local law enforcement agencies along the route for their response, if not using law enforcement personnel as escort, ensure that the escorts are trained in accordance with 10 CFR 73.37 Appendix D, and
- Ensure that escorts make notification calls every 2 hours to the communications center.

Additional requirements include having two armed escorts within heavily populated areas (when not in heavily populated areas, only one escort is needed) and the capability of communicating with the communications center and local law enforcement agencies through a radiotelephone or other NRC-approved means of two-way voice communications.

The shipper of record, as required by 49 CFR 173.22, provides physical security measures for spent fuel shipments equivalent to those of the NRC. The shipper and his agent will provide notification for unclassified spent fuel shipments to State officials.

For carriage by truck, the carrier will use interstate highways or State-designated preferred routes for movement of radioactive materials in conformity with the Department of Transportation rule known as Docket HM-164. These regulations, found in 49 CFR 397.101, establish routing and driver training requirements for highway carriers of packages containing "highway-route-controlled quantities" of radioactive materials. Spent fuel shipments constitute such quantities. Department of Transportation rules make those routes designated by appropriate State agencies enforceable by the Federal Government according to the Department of Transportation's own determination that such route designations, when accompanied by an adequate safety analysis, are likely to result in further reduction of radiological risk.

For carriage by rail car, each shipment by the railroad must comply with 49 CFR 174, in particular, 174 Subpart K, Detailed Requirements for Radioactive Materials.

5.5 Emergency Management and Response

5.5.1 Authorities and Directives

Emergency Planning and Community Right-to-Know Act of 1986 (42 USC §11001 et seq.) (also known as "SARA Title III")

Under Subtitle A of this Act, Federal facilities, including those owned by DOE, provide various information (such as inventories of specific chemicals used or stored and releases that occur from these sites) to the State Emergency Response Commission and to the Local Emergency Planning Committee to ensure that emergency plans are sufficient to respond to unplanned releases of hazardous substances. Implementation of the provisions of this Act began voluntarily in 1987, and inventory and annual emissions reporting began in 1988 based on 1987 activities and information. DOE also requires compliance with Title III as a matter of Agency policy. The requirements for this Act were promulgated by the Environmental Protection Agency in 40 CFR Parts 350 through 372.

The Toxic Substances Control Act also regulates the treatment, storage, and disposal of certain toxic substances not regulated by the Resource Conservation and Recovery Act or other statutes, particularly polychlorinated biphenyls, chlorofluorocarbons, and asbestos.

Quantities of Radioactive Materials Requiring Consideration of the Need for an Emergency Plan for Responding to a Release (10 CFR Part 30.72 Schedule C)

This list is the basis for both the public and private sector to determine if the radiological materials they deal with must have an emergency response plan for unscheduled releases. It is one of the threshold criteria documents for DOE Hazards Assessments required by DOE Order 5500.3A, "Planning and Preparedness for Operational Emergencies" (DOE, 1991c).

Occupational Safety and Health Administration Emergency Response, Hazardous Waste Operations and Worker Right to Know (29 CFR)

This regulation sets down the Occupational Safety and Health Administration requirements for employee safety in a variety of working environments. It addresses employee emergency and fire prevention plans (Section 1910.38), hazardous waste operations and emergency response (Section 1910.120), and hazards communication (Section 1910.1200) that enables employees to be aware of the dangers they face from hazardous materials at their workplace.

Emergency Management and Assistance (44 CFR 1.1)

This regulation contains the policies and procedures for the Federal Emergency Management Act, National Flood Insurance Program, Federal Crime Insurance Program, Fire Prevention and Control Program, Disaster Assistance Program, and Preparedness Program including radiological planning and preparedness.

Hazardous Materials Tables & Communications, Emergency Response Information Requirements (49 CFR Part 172)

The regulatory requirements for marking, labeling, placarding, and documenting hazardous materials shipments are defined in this regulation. It also specifies the requirements for providing hazardous material information and training.

Public Law 93-288, as Amended by Public Law 100-707, "Robert T. Stafford Disaster Relief and Emergency Assistance Act," November 23, 1988

The Robert T. Stafford Disaster Relief and Emergency Assistance Act, P.L. 93-288, as amended, provides an orderly and continuing means of assistance by the Federal Government to State and local governments in carrying out their responsibilities to alleviate the suffering and damage resulting from disasters. The President, in response to a State Governor's request, may declare an "emergency" or "major disaster," in order to provide Federal assistance under the Act. The President, in Executive Order 12148, delegated all functions, except those in Sections 301, 401, and 409, to the Director, Federal Emergency Management Agency. The Act provides for the appointment of a Federal Coordinating Officer who will operate in the designated area with a State Coordinating Officer for the purpose of coordinating State and local disaster assistance efforts with those of the Federal Government.

Public Law 96-510, "Comprehensive Environmental Response, Compensation, and Liability Act of 1980," Section 104(i), 42 U.S.C. 9604(i)

More popularly known as "Superfund," this Act provides the needed general authority for Federal and State governments to respond directly to hazardous substances incidents. The Act requires reporting of spills, including radioactive, to the National Response Center.

Public Law 98-473, Justice Assistance Act of 1984

These Department of Justice regulations implement the Emergency Federal Law Enforcement Assistance functions vested in the Attorney General. Those functions were established to assist State and/or local units of government in responding to a law enforcement emergency. The Act defines the term "law enforcement emergency" as an uncommon situation which requires law enforcement, which is or threatens to become of serious or epidemic proportions, and with respect to which State and local resources are inadequate to protect the lives and property of citizens, or to enforce the criminal law. Emergencies that are not of an ongoing or chronic nature, such as the Mount Saint Helens volcanic eruption, are eligible for Federal law enforcement assistance. Such assistance is defined as funds, equipment, training, intelligence information, and personnel. Requests for assistance must be submitted in writing to the Attorney General by the chief executive office of a State. The Plan does not cover the provision of law enforcement assistance. Such assistance will be provided in accordance with the regulations referred to in this paragraph [28 CFR Part 65, implementing the Justice Assistance Act of 1984] or pursuant to any other applicable authority of the Department of Justice.

Communications Act of 1934, as Amended

This Act gives the Federal Communications Commission emergency authority to grant Special Temporary Authority on an expedited basis to operate radio frequency devices.

5.5.2 Executive Orders

Executive Order 10480, as Amended, "Further Providing for the Administration of the Defense Mobilization Program," August 1953

Part II of the Order delegates to the Director, Federal Emergency Management Agency, with authority to redelegate, the priorities and allocation functions conferred on the President by Title I of the Defense Production Act of 1950, as amended.

Executive Order 12148, "Federal Emergency Management," July 20, 1979

Executive Order 12148 transferred functions and responsibilities associated with Federal emergency management to the Director, Federal Emergency Management Agency. The Order assigns the Director, Federal Emergency Management Agency, the responsibility to establish Federal policies for and to coordinate all civil defense and civil emergency planning, management, mitigation, and assistance functions of Executive Agencies.

Executive Order 12472, "Assignment of National Security and Emergency Preparedness Telecommunications Functions," April 3, 1984

Executive Order 12472 establishes the National Communication System. The National Communication System consists of the telecommunications assets of the entities represented on the National Communication System Committee of Principals and an administrative structure consisting of the Executive Agent, the National Communication System Committee of Principals, and the Manager. The National Communication System Committee of Principals consists of representatives from those Federal departments, agencies, or entities, designated by the President, which lease or own telecommunications facilities or services of significance to national security or emergency preparedness.

Executive Order 12656, "Assignment of Emergency Preparedness Responsibilities," November, 1988

This order assigns emergency preparedness responsibilities to Federal departments and agencies.

5.5.3 Emergency Planning Documents

"Federal Radiological Emergency Response Plan," November 1985

This document is to be used by Federal agencies in peacetime radiological emergencies. It primarily concerns the off-site Federal response in support of State and local governments with jurisdiction for the emergency. The Federal Radiological Emergency Response Plan provides the Federal Government's concept of operations based on specific authorities for responding to radiological emergencies, outlines Federal policies and planning assumptions that underlie this concept of operations and on which Federal agency response plans were based, and specifies authorities and responsibilities of each Federal agency that may have a significant role in such emergencies.

"National Plan for Telecommunications Support [in Non-Wartime Emergencies," January 1992

This plan provides guidance in planning for and providing telecommunications support for Federal agencies involved in emergencies, major disasters, and other urgent events, excluding war.

Department of Defense Directive 3025.1, "Military Support to Civil Authorities," 1992

This directive outlines Department of Defense policy on assistance to the civilian sector during disasters and other emergencies. Use of the Department of Defense military resources in civil emergency relief operations will be limited to those resources not immediately required for the execution of the primary defense mission. Normally, the Department of Defense military resources will be committed as a supplement to non-Department of Defense resources that are required to cope with the humanitarian and property protection requirement caused by the emergency. In any emergency, commanders are authorized to employ Department of Defense resources to save lives, prevent human suffering, or mitigate great property loss. Upon declaration of a major disaster under the provisions of P.L. 93-288, as amended, the Secretary of the Army is the Department of Defense Executive Agent, and the Director of Military Support

is the action agent for civil emergency relief operations. Military personnel will be under command of and directly responsible to their military superiors and will not be used to enforce or execute civil law in violation of 18 U.S.C. 1385, except as otherwise authorized by law. Military resources shall not be procured, stockpiled, or developed solely to provide assistance to civil authorities during emergencies.

Federal Preparedness Circular 8, "Public Affairs in Emergencies"

This Circular establishes the Interagency Committee on Public Affairs in Emergencies to coordinate public information planning and operations for management of emergency information. The Circular was reviewed in draft by the Interagency Committee on Public Affairs in Emergencies and will receive formal department and agency review.

American Red Cross Disaster Services Regulations and Procedures, ARC 3003, January 1984

This document details the delegation of disaster services program responsibilities to officials and units of the American Red Cross. Also defined are the American Red Cross administrative regulations and procedures for disaster planning, preparedness, and response.

Statement of Understanding between the Federal Emergency Management Agency and the American National Red Cross, January 22, 1982

The statement of understanding between the Federal Emergency Management Act and the American National Red Cross describes major responsibilities in disaster preparedness planning and operations in the event of a war-caused national emergency or a peacetime disaster, outlines areas of mutual support and cooperation, and provides a frame of reference for similar cooperative agreements between State and local governments and the operations headquarters and chapters of the American Red Cross.

6. List of Preparers

Name:	Charles R. Head
Affiliation:	Department of Energy
Education:	MS, Control Theory, George Washington University BS, Electrical Engineering, Rice University
Experience/ Technical Specialty:	Twenty-seven years. Nuclear safety oversight, safeguards and security requirements, Tiger Team assessments, spent fuel storage.
EIS Responsibility:	DOE Foreign Research Reactor Spent Nuclear Fuel Project Manager
Name:	Patrick J. Wells
Affiliation:	Department of Energy
Education:	MS, Engineering Management, George Washington University BS, Civil Engineering, Marquette University
Experience/ Technical Specialty:	Eleven years. Occupational safety and health, oversight system acquisition, reliability, and maintainability.
EIS Responsibility:	Assistant to the DOE Project Manager
Name:	Darren W. Piccirillo
Affiliation:	Department of Energy
Education:	BS, Physics, Southern Connecticut State University
Experience/ Technical Specialty:	Eight years. Reactor plant construction and operation.
EIS Responsibility:	Spent fuel characterization, storage impact analysis
Name:	Eleanor R. Busick
Affiliation:	Department of State
Education:	MA, Economics, Yale University BA, Oberlin College
Experience/ Technical Specialty:	Nineteen years. Nuclear nonproliferation policy, economics (fuel markets, finance).
EIS Responsibility:	Nonproliferation and national policies

Name:	Fred McGoldrick
Affiliation:	Department of State
Education:	PhD, Political Science, American University BA, Boston College
Experience/ Technical Specialty:	Twenty-three years. Nuclear nonproliferation policy.
EIS Responsibility:	Nonproliferation and national policies
Name:	Ibrahim H. Zeitoun
Affiliation:	Science Applications International Corporation
Education:	PhD, Environmental Sciences, Michigan State University MS, Fisheries, Michigan State University BS, Chemistry & Zoology, University of Alexandria
Experience/ Technical Specialty:	Twenty-two years. Waste management, environmental assessment, and NEPA compliance.
EIS Responsibility:	Overall EIS Project Manager. NEPA compliance, spent fuel management environmental justice
Name:	Audrey J. Adamson
Affiliation:	Science Applications International Corporation
Education:	BA, University of Michigan MPA, George Washington University
Experience/ Technical Specialty:	Eleven years. International, environmental, and technology policy analysis, public outreach, and technical writing.
EIS Responsibility:	Emergency response and communication planning
Name:	Douglas H. Amick
Affiliation:	Science Applications International Corporation
Education:	AS, Law Enforcement, Walter State Community College
Experience/ Technical Specialty:	Twenty years. Marine ports, port safety inspections and security, plant operations, transportation risks.
EIS Responsibility:	Port safety, operation and characteristics

Name:	Paula W. Austin
Affiliation:	Science Applications International Corporation
Education:	BS, Management and Technology, University of Maryland
Experience/ Technical Specialty:	Nineteen years. Nuclear and environmental policy analysis, public outreach, technical writing.
EIS Responsibility:	EIS Summary, public hearings task leader
Name:	Rakesh Bahadur
Affiliation:	Science Applications International Corporation
Education:	PhD, Groundwater Hydrology, Colorado State University MS, Groundwater Hydrology, Colorado State University MSc, Geology, Punjab University
Experience/ Technical Specialty:	Fifteen years. Hydrology, site characterization, environmental assessment, and risk assessment.
EIS Responsibility:	Affected environment, Geographic Information Systems, Environmental Justice
Name:	Bruce M. Biwer
Affiliation:	Argonne National Laboratory
Education:	PhD, Chemistry, Princeton University MA, Chemistry, Princeton University BA, Chemistry, St. Anselm College
Experience/ Technical Specialty:	Fourteen years. Radiological pathway analysis, dose calculations, radiological transportation risk analysis.
EIS Responsibility:	Radiological transportation risk analysis
Name:	Keith R. Brown
Affiliation:	Science Applications International Corporation
Education:	MS, Mathematics, Idaho Sate University BS, Mathematics, Idaho State University
Experience/ Technical Speciality:	Thirty-four years. Transportation casks, research reactor operations, and spent nuclear fuel management
EIS Responsibility:	Spent fuel management, transportation assessment

Name:	Burrus M. Carnahan
Affiliation:	Science Applications International Corporation
Education:	LLM, International Law, University of Michigan JD, Northwestern University BA, Political Science, Drake University
Experience/ Technical Specialty:	Twenty-one years. Weapons proliferation, international agreements, and arms control.
EIS Responsibility:	Nonproliferation policies
Name:	Harry Chernoff
Affiliation:	Science Applications International Corporation
Education:	MBA, Marymount University BA, Economics, College of William & Mary
Experience/ Technical Specialty:	Seventeen years. Economics, socioeconomics, finance, and engineering economics.
EIS Responsibility:	Costs, and Socioeconomics
Name:	Louis Cofone, Jr.
Affiliation:	Science Application International Corporation
Education:	MS, Microbiology, University of Dayton BS, Biology, Philadelphia College of Pharmacy and Science
Experience/ Technical Specialty:	Twenty years. Computer information analysis, data base development and management, environmental and health risk assessment.
EIS Responsibility:	Development and management of the comment tracking and document control system
Name:	Cecil C. Cross, III
Affiliation:	Science Applications International Corporation
Education:	MEM, Environmental Management, Duke University BA, Biology, Gettysburg College
Experience/ Technical Specialty:	Thirteen years. Regulatory compliance, environmental assessment, and hazardous and mixed waste management.
EIS Responsibility:	Port operation, port environmental and climatic conditions

Name:	Larry Danese
Affiliation:	Science Applications International Corporation
Education:	MBA, Florida International University BS, Electrical Engineering, University of Florida
Experience/ Technical Specialty:	Twenty-three years. Cask design, transportation systems, emergency response, and regulatory compliance.
EIS Responsibility:	Transportation casks and regulations, port operation regulations and activities
Name:	Gary M. DeMoss
Affiliation:	Science Applications International Corporation
Education:	MS, Engineering Administration, Virginia Polytechnic Institute BS, Mechanical Engineering, University of Virginia
Experience/ Technical Specialty:	Thirteen years. Risk analysis, reliability and safety engineering, uranium enrichment, and transportation.
EIS Responsibility:	Ground transportation safety and impact analysis, port selection and operation
Name:	Scott E. Drummond, Jr.
Affiliation:	Science Applications International Corporation
Education:	BS, Marine Transportation, SUNY Maritime College
Experience/ Technical Specialty:	Forty-two years. Strategic sealift, logistics support, ocean survey, nautical charting, SWATH ship design and operation.
EIS Responsibility:	Port information
Name:	Habib A. Durrani
Affiliation:	Science Applications International Corporation
Education:	BSc, Engineering Science, Peshawar University
Experience/ Technical Specialty:	Twenty years. Nuclear facilities operation, design maintenance regulations and safety
EIS Responsibility:	Chemical separation technologies
Name:	Barbara M. Ebert
Affiliation:	Science Applications International Corporation
Education:	MA, National Security Studies, Georgetown University BS, Foreign Service, Comparative and Regional Studies, Georgetown University
Experience/ Technical Specialty:	Twelve years. Weapons proliferation.
EIS Responsibility:	Nonproliferation policies

Name:	Martin W. Ebert
Affiliation:	Science Applications International Corporation
Education:	BSc, Nuclear Engineering, University of Arizona MSc, Applied Physics, University of Strathclyde
Experience/ Technical Specialty:	Twenty-four years. Nuclear powerplant operations, spent fuel technology, and technical safety requirements.
EIS Responsibility:	Marine and port safety and impact analysis, public hearings response coordinator
Name:	Daniel W. Gallagher
Affiliation:	Science Applications International Corporation
Education:	MS, Nuclear Engineering, Rensselaer Polytechnic Institute BS, Nuclear Engineering, Rensselaer Polytechnic Institute
Experience/ Technical Specialty:	Fifteen years. Reliability and risk engineering, probabilistic safety assessment, plant design, and regulatory analysis.
EIS Responsibility:	Marine and port safety and impact analysis
Name:	Reginald L. Gotchy
Affiliation:	Science Applications International Corporation
Education:	PhD, Radiation Biology, Colorado State University MS, Radiation Health, Colorado State University BS, Zoology, University of Washington
Experience/ Technical Specialty:	Twenty-six years. NEPA compliance, safety analysis, risk assessment, radiation biology, health physics (Certified Health Physicist), and emergency response planning.
EIS Responsibility:	Port selection and radiological consequences and health effects
Name:	Peter Grier
Affiliation:	Science Applications International Corporation
Education:	BS, Psychology, University of Maryland
Experience/ Technical Specialty:	Twenty years. Emergency management, commercial nuclear energy, quality assurance, and transportation regulatory compliance.
EIS Responsibility:	Emergency response, security, and communication planning

Name:	Timothy T. Holmes
Affiliation:	Science Applications International Corporation
Education:	JD, University of Kansas School of Law BA, Business, Washburn University
Experience/ Technical Specialty:	Four years. Legal and environmental analysis, involving NEPA, RCRA, and other environmental regulations, document review and contract compliance.
EIS Responsibility:	Comment Response Document task leader, technical editor
Name:	Joseph W. James
Affiliation:	Science Applications International Corporation
Education:	BSG, Administration of Justice, American University MA, Management, Central Michigan University PhD, Environmental Science, LaSalle University
Experience/ Technical Specialty:	Thirty years. Nuclear safeguards and security, standards development, quality assurance, regulatory analysis, and licensing support.
EIS Responsibility:	Safeguards and security planning
Name:	Roy Karimi
Affiliation:	Science Applications International Corporation
Education:	ScD, Nuclear Engineering, Massachusetts Institute of Technology NE, Nuclear Engineering, Massachusetts Institute of Technology MS, Nuclear Engineering, Massachusetts Institute of Technology BSc, Chemical Engineering, Abadan Institute of Technology
Experience/ Technical Specialty:	Fourteen years. Nuclear powerplant safety, risk and reliability analysis, design analysis, and probabilistic risk assessment.
EIS Responsibility:	Spent fuel characterization, accident and impact analysis, quality control reviews
Name:	Stephen J. Krill, Jr.
Affiliation:	Science Applications International Corporation
Education:	BS, Nuclear and Power Engineering, University of Cincinnati
Experience/ Technical Specialty:	Five years. Safety and risk analysis, reactor and fuel processing system design, operation and inspection, and emergency preparedness.
EIS Responsibility:	Transportation cask descriptions, environmental consequences

Name:	Merritt E. Langston, PE
Affiliation:	Science Applications International Corporation
Education:	BS, MS, Metallurgical Engineering, Missouri School of Mines
Experience/ Technical Specialty:	Thirty-two years. Quality management, nuclear engineering, defense programs, nuclear waste management. Six years. Reactor containment materials development.
EIS Responsibility:	Technical reviews, quality control task leader
Name:	Christi D. Leigh
Affiliation:	Sandia National Laboratories
Education:	PhD, Engineering, University of New Mexico MS, Chemical Engineering, Stanford University BS, Chemical Engineering, Arizona State University
Experience/ Technical Specialty:	Six years. Radioactive and hazardous waste management and minimization. Five years. Nuclear reactor safety.
EIS Responsibility:	At-sea submerged cask risk assessment
Name:	Charles D. Massey
Affiliation:	Sandia National Laboratories
Education:	PhD, Radiation Health, University of Pittsburgh MS, Health Physics, University of Pittsburgh BS, Marine Transportation, U.S. Merchant Marine Academy
Experience/ Technical Specialty:	Thirteen years. NEPA, risk assessment, transportation and energy technology evaluation.
EIS Responsibility:	Marine transportation risk assessment and impacts
Name:	Ronya J. McMillen
Affiliation:	Science Applications International Corporation
Education:	MA, International Science & Technology Policy, George Washington University BS, Sociology, Chatham College
Experience/ Technical Specialty:	Thirteen years. Technical analysis and report writing. Four years public outreach and policy analysis on domestic and foreign nuclear technology regulatory issues.
EIS Responsibility:	EIS Summary Coordinator, Public comment and hearing summaries

Name:	Charles D. Miller
Affiliation:	Science Applications Internal Corporation
Education:	BS, Marine Transportation, SUNY Maritime College
Experience/ Technical Specialty:	Forty years. Transportation/distribution system design, planning, implementation,.and management.
EIS Responsibilty:	Port information
Name:	Todd Miller
Affiliation:	Science Applications International Corporation
Education:	BS, Civil Engineering, Worcester Polytechnic Institute
Experience/ Technical Specialty:	Four years. Safety analysis, environmental assessment, NEPA compliance.
EIS Responsibility:	Accident analysis, radiological consequences
Name:	Steven M. Mirsky
Affiliation:	Science Applications International Corporation
Education:	MS, Nuclear Engineering, Pennsylvania State University BS, Mechanical Engineering, The Cooper Union
Experience/ Technical Specialty:	Nineteen years. Safety analysis, nuclear powerplant design, operations, and foreign nuclear powerplant system analysis.
EIS Responsibility:	Storage technology, safety and impact analysis
Name:	Frederick A. Monette
Affiliation:	Argonne National Laboratory
Education:	MS, Health Physics, Colorado State University BA, Physics, St. Johns University
Experience/ Technical Specialty:	Six years. Radiological risk assessment, radiological transportation risk analysis, dose calculations.
EIS Responsibility:	Radiological transportation risk and impacts analysis
Name:	Michael Moore
Affiliation:	Science Applications International Corporation
Education:	BA, Economics, University of Maryland
Experience/ Technical Specialty:	Twelve years. Analysis and design of environmental/waste information systems, drafting and editing of technical documents for energy, environmental, and defense initiatives.
EIS Responsibility:	Quality control reviews, technical editor

Name:	Alexander P. Murray
Affiliation:	Science Applications International Corporation
Education:	MS, Chemical Engineering, Carnegie-Mellon University BS, Chemical Engineering, Carnegie-Mellon University
Experience/ Technical Specialty:	Nineteen years. Waste management, environmental and regulatory compliance, design engineering and computer modeling, nuclear reactors and systems, dose analysis, nuclear fuel cycle, and spent fuel reprocessing.
EIS Responsibility:	Storage and chemical separation technologies
Name:	Iral C. Nelson
Affiliation:	Pacific Northwest Laboratories
Education:	MA, Physics, University of Oregon Diplomate, American Board of Health Physics BS, Mathematics, University of Oregon
Experience/ Technical Specialty:	Thirty-nine years. Health physics, radiation protection, and NEPA compliance and reviews.
EIS Responsibility:	Affected environment, environmental consequences
Name:	Aris Papadopoulos
Affiliation:	Science Applications International Corporation
Education:	MS, Nuclear Engineering, University of Utah BS, Physics, Hamline University
Experience/ Technical Specialty:	Twenty-two years. Safety analysis assessment, regulatory reviews, reactor safety, fuel cycle facility systems, radioactive waste management, and accident analysis support.
EIS Responsibility:	Transportation casks, storage alternatives, and impact assessment
Name:	Kathleen Rhoads
Affiliation:	Pacific Northwest Laboratories
Education:	MS, Radiological Sciences, University of Washington BS, Microbiology, University of Washington
Experience/ Technical Specialty:	Nineteen years. Risk assessment, radiation doses, health effects from energy production.
EIS Responsibility:	Radiological consequences analysis

Name:	Van Romero
Affiliation:	Sandia National Laboratories
Education:	PhD, Physics, State University of New York MS, Physics, New Mexico Tech BS, Physics, New Mexico Tech
Experience/ Technical Specialty:	Fifteen years. Environmental health physics and radiation protection, NEPA compliance, DOE order compliance, environmental impact testing, risk assessment, nuclear safety, health physics, radiation transport, and nuclear emergency response.
EIS Responsibility:	Radiation exposure analysis for marine transport
Name:	William B. Samuels
Affiliation:	Science Applications International Corporation
Education:	PhD, Biology, Fordham University MS, Marine Science, Long Island University BS, Biology & Geology, University of Rochester
Experience/ Technical Specialty:	Sixteen years. Geographic Information Systems, computer simulation and mathematical modeling, environmental database management systems.
EIS Responsibility:	Geographic Information Systems, environmental justice
Name:	Elizabeth C. Saris
Affiliation:	Science Applications International Corporation
Education:	BA, Political Science, George Washington University
Experience/ Technical Specialty:	Fifteen years. Energy and environmental policy analysis, public outreach, and technical writing.
EIS Responsibility:	EIS Summary, public hearings support
Name:	Patrick R. Schwab
Affiliation:	Science Applications International Corporation
Education:	PhD, Nuclear Engineering, University of Wisconsin MS, Nuclear Engineering, University of Wisconsin BS, Nuclear Engineering, Kansas State University
Experience/ Technical Specialty:	Eighteen years. Design criteria, technical safety surveys, foreign nuclear technology analysis, configuration studies, and spent fuel reprocessing.
EIS Responsibility:	Environmental and policy consequences, chemical separation technologies and impacts

Name:	Barry Smith
Affiliation:	Science Applications International Corporation
Education:	JD, George Washington University National Law Center BA, Political Science, Indiana University
Experience/ Technical Specialty:	Twenty-three years. NEPA compliance, environmental law, regulatory compliance, and waste management.
EIS Responsibility:	Environmental regulation/compliance
Name:	Jeremy L. Sprung
Affiliation:	Sandia National Laboratories
Education:	PhD, Physical-Organic Chemistry, UCLA BA, Chemistry, Yale University
Experience/ Technical Specialty:	Twenty-nine years. Photochemistry and air pollution, reactor accident consequences, reactor safety studies, and transportation risk assessment.
EIS Responsibility:	Port accident risk analysis
Name:	Donna J. Stucky
Affiliation:	Pacific Northwest Laboratories
Education:	MS, Agricultural Economics, Purdue University BA, Economics, Pacific Lutheran University
Experience/ Technical Specialty:	Two years. Economic research.
EIS Responsibility:	Environmental consequences
Name:	Robert Wayland
Affiliation:	Science Applications International Corporation
Education:	PhD, Atmospheric Science, North Carolina State University MS, Environmental Science, University of Virginia BA, Environmental Science, University of Virginia
Experience/ Technical Specialty:	Eleven years. Boundary-layer meteorology, atmospheric structure and composition, ocean-atmosphere interactions, atmospheric modeling.
EIS Responsibility:	Port meteorological data assessments, site nonradiological impact analyses

Name:	Timothy Wheeler
Affiliation:	Sandia National Laboratories
Education:	MS, Systems Engineering, University of Virginia BS, Mechanical Engineering, University of New Hampshire
Experience/ Technical Specialty:	Fourteen years. NEPA compliance, radioactive material transportation risk analysis, probabilistic risk assessment.
EIS Responsibility:	At-sea submerged cask risk assessment
Name:	John W. Williams
Affiliation:	Science Applications International Corporation
Education:	PhD, Physics, New Mexico State University MS, Physics, New Mexico State University BS, Mathematics, North Texas State University
Experience/ Technical Specialty:	Twenty years. NEPA compliance, electromagnetic models, air quality modeling, ionizing radiation impacts and safety.
EIS Responsibility:	Environmental justice, ports selection, quality control reviews
Name:	Steven E. Wujciak
Affiliation:	U.S. Department of Transportation, Research & Special Projects Administration, Volpe National Transportation System Center
Education:	MBA, Anna Maria College BS, Business Administration, Anna Maria College
Experience/ Technical Specialty:	Fifteen years. Operations research, transportation analysis, emergency preparedness.
EIS Responsibility:	Ground transportation analysis
Name:	Maron D. Wylie
Affiliation:	U.S. Department of Transportation, Research & Special Projects Administration, Volpe National Transportation System Center
Education:	MS, Math and Computer Science, Worcester State College BS, Business Administration, University of Southern Mississippi
Experience/ Technical Specialty:	Fifteen years. Operations research, transportation analysis, emergency preparedness.
EIS Responsibility:	Ground transportation analysis

Name	Michael R. Zanotti
Affiliation:	Science Applications International Corporation
Education:	MPA, Administrative Management and Organization, Golden Gate University MPA, Health Services Administration, Golden Gate University BA, Behavioral Sciences, University of Maine AA, Criminal Justice, University of Maine
Experience/ Technical Specialty:	Fifteen years. Certified Emergency Manager (CEM), Emergency management, emergency response, fire response, hazardous materials response, facilities operation.
EIS Responsibility:	Emergency management and response

7. Agencies Consulted

The following agencies were consulted in the development of this Draft Environmental Impact Statement.

Federal Agencies

Arms Control and Disarmament Agency
Military Traffic Management Command
Military Ocean Terminal, Oakland (CA)
Military Ocean Terminal, Sunny Point (NC)
Naval Weapons Station, Concord (CA)
Naval Weapons Station, Charleston (SC)
Port Hueneme (CA) Naval Construction Battalion Center
U.S. Department of Defense
U.S. Department of Army
U.S. Coast Guard
U.S. Merchant Marine Academy
U.S. Fish and Wildlife Service

State Agencies

Alabama Department of Conservation and Natural Resources
Alabama Department of Environmental Management, Water Quality Division
Alabama Natural Heritage Program
Alabama State Docks, Mobile (AL)
California Fish & Game Heritage Program
California Regional Water Quality Control Board, San Francisco Bay Region
Delaware Department of Natural Resources and Environmental Control, Division of Water Resources
Delaware Natural Heritage Inventory
Florida Department of Environmental Regulation, Bureau of Surface Water Management
Florida Natural Areas Inventory
Fort Clinch State Park, Amelia Island, FL
Georgia Department of Natural Resources, Environmental Protection Division
Georgia Department of Natural Resources, Wildlife Resources Division
Georgia Ports Authority
John U. Lloyd Beach State Recreation Area, Port Everglades, FL
Louisiana Department of Environmental Quality
Louisiana Natural Heritage Program
Maryland Natural Heritage Program
Massachusetts Port Authority
Maryland Port Administration
Mississippi Department of Environmental Quality, Water Quality Division
Mississippi Natural Heritage Program
Mississippi State Port Authority at Gulfport
New Hampshire Port Authority
New Jersey Natural Heritage Program
North Carolina Department of Environment, Health, and Natural Resources, Division of Environmental Management
North Carolina Natural Heritage Program
North Carolina State Ports Authority
Oregon Natural Heritage Program
Pennsylvania Department of Environmental Resources, Water Quality Division
Pennsylvania Natural Diversity Inventory
Ports Authority of New York & New Jersey
South Carolina Department of Health and Environmental Control, Water Quality Division
South Carolina Heritage Trust
South Carolina State Ports Authority
South Jersey Port Corporation
Virginia Department of Conservation and Recreation, Division of Natural Heritage
Virginia Department of Environmental Quality, Water Division
Virginia Water Control Board
Virginia Port Authority
Washington Department of Wildlife

Local Agencies

Bridgeport Port Authority (CT)
Commissioners of Pilotage, Port of Charleston (SC)
Jacksonville Port Authority (FL)
Manatee County Port Authority (FL)
Penn Terminals (Port of Eddystone, PA)
Port Authority of Greater New Orleans (LA)
Port Everglades Authority (FL)
Port of Albany (NY)
Port of Alexandria (VA)
Port of Baton Rouge (LA)
Port of Beaumont (TX)
Port of Corpus Christi (TX)
Port of Fall River (MA)

Local Agencies (Continued)

Port of Fernandina (FL)
Port of Galveston (TX)
Port of Grays Harbor (WA)
Port of Houston Authority (TX)
Port of Hueneme (CA)
Port of Long Beach (CA)
Port of Longview (WA)
Port of Los Angeles (CA)
Port of Miami (FL)
Port of New Haven (CT)
Port of Oakland (CA)
Port of Palm Beach (FL)
Port of Port Arthur (TX)
Port of Portland (ME)
Port of Portland (OR)
Port of Portsmouth (NH)
Port of Richmond (CA)
Port of Richmond Commission (VA)
Port of San Francisco (CA)
Port of Seattle (WA)
Port of Tacoma (WA)
Port of Vancouver, U.S.A. (WA)
Port of Wilmington (DE)
Port of Wilmington (NC)
San Diego Unified Port District (CA)
Tampa Port Authority (FL)

Other

Australian Nuclear Science & Technology Organization (ANSTO)
Austrian Research Centre, Austria
Belgian Nuclear Research Centre
GKSS Research Center, Germany
Hahn-Meitner Institut Berlin, Germany
Interfaculty Reactor Institute, Delft University of Technology, The Netherlands
Joint Research Centre-Petten, Institute for Advanced Materials, The Netherlands
National Center for Scientific Research, "Demokritos," Greece
Paul Scherrer Institute, Switzerland
RISO National Laboratory, Denmark
Studsvik Nuclear AB, Sweden
United Kingdom Atomic Energy Authority, Thurso, Dounreay Caithness, Scotland

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9. Glossary

Absorbed dose. The energy imparted by ionizing radiation per unit mass of irradiated material. The unit of absorbed dose is the rad.

Accident. An unplanned sequence of events that results in undesirable consequences.

Actinide. Any of a series of chemically similar, mostly synthetic, radioactive elements with atomic numbers ranging from actinium (89) through lawrencium (103).

Acute exposure. A single exposure to a toxic substance which may result in severe biological harm or death. Acute exposures are usually characterized as lasting no longer than a day.

Alpha-emitter. A radioactive substance that decays by releasing an alpha particle.

Alpha particle. A particle consisting of two protons and two neutrons, given off by the decay of many elements, including uranium, plutonium, and radon. Alpha particles cannot penetrate a sheet of paper. However, alpha emitting isotopes in the body can be very damaging.

As low as reasonably achievable (ALARA). The approach to radiation protection to manage and control exposures (both individual and collective) to the work force and to the general public to as low as is reasonable, taking into account social, technical, economic, practical, and public policy considerations. ALARA is not a dose limit but a process which has the objective of attaining doses as far below the applicable limits as is reasonably achievable.

Atomic Energy Act (AEA). A law passed in 1954 that placed nuclear production and control of nuclear materials within a civilian agency, originally the Atomic Energy Commission. The Atomic Energy Commission was replaced by the U.S. Nuclear Regulatory Commission, the U.S. Department of Energy, and predecessor agencies (i.e., ERDA, FERC).

Atomic number. The number of positively charged protons in the nucleus of an atom or the number of electrons on an electrically neutral atom.

Background radiation. Radiation from: (1) Naturally occurring radioactive materials which have not been technologically enhanced, (2) cosmic sources, (3) global fallout as it exists in the environment (such as from the testing of nuclear explosive devices), (4) radon and its progeny in concentrations or levels existing in buildings or the environment which have not been elevated as a result of current or prior activities, and (5) consumer products containing nominal amounts of radioactive material or producing nominal amounts of radiation.

Beta particle. A particle emitted in the radioactive decay of many radionuclides. A beta particle is identical with an electron. It has a short range in air and a low ability to penetrate other materials.

Canning. The process of placing spent nuclear fuel in canisters to retard corrosion, contain radioactive releases, or control geometry.

Cask. A heavily shielded massive container for holding nuclear materials during shipment.

Characterization. The determination of waste or spent nuclear fuel composition and properties, whether by review of process knowledge, nondestructive examination or assay, or sampling and analysis, generally done to determine appropriate storage, treatment, handling, transportation, and disposal requirements.

Chemical separation. A process for extracting uranium and plutonium from dissolved spent nuclear fuel and irradiated targets. The fission products that are left behind are high level wastes. Chemical separation is also known as reprocessing.

Cladding. The outer layer of metal over the fissile material of a nuclear fuel element. Cladding on the Department of Energy's spent fuel is usually aluminum, zirconium, or stainless steel.

Collective dose. The sum of the total effective dose equivalents of all individuals in a specified population. Collective dose is expressed in units of person-rem (or person-sievert).

Committed effective dose equivalent. The sum of the committed dose equivalents to various tissues in the body, each multiplied by the appropriate weighting factor. Committed effective dose equivalent is expressed in units of rem (or sievert), and will be accumulated during the fifty years following an intake of radioactive material into an individual's body.

Competitive fee. A fee that could be charged to foreign research reactor operators related to the estimated cost of spent nuclear fuel management and disposal outside the United States.

Conditioning. See stabilization (of spent nuclear fuel).

Contact-handled waste. Packaged waste whose external surface dose rate does not exceed 200 mrem per hour.

Contamination. The deposition of undesirable radioactive material on the surfaces of structures, areas, objects, or personnel.

Core. The central portion of a nuclear reactor containing the fuel elements, moderator, neutron poisons, and support structures.

Criticality. The conditions in which a system is capable of sustaining a nuclear chain reaction.

Cumulative impact. The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Curie. The basic unit used to describe the intensity of radioactivity in a sample of material. The curie is equal to 37 billion disintegrations per second, which is approximately the rate of decay of 1 gram of the isotope radium-266. A curie is also a quantity of any radionuclide that decays at a rate of 37 billion disintegrations per second.

Decay (radioactive). Spontaneous disintegration of the nucleus of an unstable atom, resulting in the emission of particles and energy.

Decommissioning. Retirement of a nuclear facility, including decontamination and/or dismantlement.

Decontamination. Removal of unwanted radioactive or hazardous contamination by a chemical or mechanical process.

Degraded (spent nuclear fuel). See failed fuel.

Depleted uranium. Uranium that, through the process of enrichment, has been stripped of most of the uranium-235 it once contained, so that it has more uranium-238 than natural uranium. It is used as shielding, in some parts of nuclear weapons, and as a raw material for plutonium production.

Developed countries. Countries with high-income economies (World Bank, 1994).

Developing countries. Countries with other-than-high-income economies (World Bank, 1994).

Discounted dollars. Expressing income and expenditures that occur over time as if they occurred at a common point in time.

Disposal of fuel. Emplacement of fuel to ensure its isolation from the biosphere, with no intention of retrieval.

DOE Orders. Requirements internal to the U.S. Department of Energy (DOE) that establish DOE policy and procedures, including those for compliance with applicable laws.

Dose (or radiation dose). A generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed effective dose equivalent, or total effective dose equivalent as defined elsewhere in this glossary.

Dose rate. The radiation dose delivered per unit time (e.g., rem per year).

Dry storage. Storage of spent nuclear fuel in environments where the fuel is not immersed in water for purposes of both cooling and shielding.

Ecology. The relationship of living things to one another and their environment, or the study of such relationships.

Effective dose equivalent. The summation of the products of the dose equivalent received by specified tissues of the body and the appropriate weighting factor. It includes the dose from radiation sources internal and/or external to the body. The effective dose equivalent is expressed in units of rem (or sievert).

Endangered species. Animals, birds, fish, plants, or other living organisms threatened with extinction by man-made or natural changes in their environment. Requirements for declaring a species endangered are contained in the Endangered Species Act.

Enriched uranium. Uranium that has greater amounts of the isotope uranium-235 than occurs naturally. Naturally occurring uranium is 0.72 percent uranium-235.

Environmental monitoring. The process of sampling and analysis of environmental media in and around a facility being monitored for the purpose of (1) confirming compliance with performance objectives and (2) early detection of any contamination entering the environment to facilitate timely remedial action.

Escalation. A real change in the price level of a particular good or service, unrelated to inflation.

Existing facilities. Facilities that existed at an active DOE site as of the Record of Decision for this Environmental Impact Statement.

Failed fuel. Spent nuclear fuel whose external cladding has cracked, pitted, corroded, or potentially allows the leakage of radioactive gases.

SECTION 9

National Environmental Policy Act. A Federal law, enacted in 1970, that requires the Federal government to consider the environmental impacts of, and alternatives to, major proposed actions in its decisionmaking processes. Commonly referred to by its acronym, NEPA.

Natural phenomena accidents. Accidents that are initiated by phenomena such as earthquakes, tornadoes, floods, etc.

Nearest public access individual (NPAI). A theoretical individual located at the point of nearest public access to a DOE facility, usually during an accident situation.

Net present value. The value of a series of future income and expense streams brought forward to the present at the discount rate.

Neutron. Uncharged elementary particles with a mass slightly greater than that of the proton, and found in the nucleus of every atom heavier than hydrogen.

Nonproliferation. Efforts to prevent or slow the spread of nuclear weapons and the materials and technologies used to produce them.

Normal operation. All normal conditions and those abnormal conditions that frequency estimation techniques indicate occur with a frequency greater than 0.1 events per year.

Nuclear fuel. Materials that are fissionable and can be used in nuclear reactors.

Plutonium. A manmade fissile element. Pure plutonium is a silvery metal that is heavier than lead. Material rich in the plutonium-239 isotope is preferred for manufacturing nuclear weapons, although any plutonium can be used. Plutonium-239 has a half-life of 24,000 years.

Population dose. See collective dose.

Probable maximum flood. The largest flood for which there is any reasonable expectancy in a specific area. The probable maximum flood is normally several times larger than the largest flood of record.

Processing (of spent nuclear fuel). Applying a chemical or physical process designed to alter the characteristics of the spent nuclear fuel matrix.

Public. Anyone outside the DOE site boundary at the time of an accident or during normal operation.

PUREX. An acronym for Plutonium-Uranium Extraction, the name of the chemical process usually used to reprocess spent nuclear fuel and irradiated targets.

Rad. The special unit of absorbed dose. One rad (0.01 gray) is equal to an absorbed dose of 100 ergs/gram.

Radiation (ionizing). Energy transferred through space or other media in the form of particles or waves. In this document, we refer to ionizing radiation which is capable of breaking up atoms or molecules. The splitting, or decay, of unstable atoms emits ionizing radiation.

Radioactive waste. Waste that is managed for its radioactive content; solid, liquid or gaseous material that contains radionuclides regulated under the AEA of 1954, as amended and of negligible economic value considering costs of recovery.

Radioactivity. The spontaneous emission of radiation from the nucleus of an atom. Radionuclides lose particles and energy through this process of radioactive decay.

Region of influence. Region in which the principal direct and indirect socioeconomic effects of actions are likely to occur and are expected to be of consequence for local jurisdictions.

Regulated substances. A general term used to refer to materials other than radionuclides that may be regulated by other applicable Federal, State, (or possibly local) requirements.

rem. Roentgen Equivalent Man which is a unit of dose equivalent. Dose equivalent in rem is numerically equal to the absorbed dose in rad multiplied by a quality factor, distribution factor and any other necessary modifying factor (1 rem = 0.01 sievert).

Reprocessing (spent nuclear fuel). See chemical separation.

Risk. Quantitative expression of possible loss that considers both the probability that a hazard causes harm and the consequences of that event.

Saltstone. Low-radioactivity fraction of high-level waste formed into a concrete block at the Savannah River Site.

Source material. (1) Uranium, thorium, or any other material that is determined by the Nuclear Regulatory Commission pursuant to the provisions of the Atomic Energy Act of 1954, Section 61, to be source material; or (2) ores containing one or more of the foregoing materials, in such concentration as the Nuclear Regulatory Commission may by regulation determine from time-to-time [Atomic Energy Act 11(z)].

Special nuclear material. (1) Plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material that the Nuclear Regulatory Commission, pursuant to the provisions of the Atomic Energy Act of 1954, Section 51, determines to be special nuclear material, but does not include source material; or (2) any material artificially enriched by any of the foregoing, but does not include source material.

Spent nuclear fuel. Fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated.

Stabilization (of spent nuclear fuel). Actions taken to further confine or reduce the hazards associated with spent nuclear fuel, as necessary for safe management and environmentally responsible storage for extended periods of time. Activities which may be necessary to stabilize spent nuclear fuel include canning, processing, and passivation.

Storage. The collection and containment of waste or spent nuclear fuel in such a manner as not to constitute disposal of the waste or spent nuclear fuel for the purposes of awaiting treatment or disposal capacity (i.e., not short-term accumulation).

Surface water. All waters that are open to the atmosphere and subject to surface runoff. All waters naturally open to the atmosphere (rivers, lakes, reservoirs, streams, impoundments, seas, estuaries, etc.) and all springs, wells, or other collectors that are directly influenced by surface water.

Target. A tube, rod, or other form containing material that, on being irradiated in a nuclear reactor would produce a designed end product (i.e., uranium-238 produces plutonium-239 and neptunium-237 produces plutonium-238).

Target material. Residual material that is left after a target has been irradiated and dissolved, and the end product has been removed. In this EIS, target material contains enriched uranium and fission products.

Total effective dose equivalent. The sum of the deep dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

Type B packaging. Packaging for radioactive material which meets the standards for Type A packaging and, in addition, meets the standards for the hypothetical accident conditions of transport as prescribed in 49 Code of Federal Regulations Part 173.398(c). This includes spent fuel casks.

Ultimate disposition. The final step in which a material is either processed for some use or disposed of.

Undiscounted dollars. Expressing income and expenditures in the year they occur, not at some common point in time.

Uranium. The basic material for nuclear technology. It is a slightly radioactive naturally occurring heavy metal that is more dense than lead. Uranium is 40 times more common than silver.

Vitrification. The process of immobilizing waste that produces a glass-like solid that permanently captures the radioactive materials.

Vulnerabilities. Conditions or weaknesses that may lead to radiation exposure to the public, unnecessary or increased exposure to the workers, or release of radioactive materials to the environment.

Waste classification. Wastes are classified according to 10 CFR § 61.55 for the purpose of near surface disposal to three classes: A, B, and C. Class C waste represents the waste that must meet the most rigorous requirements on waste form to ensure stability and additional measures at the disposal facility to protect against inadvertent intrusion.

Waste management. The planning, coordination, and direction of those functions related to generation, handling, treatment, storage, transportation, and disposal of waste, as well as associated surveillance and maintenance activities.

Waste minimization. An action that economically avoids or reduces the generation of waste by source reduction or reduces the toxicity of hazardous waste, improving energy usage, or by recycling. This action will be consistent with the general goal of minimizing present and future threats to human health, safety, and the environment.

Wet storage. Storage of spent nuclear fuel in a pool of water, generally for the purposes of both cooling and worker shielding.

NEPA TEAM

DOE/EIS-0218F
February 1996

Summary

FINAL ENVIRONMENTAL IMPACT STATEMENT

on a

Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

United States Department of Energy
Assistant Secretary for Environmental Management
Washington, DC 20585

NEPA TEAM

Department of Energy
Washington, DC 20585

February 8, 1996

Dear Interested Party:

I am enclosing a copy of the Summary of the final Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. The Department of Energy, in cooperation with the State Department, prepared the final Environmental Impact Statement.

This study analyzes the potential environmental impacts of adopting a policy to manage foreign research reactor spent fuel containing uranium enriched in the United States. In particular, the study examines the comparative impacts of several alternative approaches to managing the spent fuel. The analyses demonstrate that the impacts on the environment, workers and the general public of implementing any of the alternative management approaches would be small and within applicable Federal and state regulatory limits.

The Department's preferred approach to managing the spent fuel, referred to in the study as the "preferred alternative," is for the Department to receive the spent fuel into the United States, and to manage it at the Department's Savannah River Site in South Carolina and the Idaho National Engineering Laboratory. The spent fuel would be shipped to the United States over 13 years through two military ports. The Charleston Naval Weapons Station in South Carolina would receive about one to two shipments every month beginning in 1996. The Concord Naval Weapons Station in California would receive far fewer shipments (as few as five shipments over a 13-year period) beginning in 1997.

The final Environmental Impact Statement is a three-volume document, approximately 4000 pages in length. Volume 1 (494 pages) describes the policy considerations of adopting a policy to manage foreign research reactor spent fuel, and the potential environmental impacts. Volume 2 (1111 pages) contains eight appendices relating to the technical analyses. Volume 3 (2230 pages) contains the public's comments on the draft Environmental Impact Statement, the Department's responses to those comments, and summaries of the 17 public hearings held throughout the United States during the 90-day comment period on the draft.

Our experience has taught us that many people who are interested in the Department's proposed activities do not necessarily want to receive a lengthy, multi-volume document to review. For this reason, we are sending you the Summary alone at this time. If, however, you would like a copy of the entire study, a particular volume, or an additional copy of the Summary, we would be pleased to send it to you. Please let us know by calling the Department's

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Center for Environmental Management Information at 1-800-736-3282 (toll-free). The entire document will be placed in the public reading rooms and information locations listed in the Summary.

The Department will not make a final decision on whether to adopt the proposed policy until late March 1996. Thank you for your interest in this proposed action.

Sincerely,

Thomas P. Grumbly
Assistant Secretary for
Environmental Management

Enclosure

Cover Sheet

Responsible Agencies: Lead Agency: United States Department of Energy
Cooperating Agency: United States Department of State

Title: Final Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Contact: For further information, concerning this Final Environmental Impact Statement, contact:

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-67)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

For general information on the United States Department of Energy's National Environmental Policy Act process, call 1-800-472-2756 to leave a message, or contact:

Carol Borgstrom, Director
Office of NEPA Policy and Assistance (EH-42)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585
202-586-4600

Abstract: The United States Department of Energy and United States Department of State are jointly proposing to adopt a policy to manage spent nuclear fuel from foreign research reactors. Only spent nuclear fuel containing uranium enriched in the United States would be covered by the proposed policy. The purpose of the proposed policy is to promote U.S. nuclear weapons nonproliferation policy objectives, by seeking to reduce and eventually eliminate highly-enriched (weapons-grade) uranium from civilian commerce worldwide. Environmental effects and policy considerations of three Management Alternative approaches for implementation of the proposed policy are assessed. The three Management Alternatives analyzed are: (1) acceptance and management of the spent nuclear fuel by the Department of Energy in the United States, (2) facilitate the management of the spent nuclear fuel at one or more foreign facilities (under conditions that satisfy United States nuclear weapons nonproliferation policy objectives), and (3) a combination of elements from one or both of Management Alternatives 1 and 2 (Hybrid Alternative). A No Action Alternative is also analyzed.

For each Management Alternative, there are a number of implementation alternatives. For Management Alternative 1, this document addresses the environmental effects of various implementation alternatives, such as varied policy durations, management of various quantities of spent nuclear fuel, chemical separation, developmental treatment and/or packaging technologies, and differing financing arrangements. Environmental impacts are also examined at various potential ports of entry, along truck and rail transportation routes, at candidate management sites, and for alternate storage technologies. For Management Alternative 2, this document addresses the environmental effects of two implementation alternatives: (1) assisting foreign nations with storage; and (2) assisting foreign nations with reprocessing

of the spent nuclear fuel. With respect to Management Alternative 3, an example Hybrid Alternative is analyzed wherein a portion of the spent nuclear fuel would be processed at overseas facilities and the remaining portion would be managed in the United States.

The United States Department of Energy and United States Department of State, in consultation with other government agencies, designate the acceptance and management of the foreign research reactor spent nuclear fuel in the United States (i.e., Management Alternative 1 with modifications to several basic implementation elements) as the preferred alternative.

Public Comments: The public comment period on the Draft EIS was conducted from April 21, 1995 to July 20, 1995. During this period, DOE held 17 public hearings in the locations most likely to be directly affected by the EIS alternatives, including the 10 candidate ports of entry and 5 candidate spent nuclear fuel management sites. In addition, a public hearing was held in Washington, D.C. The Draft EIS was made available to the public through mailings, requests to DOE's Environmental Management Information Center, and at DOE Public Reading Rooms and other designated information locations.

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Summary

S.1 Introduction

Reducing the threat of the proliferation of nuclear weapons is one of the foremost goals of the United States. Proper management of spent nuclear fuel from foreign research reactors supports this goal, since much of this spent nuclear fuel contains highly-enriched uranium (HEU) which can be directly used in simple nuclear weapons.

The proposed action is for the U.S. Department of Energy (DOE) and the Department of State to jointly adopt a policy to manage spent nuclear fuel from foreign research reactors. Only spent nuclear fuel containing uranium enriched in the United States would be covered by the proposed action. The purpose of the proposed policy is to promote U.S. nuclear weapons nonproliferation policy objectives, specifically by seeking to reduce, and eventually eliminate, HEU from civilian commerce.

DOE and the Department of State have evaluated various Management Alternatives for implementing this policy. A key element of DOE and Department of State decisionmaking is a thorough understanding of the policy considerations and environmental impacts that may be associated with implementation of the proposed action. The National Environmental Policy Act of 1969 (NEPA), as amended, provides Federal agency decisionmakers with a process to use in considering potential environmental impacts (both positive and negative) of proposed actions before agencies make decisions.

National Environmental Policy Act

National Environmental Policy Act of 1969: A law that requires Federal agencies to consider in their decisionmaking processes the potential environmental effects of proposed actions and analyses of alternatives and measures to avoid or minimize any adverse effects of a proposed action.

Alternatives: The range of reasonable options, including not taking any action (the No Action alternative), considered in selecting an approach to meeting the need for agency action.

Environmental Impact Statement: A detailed environmental analysis for a proposed major Federal action that could significantly affect the quality of the human environment. A tool to assist in decisionmaking, it describes the positive and negative environmental effects of the proposed undertaking and alternatives.

Record of Decision: A concise public record of DOE's decision, which discusses the decision, identifies the alternatives (specifying which ones were considered environmentally preferable), and indicates whether all practicable means to avoid or minimize environmental harm from the selected alternative were adopted (and if not, why not).

In following this process, DOE and the Department of State prepared a draft Environmental Impact Statement (EIS) for public comment. The Draft EIS was issued in April 1995. Following consideration of public comments, DOE and the Department of State have prepared this *Final Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel* (Final EIS). DOE's and the Department of State's decisions will be presented in a Record of Decision to be issued not less than 30 days after issuance of the Final EIS.

S.1.1 Policy Background

Since the 1950's, as part of the "Atoms for Peace" program, the United States has provided peaceful nuclear technology to foreign nations in exchange for their promise to forego development of nuclear weapons. A major element of this program was the provision of research reactor technology and the HEU necessary to fuel the research reactors. Research reactors play a vital role in important medical, agricultural, and industrial applications. For example, research reactors are a vital tool in cancer therapy and radioimmunoassay blood testing. There are about 30,000 medical procedures per day in North America using medical isotopes produced in research reactors in other countries. There are also about 8,000 to 10,000 such procedures per day in Europe and a similar number on other continents. Figure S-1 provides examples of the uses and benefits of research reactors.

In the past, after irradiation in the research reactor, the used fuel (known as "spent") was transported to the United States, where it was reprocessed to extract the uranium still remaining in the spent nuclear fuel. In this way, the United States maintained complete control over the HEU that it provided to other nations. The United States began accepting HEU spent nuclear fuel from foreign research reactors in 1958.

The provision of enriched uranium from the United States to other nations was usually supported by a bilateral research agreement for each research reactor. Before 1964, these agreements provided for the lease of the enriched uranium, with explicit provision for the return of the spent nuclear fuel to the United States. After 1964, most agreements provided for the sale of this material to the foreign nation, and the United States began operating under a policy known as the "Off-Site Fuels Policy," under which the United States continued to accept, temporarily store, and reprocess the spent nuclear fuel.

What is Spent Nuclear Fuel?

Spent nuclear fuel is fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated. When it is removed from a reactor, spent nuclear fuel contains some unused enriched uranium and radioactive fission products. Because of its radioactivity (primarily from gamma rays), it must be properly shielded. Nuclear fuel consists of fuel elements which can come in many configurations. Generally, a fuel element is covered by a metal called cladding and is shaped like long rods, flat plates or cylinders.

What is Enriched Uranium?

Uranium ore occurs naturally in a state that cannot be used in most reactors or to make nuclear weapons. Enriching the uranium makes it easier to use in reactors. The enrichment process increases the amount of the fissionable uranium-235 (^{235}U) isotope. Uranium enriched to contain less than 20 percent ^{235}U is called low enriched uranium. Uranium enriched to contain 20 percent or greater ^{235}U is highly-enriched uranium that can be directly used to make nuclear weapons.

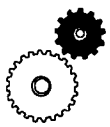
Uses and Benefits of Research Reactors

The United States has participated in cooperative international actions to expand peaceful uses of nuclear energy since the early days of the nuclear era. The foreign research reactors program has produced far-reaching benefits for medicine, science, industry, and the environment.

Advances in Nuclear Medicine

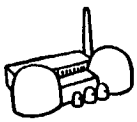
Cancer therapy, medical isotope production, clarification of the biological effects of radiation, development of improved drugs, and blood testing.

Benefits to Industry



Neutron radiography allows diagnosis of defects in metals and engines, research on new and improved materials, and leak detection.

Nonproliferation



Training of international inspectors of nuclear facilities worldwide to prevent diversion of nuclear materials.

Environmental, Agricultural, and Climate Studies

Development of tracer elements for studies of pollution, waste migration, toxic waste management, mine drainage, water chemistry, sediment transport, contamination of freshwater ecosystems, atmospheric dispersion and fallout product measurements, and soil erosion.

Advancement of Basic Scientific Research

Neutron scattering experiments produce insights into elementary particle physics, clarification of the biostructure of organic substances, and development of new magnetic materials and superconducting materials.

Materials and Advanced Fuels Testing

Testing of materials and fuel forms, including safety experimentation, is being conducted to support advance fuel design and waste management development for use in the power industry.

Figure S-1 Uses and Benefits of Research Reactors

To further reduce the danger of nuclear weapons proliferation, the United States in 1978 initiated the Reduced Enrichment for Research and Test Reactors (RERTR) program, which was aimed at reducing the use of HEU in civilian programs by promoting the conversion of foreign research reactors from HEU fuel to low enriched uranium (LEU) fuel. Research reactor fuel has become the major civilian use of HEU. As part of the RERTR program, DOE developed LEU fuel and worked with foreign research reactor operators to convert their reactors to run on such fuel.

The foreign research reactor operators who converted to LEU fuel did so in support of nuclear weapons nonproliferation objectives, even though such conversions were expensive and generally resulted in reduced capabilities of the reactors and increased operating costs. From the beginning of the RERTR program, foreign research reactor operators made it clear that their willingness to convert their research reactors to LEU fuel was contingent upon the continued acceptance by DOE of their spent nuclear fuel for disposition in the United States.

In 1986, to further encourage foreign research reactor operators to convert to LEU fuel, the DOE "Off-Site Fuels Policy" was extended to include the acceptance of spent nuclear fuel containing LEU enriched in the United States. The RERTR program has been highly successful and many foreign research reactors have been modified to operate, or have been designed to operate, with the high-density LEU fuels developed by the RERTR program. Of the 42 foreign research reactors with power levels equal to or above one million watts that use U.S. enriched fuel, 37 could operate with the currently available high-density LEU fuels. Of these, 25 are either operating on LEU fuel, or have ordered LEU fuel, and DOE anticipates that an additional eight reactors will convert to LEU fuel by 2001. Work is underway to develop improved high-density LEU fuels that would enable the remaining HEU-fueled reactors to convert as well. Thus, the RERTR program has contributed to a significant reduction in the level of HEU fuel usage in foreign research reactors.

The United States accepted foreign research reactor spent nuclear fuel until the program expired (in 1988 for HEU fuels and 1992 for LEU fuels). At that time, DOE committed to prepare an environmental review of the impacts of extending the program for accepting foreign research reactor spent nuclear fuel. In 1991, DOE issued an environmental assessment of the potential environmental impacts of the proposed extension. DOE received numerous comments from the public stating that any long-term policy should not be implemented until an EIS was prepared. DOE decided in mid-1993 to prepare an EIS to evaluate the impacts of implementing a new foreign research reactor spent nuclear fuel acceptance policy.

On April 21, 1995, DOE published a Notice of Availability (60 FR 19899) of the *Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel* (Draft EIS). Only spent nuclear fuel containing uranium enriched in the United States would be covered under the proposed action. The Draft EIS analyzed three Management Alternatives for implementing the proposed action: Management Alternative 1, accept and manage foreign research reactor spent nuclear fuel in the United States; Management Alternative 2, facilitate the management of foreign research reactor spent nuclear fuel overseas; and Management Alternative 3, a hybrid, or combination, of elements from the

first two Management Alternatives. In Management Alternative 1, the Draft EIS assesses the impacts of managing the spent nuclear fuel at five DOE sites and using ten candidate ports of entry.

During the 90-day public comment period (April 21, 1995 to July 20, 1995), about 900 individuals attended the 17 public hearings held in or near candidate ports, management sites, and in Washington, DC. In addition to oral comments, DOE received approximately 5,040 written comments contained within approximately 1,250 comment documents on a wide range of policy, economic, and technical issues. Many commentors supported the U.S. nuclear weapons nonproliferation policy objective of seeking to reduce the use of HEU in civilian commerce. However, comments reflected a wide range of views as to which management alternative should be adopted. Some commentors supported management of the spent nuclear fuel in the United States. Other commentors questioned the need to accept spent nuclear fuel from allies and those countries that can manage their spent nuclear fuel abroad. These commentors generally believed that such spent nuclear fuel should be managed overseas. With regard to the implementation of the policy in the United States, some commentors preferred the use of military ports. Risks during transport, including those from terrorism, a sunken cask, severe shipboard fires, and the level of emergency preparedness at ports, were frequently raised as matters of concern.

In consideration of public comments, DOE has added information to the EIS, including: clarification of the proposed U.S. policy on accepting spent nuclear fuel from allies; examination of the consequences of sabotage or terrorist attack; safety of transportation casks; re-examination of the shipboard fire analysis; and general provisions of transportation and emergency response regulations and management. The Naval Weapons Station at Charleston was analyzed in addition to the other terminals of the port of Charleston that were discussed in the Draft EIS. An overview of the public comment process is presented in Section S.5 of this EIS Summary and Volume 3 of the EIS. Each public comment received is presented in Volume 3 with the DOE response. In this Final EIS, DOE and the Department of State, in consultation with other government agencies and in consideration of public comments and the EIS analysis, designated the acceptance and management of foreign research reactor spent nuclear fuel in the United States as the preferred alternative (i.e., Management Alternative 1 with modifications to several basic implementation elements).

S.1.2 Purpose and Need for Agency Action

For more than 50 years, the United States has played a leading role in international efforts to prevent the proliferation of nuclear weapons throughout the world. A key element of U.S. nuclear weapons nonproliferation policy is to reduce international commerce in HEU. DOE's and the Department of State's proposal to adopt a policy to manage foreign research reactor spent nuclear fuel containing uranium enriched in the United States is linked to U.S. efforts to convert the foreign research reactors from HEU to LEU fuels (the latter cannot be used directly in simple nuclear weapons) and to gain worldwide acceptance of the use of LEU fuels in new research reactors.

The failure of the United States to manage foreign research reactor spent nuclear fuel could have a number of adverse consequences. Foreign governments and research reactor operators participated in the RERTR program in part because the United States accepted the spent nuclear fuel from their research reactors. The United States has not accepted HEU spent nuclear fuel for more than six years, with the exception of recent shipments of 252 spent nuclear fuel elements (153 elements from Austria, The Netherlands, Sweden, and Denmark, and 99 elements from Switzerland and Greece) under the *Environmental Assessment of Urgent Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel, April 1994*. As a result, some foreign research reactor operators have run out of space to store their spent nuclear fuel and others soon will. Under such conditions, the foreign research reactor operators must either shut down their reactors, construct new storage facilities, or ship the spent nuclear fuel offsite for storage or reprocessing. Currently, overseas reprocessing results in separated HEU that is placed back into commerce for use as new reactor fuel. The overseas reprocessing facilities (e.g., Dounreay in the United Kingdom) currently do not have the special equipment to reprocess the high-density LEU fuels that the United States is encouraging foreign research reactors to use to replace the HEU fuels. Thus, in the absence of action to resolve the question of the disposition of spent nuclear fuel, any foreign research reactor operator who reprocesses spent nuclear fuel to control a spent fuel inventory must continue to use, or convert back to, fuel containing HEU. Some nations, such as Belgium and Germany, have already begun shipments for reprocessing. For most foreign research reactor operators, construction of a new storage facility would not be practical due to the very high cost of storing small amounts of spent nuclear fuel and the long time required to design, license, and construct facilities. The most realistic near-term option for these reactor operators (particularly those in countries without power reactor programs) is to ship their spent nuclear fuel offsite for reprocessing. In such a case, foreign research reactor operators would have little incentive to convert their reactors to LEU fuels.

A crucial consideration in making the proposal to manage foreign research reactor spent nuclear fuel was the then upcoming 1995 international conference on the *Treaty on the Non-Proliferation of Nuclear Weapons*. At that conference, a major United States foreign policy objective was reached when the parties agreed by consensus to make the Treaty a permanent part of the international nuclear nonproliferation regime. One key to the success of the conference was the ability of the United States to convince other Treaty parties that the nuclear weapons States had complied with their obligations

The Treaty on the Non-Proliferation of Nuclear Weapons

The 1968 *Treaty on the Non-Proliferation of Nuclear Weapons* is the basis for the world's nuclear weapons nonproliferation regime. The purpose of the Treaty is to keep the number of countries with nuclear weapons to the five countries that possessed such weapons before 1967: the United States, Russia, the United Kingdom, France, and China. In addition to the five nuclear weapons States, 175 other countries are members of the Treaty. On May 12, 1995, the Review and Extension Conference of the Parties to the Treaty agreed by consensus to extend the Treaty for an indefinite period. This accomplishment achieved a major goal of United States foreign policy. The obligations for compliance with the *Treaty on the Non-Proliferation of Nuclear Weapons* apply to both nuclear weapons States and nonnuclear weapons States. While nonnuclear weapons States agree not to pursue development or acquisition of nuclear weapons or other nuclear explosive devices, the nuclear weapons States commit themselves to work toward the ultimate elimination of their nuclear arsenals. All States are thus bound to help reduce the global threat of nuclear weapons, but must do so without prejudice to a nation's ability to pursue the benefits of peaceful uses of nuclear energy.

under Article IV of the Treaty and had shared with nonnuclear weapons States the benefits of peaceful nuclear cooperation.

The parties also agreed to review the Treaty every five years to ensure that all parties are in compliance. Any country which has been compelled to shut down its research reactors, or has been forced to seek reprocessing, could accuse the United States of not having complied with its Treaty obligations. This accusation, however ill-founded, could be made not only by the affected countries, but by any country opposed to U.S. interests.

To illustrate the level of concern that exists, DOE has received letters from the U.S. Department of State, the Nuclear Regulatory Commission (NRC), the Arms Control and Disarmament Agency, and the International Atomic Energy Agency, all urging DOE to implement a new policy to manage the foreign research reactor spent nuclear fuel. (See Appendix G of the Final EIS.)

By proposing a policy for management of certain foreign research reactor spent nuclear fuel, DOE and the Department of State do not seek to indefinitely accept or otherwise manage spent nuclear fuel from foreign research reactors. Rather, the purpose of the proposed new policy is to remove as much U.S.-origin HEU as possible from international commerce while giving the foreign research reactor operators and their host countries time to convert to operation with LEU fuel and to make their own arrangements for disposition of subsequently generated LEU spent nuclear fuel. Should the proposed policy be adopted, the foreign research reactor operators and countries in which the research reactors are operating must be prepared to implement their own arrangements for disposition of their spent nuclear fuel after the policy expires.

S.1.3 Decisions to be Made Based on this EIS

The principal policy decision for which this EIS will provide a basis is whether the United States should adopt a policy for the management of foreign research reactor spent nuclear fuel containing uranium enriched in the United States. The countries which host foreign research reactors covered under this EIS are identified in Figure S-2.

Should a decision be made to manage this foreign research reactor spent nuclear fuel in the United States, decisions also would have to be made on the duration of the policy, amount of fuel to be accepted, transportation modes, ports of entry, and method of spent nuclear fuel management (storage, chemical separation, or use of a new treatment and/or packaging technology). Should the decision be made to facilitate management of foreign research reactor spent nuclear fuel overseas, decisions would need to be made on what assistance the United States would provide to foreign nations for storage or reprocessing of the spent nuclear fuel overseas. The decisions of DOE and the Department of State will be announced in the Record of Decision for this EIS, which will be available no less than 30 days after the Environmental Protection Agency publishes a Notice of Availability for the Final EIS.

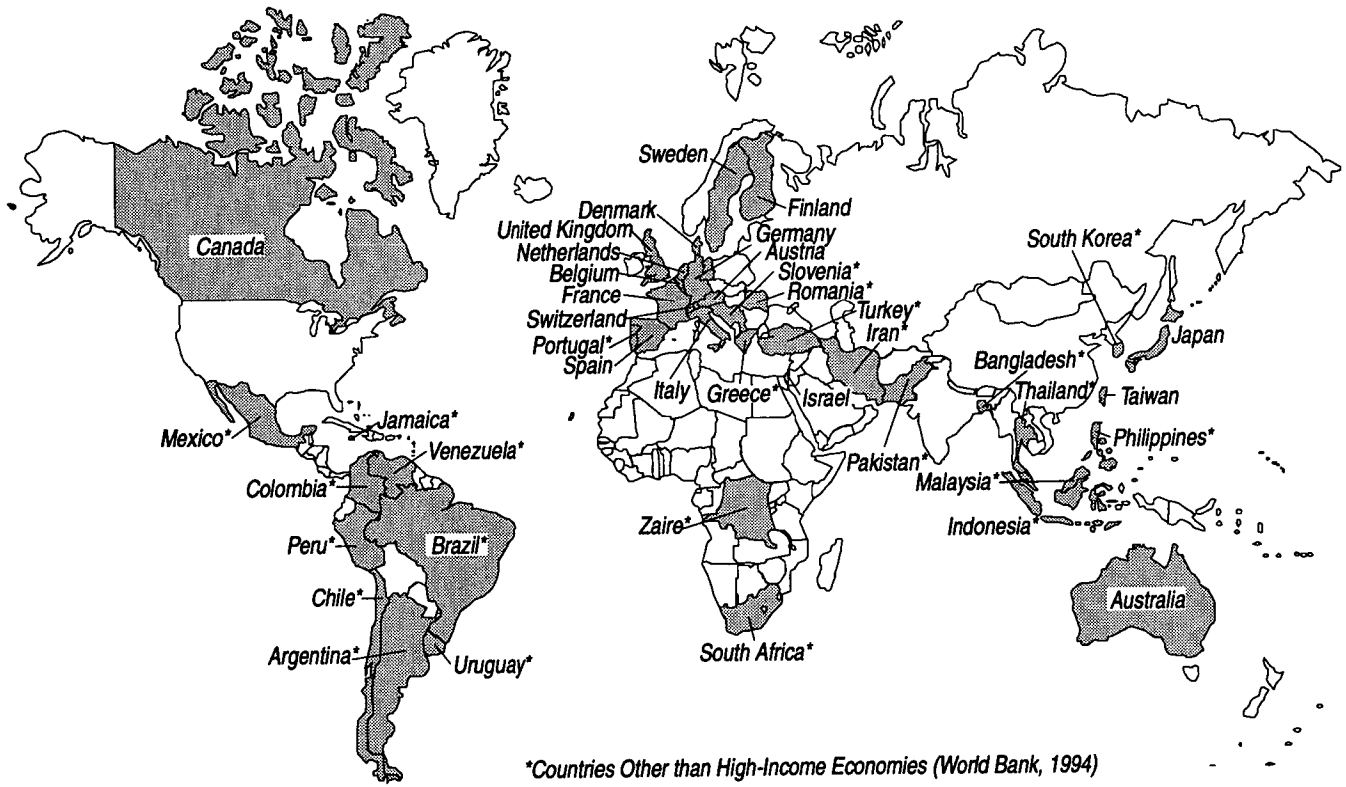


Figure S-2 Countries which Host the Research Reactors

S.1.4 Relationship of This EIS to Other NEPA Documentation and Reports Relating to Spent Nuclear Fuel Management

Certain potential actions discussed in this EIS would depend on decisions to be made under other NEPA analyses. For example, the site(s) at which foreign research reactor spent nuclear fuel would be managed (if the spent nuclear fuel were to be accepted in the United States) were considered in Volume 1 of the *DOE Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement*, or "Programmatic SNF&INEL Final EIS," issued in April 1995. The five management sites considered were: the Savannah River Site, the Idaho National Engineering Laboratory, the Oak Ridge Reservation, the Hanford Site, and the Nevada Test Site. The Record of Decision, issued on May 30, 1995, indicated that DOE aluminum clad spent nuclear fuel will be managed at the Savannah River Site and other DOE spent nuclear fuel will be managed at the Idaho National Engineering Laboratory. Accordingly, the Comment Response Document (Volume 3) for this EIS focuses on the Savannah River Site and the Idaho National Engineering Laboratory, although to maintain maximum consistency with the analysis provided in the Programmatic SNF&INEL Final EIS, this EIS analyzes the impacts of the proposed action at all five sites.

Potential chemical separation activities for nuclear materials already in inventory at the Savannah River Site are addressed in the *Interim Management of Nuclear Materials Final Environmental Impact Statement.* A Record of Decision and Notice of Preferred Alternative was published in December 1995 in the *Federal Register* (60 FR 65300). Decisions were made in the Record of Decision for the majority of materials covered by the EIS and processing Mark-16 and Mark-22 fuels and blending down the resulting HEU to LEU was identified as the preferred alternative. These fuels are similar to the aluminum-based foreign research reactor spent nuclear fuel, although significant corrosion has been identified. An amended Record of Decision is expected soon regarding the Mark-16 and Mark-22 spent nuclear fuel. DOE has taken into consideration the Record of Decision on the *Interim Management of Nuclear Materials Final EIS* in preparation of this EIS and in reaching a decision on how to implement the proposed policy, if adopted.

The relationship of this EIS to other DOE NEPA reviews, either completed or currently under preparation, and other DOE analyses related to the EIS, is discussed in Volume 1, Section 1.5 of the EIS.

S.2 Proposed Action and Alternatives

The proposed action is for DOE and the Department of State to jointly adopt a policy to manage spent nuclear fuel from foreign research reactors. Only spent nuclear fuel containing uranium enriched in the United States would be covered by the proposed action. The purpose of the proposed policy is to promote U.S. nuclear weapons nonproliferation policy objectives, specifically by seeking to reduce, and eventually eliminate, HEU from civilian commerce. The proposed policy applies solely to aluminum-based and Training, Research, Isotope, General Atomic (TRIGA) foreign research reactor spent fuels and target material containing HEU and LEU of U.S. origin.

To implement the proposed action, the EIS analyzes three "Management Alternatives," which are:

Management Alternative 1: Accept and manage foreign research reactor spent nuclear fuel in the United States. This could be implemented by accepting foreign research reactor spent nuclear fuel (containing HEU or LEU enriched in the United States) for management in the United States.

Management Alternative 2: Facilitate the management of foreign research reactor spent nuclear fuel overseas. This could be implemented by U.S. assistance in spent nuclear fuel storage or reprocessing.

Management Alternative 3: A hybrid, or combination, of elements from the above two Management Alternatives.

Each management alternative has further implementation components and alternatives, as identified in Figure S-3. These are addressed in succeeding sections.

The EIS also evaluates the "No Action" alternative, in which case the United States would take no action concerning such a policy.

DOE did not identify a preferred alternative for the management of foreign research reactor spent nuclear fuel in the Draft EIS. After careful consideration of public comments on the Draft EIS and other factors, DOE and the Department of State have designated Management Alternative 1, with modifications to several basic implementation

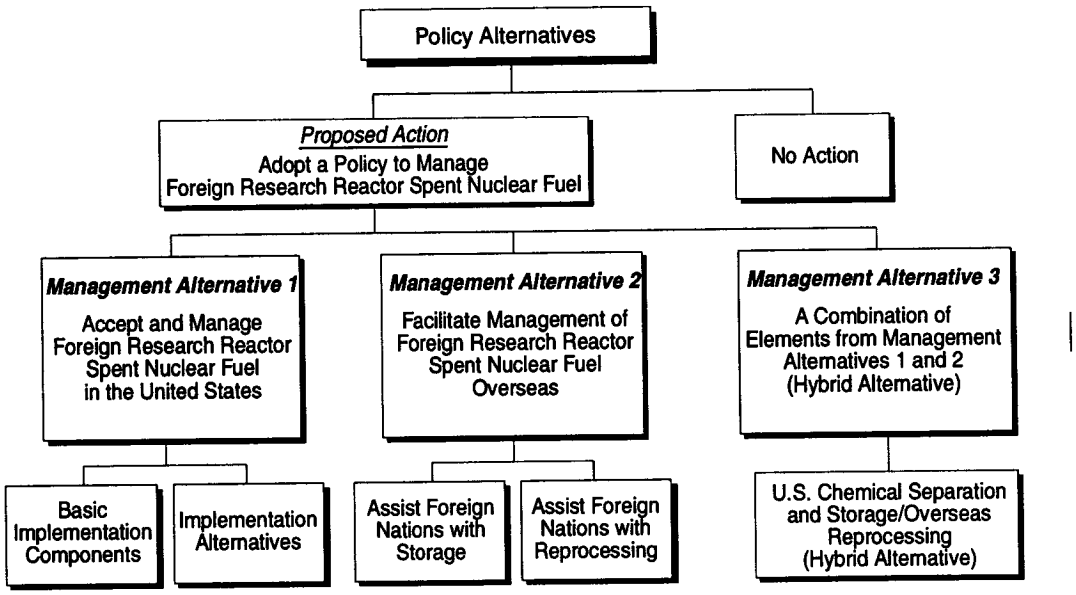


Figure S-3 Management Alternatives of the Proposed Action

elements, as the preferred alternative for the implementation of the proposed policy. This preferred alternative is to accept and manage in the United States up to 22,700 elements of foreign research reactor spent nuclear fuel containing uranium enriched in the United States and target material. The preferred alternative is described in Section S.2.3 of this Summary.

S.2.1 Overview of Management Alternatives to Implement the Proposed Action

The three Management Alternatives are summarized below.

Management Alternative 1: Manage Foreign Research Reactor Spent Nuclear Fuel in the United States

Under Management Alternative 1, foreign research reactor spent nuclear fuel, which contains uranium enriched in the United States, would be transported to the United States in casks designed on the basis of international regulations that are essentially identical to those promulgated by the NRC and certified by the U.S. Department of Transportation. In accordance with the Record of Decision for the Programmatic SNF&INEL Final EIS, all of the aluminum clad foreign research reactor spent nuclear fuel accepted by DOE would be managed at the Savannah River Site in South Carolina, and any other foreign research reactor spent nuclear fuel, such as the TRIGA elements, to be accepted by DOE would be managed at the Idaho National Engineering Laboratory, pending ultimate disposition. Nevertheless, all five of the spent nuclear fuel management sites originally considered in the Draft EIS have been kept in this Final EIS to maintain maximum consistency with the analyses provided in the Programmatic SNF&INEL Final EIS. The components of the basic implementation of Management Alternative 1 are identified in Figure S-4.

The EIS also evaluates several different options for implementing Management Alternative 1. (Indeed, the preferred alternative incorporates a combination of various implementation alternatives that were analyzed.) The implementation alternatives are identified in Figure S-5. They include, for example, different time periods for the policy duration, different storage technologies, and a chemical separation alternative to storing the fuel.

Management Alternative 2: Facilitate the Management of Foreign Research Reactor Spent Nuclear Fuel Overseas

This Management Alternative would require bilateral agreements between the United States and one or more foreign governments in order to ensure consistency with U.S. nuclear weapons nonproliferation policy. Under this Management Alternative there are two subalternatives: one is to provide assistance to foreign nations that are able to store their spent nuclear fuel in facilities in their own countries, and a second is to provide nontechnical (financial and/or logistical) assistance in reprocessing the spent nuclear fuel overseas in facilities operated under international safeguards sufficient to satisfy U.S. nuclear weapons nonproliferation concerns.

Under the first subalternative, DOE and the Department of State would provide assistance, incentives, and coordination for storage at one or more locations overseas, with appropriate storage technologies, regulations, and safeguards. In the second

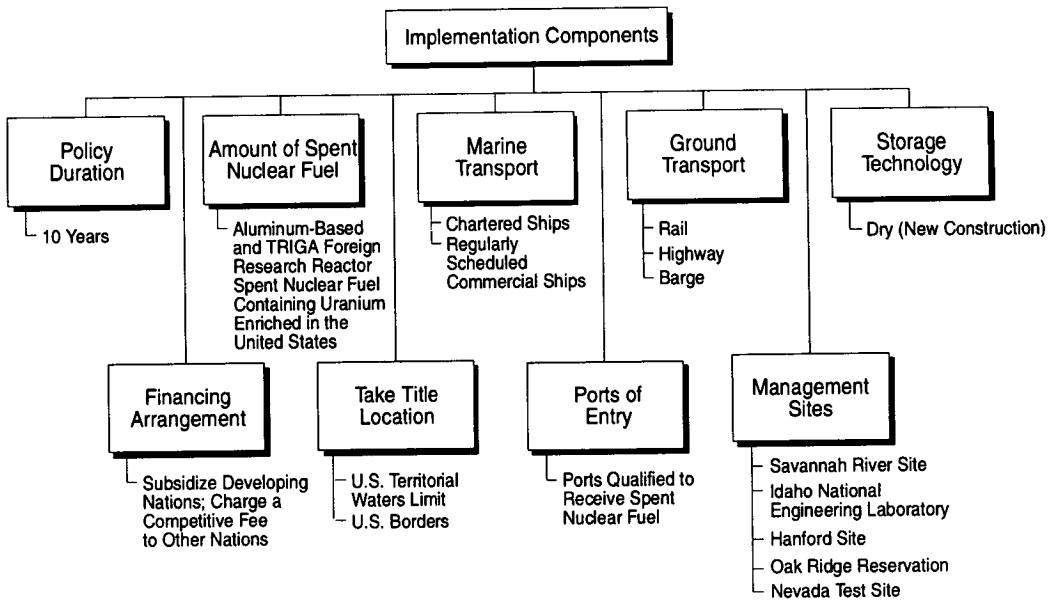


Figure S-4 Basic Implementation Components of Management Alternative 1

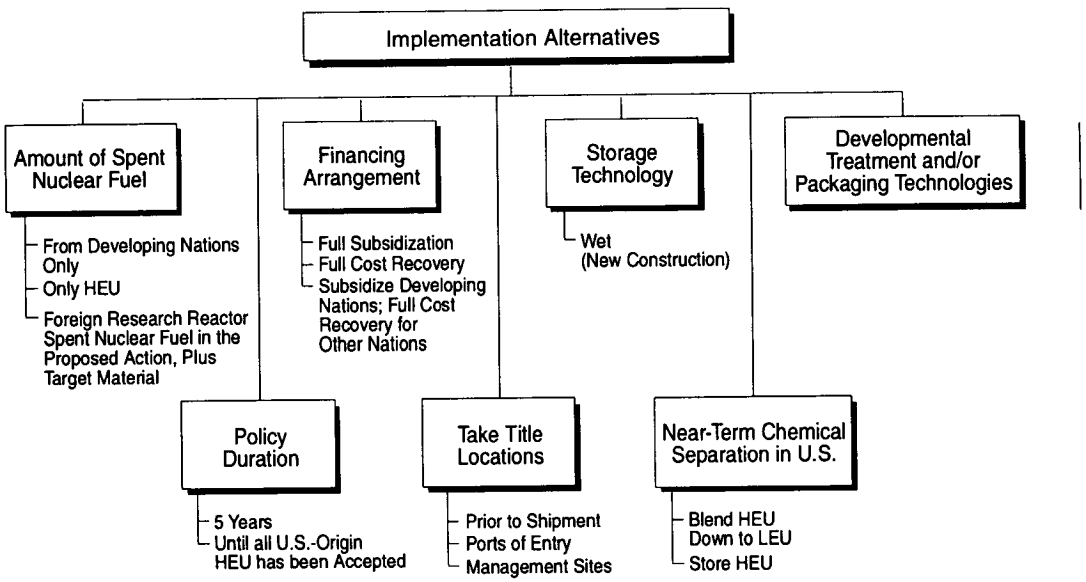


Figure S-5 Implementation Alternatives

subalternative, DOE and the Department of State would provide nontechnical assistance, incentives, and coordination to foreign research reactor operators and reprocessors to facilitate reprocessing of spent nuclear fuel overseas in facilities operated under international inspections and safeguards. Facilities operated by the United Kingdom Atomic Energy Authority at Dounreay, United Kingdom, and by Cogema at Marcoule, France might be used for this purpose. After reprocessing, the recovered HEU would be blended down to LEU at these same facilities for reuse as either LEU research reactor fuel or commercial power reactor fuel. The high-level wastes resulting from this reprocessing would be sent to the country in which the spent nuclear fuel was irradiated. If the reprocessing wastes could not be sent to the country in which the spent nuclear fuel was irradiated, such wastes would be accepted by the United States for storage and ultimate geologic disposal.

Management Alternative 3: A Combination of Elements From Management Alternatives 1 and 2 (Hybrid Alternative)

Under Management Alternative 3, DOE and the Department of State would combine elements from Management Alternatives 1 and 2 to develop new alternatives for management of foreign research reactor spent nuclear fuel in the United States or abroad. For example, DOE and the Department of State could combine partial storage or reprocessing overseas with partial storage or chemical separation in the United States.

The following sections discuss in more detail the implementation of each Management Alternative.

S.2.2 Management Alternative 1 - Manage Foreign Research Reactor Spent Nuclear Fuel in the United States

This section provides a more detailed summary of Management Alternative 1 and identifies components of its basic implementation and components of various implementation alternatives.

S.2.2.1 Basic Implementation Components

The components of the basic implementation of Management Alternative 1 (see Figure S-4) provide the foundation for the analyses of impacts presented in the EIS. They are:

- Policy Duration
- Financing Arrangement
- Amount of Foreign Research Reactor Spent Nuclear Fuel
- Location for Taking Title to Foreign Research Reactor Spent Nuclear Fuel
- Marine Transport
- Port(s) of Entry
- Ground Transport

- Foreign Research Reactor Spent Nuclear Fuel Management Sites
- Storage Technologies.

S.2.2.1.1 Policy Duration

The policy duration would be the 10-year period beginning on the date when the policy takes effect. Spent nuclear fuel containing HEU and LEU of U.S. origin that is currently being stored or is to be generated during the 10-year policy period would be accepted. Actual shipments of spent nuclear fuel to the United States could be made for a period of 13 years starting from the effective date of the policy implementation, as long as spent nuclear fuel was generated within the 10-year policy period. The additional three years would allow for a cooling time for fuel discharged from a reactor late in the policy period, logistics in arranging for shipment of this fuel, and other unplanned for delays.

S.2.2.1.2 Financing Arrangement

The United States would bear the full cost of transporting and managing the foreign research reactor spent nuclear fuel received from countries with other-than-high-income-economies. For high-income economy countries, the United States would charge a competitive fee for all spent nuclear fuel management activities conducted by the United States.

S.2.2.1.3 Amount of Foreign Research Reactor Spent Nuclear Fuel

The amount of foreign research reactor spent nuclear fuel that would be accepted under the basic implementation of Management Alternative 1 is up to about 19.2 MTHM from up to approximately 22,700 individual spent nuclear fuel elements (1 MTHM equals about 2,200 pounds).

S.2.2.1.4 Location for Taking Title to Foreign Research Reactor Spent Nuclear Fuel

DOE would take title to the foreign research reactor spent nuclear fuel when the fuel entered U.S. territorial waters (19 km or 12 miles offshore) or crossed U.S. continental borders for shipments from Canada.

As a comparison:

- *During the last 5 decades, DOE and its predecessor agencies have produced, transported, received, stored, and processed more than 100,000 metric tons of heavy metal (MTHM) of spent nuclear fuel.*
- *Currently about 2,700 MTHM of DOE spent nuclear fuel are being stored at various DOE facilities.*
- *Currently, about 30,000 MTHM of spent nuclear fuel from commercial reactors are stored at reactor sites in the United States.*

S.2.2.1.5 Marine Transport

DOE estimates that 721 cask loads of foreign research reactor spent nuclear fuel would be sent to the United States by ship over a 13-year acceptance period under the basic implementation of Management Alternative 1.

S.2.2.1.6 Port(s) of Entry

The receipt of the foreign research reactor spent nuclear fuel could occur at any of the following candidate ports of entry:

- Charleston, SC (includes Naval Weapons Station and Wando Terminal, Mt. Pleasant)
- Galveston, TX
- Hampton Roads, VA (includes Terminals at Newport News, Norfolk, and Portsmouth, VA)
- Jacksonville, FL
- Military Ocean Terminal Sunny Point, NC
- Naval Weapons Station Concord, CA
- Portland, OR
- Savannah, GA
- Tacoma, WA
- Wilmington, NC

The locations of these ports in relation to the five candidate management sites are depicted on the map in Figure S-6.

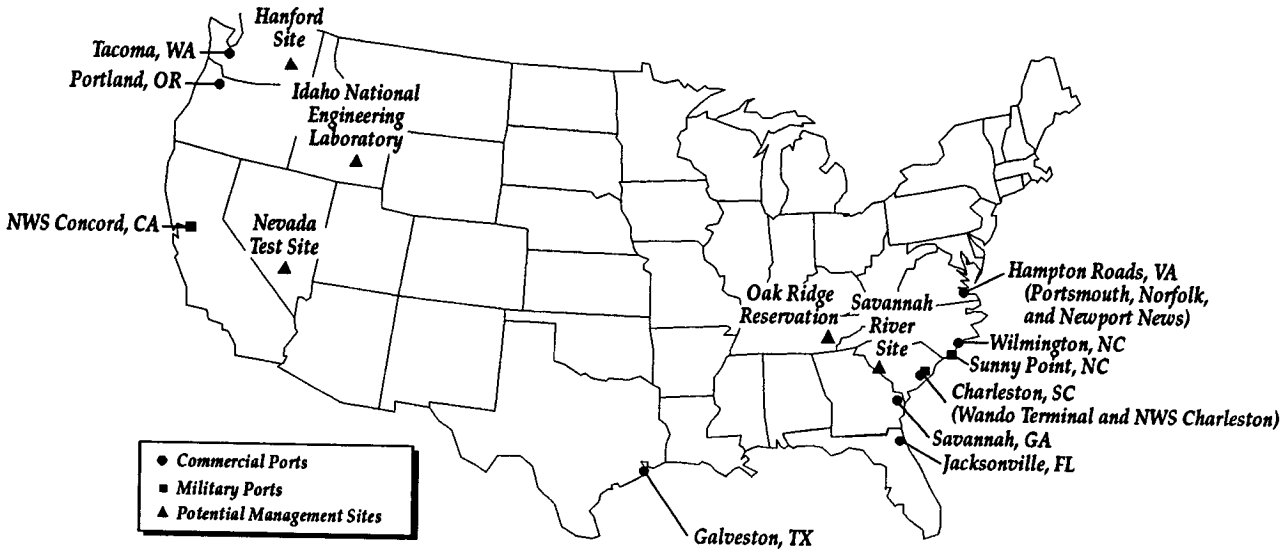


Figure S-6 Location of Potential Ports of Entry and Management Sites

The potential ports of entry were identified using screening criteria that included appropriate experience, safe transit, adequate facilities, and population around the ports and along routes to potential management sites. Screening criteria were based on input from the public (during the EIS scoping process), a U.S. Merchant Marine Academy panel of maritime safety experts, and factors identified in Section 3151 of the National Defense Authorization Act for Fiscal Year 1994.

S.2.2.1.7 Ground Transport

The basic implementation of Management Alternative 1 would involve transporting casks containing foreign research reactor spent nuclear fuel by truck, rail, or barge from the ports of entry or Canadian border crossings to potential management sites. It could also involve later transport of the spent nuclear fuel between the management sites.

All spent nuclear fuel shipments must comply with both NRC and Department of Transportation regulatory requirements. Specific highway routing of the cask shipments would follow a systematic process in accordance with Department of Transportation regulations. Shipments must also comply with NRC regulations covering physical security and notification.

Rail routing is not covered by specific Department of Transportation and NRC regulations. Therefore, shippers would generally select the most direct available rail route, which would serve to reduce travel time and radiation exposure consistent with track class and other rail service requirements.

S.2.2.1.8 Foreign Research Reactor Spent Nuclear Fuel Management Sites

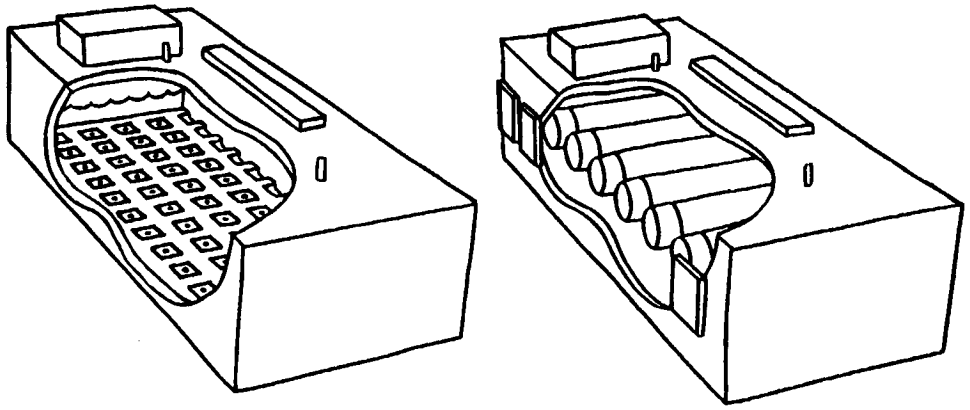
Potential sites for the receipt and management of foreign research reactor spent nuclear fuel have been specified by DOE in the Record of Decision for the Programmatic SNF&INEL Final EIS, which is concerned with the environmental impacts of management of spent nuclear fuel. In accordance with this Record of Decision, all of the aluminum clad foreign research reactor spent nuclear fuel accepted by DOE would be managed at the Savannah River Site in South Carolina, and any other foreign research reactor spent nuclear fuel, such as the TRIGA elements, to be accepted by DOE would be managed at the Idaho National Engineering Laboratory, pending ultimate disposition. Notwithstanding the Record of Decision of the Programmatic SNF&INEL Final EIS, full analyses of all five sites are included in the EIS to maintain analytical consistency with the programmatic analyses.

In the analyses considering use of potential management sites other than the Savannah River Site and the Idaho National Engineering Laboratory, the near-term unavailability of the other three candidate management sites to accept foreign research reactor spent nuclear fuel at the beginning of the implementation period (due to lack of existing storage capacity) would necessitate temporary receipt and storage of the spent nuclear fuel at either the Savannah River Site or the Idaho National Engineering Laboratory. The other three sites — the Oak Ridge Reservation, the Hanford Site, and the Nevada Test Site — would not have facilities available for approximately 10 years. The Nevada Test Site could receive the spent nuclear fuel in approximately five years if a decision were made to refurbish the Engine Maintenance and Disassembly (E-MAD) facility rather than construct a new facility.

S.2.2.1.9 Storage Technologies

Under the basic implementation of Management Alternative 1, DOE would manage foreign research reactor spent nuclear fuel for a period starting in 1996, and continuing for 40 years, or until ultimate disposition. The technology for safely storing spent nuclear fuel has been in use for over 40 years in the nuclear industry. Spent nuclear fuel storage is generally characterized as either "wet" or "dry." Wet storage means that the spent nuclear fuel elements reside in a water-filled pool. Dry storage means that the fuel is stored in a dry enclosed atmosphere. During the first few years, storage would take place in existing storage facilities that use both wet and dry storage technologies. For the period beyond those first few years, when construction of new facilities may become necessary, the storage technology evaluated under the basic implementation is dry storage. However, construction of new wet storage facilities is considered as an implementation alternative. Figure S-7 depicts typical wet and dry storage facilities.

The wet pool type of spent nuclear fuel storage is used at almost every water-cooled nuclear reactor in the world. There are currently more than 600 operating water-cooled power and research nuclear reactors, each with an individual storage pool. Dry storage technology involves the encapsulation of spent nuclear fuel in a steel cylinder that may be placed in a concrete or massive steel cask or structure. Different forms of dry spent nuclear fuel storage have been used for over 40 years in the nuclear industry. Whether wet or dry storage is used, the facilities are designed or have been upgraded to withstand natural phenomena such as earthquakes, floods, tornadoes, hurricanes, high and low temperatures, and wind generated missiles (branches, poles, etc.). The designs also include provisions to mitigate sabotage or terrorist acts.



Typical Wet Storage Facility *Typical Dry Storage Facility*

Figure S-7 Typical Storage Facilities

S.2.2.1.10 Ultimate Disposition

Ultimate disposition of DOE's spent nuclear fuel, including foreign research reactor spent nuclear fuel, is a high priority. For planning purposes, DOE has determined that its spent nuclear fuel that is not otherwise managed (e.g., chemically separated, with the high-level waste being converted into a vitrified glass for repository disposal) is authorized for disposal in a geologic repository. The Nuclear Waste Policy Act of 1982 (as amended) authorizes disposal of the foreign research reactor spent nuclear fuel in a geologic repository (if DOE takes title to such spent nuclear fuel). However, since the repository characterization program is in its early stages, the waste acceptance criteria for disposal of DOE's spent nuclear fuel in a repository have not been developed. Thus, a determination cannot be made at this time as to the requirements that must be met to allow emplacement of the foreign research reactor spent nuclear fuel in the repository. As a result, the EIS analysis for the time period beyond 40 years is qualitative rather than quantitative. The qualitative assessment includes consideration of disposal of intact foreign research reactor spent nuclear fuel, disposal of vitrified high-level waste resulting from chemical separation, as well as utilization of various potential new technologies to process the spent nuclear fuel into a more stable form prior to its ultimate disposition. In the event that the availability of a geologic repository were to be delayed beyond the 40-year program period, DOE assumed for purposes of this analysis that it would continue to manage the foreign research reactor spent nuclear fuel, or the high-level radioactive waste resulting from the chemical separation or other processing of such spent nuclear fuel, at the management sites until a geologic repository becomes available. Decisions regarding the actual disposition of DOE's spent nuclear fuel will follow appropriate review under NEPA.

S.2.2.2 Implementation Alternatives for Management Alternative 1

This EIS also evaluates a range of implementation alternatives that modify one of the basic implementation components of Management Alternative 1 (see Figure S-5). The implementation alternatives (and implementation subalternatives) include the following:

1. Alternative amount of foreign research reactor spent nuclear fuel to be accepted:

    a. Only from countries with other-than-high-income-economies (up to 1.9 MTHM; 5,000 elements)
    b. HEU only (up to 4.6 MTHM; 11,200 elements)
    c. Target material in addition to spent nuclear fuel (up to 0.6 MTHM; equivalent to 620 elements)

2. Alternative policy durations:

    a. Five-year policy (up to 13 MTHM; 18,800 elements)
    b. Indefinite HEU/10-year LEU policy (same amount as basic implementation; different timing)

3. Alternative financing arrangements:

    a. Subsidize all countries

   b. Charge all countries full cost of accepting and managing foreign research reactor spent nuclear fuel
   c. Subsidize other-than-high-income economy countries; charge high-income economy countries full-cost recovery fee

4. Alternative locations for taking title:

   a. Prior to shipment
   b. Port(s) of entry
   c. Management sites

5. Wet storage technology for new construction

6. Near-term conventional chemical separation in the United States[1]

   a. Extent of chemical separation: dedicated to foreign research reactor spent nuclear fuel only, or part of larger-scale DOE chemical separation activities
   b. Uranium disposition: blend HEU down to LEU or process HEU to oxide for interim storage

7. Developmental treatment and/or packaging technologies (Conduct a development program leading to a decision on whether to construct and operate a cost-effective new treatment and/or packaging facility. The objective of this technical strategy is to treat, package, and store spent nuclear fuel in a manner suitable for placement into a geologic repository.

S.2.3 Preferred Alternative

In selecting a preferred alternative for the management of foreign research reactor spent nuclear fuel, DOE and the Department of State took several factors into consideration, including the following:

1. U.S. Government nuclear weapons nonproliferation policies and objectives;

2. DOE responsibilities (e.g., safe handling of hazardous materials, safety/health risks to workers, compatibility with other ongoing missions, etc.);

3. Potential environmental impacts (e.g., public safety, etc.);

4. Public comments received and concerns expressed following issuance of the Draft EIS;

5. Analysis of impacts and alternatives in the Programmatic SNF&INEL Final EIS (DOE, 1995c), as well as the Record of Decision for that EIS;

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1 *Chemical separation of foreign research reactor spent nuclear fuel in existing facilities is not preferred by DOE as a technology for routine management of spent nuclear fuel in the United States because of the additional waste streams that would be generated when these activities are conducted. Nonetheless, chemical separation remains a reasonable alternative in light of DOE's substantial technical expertise in these operations and the availability of existing facilities.*

6. Estimated costs of alternatives for management of foreign research reactor spent nuclear fuel;

7. Public issues/concerns/perceptions (e.g., fairness/equity to affected States and populations, etc.); and

8. Uncertainties (e.g., future budget priorities and continuity of funding, technology development, repository timing and waste form acceptance criteria, regulatory change, etc.).

Based on consideration of these factors, DOE and the Department of State, in consultation with other Government agencies, designate the alternative described below as the preferred alternative. This preferred alternative is the same as Management Alternative 1 (Manage Foreign Research Reactor Spent Nuclear Fuel in the United States, discussed in Section 2.2 of the EIS and S.2.2 of the Summary), with the modifications discussed below. The basic components of Management Alternative 1 have been modified to incorporate various implementation alternatives discussed in Section 2.2.2 of the EIS and S.2.2.2 of the Summary.

The amount of foreign research reactor spent nuclear fuel that would be accepted and managed, as specified in Section 2.2.1.3 of the EIS, could total approximately 19.2 MTHM, with a volume of approximately 110 m^3 (4,100 ft^3), representing approximately 22,700 individual spent nuclear fuel elements. The target material that would be accepted and managed, as specified in Section 2.2.2.1 of the EIS, contains an additional 0.6 MTHM representing the uranium content of approximately 620 additional typical foreign research reactor spent nuclear fuel elements. The following stipulations on qualifying spent nuclear fuel types would apply:

- Spent nuclear fuel (HEU and/or LEU) would be accepted from research reactors operating on LEU fuel or in the process of converting to LEU fuel when the policy becomes effective.

- Spent nuclear fuel (HEU and/or LEU) would be accepted from research reactors which operate on HEU fuel when the policy

Preferred Alternative Elements

Policy: Adopt a policy to accept and manage foreign research reactor spent nuclear fuel and target material in the United States.

Amount of Fuel to be Accepted: Up to 19.2 metric tons of heavy metal in 22,700 fuel elements, and 0.6 metric tons of heavy metal of target material.

Policy Duration: Ten years. Shipment to United States could occur for 13 years.

Financing Arrangements: United States would bear the full cost for transporting and managing the spent nuclear fuel accepted from countries with other-than-high-income economies, and would charge high-income economy countries a fee.

Marine Transport: Either chartered or commercial ships.

Ports of Entry: Military ports of Charleston Naval Weapons Station, SC, and Naval Weapons Station Concord, CA.

Location for Taking Title: Upon unloading the spent nuclear fuel at U.S. ports of entry and at the U.S.-Canadian border.

Ground Transport: Truck or rail.

Management Sites: Aluminum-based foreign research reactor spent nuclear fuel and target material at the Savannah River Site. TRIGA foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory.

Management Technologies: Management of the TRIGA foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory would be based on the use of existing storage facilities with the possible use of a new treatment and/or packaging technology.

Management of the aluminum-based foreign research reactor spent nuclear fuel at the Savannah River Site would be based on the use of existing storage facilities, development and implementation of a new treatment and/or packaging technology, and chemical separation if necessary.

DOE would conduct an independent study of the nonproliferation and other implications of reprocessing a portion of the foreign research reactor spent nuclear fuel at F-Canyon prior to committing to the use of reprocessing for other than health or safety reasons.

becomes effective and which agree to convert to LEU fuel. Spent nuclear fuel would not be accepted from research reactors that could convert to LEU fuel but refuse to do so.

- Spent nuclear fuel (HEU) would be accepted from research reactors having lifetime cores, from research reactors planning to shut down by a specific date while the policy is in effect, and from research reactors for which a suitable LEU fuel is not available.

- Spent nuclear fuel (HEU and/or LEU) would be accepted from research reactors that are already shut down.

- Unirradiated fuel (HEU and/or LEU) from eligible research reactors would be accepted as spent nuclear fuel.

- For research reactors with both HEU and LEU spent nuclear fuel available for shipment, LEU spent nuclear fuel would not be accepted until the HEU spent nuclear fuel is exhausted, unless there are extenuating circumstances (e.g., deterioration of one or more LEU elements sufficient to cause a safety problem).

- Spent nuclear fuel (HEU and/or LEU) would not be accepted from new research reactors starting operation after the date of implementation of the policy.

The policy duration under this preferred alternative would be 10 years, beginning on the date when the management policy would become effective, as discussed in Section 2.2.1.1 of the EIS. Shipments of spent nuclear fuel to the United States could be made for a period of 13 years, starting from the effective date of policy implementation, as long as the spent nuclear fuel had already been discharged prior to the beginning of the policy period or is discharged during the policy period.

The aluminum-based foreign research reactor spent nuclear fuel would be managed at the Savannah River Site and the TRIGA foreign research reactor spent nuclear fuel would be managed at the Idaho National Engineering Laboratory, in accordance with the Record of Decision for the Programmatic SNF&INEL Final EIS (DOE, 1995c) and the settlement agreement reached between DOE and the State of Idaho [Public Service Co. of Colorado v. Batt, No. CV 91-0035-S-EJL (D. Id.) and United States v. Batt, No. CV-91-0054-S-EJL (D. Id.)]. Under this preferred alternative, up to approximately 19 MTHM of aluminum-based foreign research reactor spent nuclear fuel (approximately 17,800 elements), representing up to approximately 675 casks, and target material representing up to approximately 140 additional casks would be accepted and managed at the Savannah River Site. Also, up to approximately 1 MTHM of TRIGA foreign research reactor spent nuclear fuel (approximately 4,900 elements), representing up to approximately 162 casks would be accepted and managed at the Idaho National Engineering Laboratory.

The candidate U.S. ports of entry are listed in Section 2.2.1.6 of the EIS and S.2.2.1.6 of the Summary, and are described in detail in Chapter 3 of the EIS. Although all of the candidate ports are acceptable based on the port selection criteria discussed in Appendix D, DOE would prefer to use the military ports in proximity to the spent nuclear fuel management sites (i.e., Charleston Naval Weapons Station and the Naval Weapons

Station Concord). Under this preferred alternative, a maximum of 38 casks of TRIGA foreign research reactor spent nuclear fuel (estimated to require about 5 shipments) could be accepted at a western port, with 150 to 300 shipments being accepted via an eastern port.

The foreign research reactor spent nuclear fuel and target material would be shipped by either chartered or regularly scheduled commercial ships from the foreign ports to the United States, as specified in Section 2.2.1.5 of the EIS.

DOE would take title to the foreign research reactor spent nuclear fuel and target material that is shipped by sea after it is offloaded at the port of entry, and to the spent nuclear fuel and target material shipped solely overland (i.e., from Canada) at the border crossing between Canada and the United States.

The foreign research reactor spent nuclear fuel and target material would be transported from the United States ports to the management sites by truck and rail as specified in Section 2.2.1.7 and S.2.2.1.7 of the Summary.

The financing arrangement under this preferred alternative would be for the United States to bear the full cost for transporting and managing the foreign research reactor spent nuclear fuel and target material accepted from countries with other-than-high-income economies, and to charge high-income economy countries a competitive fee. The fee would be established in a *Federal Register* Notice (as opposed to being published in this Final EIS), to allow DOE flexibility to adjust the fee to account for inflation, or changes in spent nuclear fuel management practices in the United States.

For the aluminum-based foreign research reactor spent nuclear fuel, a three point strategy is proposed, as follows:

1. DOE would embark immediately on an accelerated program at the Savannah River Site to identify, develop, and demonstrate one or more non-reprocessing, cost-effective treatment and/or packaging technologies to address potential health and safety issues that may develop and to prepare the foreign research reactor spent nuclear fuel for ultimate disposal. The purpose of any new facilities that might be constructed to implement these technologies would be to change the foreign

Developmental Treatment and/or Packaging Technology Options for Spent Nuclear Fuel

Direct Disposal in Small Packages: Place fuel into small waste packages with neutron poison to control criticality.

Dissolve and Vitrify: Dissolve and mix fuel with depleted uranium to produce LEU and vitrify the mixture.

Melt and Dilute/Poison: Melt and dilute or mix fuel with a neutron poison.

Chop and Dilute/Poison: Chop fuel and dilute with depleted uranium or mix with a neutron poison.

Plasma Arc Treatment: Place fuel into plasma centrifugal furnace with other material to melt and convert into a ceramic material.

Electrometallurgical Treatment: Melt fuel in an electrolytic cell to remove the bulk of the aluminum (for disposal as low-level waste); vitrify the residual aluminum, actinides and fission products; recover pure uranium if required.

Glass Material Oxidation and Dissolution System: Melt fuel with glass-forming-materials in a glass melt furnace to form glass.

Can-in-Canister: Place fuel, with a critically safe quantity of uranium, in a can and place that can into a canister and surround with high-level waste glass from the Defense Waste Processing Facility.

Chloride Volatility: React fuel with chlorine gas to convert all materials into a volatile gas. Separate uranium, actinides, and fission products by cooling and distillation.

research reactor spent nuclear fuel into a form that is suitable for geologic disposal, without necessarily separating the fissile materials, while meeting or exceeding all applicable safety and environmental requirements. Examples of technologies that would be considered include: *can-in-canister, chop and dilute/poison, melt and dilute/poison, plasma arc treatment, electrometallurgical treatment, glass material oxidation and dissolution, chloride volatility, dissolve and vitrify, direct disposal in small packages*, etc. In conjunction with the examination of new technologies, variations of conventional direct disposal methods would also be explored. After treatment and/or packaging, the foreign research reactor spent nuclear fuel would be managed on site in "road ready" dry storage until transported off-site for continued storage or disposal. DOE would select, develop, and implement, if possible, one or more of these treatment and/or packaging technologies by the year 2000. DOE is committed to avoiding indefinite storage of this spent nuclear fuel in a form that is unsuitable for disposal.

2. Despite DOE's best efforts, it is possible that a new treatment and/or packaging technology may not be ready for implementation by the year 2000. It may become necessary, therefore, for DOE to use the F-Canyon to reprocess some foreign research reactor spent nuclear fuel elements, while the F-Canyon is operating to stabilize at-risk materials as recommended by the Defense Nuclear Facilities Safety Board. (For example, under current schedules this activity could take place between the years 2000 and 2002.) In that event, the foreign research reactor spent nuclear fuel would be converted into LEU and wastes generated during reprocessing. Certain wastes would be vitrified in the Defense Waste Processing Facility, while others would be solidified in the Saltstone facility. In order to provide a sound policy basis for making a determination on whether and how to utilize the F-Canyon for processing tasks that are not driven by health and safety considerations, DOE will commission or conduct an independent study of the nonproliferation and other (e.g., cost and timing) implications of reprocessing spent nuclear fuel from foreign research reactors. The study will be initiated in mid-1996 and will be completed in a timely fashion to allow a subsequent decision about possible use of the F-Canyon for foreign research reactor spent nuclear fuel reprocessing to be fully considered by the public, the Congress and the Executive Branch agencies. Pending disposition of the foreign research reactor spent nuclear fuel by either a new treatment and/or packaging technology or reprocessing in the F-Canyon, the spent nuclear fuel would be placed in existing wet storage at the Savannah River Site.

3. DOE would conduct a program of close monitoring of any foreign research reactor spent nuclear fuel and target material that would be accepted for storage in existing wet storage facilities. DOE is presently unaware of any technical basis for believing that this spent nuclear fuel cannot be safely stored until one or more of the treatment and/or packaging technologies becomes available. Nevertheless, if health and safety concerns involving any of the foreign research reactor spent nuclear fuel elements are identified prior to development of an appropriate treatment and/or packaging technology, DOE would use the F-Canyon to reprocess the affected spent nuclear fuel elements, if it is still operating to stabilize at-risk materials.

Because of criticality constraints stemming from the configuration of the F-Canyon, under no circumstances would it be possible to produce separated HEU that is suitable for a nuclear weapon. Instead, depleted uranium would be added to the foreign research reactor spent nuclear fuel near the beginning of the reprocessing process, so that only LEU would be produced when the uranium is separated from the fission products. The trace quantities of plutonium in the spent nuclear fuel would be left in and solidified along with the high-level radioactive reprocessing wastes. This would further the President's policy to discourage the accumulation of excess weapons-grade fissile materials, to strengthen controls and constraints on these materials and, over time, to reduce worldwide stocks.

The TRIGA foreign research reactor spent nuclear fuel would be stored at the Idaho National Engineering Laboratory in the Fluorinel Dissolution and Fuel Storage (FAST) facility (wet storage) or preferably the dry storage Irradiated Fuel Storage Facility (IFSF) and the CPP-749 dry storage area. After 2003, all foreign research reactor spent nuclear fuel would be managed in accordance with the provisions of the settlement agreement between DOE and the State of Idaho, until transported off-site for ultimate disposition. Depending on the nature of any new treatment and/or packaging technology that might be developed, the TRIGA spent nuclear fuel would also be processed using such a new technology, if necessary for disposal.

A critical result of implementing this preferred alternative would be the continued viability and vitality of the Reduced Enrichment for Research and Test Reactors (RERTR) Program, whose goal is minimizing and eventually eliminating the use of HEU in civil nuclear programs, by providing foreign research reactor operators with a continued incentive to participate. Similarly, the successful development of alternative fuels for research reactors and the expansion of the program to Russia, the other Newly Independent States, China, South Africa, and other countries, and the establishment of a world-wide norm discouraging the use of HEU, are dependent on the United States' commitment to action such as that embodied in this preferred alternative.

DOE is aware that the inclusion of chemical separation within the preferred alternative could be interpreted by some nations, organizations and persons as a signal of endorsement of the use of reprocessing as a routine method of waste management for spent nuclear fuel or a reversal of U.S. policy on reprocessing. This would not be an accurate interpretation. The U.S. policy regarding reprocessing was established in Presidential Decision Directive 13. DOE and the Department of State have determined that this preferred alternative is not inconsistent with that policy. The draft version of this EIS indicated that reprocessing is a non-preferred technology and would not be used unless one or more of a set of specific conditions occurred (Section 2.2.2.6 of the Draft EIS). This final preferred alternative, which includes reprocessing, establishes a prescribed set of circumstances that would have to be met before reprocessing would be used. The independent study discussed above in point 2 of the strategy for management of aluminum-based spent nuclear fuel will review the policy, technology, cost and schedule implications for reprocessing foreign research reactor spent nuclear fuel to determine whether reprocessing of foreign research reactor spent nuclear fuel is justified for other than health and safety reasons.

Policy considerations and environmental impacts associated with implementation of this preferred alternative are presented in Section 4.7 of the EIS and S.4.4.1 and S.4.4.2 of the Summary. Cost considerations are included in Section 4.9 of the EIS and S.4.9 of the Summary.

Basis for the Preferred Alternative - The elements of the preferred alternative discussed above have been selected based on the following considerations:

1. ***Management Alternative*** - The various management alternatives considered are discussed in Sections 2.2 through 2.4 of the EIS and S.2.2, S.2.4 and S.2.5 of the Summary. The analyses in Sections 4.2 through 4.5 of the EIS and S.4.2, S.4.3, S.4.5 and S.4.6 of the Summary demonstrate that the impacts on the environment, involved workers, or the citizens of the United States from implementation of any of the management alternatives or implementation alternatives analyzed (other than beneficial impacts associated with support for United States nuclear weapons nonproliferation policy) would be small and completely within the applicable regulatory limits, and would not provide a basis for discrimination among the alternatives. As a result, the process for selection of the elements of the preferred alternative focused on programmatic considerations:

   a. DOE and the Department of State concluded that the No Action Alternative and Management Alternative 2, Implementation Alternative 1a (Overseas Storage) would be unacceptable since these alternatives are not consistent with United States nuclear weapons nonproliferation policy objectives.

   b. DOE and the Department of State believe that the basic implementation of Management Alternative 1 would be undesirable to the extent that it would involve indefinite storage of foreign research reactor spent nuclear fuel in a form that is not suitable for disposal. Management Alternative 1 modified to rely solely on Implementation Alternative 6 (Near Term Conventional Chemical Separation in the United States) would raise nuclear weapons nonproliferation policy questions. Management Alternative 1 modified to rely solely on Implementation Alternative 7 (Developmental Treatment and/or Packaging Technologies) could not be selected at this time because no decision has been made on which technology will be pursued.

   c. DOE and the Department of State also believe that Management Alternative 2, Implementation Alternative 1b (Overseas Reprocessing) would be technically complex and potentially extremely expensive because it would require the United States to accept reprocessing wastes from the overseas reprocessing operations. This is due to the fact that both of the countries in which the overseas reprocessing might be accomplished require the reprocessing wastes to leave their countries, and many of the countries that would be covered by the proposed policy cannot accept the return of such reprocessing wastes. The intermediate-level radioactive wastes produced in Europe during reprocessing of research reactor spent nuclear fuel are often in a concreted waste form, unlike any high-level radioactive waste form in the United States. This concreted waste form has not been evaluated for disposal in a United States geologic repository. Accordingly, acceptance of such waste in the United

States likely could require expensive, currently unproven treatment and/or packaging technologies to transform it into a form that would be acceptable for disposal.

d. The sample hybrid alternative (Management Alternative 3) analyzed in the Draft EIS involved partial reprocessing overseas coupled with partial management in the United States. In order for this alternative to be consistent with United States nuclear weapons nonproliferation policy objectives, certain conditions would have to be met by either the reprocessor (e.g., Dounreay) or the research reactor operators. Staff from both DOE and the Department of State have addressed this issue with representatives of the United Kingdom Department of Trade and Industry and reactor operators, and have determined that it would not be possible to ensure compliance with the United States nuclear weapons nonproliferation policy objectives. The primary concern was the inability to ensure that any separated HEU would be blended down to LEU. Obtaining the reactor operators' agreement to such a policy would likely require significant financial subsidies. The potential cost of achieving agreement to blend down the uranium, plus uncertainties regarding Dounreay's long-term availability, led DOE and the Department of State to conclude that successful implementation of this alternative could not be relied on.

None of the alternatives analyzed in the Draft EIS could be implemented without some degree of difficulty. However, a modification of Management Alternative 1 (Manage Foreign Research Reactor Spent Nuclear Fuel in the United States), incorporating a combination of alternatives to the basic implementation components balances policy, technical, cost and schedule requirements. DOE and the Department of State consider that this approach provides the highest assurance that programmatic requirements could be met. This combination also provides the strongest support for United States nuclear weapons nonproliferation policy objectives as all aspects of the alternative would be under the control of DOE, either directly or through the spent nuclear fuel acceptance contracts with the reactor operators.

2. ***Management Technology*** - The alternative spent nuclear fuel management technologies considered are discussed in Sections 2.2.2.7 and 2.6.5 of the EIS and S.2.2.1.9 and S.2.2.2 of the Summary. The approaches fall into four broad categories, as follows:

Wet Storage - Wet storage is a proven technology, the impacts of which would be small, and completely within the applicable regulatory limits, if it were used to implement the proposed action. Furthermore, DOE currently has wet storage facilities in operation at the Savannah River Site and the Idaho National Engineering Laboratory that could be used for storage of foreign research reactor spent nuclear fuel. However, wet storage requires attention to ensure that the storage conditions do not foster slow degradation of the spent nuclear fuel through corrosion.

Dry Storage - Dry storage is also a proven technology, that would also have no more than small impacts, completely within the applicable regulatory limits, if used to implement the proposed action. It is the storage medium that is being selected at all commercial power reactor sites where additional storage capacity is being built. However, it has not been used for research reactor spent nuclear fuel in the United States. Dry storage capacity could be provided at the management sites in time to meet the program's projected needs, if initial spent nuclear fuel receipts were placed into the available wet storage.

Chemical Separation - Chemical separation is also a proven technology, the impacts of which would be small, and completely within the applicable regulatory limits, if used to implement the proposed action. However, DOE is phasing out its chemical separation activities and is currently reprocessing only at the Savannah River Site to stabilize materials for health and safety reasons. Because these chemical separations facilities could be used to treat the foreign research reactor spent nuclear fuel, they provide a contingency to be considered pending availability of an alternate means of treating and/or packaging the spent nuclear fuel prior to ultimate disposition.

New Technologies - Due to concerns regarding geologic disposal of intact spent fuel containing HEU (i.e., the possibility of uncontrolled criticality incidents), some form of treatment of this spent nuclear fuel may be required. While several concepts have been proposed for new treatment and/or packaging technologies, none of them are ready for implementation at this time. Prior to a decision leading to their implementation, additional development work would be required to determine whether and how they could be implemented, based on technical and cost considerations.

In order to effectively implement the preferred alternative of accepting and managing the foreign research reactor spent nuclear fuel in the United States, DOE and the Department of State developed the three point strategy for management of aluminum-based spent nuclear fuel discussed earlier in this Section. This strategy draws on the strengths of each of the spent nuclear fuel management technologies discussed above, while avoiding sole reliance on any of them. Due to the relatively more robust nature of the TRIGA spent nuclear fuel, DOE believes that minimal additional development may be needed to prepare it for storage and final disposition. Accordingly, the preferred alternative specifies that the TRIGA spent nuclear fuel would be placed in existing dry storage facilities at the Idaho National Engineering Laboratory. However, the program to qualify the final geologic disposal form for the TRIGA spent nuclear fuel will continue and the appropriate treatment, if any, would be identified and implemented.

3. ***Policy Duration*** - The alternative policy durations considered are defined in Sections 2.2.2.1 and 2.2.2.2 of the EIS and S.2.2.2 of the Summary. Analysis of these alternatives concluded that the 5-year option is likely to provide insufficient time for the reactor operators to arrange for alternative spent nuclear fuel disposal mechanisms, and thus might result in some reactor operators refusing to cooperate fully with United States nuclear weapons nonproliferation programs. This, in turn, could undermine international cooperation with other nuclear weapons nonproliferation programs the United States might seek to implement.

On the other hand, the analysis determined that there was insufficient benefit to be gained from indefinite acceptance of all the spent nuclear fuel containing HEU because such an approach likely would provide insufficient incentive for other countries to proceed expeditiously with arrangements for alternative disposal mechanisms not involving the United States.

The approach incorporated into the preferred alternative allows sufficient incentive to the reactor operators to ensure their cooperation, while specifying a definite cut-off point. This alternative provides sufficient lead time to allow the reactor operators to make other arrangements for disposition of their spent nuclear fuel, and provides sufficient time to accept all spent nuclear fuel containing HEU enriched in the United States.

4. ***Amount of Material to Manage*** - The alternative amounts of material that might be covered by the proposed policy are defined in Sections 2.2.1.3 and 2.2.2.1 of the EIS and S.2.2.2 of the Summary. DOE and the Department of State concluded that management of spent nuclear fuel only from other-than-high-income economy countries would strongly encourage the resurgence of the use of HEU in the high-income economy countries, as well as opening the United States, fairly or unfairly, to charges that we are not living up to our commitments under the *Treaty on the Non-Proliferation of Nuclear Weapons*. Management of only spent nuclear fuel containing HEU would penalize those reactors that have already converted to the use of LEU fuel, and would provide an incentive for reactors to continue to use HEU fuel, or switch back to its use. The impacts that would result from management of any of these different amounts of material would be small, and within the applicable regulatory limits.

   DOE and the Department of State concluded that management of all of the aluminum-based and TRIGA foreign research reactor spent nuclear fuel currently in storage or projected to be discharged during the policy period, and target material containing uranium enriched in the United States, would provide the best support for the objectives of the proposed policy. Implementation of this preferred alternative would provide an opportunity for removal of the maximum amount of HEU from civil commerce and would provide an incentive for the continued conversion to and use of LEU as fuel for foreign research reactors, in place of highly-enriched (weapons-grade) uranium.

5. ***Marine Transport*** - The alternative approaches to marine transport of foreign research reactor spent nuclear fuel are discussed in Section 2.2.1.5 of the EIS. The analysis in the EIS demonstrates that the impacts to the environment, workers, or the public from transport of the spent nuclear fuel using any of these types of ships would be small, and within the regulatory limits. The analyses do not identify any difference in the small impacts that would result from the use of purpose-built vs. general purpose ships. Since "military transports" are in fact the same type of ship as the chartered commercial cargo ships and are crewed by civilians, use of "military transports" would not actually result in any difference in impacts. DOE and the Department of State believe that use of actual warships would be both unnecessary from a security standpoint and could entail additional risk to the environment and the public, since such ships do not routinely carry cargo.

The approach selected by DOE and the Department of State for the preferred alternative provides maximum flexibility for marine transport.

6. ***Ground Transport*** - The ground transportation alternatives are defined in Section 2.2.1.7 of the EIS and S.2.2.1.7 of the Summary. The analyses in the EIS demonstrate that the impacts to the environment, workers, or the public, from any of these modes of ground transport (counting barge as a mode of "ground transport") would be small and within the applicable regulatory limits. Furthermore, the differences in potential impacts between the truck, rail and barge alternatives were not significant.

   Both the truck and rail transportation options have been used successfully to transport foreign research reactor spent nuclear fuel in the past. Truck transport was the predominant mode used for over twenty years, until the old "Off-Site Fuels Policy" lapsed in 1988. Rail was the mode used for both shipments under the *Environmental Assessment of Urgent-Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel.* Since neither of the preferred ports of entry (see item 8 below) can reasonably provide barge transport to either of the proposed management sites, barge transport was dismissed from consideration in the preferred alternative.

   By providing for either truck or rail transport, the preferred alternative would build on previous satisfactory experience while providing maximum flexibility for dealing with changes in the transportation process in the future.

7. ***Title Transfer Location*** - The alternative points at which DOE might take title to the spent nuclear fuel and target material are discussed in Sections 2.2.1.4 and 2.2.2.4 of the EIS and S.2.2.2 of the Summary. The point at which title would be transferred has no effect on the physical processes that would take place, and thus would not have any effect on the impacts on the environment, workers, or on the public. The Price-Anderson Act would provide liability protection in the unlikely event of a nuclear accident in the United States, whether or not DOE had taken title to the spent nuclear fuel at the time of such an accident. As a result, DOE and the Department of State concluded that the selection of the title transfer location could be made solely on programmatic considerations.

   Acceptance of title at the foreign research reactor sites could make the United States Government liable for any accident that might occur in the country of origin, or on the high seas. DOE and the Department of State have been unable to identify any advantage to the United States of taking title outside the United States.

   Taking title at the limit of United States territorial waters makes the title transfer depend solely on when the ship enters United States waters, which could be difficult for DOE to control in certain circumstances (e.g., a storm).

   Acceptance of title when the foreign research reactor spent nuclear fuel actually enters the land mass of the United States provides the most certainty for implementation.

The approach incorporated into the preferred alternative ensures that liability for accidents during the transportation process outside the United States would remain with the reactor operators while reinforcing in the minds of the public that the United States Government would be accountable in the unlikely event of an accident within United States territory.

8. ***Ports of Entry*** - The alternative ports of entry considered are discussed in Sections 2.2.1.6 and 3.2 of the EIS and S.2.2.1.6 of the Summary. The analyses in the EIS demonstrate that the impacts on either the environment, workers, or the public due to use of any of the potential ports of entry analyzed would be small and within applicable regulatory limits.

   Although any one or all of the ten ports of entry described in Sections 2.2.1.6 and 3.2 of the EIS would be acceptable ports of entry, DOE and the Department of State concluded that foreign research reactor spent nuclear fuel marine shipments to the United States should be made via the military ports (selected from among those analyzed in the EIS and found acceptable) in close proximity to the spent nuclear fuel management sites. DOE would seek to transport multiple casks per ship to keep the total number of shipments as low as possible, as well as to reduce risks. The exact number of shipments that might be made would be determined by several factors that are unknown at this time, such as the times at which the reactor operators need to make shipments over the 13 year shipping period, the geographic distribution of the reactors, and the availability of suitable ships that would stop at the required ports to pick up and drop off the spent nuclear fuel and target material.

   Use of military ports would provide additional confidence in the safety of the shipments due to the increased security associated with the military ports. It could also require much of the spent nuclear fuel to be shipped via chartered ships since commercial ships would not have stops scheduled at military ports, increasing the cost of spent nuclear fuel shipping. This additional cost would be borne by the reactor operators for shipments from high-income economy countries, and by the United States for shipments from other-than-high-income economy countries. Additional costs would be kept to a minimum by shipping as many casks as possible on each ship (up to a maximum of eight per ship).

9. ***Management Sites*** - The question of which sites should be used for management of all of DOE's spent nuclear fuel was addressed in the Programmatic SNF&INEL Final EIS (DOE, 1995c). That EIS included consideration of the potential receipt of the foreign research reactor spent nuclear fuel. The Record of Decision for that EIS, issued on May 30, 1995, specifies that any aluminum-based foreign research reactor spent nuclear fuel accepted in the United States shall be managed at the Savannah River Site; and that the remaining foreign research reactor spent nuclear fuel shall be managed at the Idaho National Engineering Laboratory. The site for management of the target material was left to be decided under this EIS. All of the target material currently in DOE's possession is managed at the Savannah River Site. The approach incorporated into the preferred alternative is in compliance with the decision specified in the Record of Decision for the Programmatic SNF&INEL Final EIS.

The analyses in the EIS demonstrate that the impacts to either the environment or the public through use of any of the sites for management of the foreign research reactor spent nuclear fuel and target material would be small, and within the applicable regulatory limits.

10. ***Financing Arrangement*** - The alternative financing arrangements are discussed in Sections 2.2.1.2 and 2.2.2.3 of the EIS and S.2.2.2 of the Summary. The financing arrangement used for the proposed action would have no effect on the physical processes that would take place, and thus would not have any effect on the potential impacts on the environment, or on the public. However, it could affect how many foreign research reactor operators elect to ship spent nuclear fuel to the United States. For instance, if DOE and the Department of State chose to charge a full cost recovery fee to all reactors, many, if not all, of the reactors in other-than-high-income economy countries would not have the financial resources to participate. On the other hand, if the United States subsidized all of the reactors, the United States would bear the full financial burden, even for reactors which can afford to pay their fair share.

    DOE and the Department of State concluded that, to ensure that reactor operators in other-than-high-income economy countries would participate in the program, the United States should subsidize receipt of their spent nuclear fuel. DOE and the Department of State also concluded that DOE should strive to recover as much of the cost of managing the spent nuclear fuel as possible from high-income economy countries. DOE concluded that it would announce the fee in a *Federal Register* notice, so that the fee may be changed from time to time as necessary to reflect inflation or improvements in DOE's knowledge concerning the costs of the activities to be carried out.

    Such an approach would encourage participation by as many other-than-high-income economy countries as possible, would recover as much as possible of the United States' expenses for management of spent nuclear fuel from high-income economy countries without encouraging any of them to resort to reprocessing of their spent nuclear fuel, and would provide a mechanism through which to account for inflation and future definition of program details.

S.2.4 Management Alternative 2 - Facilitate the Management of Foreign Research Reactor Spent Nuclear Fuel Overseas

Under this Management Alternative, DOE and the Department of State would seek to facilitate the management of foreign research reactor spent nuclear fuel overseas in a manner that would be consistent with U.S. nuclear weapons nonproliferation policy. DOE and the Department of State have evaluated two subalternatives: Overseas Storage and Overseas Reprocessing.

1a. Overseas Storage

The United States would assist foreign research reactors that are able to store their spent nuclear fuel in facilities in their own countries as a step toward final disposition. U.S. assistance would be provided to ensure that appropriate storage technologies, regulations and safeguards were applied.

1b. Overseas Reprocessing

The United States would facilitate and provide nontechnical (financial and/or logistical) assistance to foreign research reactors and reprocessors to facilitate reprocessing of spent nuclear fuel overseas in facilities operated under international safeguards consistent with U.S. nuclear weapons nonproliferation concerns.

The overseas reprocessing option was evaluated in light of the U.S. nuclear weapons nonproliferation policy on HEU minimization. For example, factors such as the following were considered:

- A commitment that HEU separated during reprocessing would be blended down to LEU for research reactors which are converting to LEU.
- The foreign reprocessors would provide the capability to reprocess LEU as well as HEU.
- Research reactors would be encouraged to convert to LEU if a LEU fuel exists or is developed that will allow such operation.

Arrangements would have to be worked out with foreign reprocessors that would be consistent with U.S. nuclear weapons nonproliferation objectives to minimize the civil use of HEU worldwide.

S.2.5 Management Alternative 3 - Combination of Elements From Management Alternatives 1 and 2 (Hybrid Alternative)

In implementing the proposed action, DOE and the Department of State could combine implementation elements from Management Alternatives 1 and 2, such as partial storage or reprocessing overseas with partial storage or chemical separation in the United States.

To demonstrate the kind of hybrid alternatives that could be developed, this EIS considers the following hybrid alternative example: DOE and the Department of State would facilitate the reprocessing of foreign research reactor spent nuclear fuel at Western European reprocessing facilities (e.g., Dounreay or Marcoule) for research reactors in countries that could accept the waste from reprocessing, and DOE would accept and manage in the United States the rest of the foreign research reactor spent nuclear fuel from countries that could not accept the waste from reprocessing. Of the foreign research reactor spent nuclear fuel to be accepted in the United States, the aluminum-based portion would be chemically separated at the Savannah River Site and the TRIGA portion would be stored in existing facilities at the Idaho National Engineering Laboratory.

The impacts to the U.S. environment from hybrid alternatives would be covered by the analyses presented in the EIS for Management Alternative 1, because the analyses for Management Alternative 1 consider the maximum amount of foreign research reactor spent nuclear fuel that could be accepted, stored, and/or chemically separated in the United States.

S.2.6 No Action

In the No Action Alternative, the United States would neither manage foreign research reactor spent nuclear fuel containing uranium enriched in the United States, nor provide technical assistance or financial incentives for overseas storage or reprocessing. In this case, there would be no foreign research reactor spent nuclear fuel shipments to the United States and no assistance to foreign countries for managing foreign research reactor spent nuclear fuel overseas.

S.2.7 Characteristics of Spent Nuclear Fuel Management

This section briefly summarizes information on the characteristics of the spent nuclear fuel to be managed, the types of transportation casks considered, management site storage facilities, chemical separation facilities in the United States, and foreign reprocessing facilities.

S.2.7.1 Characteristics of Foreign Research Reactor Spent Nuclear Fuel

Spent nuclear fuel is fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated. Spent nuclear fuel is radioactive because of the presence of the radioactive isotopes, products of the fission process. The radiation of most concern from spent nuclear fuel is gamma rays. Although the radiation levels can be very high, the gamma ray intensities are readily reduced by shielding the fuel elements with such materials as steel, lead, concrete, and water during the various phases of handling, transporting, or storing the spent nuclear fuel elements.

An issue associated with the management of spent nuclear fuel containing significant amounts of fissionable material is the potential for a self-sustaining nuclear fission process called criticality. Prevention of criticality conditions enters in the design of the spent nuclear fuel transportation casks, the spent nuclear fuel storage and processing facilities, and the spent nuclear fuel packaging for ultimate disposition. In general, criticality prevention is accomplished by either controlling the amount of fissionable material present within a certain volume (dilution or spatial separation techniques) or by introducing neutron absorbing materials that reduce the number of neutrons available to the fission process (poisoning technique).

Two types of foreign research reactor spent nuclear fuel are covered under the proposed policy. They are the aluminum-based fuel and TRIGA-type reactor fuel. In addition to the two types of spent nuclear fuel described above, target material is also covered under the proposed policy. Target material is the residual material from medical isotope production targets irradiated in research reactors.

Figure S-8 graphically depicts the differences in size of a typical pressurized water reactor assembly, a typical aluminum-based fuel element, and a TRIGA fuel element.

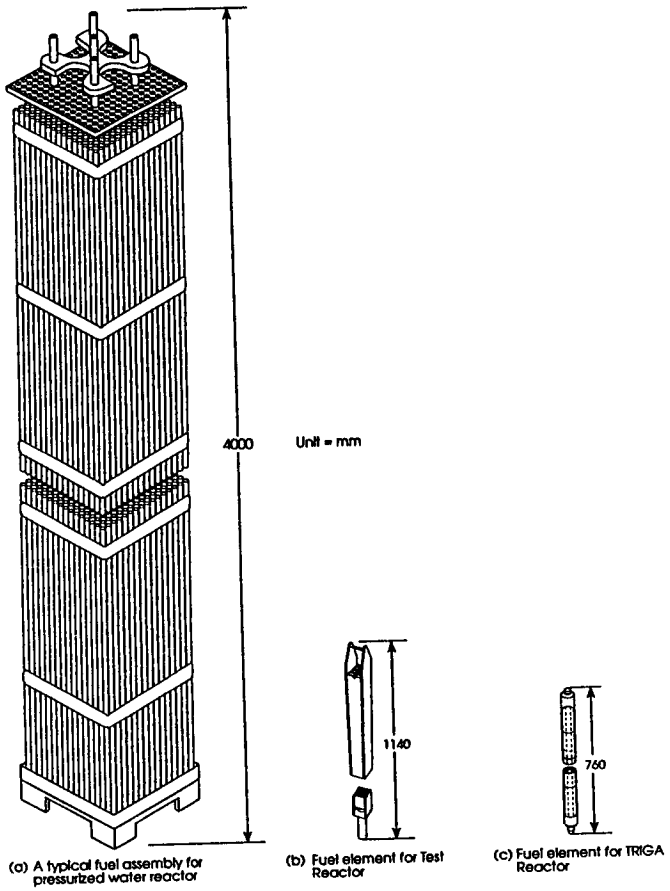


Figure S-8 Typical Spent Nuclear Fuel Elements

S.2.7.2 Transportation Casks

Spent nuclear fuel elements are transported in stainless steel packages, usually weighing several tons, called transportation casks. A typical cask for the transportation of foreign research reactor spent nuclear fuel elements is shown in Figure S-9.

The casks are designed to provide shielding from radiation. However, a low radiation field is present outside the cask — frequently less than one millirem (mrem) per hour at one meter (3.3 ft) away from the cask. A full cask can carry from 13 to 120 spent nuclear fuel elements from foreign research reactors, depending on fuel element design, size, and cask capacity. The casks that would be used to transport foreign research reactor spent nuclear fuel to the United States are "Type B" casks designed on the basis of international regulations essentially identical to those promulgated by the NRC and certified by the Department of Transportation. "Type B" casks have been used for years to transport spent nuclear fuel elements within the United States and around the world. In more than

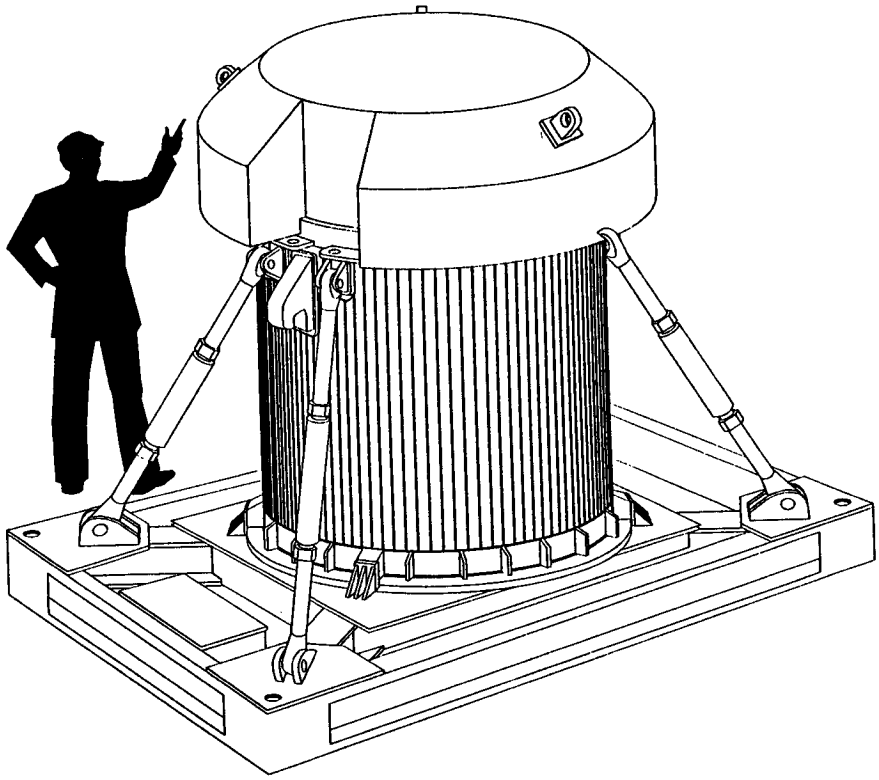


Figure S-9 Typical Spent Nuclear Fuel Transportation Cask

four decades of transporting spent nuclear fuel within the United States, no accident has ever occurred in which a "Type B" spent nuclear fuel transportation cask was punctured or spent nuclear fuel contents released, even in actual highway accidents.

S.2.7.3 Spent Nuclear Fuel Storage Facilities in the United States

The EIS analyzes a variety of scenarios in which each site could manage foreign research reactor spent nuclear fuel. However, as noted in S.2.2.1.8, in accordance with the Record of Decision for the Programmatic SNF&INEL Final EIS, all of the aluminum clad foreign research reactor spent nuclear fuel accepted by DOE would be managed at the Savannah River Site in South Carolina, and any other foreign research reactor spent nuclear fuel to be accepted by DOE would be managed at the Idaho National Engineering Laboratory, pending ultimate disposition. Of the five management sites considered in the Draft EIS, only the Savannah River Site and the Idaho National Engineering Laboratory have facilities that could be available in 1996. The other three could become available as management sites at a later date after construction or refurbishment of appropriate facilities could be completed. This constraint has resulted in a two-phased approach to the implementation of the policy. For the purpose of site impact analysis, the implementation of the policy was divided into two functional periods -- the period during which receipt and management of foreign research reactor spent nuclear fuel would be accomplished by using existing facilities (Phase 1), and the period during which new or refurbished

facilities could be used (Phase 2). The following discussion summarizes key points concerning facility capabilities and assumptions at each site, which drive the analysis of environmental impacts in the EIS.

S.2.7.3.1 Savannah River Site

As a potential Phase 1 storage site under Management Alternative 1, the Savannah River Site would receive and manage foreign research reactor spent nuclear fuel at its existing wet storage facilities. The Receiving Basin for Offsite Fuels and the L-Reactor Disassembly Basin are considered for this purpose.

As a potential Phase 2 storage site, the Savannah River Site could continue to receive foreign research reactor spent nuclear fuel in a new dry storage facility or a new wet storage facility that would be constructed in the H-Area of the site or a refurbished Barnwell Nuclear Fuels Plant which would have to be acquired by DOE. The spent nuclear fuel would be managed at the new storage facility until ultimate disposition.

S.2.7.3.2 Idaho National Engineering Laboratory

As a potential Phase 1 storage site under Management Alternative 1, the Idaho National Engineering Laboratory would receive and manage foreign research reactor spent nuclear fuel at existing dry and/or wet storage facilities. The existing facilities identified for this purpose would be the Fluorinel Dissolution and Fuel Storage Facility in CPP-666, the Irradiated Fuel Storage Facility in CPP-603, and the CPP-749 storage area.

As a potential Phase 2 storage site, the Idaho National Engineering Laboratory could continue to receive and manage foreign research reactor spent nuclear fuel at a new dry storage or wet storage facility to be constructed at the site.

S.2.7.3.3 The Hanford Site, Oak Ridge Reservation, and Nevada Test Site

The Hanford Site, the Oak Ridge Reservation, and the Nevada Test Site could only be Phase 2 storage sites (under Management Alternative 1) if they had been selected as management sites under the Programmatic SNF&INEL Final EIS Record of Decision. As noted in Summary Section S.1.4, these three sites are no longer candidates for management of the foreign research reactor spent nuclear fuel under the Record of Decision in the Programmatic SNF&INEL Final EIS, but are considered in this EIS in order to maintain consistency with the analyses provided in the Programmatic SNF&INEL Final EIS.

S.2.7.4 Chemical Separation Technology and Facilities in the United States

The EIS evaluates near-term conventional chemical separation in the United States as an alternative method of managing foreign research reactor spent nuclear fuel. Chemical separation involves separating the uranium in the spent nuclear fuel from the other material (i.e., cladding material, fission products, etc.). Aluminum would be the predominant cladding material. Waste materials would mainly be fission products, and consist of radioactive species such as cesium and strontium. The separated uranium could be placed into commerce as new fuel (as LEU fuel) or could require further disposition steps. Vitrification (conversion into a solid glass form) of the high-level waste would be the preferred waste management approach.

An aqueous chemical method is the only processing method applied on a large scale. All existing chemical separation plants use an extraction process that has been in use for some 40 years. Under the chemical separation implementation alternative of Management Alternative 1, foreign research reactor spent nuclear fuel would be chemically separated at the Savannah River Site or the Idaho National Engineering Laboratory. For purposes of analysis, this EIS assumes that the Savannah River Site would chemically separate aluminum-based spent nuclear fuel in the F-Canyon and the Idaho National Engineering Laboratory would chemically separate both aluminum-based and TRIGA spent nuclear fuel. Near-term conventional chemical separation of foreign research reactor spent nuclear fuel at the other three proposed foreign research reactor spent nuclear fuel management sites would not be considered since the Oak Ridge Reservation and the Nevada Test Site do not have facilities in which such chemical separation could be conducted, and the facilities at the Hanford Site are no longer operable. Figure S-10 provides an overview of chemical separation.

S.2.7.5 Foreign Reprocessing Facilities

Both France and the United Kingdom have modern fuel cycle facilities and offer reprocessing services to international customers. These facilities are capable of reprocessing spent nuclear fuel and preparing the waste products for disposal. Both France and the United Kingdom would require the country operating the reactor to accept the waste from reprocessing.

S.2.8 Emergency Management and Response

An emergency management and response infrastructure exists to support the implementation of those Management Alternatives that would be carried out in the United States, including ports of entry, ground transport routes, and management sites. In the United States, State and local governments are required to have emergency management and response programs. These programs must be capable of managing all hazards, ranging from natural disasters to hazardous material incidents on a day-to-day basis. These programs include support from special emergency response teams and emergency operations centers.

S.2.9 Security Measures

Domestic transportation of foreign research reactor spent nuclear fuel would be under the regulatory jurisdiction of the Department of Transportation and the NRC. In the event that foreign research reactor spent nuclear fuel was transported through a military port of entry, applicable requirements would be established in advance by the U.S. Department of Defense, DOE, and NRC to provide the appropriate level of security.

The objectives of the security measures during transportation of spent nuclear fuel are to minimize the possibilities for sabotage of spent nuclear fuel shipments, and facilitate the location and recovery of spent nuclear fuel shipments in the unlikely event that a shipment came under the control of unauthorized persons. Specific elements of the security

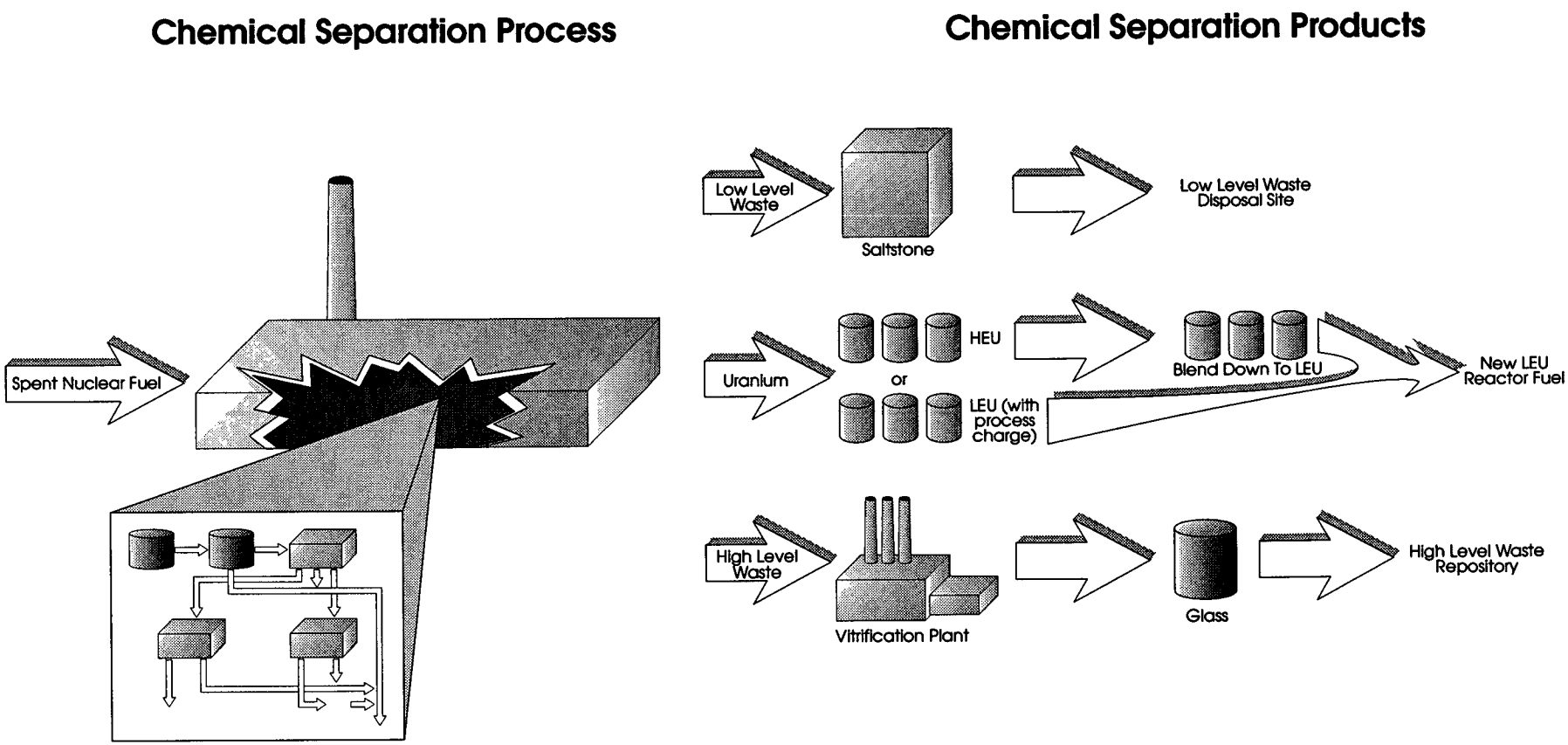


Figure S-10 Chemical Separation Overview

measures to be implemented would be included in the Transportation Plan developed by DOE in consultation with State, local, and Tribal officials prior to any actual spent nuclear fuel shipments.

S.2.10 Additional Alternatives Considered but Dismissed from Detailed Analysis

The EIS considered additional alternatives that were dismissed as unreasonable and therefore were not further analyzed. These are the use of an air mode of transportation and acceptance of foreign research reactor spent nuclear fuel only from countries that present an actual nuclear weapons nonproliferation risk.

The air mode of transportation was not considered to be a feasible alternative to the sea mode for transportation of the foreign research reactor spent nuclear fuel for two reasons. First, there is no commercial operational experience in the United States with air transport of spent nuclear fuel. Second, no spent nuclear fuel transportation cask has been certified to meet air transport packaging standards.

Accepting foreign research reactor spent nuclear fuel only from countries posing an actual nuclear weapons nonproliferation risk would not fully address the key U.S. nuclear weapons nonproliferation goal of the proposed policy--namely, to reduce and eventually eliminate the use of HEU in research reactors worldwide.

S.3 Affected Environment

The proposed action would potentially affect marine, port, transportation route, and management site environments. Chapter 3 and Appendices A and E of the EIS describe these potentially affected environments. Geological, chemical, physical, and biological descriptions of the oceans are included in Chapter 3 to provide a background for the evaluation of marine environmental effects that would result from implementation of the proposed policy. Demographic data and description of the natural environment surrounding candidate ports of entry and management sites follow the description of the marine environment. The EIS also provides a description of populations residing near representative ground and water transportation routes which could be used to transport foreign research reactor spent nuclear fuel from candidate ports of entry to management sites.

S.4 Policy Considerations and Environmental Impacts

The EIS assesses the policy considerations and potential environmental impacts resulting from each of the Management Alternatives for implementation of the proposed policy, including the preferred alternative designated by DOE and the Department of State, and the No Action Alternative. Policy considerations are addressed by characterizing the extent to which each of the alternatives supports the U.S. goal of nuclear weapons nonproliferation. This characterization takes two forms: 1) estimates of the maximum

amount of HEU that could be removed from international commerce under each alternative, and 2) the extent to which each alternative would provide incentives for foreign research reactor operators to convert their reactors to LEU fuel.

The environmental analyses address potential impacts to workers, the public, and the environment. The analyses are based on conservative assumptions (that is, those that tend to overstate the risks). In other words, the analytical approaches are designed to produce estimates of the maximum reasonably foreseeable risks. Cumulative impacts were determined by evaluating past, present, and reasonably foreseeable DOE and non-DOE related activities, in combination with the alternatives. Radiological impacts were calculated in terms of absorbed dose and associated health effects in the exposed populations. Nonradiological impacts to the environment, namely land use, waste management, cultural resources, aesthetic and scenic resources, geology, air quality, water quality, ecology, noise, utilities and energy, and socioeconomics were also analyzed in this EIS. This analysis reveals that none of the impacts clearly differentiates among the potential management sites and the environmental impacts are estimated to be low. Environmental justice concerns are addressed in the EIS by characterizing the distribution of minority and low-income households near candidate ports, along transportation routes, and near management sites. Based on the analyses in the EIS, the health and environmental effects for the total population, including low-income and minority populations, were found to be very low.

Implementation of the proposed action would have little effect on the social and economic status of the general population, minority populations, and the low-income population surrounding candidate ports, along transportation routes, and residing near management sites. The EIS analyses show that economic benefits from increased cargo handling, transportation, and storage at management sites would be small for the general population or any particular segment of the population residing near ports, transportation routes and management sites.

S.4.1 Overview of Environmental Impacts

The EIS presents impacts from potential radiological and nonradiological activities and accidents in four segments of the potentially affected environment. These four segments are:

- Marine transport
- Port activity
- Ground transport, and
- Management site activity.

The conclusion in each of the segments individually, and in the four segments collectively, is that the implementation of the proposed action would present low risks to workers and to the public. Marine transport, port, ground transport, and management site impacts are addressed in more detail in the discussion of impacts for each of the Management Alternatives.

S.4.1.1 General Radiological Health Effects

One way of presenting potential impacts to human populations in the EIS is by using radiation dose. Potential damage to human cells from radiation is measured in rem and millirem (mrem). The U.S. government has set a limit of 5,000 mrem (5 rem) per year for individual radiation workers and 100 mrem (0.1 rem) per year for individual members of the public from man-made, non-medical sources. The average American receives about 300 mrem of radiation per year from natural sources such as radon gas from the earth's soil. Living in a brick house rather than a wood-frame house can add 45-50 mrem annually to one's dose. Living at high altitudes rather than at sea level also increases one's dose. A single coast-to-coast flight exposes an individual to about 4 mrem.

Another way of presenting results in the EIS is by using the concept of risk. The most significant radiation-related illness is the inducement and development of cancers that may lead to death in later years. This effect is called a latent cancer fatality. The risks of incurring a latent cancer fatality are estimated by converting radiation doses into possible numbers of future cancer fatalities.

For an exposed population group, the latent cancer fatality number is the chance that there would be an additional latent cancer fatality within the exposed group. The chance that a member of that group would develop a latent cancer fatality depends on the size of the exposed group. For example, if the estimated number of latent cancer fatalities for a group of 100,000 people is one, the average member of this group would have a one in 100,000 chance of developing a latent cancer fatality.

Radiological risk can also be expressed for hypothetical individuals who could record the highest possible dose in a given situation. Examples are a seaman who inspects the casks at sea, a port worker who unloads the casks, a truck driver who transports the casks to a management site, or an individual living at the site boundary of a management site. When a latent cancer fatality number is given for an individual, it represents the chance that the exposed individual would develop a latent cancer fatality. As a practical matter, the maximally exposed individual during incident-free operations

Measuring Radiation Exposure

Potential radiological impacts are estimated for the highest radiation dose any single person might receive, as well as the collective dose a particular population might receive, such as all those living in the vicinity of a port. Two primary units of radiation dose measurement are used in the Final EIS to estimate these impacts: the rem and person-rem.

The rem is a unit of radiation dose. Because 1 rem is a relatively large dose, the unit actually used most frequently is the millirem (mrem), which is equal to 1/1000 of a rem. It is estimated that the average individual in the United States receives a background dose of about 300 mrem/yr from all natural sources including radon.

Radiation dose to a population or a group of persons is measured in person-rem. The total population dose (all the person-rem) is determined by adding all the individual doses in the exposed group. This measurement is particularly important when trying to take into account the potential impacts of very small doses on very large populations (for example, all those living along a transportation route).

Using a conversion factor, the estimated doses can be converted into possible numbers of health effects. Because the doses predicted in this study are far less than those known to cause immediate illness or fatality, only delayed health effects would occur. A delayed effect is measured in latent (future) cancer fatalities. For the general population, a collective dose of 2,000 person-rem is estimated to result in one additional latent cancer fatality within the affected population group.

Latent Cancer Fatalities Caused by Natural Background Radiation for an Individual Member of the General Public

Dose: Radioactivity from all natural sources combined produces about a 300 mrem (0.3 rem) dose to the average individual per year.

Probability: The probability of continuous exposure to this average dose is one.

Average Life Span: 72 years is considered to be the average lifetime.

Latent Cancer Fatalities Caused per Rem for an Individual Member of the General Public: 0.0005 latent cancer fatalities are estimated to be caused by exposure to 1 rem.

Calculation: Dose rate x life span x cancers caused per rem = 0.3 rem/yr x 72 yr x 0.0005 latent cancer fatalities per rem = 0.01 latent cancer fatalities per individual lifetime.

Risk: Probability x latent cancer fatalities = 1 x 0.01 = 0.01 latent cancer fatalities, which is about 1 chance in 100 of death from exposure to natural background radiation over a lifetime.

would be a worker because he or she would be close to the spent nuclear fuel. If necessary, DOE would implement mitigation measures to maintain individual doses under the regulatory limit for the general public. The doses and risks estimated in the EIS reflect DOE mitigation efforts directed at ship crews, port workers, and truck drivers.

Radiological risks calculated in the EIS are also compared to those of common activities, such as smoking, flying, or receiving a medical x-ray.

S.4.2 Policy Considerations and Environmental Impacts of the Basic Implementation of Management Alternative 1

Under the basic implementation of Management Alternative 1, all the foreign research reactor spent nuclear fuel could be accepted into the United States. Up to 4.6 metric tons (5.1 tons) of HEU would be removed from international commerce. DOE and the Department of State believe implementation of this alternative would promote the nuclear weapons nonproliferation objective of reducing, and eventually eliminating, the use of highly-enriched (weapons-grade) uranium in civil programs worldwide. The spent nuclear fuel could be managed safely and securely at any of five management sites.

The following sections summarize the environmental impacts of the four segments of the affected environment under the basic implementation of Management Alternative 1.

S.4.2.1 Marine Transport Impacts

The shipment of foreign research reactor spent nuclear fuel would begin with the transport of the spent nuclear fuel from the onsite storage facility at the foreign research reactor to the foreign port. The spent nuclear fuel would then be shipped in transportation casks by sea (except for shipments from Canada) to a U.S. port. The potential impact of marine transport in the territorial waters of the United States was evaluated. Because

implementation of the proposed action could involve ocean transport, the EIS also considers the environmental impacts on the global commons in accordance with Executive Order 12114. Shipments of any material via ocean transport entails risks to the ship's crew members and the environment. The risks result from transportation-related accidents and, in the case of radioactive materials, from exposure to the material itself.

S.4.2.1.1 Impacts of Incident-Free Marine Transport

The primary impact of incident-free marine shipping of foreign research reactor spent nuclear fuel would be upon the crews of the ships used to carry the spent nuclear fuel casks. Members of the general public and marine life would not receive any measurable dose from the spent nuclear fuel during marine transport. The crew would normally be separated from the cargo and shielded from radiation emitted from the cask by both the ship's structure and other cargo, resulting in small risk to the crew during most crew activities. Crew exposure would primarily be limited to crew members exposed during the loading and off-loading of the spent nuclear fuel casks and to crew members who would inspect the cargo daily to ensure secure stowage and operational safety of the vessel. This exposure from loading, inspection, and unloading of the casks would pose the highest radiation risk during incident-free marine transport.

An estimate of the maximum radiation dose that a member of a ship's crew might receive during an incident-free voyage of 21 days carrying foreign research reactor spent nuclear fuel is approximately 66 mrem. If this same crew member were to be involved in multiple voyages per year, then the yearly dose to this individual could exceed the DOE and NRC annual limit of 100 mrem per year for the public. Although this situation is not likely to occur, DOE would implement a system to track, through the contracted shippers, each ship and crew member involved in the shipment of foreign research reactor spent nuclear fuel. A clause in the contract for shipment of foreign research reactor spent nuclear fuel would require that any crew member approaching the 100 mrem per year limit be rotated to another job.

Nonradiological impacts were found to result in a small impact on the health of the public and workers. The number of shipments necessary to transport about 720 transportation casks would result in a minimal change in the number of ocean crossings by transport vessels. No increase in the exposure of the public to ship exhaust emissions or marine transport-related accidents is anticipated.

S.4.2.1.2 Impacts of Accidents During Marine Transport

The EIS analyzes two kinds of ocean accidents: 1) a ship collision, which in this EIS was assumed to result in damage to the cask and an on-board fire, and 2) loss of a cask at sea, where the cask sinks, and seawater penetrates the cask seals. However, the probability of a collision or fire resulting in a cask breach is low. The probability of a large radiation release is low because the spent nuclear fuel is a solid metal. In the type of collision or fire that could breach the cask and liberate significant quantities of radiation, the major impact on the crew would be the collision or fire, not the radiation. The radioactive particles dispersed over the ocean would not be in large enough amounts to have a measurable impact on the environment.

Immersing a cask in water does not cause the radioactive contents to be released immediately. Casks can be recovered in coastal waters and much deeper waters with modern technology. Thus, if a cask were to fall overboard in U.S. coastal waters or inland waters, DOE would employ modern underwater search techniques to locate and recover the cask, thus minimizing the potential impacts to marine life. Outside U.S. coastal waters, if a cask were to sink, modern technology would be used, if possible, in an effort to retrieve the cask. If the cask could not be recovered, seawater would penetrate the cask seals and corrode the spent nuclear fuel. There is no mechanism, however, by which the seawater entering the cask could be forced out of the cask. Thus, the radioactive material would escape from the cask at a very low rate and would have a very small effect on the marine environment.

S.4.2.2 Port Activities Impacts

Ports having high-, medium-, and low-population density and covering the Atlantic, Pacific, and Gulf coasts were analyzed. The risk of incurring latent cancer fatalities was found to be so low that the most likely outcome would be zero latent cancer fatalities due to accidents at ports. Calculations for incident-free and accident conditions clearly demonstrate that for the general population, including minority and low-income groups, the impacts would be very low. In consideration of environmental justice concerns, the EIS analyzed the characterization and distribution of minority and low-income households near candidate ports of entry. Minority and low-income populations living near the potential ports of entry would not be subjected to any greater impacts than the general population. Therefore, these populations would not receive disproportionately high and adverse impacts, but would be subject to the same very low impacts as would the general population.

Implementation of the proposed action would have few nonradiological effects on the environment at candidate ports, including the social and economic status of the general population, minority populations, and the low-income population surrounding candidate ports. The EIS analyses show that economic benefits resulting from increased cargo handling and transportation in the port area would be small for the general population, or any particular segment of the population, residing near candidate ports.

S.4.2.2.1 Impacts of Incident-Free Port Activities

The incident-free risks would predominantly be those to inspectors and port workers who would handle spent nuclear fuel casks. Based on the time to conduct port activities and the distances from the cask to the worker during these activities, a maximum dose (higher than the limit of 100 mrem per year) could result if the same individual inspected every shipment. This risk is not likely to occur, however, due to the fact that the same inspectors and port workers would not likely be responsible for all the shipments made in a given year. Nevertheless, DOE would mitigate this effect by implementing a system to track each inspector and port worker involved in the handling of foreign research reactor spent nuclear fuel to ensure that other inspectors or port workers would be used if any of these individuals approach a 100 mrem dose in any year.

S.4.2.2.2 Impacts of Accidents During Port Activities

Marine accidents could occur in the open ocean or in coastal passages. Taking into account the severity of the accident (i.e., severe collision with and without severe fires), the probability of the accident (i.e., the more severe the accident the less likely it is), the location of the accident (i.e., in the harbor channel or at the dock), meteorology, and nearby populations, the highest estimated risk of cancer for the entire population over the entire foreign research reactor spent nuclear fuel program is less than one in 10,000. This translates into less than one additional latent cancer fatality for the affected port population. The highest estimated risk to the maximally exposed individual of a future cancer death is less than one in a billion.

S.4.2.3 Ground and Barge Transport Impacts

Foreign research reactor spent nuclear fuel is transported in large, heavy transportation casks designed and constructed to contain radioactivity during severe transportation accidents. The NRC has estimated that transportation casks will withstand 99.4 percent of truck and rail accidents without breaching the cask. Only in severe accident conditions, which are of low probability, could the transportation cask be so damaged that there would be a reasonable possibility of release of radioactivity to the environment. Since 1949, there have been 21 incidents involving vehicles carrying irradiated fuel elements. None of these incidents resulted in damage to the structural integrity of the spent nuclear fuel transportation cask or release of the radioactive contents. The EIS calculations for incident-free and accident conditions demonstrate that for the general population the impacts would be low. Minority or low-income populations living near these routes would not be subjected to any greater impacts. Therefore, these populations would not receive disproportionately high and adverse impacts, but would be subject to low impacts as would the general population.

Impacts from barge transportation were also evaluated as a substitute for truck or rail transport. The only two locations where barge transport is feasible are from the Port of Portland, OR, up the Columbia River to the Hanford Site in Washington, and from the Port of Savannah, GA, up the Savannah River to the Savannah River Site in South Carolina. The net result is that the foreign research reactor spent nuclear fuel could be transported by barge with approximately the same level of risk to workers and the public as if it was transported by truck or rail. This level of risk is very low.

Implementation of the proposed action would have extremely low nonradiological effects on the environment along transportation routes, including the social and economic status of the general population, minority populations, and the low-income population residing along transportation routes. The EIS analyses show that economic benefits resulting from increased transportation of cargo along transportation routes would be small for the general population, or any particular segment of the population residing along transportation routes.

S.4.2.3.1 Impacts of Incident-Free Ground Transport

For incident-free ground transport, the radiological impacts result from the radiation field that surrounds the cask. Impacts are estimated for workers and the population along the transportation route. These impacts were quantified as the estimated number of radiation-related cancer fatalities and the estimated number of nonradiological fatalities from vehicular emissions and traffic accidents.

Allowing for transport by truck and/or rail, and assuming a wide range of inter-site shipments (depending on the management site(s) chosen for the program), the incident-free ground transport of foreign research reactor spent nuclear fuel in the United States is estimated to result in up to 0.30 (i.e., less than one) latent cancer fatalities over the entire duration of the program. This includes risk to both the public and the transportation workers. In other words, DOE and the Department of State would not expect any fatalities from cancer as a result of the ground transport of spent nuclear fuel if the proposed policy were implemented.

In the case of truck transport, truck driver(s) would be monitored for radiation dose. The regulatory limit of 100 mrem per year would never be reached during any single shipment, but the same driver could be used for multiple shipments throughout the year. DOE would implement mitigation measures through the foreign research reactor spent nuclear fuel acceptance contracts to ensure that each individual driver's dose remains below the regulatory limit. Should any individual truck driver's accumulated dose approach the 100 mrem limit in a year, DOE would require that a new driver(s) be used to keep each individual driver's dose below the regulatory limit.

S.4.2.3.2 Impacts of Accidents During Ground Transport

The most severe ground transport accidents would be truck or train crashes, followed by a large fire. Although this type of accident is highly unlikely, total ground transportation accident risks would be up to 0.00028 latent cancer fatalities from radiation and up to 0.14 for traffic fatalities depending on the transportation mode and foreign research reactor spent nuclear fuel management sites. The radiological risk of 0.00028 latent cancer fatalities means that the chance of any additional cancers among the population due to a ground transport accident is less than one in 1,000. The risk of 0.14 for a traffic fatality means that, under these conservative assumptions, there would be a 14 percent chance of a traffic fatality.

For the maximally exposed individual member of the public along the transportation route, the radiological risk from ground transport accidents would be 0.000000000014, or less than one chance in 10 billion of that individual incurring a fatal cancer.

The use of NRC- and Department of Transportation-approved routes and the development of specific foreign research reactor spent nuclear fuel transportation plans that would incorporate and integrate State and local emergency response plans would increase emergency responder effectiveness and reduce the potential consequences of a foreign research reactor spent nuclear fuel accident.

S.4.2.4 Foreign Research Reactor Spent Nuclear Fuel Management Site Impacts

The EIS examined the potential environmental impacts resulting from activities at the proposed management sites under the basic implementation of Management Alternative 1. The analysis examined environmental topics including land use, socioeconomics, cultural resources, aesthetic and scenic resources, geology, air quality, water quality, ecology, occupational and public health and safety, noise, traffic and transportation, utilities and energy, and waste management. The analysis showed that at any of the proposed spent nuclear fuel management sites (the Savannah River Site, the Idaho National Engineering Laboratory, the Nevada Test Site, the Oak Ridge Reservation, and the Hanford Site), the potential impacts on the environment would be low. Further, there were no major differences among the spent nuclear fuel management sites for any of these environmental topics.

Potential radiation exposures to workers and the public at the management sites would be low. The EIS characterized the number and location of minority and low-income populations residing near candidate management sites. Minority or low-income populations living near the proposed management sites would not be subjected to any greater impacts. Therefore, these populations would not receive disproportionately high and adverse impacts. Rather, they would be subjected to very low impacts as would the general population.

Implementation of the proposed action would have few nonradiological effects on the environment at management sites, including the social and economic status of the general population, minority populations, and the low-income population surrounding management sites. The EIS analyses show that the economic benefits resulting from increased cargo handling, transportation, and storage at management sites would be small for the general population or any particular segment of the population residing near management sites.

S.4.2.4.1 Impacts from Incident-Free Management Site Activities

The EIS analyses show that the risk to the maximally exposed individual member of the public from incident-free operations on DOE's spent nuclear fuel management sites would be 0.00000014 latent cancer fatalities for the duration of the foreign research reactor spent nuclear fuel receipt period. This hypothetical individual would be living at the site boundary of the Oak Ridge Reservation. This represents less than one chance in one million that this hypothetical individual would develop a latent cancer fatality due to the proposed spent nuclear fuel management activities.

The greatest population risk to the public living near any of DOE's spent nuclear fuel management sites would be 0.00027 latent cancer fatalities resulting from the combination of Phase 1 (i.e., near-term) receipt and storage of foreign research reactor spent nuclear fuel at the Savannah River Site and Phase 2 (i.e., future) receipt and storage at the Oak Ridge Reservation.

The highest estimated population risk to the workers who perform foreign research reactor spent nuclear fuel handling operations would be 0.21 latent cancer fatalities resulting from the combination of the near-term receipt and storage of foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory, and the future receipt and

storage at a different site. The maximum exposure to an individual worker was not calculated due to the large uncertainties involved with such calculations. A very conservative upper bound, however, would be the regulatory limit of 5,000 mrem per year, which translates to 0.026 latent cancer fatalities for workers receiving such a dose for the 13-year period during which receipts could take place.

S.4.2.4.2 Impacts of Accidents During Management Site Activities

The analysis of hypothetical accidental radioactive releases included meteorological conditions at the sites, population distributions, and food production and consumption rates within 80 kilometers (50 mi) of the storage location. Accident scenarios consisted of fuel assembly breach, dropped fuel cask, aircraft crash with and without fire, and accidental criticality. Consequences were estimated for a member of the public at the nearest site boundary and the population within 80 kilometers (50 mi) of the management site.

The highest estimated risk of incurring a latent cancer fatality for the maximally exposed individual member of the public would be 0.000010 for the duration of the foreign research reactor spent nuclear fuel receipt and storage period at the Oak Ridge Reservation. This represents one chance in 100,000 that this hypothetical individual would develop a latent cancer fatality. The greatest population risk to the public would be 0.11 latent cancer fatalities resulting from hypothetical accident conditions during Phase 1 receipt and storage at the Savannah River Site followed by Phase 2 receipt and storage at the Oak Ridge Reservation.

S.4.2.4.3 Other Potential Environmental Impacts from Management Site Activities

The EIS characterized each environmental component that would be impacted by site activities resulting from the basic implementation of Management Alternative 1.

Land Use. For all proposed management sites, unless all of the spent nuclear fuel is chemically separated or otherwise processed, new storage facilities for spent nuclear fuel including foreign research reactor spent nuclear fuel would be built on land previously disturbed or designated for industrial use. No additional land outside of the existing sites would be required for foreign research reactor spent nuclear fuel storage. The largest land use impact would be 16 ha (40 acres) at Oak Ridge Reservation to construct a new dry storage facility (less than 0.1 percent of the total site).

Socioeconomics. No construction personnel would be needed for existing facilities, and no more than 240 workers per year (peak) would be needed to build a new dry storage facility. Annual staffing requirements for operations would be about 30 full-time employees during receipt and 8 full-time employees during storage for a new dry storage facility. This would represent 0.15 to 0.9 percent of the existing work force at any of the proposed sites. No new hiring would be expected because most positions would be filled by reassignments of the existing work force. Even if all operational positions were filled by new hires, this would represent a small increase in regional employment.

Cultural Resources. Although most of the potential management sites contain areas of archaeological, cultural, or historic interest, little or no direct impacts on cultural resources would be expected because of the location of the storage facilities. However, site surveys

would be conducted prior to construction. In the event that cultural resources were found, the State Historic Preservation Officer would be contacted. Tribal leaders would be contacted if any Native American resources were found.

Aesthetic and Scenic Resources. New storage facilities would be located far from public view in areas previously disturbed or designated for industrial use. Construction activities would generate dust that could temporarily affect visibility. Every effort would be made, however, to minimize such conditions. Facility operations would not produce emissions that would affect visibility.

Geology. Except for the potential existence of gold, tungsten, and molybdenum at Nevada Test Site, geologic resources consist of sand, gravel, or clay deposits, all of which have low economic value. Construction activities would disturb these surface deposits, but because of the large volume of these materials on the potential sites, the impact would be small.

Air Quality. Construction activities would cause temporary, minor increases in dust emissions, but the use of standard dust-suppression techniques would mitigate this problem. Overall, particulate emissions during construction could temporarily affect visibility in localized areas but would not exceed Federal or State requirements.

Water Quality. Water consumption during construction would require very small amounts of water when compared to daily water usage at the proposed management sites. During operations, the maximum annual water consumption would be about 2.1 million liters (550,000 gal). This amount represents no more than 0.2 percent of the annual water consumption at any of the proposed foreign research reactor spent nuclear fuel management sites. At the Nevada Test Site, where available water is limited, a cumulative water supply impact would be significant from activities other than foreign research reactor spent nuclear fuel management, but the foreign research reactor spent nuclear fuel management contribution would be very small. Under normal operations, there would be no direct discharge or effluent to ground or surface waters from a new dry storage facility.

Ecology. During construction of new facilities, individual or small populations of some wildlife species could be disturbed, displaced, or destroyed. However, the size of the affected areas would be small compared to the size of the remaining natural habitats.

Noise. Construction activities would generate noise levels consistent with light industrial activity. Based on existing studies, these noises would not be expected to propagate offsite at levels that would affect the general population. Noises generated during operations would be less than that during construction.

Materials, Utilities, and Energy. For existing facilities, incremental increases in materials, utilities, and energy would be very small. New dry storage facilities would result in increased demands on water, power, and sewage. Increased water usage during construction would add no more than 0.2 percent to existing site-wide levels. Increased annual electricity requirements would be about 800 to 1000 megawatt-hours per year. Increased sewage generation would be less than one percent above existing site-wide levels. At the Nevada Test Site, a central sewage system would have to be constructed for

spent nuclear fuel management activities, including foreign research reactor spent nuclear fuel storage facilities. However, all other existing system capacities would manage the estimated increases for materials, utilities, and energy.

Waste Management. At all proposed foreign research reactor spent nuclear fuel management sites, the amount of waste generated from foreign research reactor spent nuclear fuel storage would be very small when compared to annual waste projection for each site, and could be handled by existing capacity at each site.

S.4.2.4.4 Cumulative Impacts at the Management Sites

The contribution to cumulative impacts from activities required for foreign research reactor spent nuclear fuel storage at any site would be very small in comparison with other spent nuclear fuel management activities and even smaller in comparison with other ongoing and reasonably expected non-spent nuclear fuel-related projects. A cumulative impact results from the incremental impact of a contemplated action added to the impacts of other past, present, and reasonably foreseeable future actions.

S.4.2.4.5 Impacts of Ultimate Disposition

Because title to the foreign research reactor spent nuclear fuel would pass to the United States if the proposed policy were adopted and foreign research reactor spent nuclear fuel were accepted into the United States, the Nuclear Waste Policy Act provides authority for its disposal in a geologic repository. A separate environmental evaluation of proposed geologic disposal activities would be conducted prior to such disposal.

It is possible that the foreign research reactor spent nuclear fuel could be accepted intact in a geologic repository. If DOE determines that geologic disposal of intact foreign research reactor spent nuclear fuel is possible, then there would be no onsite impacts beyond those associated with storage and packaging of the foreign research reactor spent nuclear fuel.

It is also possible that some form of processing (e.g., that associated with the new treatment technologies that would be examined under the preferred alternative) could be necessary to convert foreign research reactor spent nuclear fuel into a more stable form prior to its ultimate disposal. This processing could be a near-term new treatment technology, conventional chemical separation, or a new treatment technology that is implemented after an interim period of storage. The environmental impacts of such processing activities in the future cannot be precisely estimated at this time because the processes that might be used have not been fully developed. DOE expects that any new technology would produce no greater impacts than those that resulted from historical reprocessing activities in the United States. Therefore, the impacts of near-term treatment of the foreign research reactor spent nuclear fuel would be no greater than the impacts of chemically separating the same material as analyzed in the EIS. If a new treatment technology is implemented after an interim period of storage and technology development, then DOE expects that it would provide substantial improvements over conventional chemical separation.

When disposal space is available, DOE would transport the intact or processed foreign research reactor spent nuclear fuel to a repository. This transportation would be expected to produce impacts similar to the ground transportation impacts discussed in

Section S.4.2.3 of the Summary. After emplacement in a geologic repository, however, DOE expects there would be no more impacts to workers, the public, or the environment because the radioactive material would be effectively isolated.

In the event that the geologic repository were to be delayed, DOE assumed for the purposes of this analysis that it would continue to manage the foreign research reactor spent nuclear fuel, or the high-level radioactive waste form resulting from the chemical separation or other processing of such spent nuclear fuel, at the management sites until a geologic repository becomes available. The risk associated with this continued management is low and would not exceed the annual risk discussed in Section S.4.2.4.1.

S.4.3 Policy Considerations and Environmental Impacts from Implementation Alternatives of Management Alternative 1

In addition to the basic implementation of Management Alternative 1, the EIS analyzed implementation of Management Alternative 1 by various other means. The range of these implementation alternatives (which are variations on the basic implementation), deals with: 1) different amounts of material to be accepted; 2) different policy durations; 3) different financial arrangements; 4) alternative locations for taking title; 5) wet storage technology for new construction instead of new dry facilities; 6) near-term conventional chemical separation in the United States instead of interim storage in the United States; and 7) development and use of new treatment and/or packaging technologies instead of conventional chemical separation or storage. A discussion of the policy considerations and environmental impacts for each of the implementation alternatives follows. The impacts reported below cover the full range of activities (i.e., marine transport, port activities, ground transport, and site management activities) necessary to carry out the particular implementation alternative.

S.4.3.1 Implementation Alternative 1: Different Amounts of Material

The EIS evaluated impacts from accepting two different amounts of foreign research reactor spent nuclear fuel, plus target material, under this implementation alternative. These impacts are discussed below.

- *Implementation Subalternative 1a: Accept Foreign Research Reactor Spent Nuclear Fuel Only From Countries with Other-Than-High-Income-Economies*

  By excluding high-income economy countries, this subalternative would have adverse consequences for U.S. nuclear weapons nonproliferation policy. The amount of HEU that could be removed from international commerce under this implementation subalternative is less than ten percent of the amount that could be removed under the basic implementation. Furthermore, if this was the only spent nuclear fuel accepted, research reactor operators in high-income economy countries would be likely to implement several measures contrary to U.S. nuclear weapons nonproliferation policy, such as delaying or canceling plans to convert to LEU fuel, or, in some cases, reconverting from LEU to HEU fuel. The environmental impacts would be reduced in comparison with the basic implementation in direct proportion to the reduced amount of spent nuclear fuel accepted.

- *Implementation Subalternative 1b: Accept Only HEU Foreign Research Reactor Spent Nuclear Fuel*

  Foreign research reactor operators have stated that they would not participate in the Reduced Enrichment for Research and Test Reactors Program unless the United States accepts their spent nuclear fuel, including LEU spent nuclear fuel. Thus, this implementation subalternative could result in the end of that program. Furthermore, this implementation subalternative would be contrary to the broader U.S. nuclear weapons nonproliferation policy. Since the number of elements in this implementation subalternative is about half the number of elements in the basic implementation, the potential environmental impacts would be approximately half of those calculated for the basic implementation.

- *Implementation Subalternative 1c: Accept HEU and LEU Target Material in Addition to Foreign Research Reactor Spent Nuclear Fuel*

  This implementation subalternative would remove the most HEU from civil commerce and provides the most support to U.S. nuclear weapons nonproliferation policy. Acceptance of this material in addition to the spent nuclear fuel would give incentives to reactor operators producing radioisotopes to switch from HEU targets to LEU targets, thus removing additional HEU from future international civil commerce. As with the basic implementation, acceptance of this additional material would have a small impact on all environmental, health, and safety issues. The dose rate from casks loaded with target material would be lower than the dose rate from casks loaded with foreign research reactor spent nuclear fuel. Up to 140 additional cask shipments are estimated to be needed for this material. These cask shipments would include up to 125 overland Canadian shipments. The environmental impacts are expected to be slightly higher than those associated with the basic implementation due to these additional cask shipments. The total incident-free population risk to the exposed public and workers would be 0.58 latent cancer fatalities as compared with 0.55 latent cancer fatalities under the basic implementation of Management Alternative 1.

S.4.3.2 Implementation Alternative 2: Alternative Policy Durations

The EIS evaluates the impacts of reducing the policy duration to 5 years of spent nuclear fuel acceptance or of continuing the policy for acceptance of HEU spent nuclear fuel indefinitely and LEU for 10 years.

- *Implementation Subalternative 2a: 5-Year Policy*

  The amount of HEU that could be removed from international commerce under this implementation subalternative is about 88 percent of the amount that could be removed under the basic implementation. The 5-year policy would accelerate the point at which the foreign research reactor operators and governments would become responsible for disposal of their own spent nuclear fuel. This may not be enough time for some countries, especially other-than-high-income economy countries, to make arrangements for alternative means of managing their spent nuclear fuel.

Under this implementation subalternative, approximately 81 percent of the total number of shipments under the basic implementation would be needed. The environmental impacts under this implementation subalternative would be reduced as compared with the basic implementation in direct proportion to the lesser amounts of foreign research reactor spent nuclear fuel accepted. As in the basic implementation, the effects would be small and no fatalities from cancer or accidents would be expected.

- *Implementation Subalternative 2b: Indefinite HEU/10-Year LEU Policy*

The amount of spent nuclear fuel would be the same as in the basic implementation — only the timing for shipment of the HEU spent nuclear fuel would be different. Indefinite acceptance of HEU would promote U.S. nuclear weapons nonproliferation goals by allowing more time to remove the HEU from international commerce. The potential environmental impacts would be the same as or slightly lower than those of the basic implementation. Delaying the acceptance of a small fraction of the total amount of foreign research reactor spent nuclear fuel accepted would have a very small effect.

S.4.3.3 Implementation Alternative 3: Alternative Financing Arrangements

The EIS evaluated three alternative financing arrangements. These are: 1) subsidize all countries; 2) charge all countries the full cost of accepting and managing their spent nuclear fuel; and 3) subsidize other-than-high-income economy countries and charge high-income economy countries the full cost of managing their spent nuclear fuel. The first financing arrangement would be the most expensive for the United States, while the second would cost the United States nothing, and the third would fall somewhere in between.

These financing arrangements could have an indirect effect on the environmental impacts of accepting foreign research reactor spent nuclear fuel because the number of foreign research reactor operators participating in the program would depend on the fee the United States proposed to charge. The indirect effects are impossible to quantify, but would only result in a reduction in the amount of HEU removed from international commerce and in the environmental impacts on United States territory.

S.4.3.4 Implementation Alternative 4: Alternative Locations for Taking Title

The EIS evaluated alternative locations for taking title. These include: prior to shipment; at the port(s) of entry; and at the proposed foreign research reactor spent nuclear fuel management site(s).

The environmental impacts of the proposed foreign research reactor spent nuclear fuel program are not affected by who the owner of the spent nuclear fuel is or the point at which title is transferred. The Price-Anderson Act would apply to the spent nuclear fuel shipments, once they arrive in territorial United States, regardless of who holds title to the

fuel. Thus, there would be no change in the liability protection provided to the citizens of the United States, no matter where DOE would take title. Ownership would not affect shipping arrangements and precautions, or liability protection, other than to increase DOE's potential liability if DOE were to take title before shipment.

S.4.3.5 Implementation Alternative 5: Wet Storage Technology for New Construction

Wet storage technology was evaluated under the EIS as a site storage option for Phase 2 storage. At the conclusion of Phase 1, the spent nuclear fuel could be stored in new wet storage facilities or in one non-DOE facility (Barnwell Nuclear Fuels Plant) located adjacent to the Savannah River Site which could be acquired and refurbished for use as a wet storage facility. This implementation alternative would support U.S. nuclear weapons nonproliferation policy to the same extent as the basic implementation.

Impacts to the health and safety of the public and workers would be similar to those discussed for new dry storage in the basic implementation. The risk of an accidental criticality, however, is higher for wet storage technology than for dry storage technology. Thus, the total population risk to the public due to accident conditions would be 0.16 latent cancer fatalities under this implementation alternative, compared to 0.11 latent cancer fatalities under the basic implementation.

The highest maximally exposed individual risk to the public due to accident conditions would be 0.00015 latent cancer fatalities under this implementation alternative, which is the highest of all the alternatives. This individual's chance of incurring a latent cancer fatality would be less than two in 10,000.

S.4.3.6 Implementation Alternative 6: Near-Term Conventional Chemical Separation in the United States

The EIS evaluates near-term conventional chemical separation at the Savannah River Site and the Idaho National Engineering Laboratory for five key environmental impacts; 1) waste management; 2) air quality; 3) water quality; 4) occupational and public health and safety; and 5) socioeconomics. The facilities at the Savannah River Site are technically capable of chemically separating the aluminum-based foreign research reactor spent nuclear fuel. After some upgrading, the facilities at the Idaho National Engineering Laboratory would be technically capable of chemically separating all the foreign research reactor spent nuclear fuel.

The same amount of HEU could be removed from international commerce under this implementation alternative as under the basic implementation. Foreign research reactor operators would have the same incentives not to use HEU in their reactors under this implementation alternative as they would under the basic implementation.

The principal environmental impacts under this implementation alternative would be occupational and public health and safety impacts. The total incident-free population risk to the worker population of incurring a latent cancer fatality resulting from this implementation alternative would be 0.32 latent cancer fatalities among all marine, port, ground transport, and site workers combined. The largest contribution to this total risk

would be from onsite radiation workers. The risk to onsite radiation workers would be 0.21 latent cancer fatalities, which translates to 21 chances in 100 that one worker within the group of exposed workers would develop a latent cancer fatality.

The total incident-free population risk to the general public would be 0.39 latent cancer fatalities among the entire affected population under this implementation alternative. The total population risk due to accident conditions to the general public would be 0.43 latent cancer fatalities among people living near the affected site.

S.4.3.7 Implementation Alternative 7: Developmental Treatment and/or Packaging Technologies

This implementation alternative could be selected in connection with other implementation alternatives. The environmental impacts of the developmental treatment and/or packaging technologies cannot be precisely estimated at this time because the technologies and procedures are still under development. Implementation of certain treatment and/or packaging technologies would require new facilities and thus would generate impacts associated with construction as well as operation. Appropriate NEPA documentation would be prepared for any proposed implementation of new treatment and/or packaging technologies. A new facility using a new treatment technology would not be operational in the near-term, so in this case, this implementation alternative would be selected in conjunction with one of the near-term storage alternatives.

Any new facilities would be designed to meet modern environmental compliance and health and safety standards. The new design would minimize air and water emissions and would limit the public and worker radiation doses to levels no greater than those in existing facilities. Therefore, it is expected that these impacts would be somewhat lower than those presented for conventional chemical separations.

S.4.4 Implementation of the Preferred Alternative

Under the preferred alternative, as described in Section S.2.3, DOE would accept and manage the foreign research reactor spent nuclear fuel and target material in the United States. The aluminum-based foreign research reactor spent nuclear fuel and target material would be transported to and managed at the Savannah River Site. The TRIGA foreign research reactor spent nuclear fuel would be transported to and managed at the Idaho National Engineering Laboratory. Under the preferred alternative, up to 17,800 aluminum-based foreign research reactor spent nuclear fuel elements representing approximately 675 casks, and the target material from overseas, would arrive at candidate ports on the east coast of the United States, preferably the Naval Weapons Station at Charleston, South Carolina. Most of the target material would be received at the U.S.-Canadian border and all target material, representing 140 casks, would be managed at the Savannah River Site. Up to approximately 38 casks of TRIGA foreign research reactor spent nuclear fuel could arrive at candidate ports on the United States west coast, preferably the Naval Weapons Station Concord, California. DOE would strive to minimize the number of shipments necessary by coordinating shipments from several reactors at a time (i.e., by placing multiple casks [up to eight] on a ship). DOE currently estimates that approximately five shipments through the Naval Weapons Station Concord

would be necessary. All the TRIGA foreign research reactor spent nuclear fuel, representing approximately 162 casks and 4,900 elements would be transported to and managed at the Idaho National Engineering Laboratory.

The policy considerations and the impacts of marine transport, port, ground transport, and management site activities of the preferred alternative presented in this section are based on analysis performed for the basic implementation of Management Alternative 1 (Section S.4.2), Implementation Alternative 1c (Section S.4.3.1), Implementation Alternative 6 (Section S.4.3.6), and Implementation Alternative 7 (Section S.4.3.7).

S.4.4.1 Policy Considerations

A critical result of implementing the preferred alternative would be support for the Reduced Enrichment for Research and Test Reactors Program, which has the goal of minimizing and eventually eliminating the use of HEU in civil nuclear programs. The successful expansion of the program to Russia, other Newly-Independent States, China, South Africa, and other countries, and the establishment of a world-wide norm discouraging the use of HEU is dependent on the United States commitment to action such as that embodied in this preferred alternative. By including the target material, the preferred alternative maximizes the amount of HEU to be removed from international commerce. By assisting foreign research reactor operators with peaceful applications of nuclear energy, the preferred alternative complies with U.S. obligations under the *Treaty on the Non-Proliferation of Nuclear Weapons*. By not encouraging reprocessing for either nuclear power or nuclear explosive purposes, the preferred alternative supports the Administration's nuclear weapons nonproliferation policy objectives.

DOE's preferred alternative allows for the use of chemical separation under certain circumstances, such as when alternative technologies present higher safety risks, are more costly, or are unavailable. If chemical separation is used to process the foreign research reactor spent nuclear fuel, the HEU would be blended down during the separation process to a low enriched form that is unsuitable for nuclear weapons purposes (the blenddown is also required because the F-canyon cannot safely process HEU beyond initial dissolution). No plutonium would be separated. Instead, the plutonium would be left in the waste stream with the high-level radioactive chemical separation wastes. In addition, the waste generated during reprocessing would be handled using technologies that are intended to be used for substantially larger quantities of pre-existing wastes (e.g., vitrification of high-level liquid radioactive wastes, grouting for low-level wastes, and incineration for some supernatant).

This potential method of handling the foreign research reactor spent nuclear fuel would be consistent with United States nonproliferation policy, despite the use of chemical separation because (1) it would reduce the worldwide stockpiles of this nuclear weapons material; (2) no plutonium would be separated; and (3) the chemical separation would not be taking place for either nuclear weapons or nuclear power purposes.

DOE is aware that the inclusion of chemical separation within the preferred alternative could be interpreted by some nations, organizations, and persons as a signal of endorsement of the use of chemical separation as a routine method of waste management for spent nuclear fuel or a reversal of United States policy on chemical separation. This would not be an accurate interpretation. The United States policy regarding chemical

separation was established in Presidential Decision Directive 13, and DOE and the Department of State have determined that this preferred alternative is consistent with that policy. The draft version of this EIS indicated that chemical separation is a non-preferred technology. This final preferred alternative includes provision for possible chemical separation. DOE maintains a presumption that spent nuclear fuel would not be chemically separated unless there is an imminent health and safety risk, or other programmatic conditions, that cannot be addressed during the time period when no feasible alternative to chemical separation is available. These conditions will be addressed by the independent study described in S.2.3.

S.4.4.2 Potential Environmental Impacts

The potential environmental impacts due to marine transport, port activities, and ground transport would be similar to those of the basic implementation of Management Alternative 1, with the addition of the target material shipments. With the use of only military ports, which are located in areas of low population density, the risk would be reduced for port activities.

Management site activities at the Idaho National Engineering Laboratory can be estimated from the basic implementation of Management Alternative 1. For the Savannah River Site, however, the impacts would vary depending on the specific outcome of the preferred management strategy at the site. The preferred alternative includes the development and operation of a new treatment and/or packaging technology at the Savannah River Site, and environmental impacts of such a technology cannot be estimated with precision. DOE expects, however, that the radiological and nonradiological health and environmental effects from the operation of facilities that would support a new technology would not exceed those estimated for conventional chemical separation (evaluated in S.4.3.6).

The principal impacts of the preferred alternative would be occupational and public health and safety impacts. Radiological risks are determined for the maximally exposed individual and the potentially exposed population. The maximally exposed individual risk expresses the probability that the maximally exposed individual would incur a latent cancer fatality due to the preferred alternative. The population risk expresses the estimated number of additional latent cancer fatalities among the entire potentially exposed population. Risks are also determined for incident-free conditions and for accident conditions.

The greatest radiological risks would occur during ground transport or management site activities. Based on conservative assumptions, under incident-free conditions, the total population risk would be 0.25 latent cancer fatalities for the potentially exposed public, while the corresponding risk would be 0.30 latent cancer fatalities for the workers. Thus, there would be an estimated 25 percent chance of incurring one additional latent cancer fatality among the exposed general public, and a 30 percent chance of incurring one additional latent cancer fatality among workers. The maximum estimated incident-free radiological risk for an onsite radiation worker would be 0.026 latent cancer fatalities or a 2.6 percent chance of incurring a latent cancer fatality. DOE and the Department of State believe the actual risk would be much lower due to administrative procedures such as worker rotation.

Under accident conditions, the maximum population risk to the general public (which would be to the people living near both management sites at the time of an accident) would be 0.45, or an approximate 45 percent chance of incurring one additional latent cancer fatality among all the people living near both sites. The maximum estimated accident radiological risk to the maximally exposed individual is 0.000047 latent cancer fatalities, which applies to a hypothetical member of the public who lives at the site boundary. This individual's chance of incurring a latent cancer fatality due to an accident under this alternative would be less than one in 10,000. There is approximately a five percent chance that a truck driver or member of the public could die in a traffic accident associated with the preferred alternative. This death would be unrelated to the radioactive nature of the cargo.

The cumulative impacts from the receipt and management of foreign research reactor spent nuclear fuel and target material, with some chemical separation, would not have detrimental effects on the public or environmental resources at the sites. Minority and low-income populations living near the Savannah River Site or the Idaho National Engineering Laboratory would not be subjected to any disproportionately high and adverse impacts.

S.4.5 Policy Considerations and Environmental Impacts of Management Alternative 2

Under Management Alternative 2 the United States would facilitate overseas management of foreign research reactor spent nuclear fuel. Two implementation subalternatives are examined: 1) overseas storage of the foreign research reactor spent nuclear fuel with U.S. assistance; and 2) overseas reprocessing of the foreign research reactor spent nuclear fuel with U.S. nontechnical (financial and/or logistical) assistance. Under these implementation subalternatives, no foreign research reactor spent nuclear fuel would be accepted into the United States. However, vitrified waste from overseas reprocessing might be accepted into the United States resulting in some environmental impacts. In addition, other impacts would occur, such as cost of U.S. assistance and impacts to the U.S. nuclear weapons nonproliferation policy.

S.4.5.1 Impacts From Overseas Storage With U.S. Assistance

Under this subalternative, there would be no environmental impacts on U.S. territory for the duration of the proposed action. However, other impacts would occur such as cost of U.S. assistance. This subalternative would be most economical in countries that already have spent nuclear fuel storage infrastructures. In these countries, the addition of the spent nuclear fuel from research reactors to existing spent nuclear fuel inventories in storage would probably involve incremental costs without start-up costs. However, in countries that do not have an existing nuclear infrastructure, it would cost tens of millions of dollars per country to set up a secure area, purchase storage casks, transfer the spent nuclear fuel to the cask, and maintain a secure area for 40 years.

If the United States does not accept any near-term foreign research reactor spent nuclear fuel shipments, provision of U.S. technical and/or financial assistance for the development of safe and secure storage capabilities would help to alleviate some of the problems posed by a lack of sufficient storage capacity. However, this subalternative presents several

drawbacks from a nuclear weapons nonproliferation policy standpoint. The accumulation overseas of ever larger amounts of spent nuclear fuel containing HEU poses a risk that such weapons-usable material might be illicitly diverted to a weapons program. Although U.S. assistance in maintaining adequate physical security for foreign research reactor spent nuclear fuel repositories may lessen the potential for diversion, the proliferation risk would still be greater than under the basic implementation of Management Alternative 1. As the foreign research reactor spent nuclear fuel ages, it would become less radioactive and thus a more attractive target for illicit diversion.

S.4.5.2 Impacts From Overseas Reprocessing With U.S. Nontechnical Assistance

The EIS considers a subalternative in which all of the reprocessing activities occur overseas using foreign reprocessing and vitrification technology. In one subalternative, the vitrified high-level radioactive waste (i.e., high-level waste would be incorporated into high strength, dissolution-resistant glass and cast in stainless steel canisters) from overseas reprocessing would be accepted by the United States for storage and/or ultimate disposal. If no high-level waste were accepted, then there would be no impacts on U.S. territory.

In the case where vitrified high-level waste from overseas reprocessing is accepted into the United States from Europe, the environmental impacts in the United States would be, in all cases, lower than those under the basic implementation. The total number of casks received in the United States would be 90-95 percent lower and the total worker and population exposures would be lower. If vitrified high-level waste is accepted by the United States, it would either be stored in existing facilities at the Savannah River Site or shipped directly to a geologic repository site, if available.

S.4.6 Policy Considerations and Environmental Impacts of Management Alternative 3

Implementation of this Management Alternative 3, a combination of elements from Management Alternative 1 and 2, would not pose a greater risk than that determined under Management Alternative 1, assuming identical United States site management technology implementation. This is because the amount of foreign research reactor spent nuclear fuel that would be managed under the Hybrid Alternative is less than the amount that would be managed in the United States under Management Alternative 1.

S.4.7 No Action Alternative

If no action were taken to adopt a policy to manage foreign research reactor spent nuclear fuel, no direct environmental impacts would occur in the United States. However, failure to adopt a policy would have numerous other impacts, including likely continued reliance on HEU by foreign research reactor operators, increasing the amount of HEU available in civilian commerce, and possible worldwide proliferation of nuclear weapons and nuclear weapons States. The No Action alternative would be the least desirable from a nuclear weapons nonproliferation standpoint.

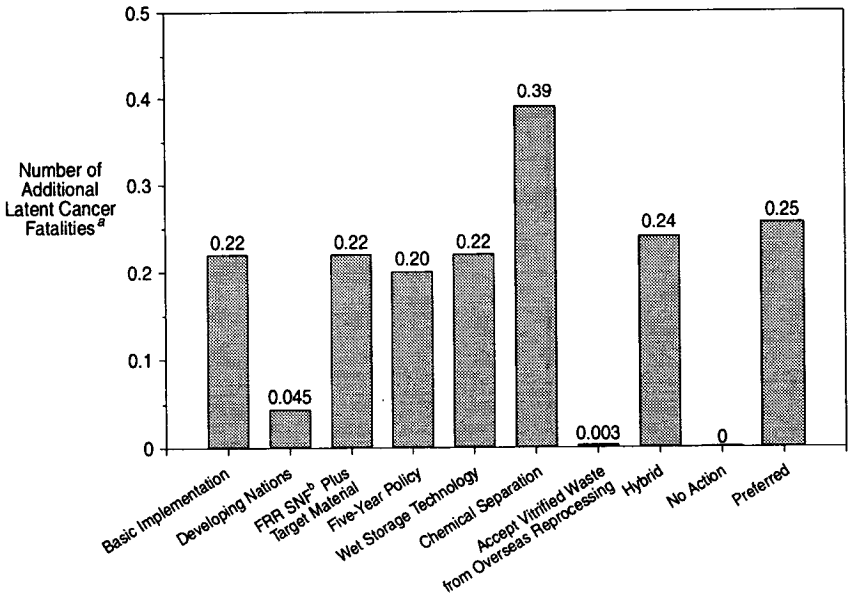
S.4.8 Comparison of the Radiological Risks

This section provides a comparison of the potential maximum estimated risks associated with the alternatives evaluated in the EIS for the general public, the workers, and the maximally exposed individual. Essentially this risk would occur during the first 13 years of the program.

Figure S-11 shows the greatest incident-free population risk to the general public under each alternative. Figure S-12 shows the greatest accident population risk to the general public under each alternative. These estimated risks (including the maximum estimated risk of 0.39 latent cancer fatalities under incident-free conditions, and 0.45 latent cancer fatalities under accident conditions) would be less than one-half additional latent cancer fatality among the public living near [within 80 kilometers (50 mi)] any of the management sites.

The accident risks to the population are estimated by combining the probabilities of accidents and the consequences of those accidents, then summing over the full range of accidents that might reasonably be expected to occur during marine transport, port activities, ground or barge transport, and management site activities. The single accident with the highest risk is estimated to have a probability of approximately 0.02 occurrences per year and a consequence of approximately 1.3 latent cancer fatalities.

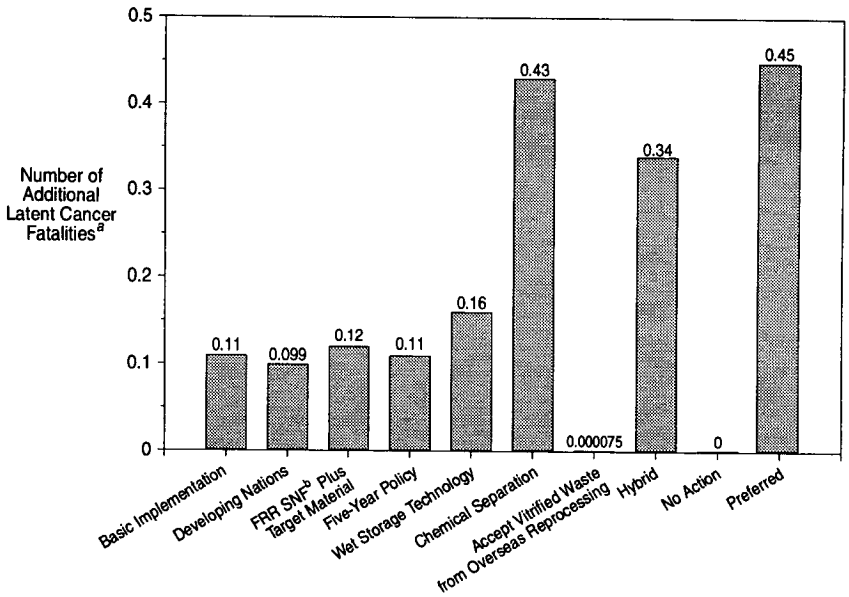
Incident-free population risks for workers are depicted in Figure S-13. The greatest incident-free radiological population risk to workers from any of the alternatives would occur in the alternative in which target material is added to the basic implementation of



[a] *Impacts evaluated were those in the United States and on the Global Commons.*

[b] *Foreign Research Reactor Spent Nuclear Fuel*

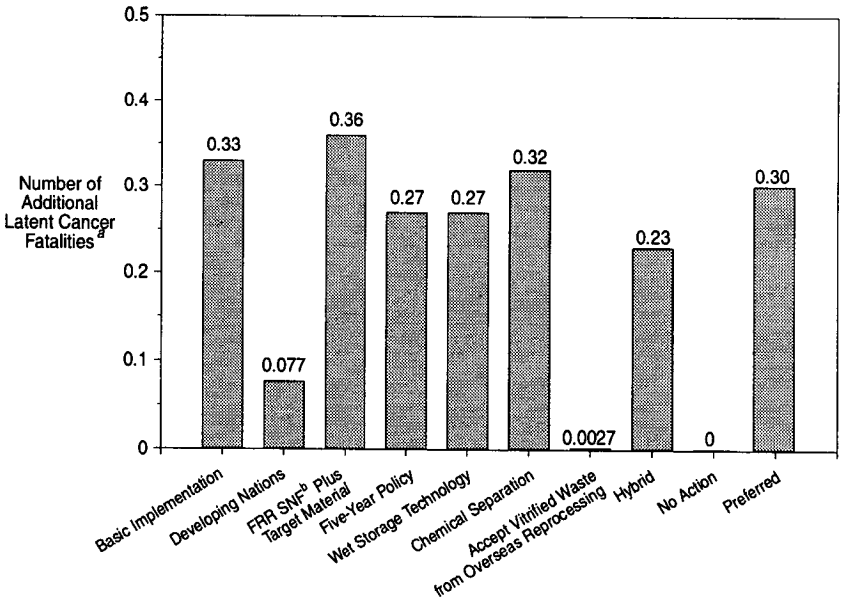
Figure S-11 Maximum Estimated Incident-Free Radiological Population Risk to the General Public Under Each Alternative



[a] *Impacts evaluated were those in the United States and on the Global Commons.*

[b] *Foreign Research Reactor Spent Nuclear Fuel*

Figure S-12 Maximum Estimated Accident Radiological Population Risk to the General Public Under Each Alternative



[a] *Impacts evaluated were those in the United States and on the Global Commons.*

[b] *Foreign Research Reactor Spent Nuclear Fuel*

Figure S-13 Maximum Estimated Incident-Free Radiological Population Risk for Workers Under Each Alternative

Management Alternative 1. This low risk would mainly occur during the first 13 years of the program and could be up to 0.36 additional latent cancer fatalities to the worker group under incident-free conditions.

The analysis in this EIS indicates that the highest estimated individual risk would be to an onsite radiation worker (i.e. the maximally exposed worker) receiving a dose equal to the regulatory limit of 5,000 mrem each year for 13 years under incident-free conditions. This risk would be 0.026 latent cancer fatalities, and this hypothetical individual's estimated chance of developing a fatal cancer would be 2.6 chances in 100. However, DOE would prevent workers from receiving this high radiation dose through existing administrative procedures.

The EIS analysis indicates that the highest estimated maximally exposed individual risk to members of the public under the proposed action is 0.00015 latent cancer fatalities. This would be a hypothetical individual member of the public who was at the worst possible location during an accidental criticality on the Oak Ridge Reservation under Implementation Alternative 5, Wet Storage Technology for New Construction. This accident is estimated to have a frequency of approximately 0.0031 occurrences per year and a consequence of approximately 0.0017 latent cancer fatalities. This hypothetical individual's chance of incurring a fatal cancer would be increased by less than two in 10,000.

The highest estimated incident-free population risk to the general public (See Figure S-11) living near any of the management sites, or ports, from any of the implementation alternatives is less than one-half latent cancer fatality. This risk occurs under Implementation Alternative 6, near-term Chemical Separation in the United States at the Savannah River Site. This risk would be spread among the roughly 600,000 people who live near the Savannah River Site, so the average risk among these people would be less than one in a million over the entire 40-year period. Common activities that produce a comparable risk of death per year are presented in Table S-1.

Table S-1 Risks Estimated to Increase Chance of Death in Any Year by One Chance in a Million

Activity	*Cause of Death*
Smoking 1.4 cigarettes	Cancer; Heart disease
Living 2 days in New York or Boston	Air pollution
Traveling 16 km (10 mi) by bicycle	Accident
Flying 1,600 km (1,000 mi) by jet	Accident; Cancer caused by cosmic radiation
Living 2 months in Denver on vacation from New York	Cancer caused by cosmic radiation
One chest x-ray taken in a good hospital	Cancer caused by radiation
Drinking 30 12-oz cans of diet soda	Cancer caused by saccharin

Adapted from Slovic, P., 1986, Informing and Educating the Public about Risk, Risk Analysis, Vol. 6(4), pp. 403-415.

S.4.9 Costs

The program costs of implementing the proposed action alternatives described in Section S.2.1 and the preferred alternative are given in Table S-2. As noted in Section S.2.3, the preferred alternative is Management Alternative 1 with modifications to several

Table S-2 Potential Total Costs
(Net Present Value, Millions of 1996 Dollars in 1996)

Scenario	Minimum Program Cost	Other Cost Factors (Technical)	Other Cost Factors (Discount Rate)	Potential Total Cost, No Escalation	1% Real Escalation, Cumulative
Management Alternative 1 (Storage)[b]	725/775[a]	210	175	~1,100	+11%
Management Alternative 1 (revised to incorporate Chemical Separation)[b]	625	85-145	125	~900	+9%
Management Alternative 2[b]	1250	600-1600	250	2,100-3,100	+13%
Management Alternative 3[b,c]	675	225-275	75	~1000	+9%
Preferred Alternative	625-950	210	225	~1,050-1,400	+10%-11%

[a] *Dry/Wet New Storage Facilities*
[b] *Adding target material to any of these scenarios would increase scenario costs by 3 to 4 percent*
[c] *The total cost risk to the United States is less than 1/2 the total cost risk since a large portion of the activities under this alternative would occur overseas*

basic implementation components, including implementation of a new treatment and/or packaging technology at the Savannah River Site for the management of the aluminum-based foreign research reactor spent nuclear fuel. A more detailed cost discussion can be found in Section 4.9 of Volume 1 and in Appendix F of the Final EIS. Costs are generally presented as minimum costs for the defined program components and approaches, and as "other cost factors" that are likely but sufficiently uncertain that they cannot be directly included in the minimum costs. However, for the preferred alternative, a wide range of costs is presented because of the uncertainty associated with the new technology development program. An example of an item covered by "other cost factors" would be the cost growth caused by adverse weather that extends the time required to make shipments of the spent nuclear fuel. All costs are discounted (i.e. the costs reflect long-term interest that can be expected) at 3 percent for the portion to be managed overseas and at 4.9 percent for the portion to be managed in the United States.

Table S-2 combines the minimum costs with the other cost factors and shows the net present value of the potential total costs of implementing the program. Costs to manage target material are included in the preferred alternative. The total costs range from about $900 million for Management Alternative 1 with chemical separation, $1.4 billion for the preferred alternative to $3.1 billion for Management Alternative 2. Except for Management Alternative 2, overseas management, the minimum costs for other alternatives are $625-$950 million.

Costs to the United States have also been calculated in each of the cost scenarios under a variety of fee schedules. DOE would establish any fee in a separate *Federal Register* notice subsequent to the issuance of this EIS. Costs to the United States under the preferred alternative would be $275-550 million for a fee of $2,000/kgTM. Higher fees would reduce this cost to zero in the $7,500/kgTM range.

S.5 *Overview of the Public Comments and DOE Response*

On April 21, 1995, DOE published in the *Federal Register* a Notice of Availability of the *Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel* (60 FR 19899). In accordance with DOE NEPA regulations 10 CFR Part 1021, the Notice invited interested agencies, organizations, and the general public to provide oral and written comments on the Draft EIS.

S.5.1 The Public Comment Process

The public comment period on the Draft EIS was initially scheduled from April 21, 1995 to June 20, 1995. In response to public requests, the comment period was extended an additional 30 days through July 20, 1995. During the comment period, DOE held 17 public hearings in the locations most likely to be directly affected by the EIS alternatives, including the 10 candidate ports of entry and five candidate management sites. In addition, a public hearing was held in Washington, D.C. The hearing dates and locations are shown in Figure S-14. The Draft EIS was made available to the public through mailings, requests to DOE's Environmental Management Information Center, and at DOE Public Reading Rooms and other designated information locations.

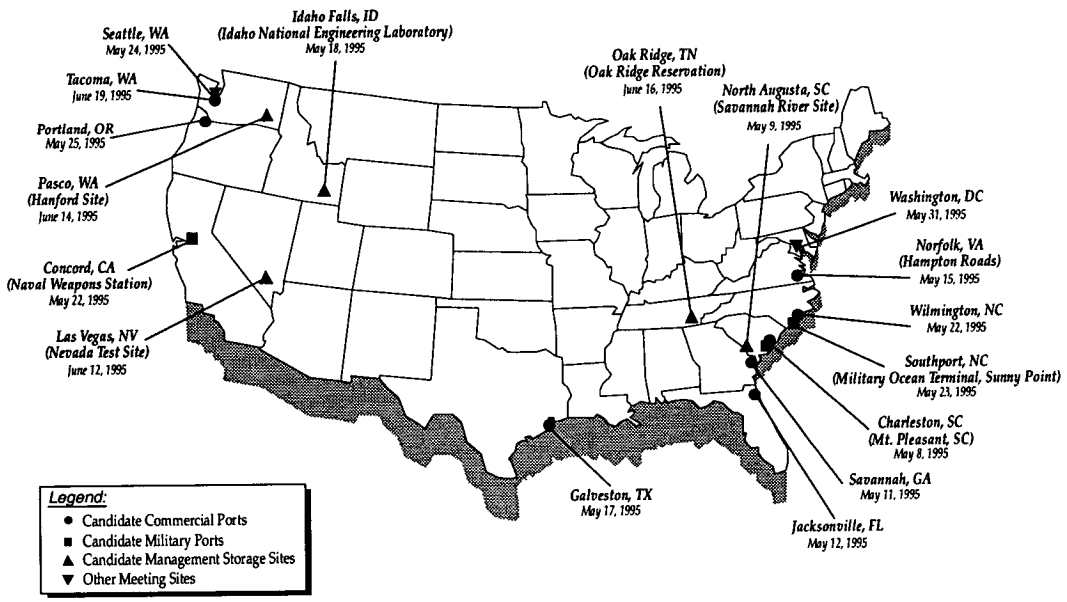


Figure S-14 Public Comment Hearing Locations and Dates

S.5.2 Written Comments

DOE received approximately 5,040 written comments contained within approximately 1,250 submissions. Written comments were submitted to DOE by mail and facsimile and at many of the public hearings. These written comments were received from individuals, Federal and State agencies, Tribal governments, local governments, foreign entities, and non-government organizations such as environmental, public interest, and industry groups. All written comments were reviewed and considered in the preparation of the Final EIS and are presented in Section 2 of Volume 3 of the Final EIS.

S.5.3 Public Hearings

In an effort to encourage a dialogue between members of the public and government officials at the public hearings, DOE used an informal, interactive format and an independent professional facilitator. The hearings were preceded by an hour-long "open house" at which exhibits, videos, and other information materials were available for review, along with opportunity for one-on-one exchanges with DOE representatives. Comment forms were provided for those wishing to submit written comments at the hearings.

Public hearings began with an explanation of the hearing format by the independent facilitator, followed by a 30-minute overview by a DOE official on the proposed policy and the factors leading to the proposal's development. Following this presentation, attendees were encouraged to ask questions, offer comments, and engage in dialogue. Notetakers summarized the questions and comments and DOE responses at all hearings. A summary of all oral comments and statements from each hearing, along with the DOE responses, is presented in Volume 3, Section 3 of the EIS.

Approximately 900 people attended the 17 public hearings. An interactive format was used at all hearings except in Tacoma, Washington. At the Tacoma public hearing, attendees expressed a desire for a more traditional approach in which people presented statements of up to five minutes, with little or no dialogue between commentors and DOE. In addition, the Tacoma hearing attendees requested that a verbatim transcript be made of the meeting. A copy of this transcript is included as Attachment 1 to Volume 3, Section 3 of the EIS.

S.5.4 Environmental Protection Agency Rating of EIS

The U.S. Environmental Protection Agency reviewed and rated the Draft EIS proposed action and each alternative as "lack of objections (LO)," which means that the EPA has not identified any potential environmental impacts requiring modifications to the proposal. A copy of the U.S. Environmental Protection Agency rating is included among the written comments in Volume 3, Section 2 of the Final EIS.

S.5.5 Major Issues Raised by Commentors

The public comments addressed a wide range of policy, economic, and technical issues. Of the approximately 6,000 written and oral comments received, few were critical of, or directed against, the analytical methods presented in the Draft EIS. The following is a

summary characterizing the most frequently raised issues and the corresponding summary of DOE's responses. (In each case, a summary of DOE's response is provided in bold text following the summary of the public comment.) DOE's full response to each specific comment and issue are provided in Sections 2 and 3, Volume 3 of the Final EIS.

S.5.5.1 Policy Considerations and Management Alternatives

Numerous comments and questions were received concerning the need for a policy to manage foreign research reactor spent nuclear fuel. Commentors questioned the need to adopt a policy to manage spent nuclear fuel from allied countries or from countries that are considered sufficiently developed to manage their own spent nuclear fuel. Other commentors questioned the objectives of the stated U.S. nuclear weapons nonproliferation policy and the rationale for considering the proposed policy, pointing out that some of the allied nations under the proposed action do not pose a nuclear weapons proliferation risk. ***The purpose of the proposed action is to support a U.S. nuclear weapons nonproliferation policy that seeks to reduce, and eventually eliminate, the use of highly-enriched (nuclear weapons-grade) uranium in civil programs worldwide. It is necessary to deal with spent nuclear fuel from the developed countries for several reasons.***

First, if the United States does not assist the developed countries with management of their spent nuclear fuel, the only mechanism available to them for spent nuclear fuel disposition would be to stay on or reconvert to use of highly-enriched uranium for fuel. Those who can accept the reprocessing wastes would disposition their spent nuclear fuel by having it reprocessed, and would recycle the remaining highly-enriched uranium. They would have to seek out sources of new highly-enriched uranium to make up for that burned, and to keep the enrichment level of the recycled uranium high enough to be of use. Since the United States could not ship additional highly-enriched uranium to them, they would likely resort to Russia or China as suppliers. Such actions could destroy all the progress made by the Reduced Enrichment for Research and Test Reactors program in attempting to eliminate the use of highly-enriched uranium in civil programs.

Second, many developed countries manufacture research reactors and sell them to developing countries. If, due to inaction by the United States, research reactors in the developed countries refuse to convert to low enriched uranium fuel, or switch back to the use of highly-enriched uranium fuel, their customers in developing countries would likely insist on obtaining reactors that also use highly-enriched uranium fuel.

Third, inaction by the United States that leads research reactors in developed countries to shut down due to the absence of a timely means of dispositioning of their spent fuel is likely to lead, rightly or wrongly, to accusations that the United States is failing to comply with its obligations under the Treaty on the Non-Proliferation of Nuclear Weapons to assist nonnuclear weapons States with peaceful applications of nuclear energy.

Some commentors further contended that the nuclear weapons nonproliferation objectives do not apply to the foreign research reactor spent nuclear fuel that contains low enriched uranium, which is not weapons-grade material. ***While it is true that low enriched uranium is not weapons-grade material, it is included in the policy because acceptance of low enriched uranium fuel would provide incentive for foreign research reactor operators to convert from highly-enriched uranium fuel to low enriched uranium fuel use. This incentive would be necessary to offset the considerable expense of conversion and the reductions in reactor***

capabilities and increased operating costs that generally accompany conversion to low enriched uranium fuel. Furthermore, by not accepting low enriched uranium, the United States would be penalizing the reactors that converted earlier under the Reduced Enrichment for Research and Test Reactors Program, because those reactors are now generating only low enriched uranium spent nuclear fuel. Since there is currently no alternative available for disposition of low enriched uranium spent nuclear fuel, the reactors that supported the Reduced Enrichment for Research and Test Reactors Program would be the first to shut down.

Some commentors believe that the continued production and export of nuclear materials by the United States appears to be in conflict with the stated U.S. nuclear weapons nonproliferation objectives. Several stated their opposition to the continued sale of new fuel for foreign research reactors, and a small number suggested that the United States cease production of all nuclear materials and develop alternative energy sources. ***As a result of the passage of the Energy Policy Act of 1992, the United States is prohibited from selling highly-enriched uranium to foreign countries, except under special conditions. Since enactment of this prohibition, no new licenses for the export of highly-enriched uranium have been issued by the United States. The United States is continuing to sell low enriched uranium since it is not a nuclear weapons material. Furthermore, by making low enriched uranium available, the United States is providing further support for reactor operators who agree to convert from use of highly-enriched uranium. With respect to development of alternative energy sources, DOE currently has on-going programs that are seeking to develop and promote use of various alternative energy sources, such as wind, water, and solar.***

Representatives of foreign research reactor operators enumerated several reasons why the United States should accept and manage foreign research reactor spent nuclear fuel. This generally held position was the result of the expiration of the Off-Site Fuels Policy, under which the United States had accepted foreign research reactor spent nuclear fuel. As a result, many foreign research reactor operators are running out of storage space for their spent nuclear fuel. The operators assert that this may cause some research reactors to shut down, as these countries do not have, and did not plan for, long-term storage facilities. Foreign research reactor operators point out that the Dounreay, United Kingdom, reprocessing facilities can only handle highly-enriched uranium at this time. As a result, foreign research reactor operators would likely revert to reliance on highly-enriched uranium which would be contrary to U.S. nuclear weapons nonproliferation policy.

Many members of the public and State and local governments supported the objectives of the proposed action, but urged further consideration of Management Alternative 2, which is to facilitate overseas management of the spent nuclear fuel with security precautions to ensure that the spent nuclear fuel is not diverted into a nuclear weapons program. Some also supported the No Action Alternative under which the United States would neither accept nor assist with the management of foreign research reactor spent nuclear fuel. Several Non-Government Organizations also expressed support for the proposed policy and cited the need to eliminate the use and stockpiling of highly-enriched uranium. ***DOE and the Department of State have considered these comments in selection of the preferred alternative. DOE's and the Department of State's reasons for not selecting the No Action Alternative or Management Alternative 2 are discussed in Section S.2.3 under the heading "Basis for the Preferred Alternative."***

Many commentors expressed concern about the cost to the United States of managing foreign research reactor spent nuclear fuel. Several opposed full subsidization of developed countries which they consider capable of managing their own spent nuclear fuel. Other commentors favored competitive pricing or charging the foreign research reactor operators a full-cost recovery fee for management of their spent nuclear fuel. Representatives of certain foreign research reactor operators expressed their willingness to pay a cost-based price, and stated that they are not asking U.S. taxpayers to subsidize their fuel cycles. A number of commentors asked for additional information in the Final EIS on life cycle costs, risks, and benefits. ***DOE and the Department of State have evaluated several financing options in the EIS, ranging from fees from the research reactor operators that would pay all of the costs of the program to full subsidization of the program by DOE. One of these options would be for developed countries (which represent about 87 percent of the spent nuclear fuel total mass and about 78 percent of the spent nuclear fuel elements) to pay a competitive fee for U.S. management of their spent nuclear fuel. As part of this option, DOE would subsidize the costs of managing the spent nuclear fuel from developing countries. The United States does not believe the developing countries can afford to pay the expense for spent nuclear fuel management either in the United States or in the host country.***

S.5.5.2 Ultimate Disposition

The ultimate disposition of DOE-owned spent nuclear fuel was a widely expressed policy concern. Many commentors, concerned with a lack of long-term storage options, raised the issue of the availability, or lack thereof, of a permanent geologic repository. Many urged that, before the United States accepts any spent nuclear fuel from foreign research reactors, a permanent repository must be established in this country. Some comments promoted reprocessing as a means to stabilize and prepare the spent nuclear fuel for geologic disposal. ***The Nuclear Waste Policy Act of 1982, as amended, establishes a framework for the ultimate disposition of spent nuclear fuel in the United States in a geologic repository. Any foreign research reactor spent nuclear fuel accepted into the United States under the alternatives considered in the EIS would be eligible for disposal in a geologic repository. Under authority of the Act, DOE is currently evaluating the feasibility of locating a geologic repository at Yucca Mountain in Nevada. In the meantime, however, DOE and the Department of State are seeking to stem the use of highly-enriched uranium in civil programs. Under the preferred alternative, if any foreign research reactor spent nuclear fuel were accepted into the United States, it would be treated and/or packaged, and the resulting materials placed in "road ready" storage pending the availability of a geologic repository, if it were not otherwise disposed of in the meantime.***

S.5.5.3 Transportation and Emergency Response

Transportation and emergency preparedness were key concerns expressed during the public comment period. The majority of comments dealt with identification of parties responsible for responding to an accident involving transport of the foreign research reactor spent nuclear fuel, local emergency response capability, marine and ground transportation routing, shipment methods, procedures, and safety criteria. ***Local and State responders would be the first to respond to a transportation accident involving the foreign research reactor spent nuclear fuel shipments, as they would to any overland shipment involving hazardous materials. State, local, and some Tribal governments have the basic capabilities and training that would be required in order to take initial measures to respond to a transportation accident by virtue of their preparation for responding to accidents involving hazardous***

materials, (i.e., assess the scene, administer emergency care, control the area, and call for a hazardous materials special team). DOE would develop emergency plans with the carrier, port officials, State, local, and Tribal officials and provide training courses for first responders to enhance their capabilities to respond appropriately in the unlikely event of an accident involving these spent nuclear fuel shipments. Technical assistance would also be provided to supplement existing State, local, or Tribal resources if any deficiencies are identified. In the event of an accident, if requested by a State, Tribal, or local government, DOE would send a radiological monitoring assistance team from the closest of eight DOE regional offices located across the country.

Appendix H, which was added to the Final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include communications and meetings between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders.

Many commentors were concerned about the safety of transportation casks. *Spent nuclear fuel is transported in "Type B" transportation casks that are designed and built to preclude release of radioactive material. They are subject to stringent design, fabrication, and operating requirements imposed by the Nuclear Regulatory Commission and Department of Transportation in the United States and by the International Atomic Energy Agency for international shipments, to withstand very severe accidents without releasing their contents. These casks are required to be able to pass stringent tests, including a 30-foot drop onto an unyielding surface (such surfaces are engineered and built for these tests and do not exist in nature), a drop onto a steel post (a puncture test), and a high temperature fire test. As a result of their very robust design and construction, to date, no "Type B" spent nuclear fuel transportation cask has ever been punctured, nor has one ever released its radioactive contents, even as the result of an accident.*

Comments on land transportation dealt mostly with routing concerns and emergency response. Several commentors requested that DOE provide notification to local officials and private citizens of the specific routes that would be used for truck or rail shipments. Many commentors expressed concern regarding the risks associated with the use of specific routes (major interstates through population centers) and during adverse weather and traffic conditions. Some questioned the safety records of radioactive waste trucking firms and inquired about the safety requirements imposed on these firms and the contract arrangements that DOE would make with the shippers. *As part of the development of a Transportation Plan (in which State, local and Tribal officials in addition to DOE, the carrier, shippers agent, the port and other Federal agencies would be involved), highway routes would be identified using criteria developed by the Department of Transportation. These criteria include using the Interstate highway system, selecting the shortest route or time in travel from the U.S. port of entry to the closest Interstate, and using by-passes or beltways to avoid major population centers. States and Tribes may designate alternate routes that are equivalent to the Interstate system in consultation with local officials, and approved by the U.S. Department of Transportation. Rail routing criteria used by the Department include avoiding interchanges and using the best available track. NRC approval of either rail or truck routes selected for use would be required. Official notification of the shipments would be provided to the Governor of each*

State and Governors or Chairpersons of Indian tribes along the route at least seven days in advance of shipment. In addition, DOE would use a satellite-based tracking system to notify Tribes and States of the pending shipment and to continuously track shipment progress. In order to maintain security, Governors and Tribal leaders are required by the NRC to only notify State and local officials who would need to know about the shipment, usually emergency management or law enforcement officials. With respect to the safety record of potential trucking firms, DOE has developed and implemented a mandatory Motor Carrier Evaluation Program with twelve evaluation criteria. Under the Motor Carrier Evaluation Program criteria, trucking firms with poor safety records would be excluded from transporting the spent nuclear fuel. The Motor Carrier Evaluation Program would be invoked as one of the requirements in DOE's foreign research reactor spent nuclear fuel acceptance contract. Other requirements would be discussed during the development of the Transportation Plan with the appropriate State, local, and Tribal officials.

Many commentors requested coordination with emergency responders en route so that localities can be prepared in the unlikely case of an accident. Many State, Tribal, and local representatives, as well as private citizens, commented that communities along shipping routes and at port and management site locations may have inadequate capabilities to respond to emergencies involving radioactive release. Many expressed the need for DOE funding for training, equipment, monitoring for local emergency responders, transportation plans, and real-time shipment tracking that would be accessible to emergency response personnel. A number of commentors suggested that the Final EIS should evaluate the potential impact on local services due to the financial burden associated with emergency response preparedness. *DOE is committed to working with State, Tribal, and local governments to ensure that they are prepared to carry out their responsibilities in the unlikely event of an accident involving shipment of foreign research reactor spent nuclear fuel. Details of emergency preparedness, security, and coordination of DOE with local emergency response authorities would be contained in the Transportation Plan, which would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State, Tribal, and local officials. Any additional training or equipment needed would be provided as part of the planning process. In addition to direct Federal assistance to State, Tribal, and local governments for maintaining emergency response programs, there are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advice and assistance to the State, Tribal, and local agencies who might be involved in responding to a radiological incident.*

Another group of commentors expressed concern regarding risks of terrorist activities. Several noted that terrorist activity is a concern of all countries, including the United States, citing the Oklahoma City bombing incident as an example. Commentors also stated that transporting nuclear material overseas to the United States would unnecessarily expose shipments to an increased possibility of terrorist threat. *In response to these concerns, Section D.5.9 was added to Appendix D of the EIS to specifically address terrorism and sabotage. This section concludes that while the risk of certain terrorist and sabotage attempts cannot be precluded, proper security measures would greatly reduce the risk. All shipments of foreign research reactor spent nuclear fuel would be conducted meeting, or exceeding, all the relevant security requirements in the Code of Federal Regulations. DOE would ensure through the spent nuclear fuel acceptance contracts with the reactor operators that proper security is provided at a port or in transit, based on the Nuclear Regulatory Commission requirements. Often local or State law enforcement personnel would be employed*

by the carrier to satisfy these security requirements, which include having armed escorts on board or near the shipment when it is in highly populated areas or at the port in the United States. In the case of military ports, a high level of security is inherently in place.

With regard to marine transport, many commentors stated a preference for using special purpose, chartered, or military ships rather than regularly-scheduled commercial liners to ship spent nuclear fuel. ***The use of commercial liners, chartered ships, and purpose-built ships was considered for the marine transport of the spent nuclear fuel. The analyses in the EIS indicate that the impacts associated with the use of any of the ships evaluated would be small. The impacts of using military ships were not analyzed in the EIS because DOE believes that the added security provided by such ships would not be required to ensure safe transport. DOE's preferred alternative includes the use of military ports as points of entry to the United States.*** Independent inspections by State, local, and/or public interest groups prior to and during shipments were suggested by some commentors. ***DOE would encourage inspections by authorized State agencies for both radiological and vehicle inspections prior to shipment and after arrival at the management site. These inspections would be coordinated with the States through the transportation planning process.***

S.5.5.4 Port Selection Criteria and Activities

Many commentors, predominately those from communities at or near potential ports of entry, questioned DOE's port selection process and the methods for application of the selection criteria, especially with respect to populations in and around candidate ports. Particular concerns were that longshoremen may not be adequately trained to handle radioactive materials or that they could be exposed to high levels of radioactivity. As an alternative, military ports were supported as having the necessary experience in handling nuclear material and being more secure. ***Section 3151 of Public Law 103-160 (the National Defense Authorization Act for the fiscal year 1994), requires that "the Secretary of Energy shall, if economically feasible and to the maximum extent practicable, provide for the receipt of spent nuclear fuel... at a port of entry in the United States which...had the lowest human population in the area surrounding the port of entry...". While this Act was written specifically to apply only to the receipt and storage of spent nuclear fuel at the Savannah River Site, DOE elected to apply this criterion, among others, to the maximum extent practicable, in identifying all suitable ports of entry for potential receipt of foreign research reactor spent nuclear fuel. In application of the population criterion, DOE considered both the population nearest the potential ports of entry analyzed, and the total population along the transportation routes. Analysis of the list of candidate ports against this criterion did not identify any port as a clear choice. Therefore, DOE selected ports that best met all of the criteria discussed in Appendix D to the EIS (e.g., appropriate experience, favorable transit from open ocean, appropriate facilities, access to intermodal transportation and human population). Both commercial and military ports were evaluated. Based on the results of this analysis, DOE believes that foreign research reactor spent nuclear fuel could be received safely via commercial ports, as it has been in the past. Nevertheless, DOE agrees that the use of military ports would provide additional security over that which would be available in a commercial port. Furthermore, although DOE has committed to provide assistance to State and local authorities to ensure that the longshoremen (or other workers) in a commercial port would have any additional training that might be required to allow them to safely handle the spent nuclear fuel, DOE considers that the personnel at a military ordnance facility would be particularly qualified to handle the spent nuclear fuel by***

virtue of their training and experience in performing their military function. Consideration of all these factors led to designation of the Naval Weapons Stations at Charleston and Naval Weapons Station Concord as the preferred ports of entry.

DOE notes that, although the maximum allowable radiation dose rate is 200 mrem per hour, this limit is applicable at the surface of the transportation cask, which would be inside of the container. The maximum radiation dose rate limit to those that would be near the container, such as longshoremen, is 10 mrem per hour at a distance of 2 meters (6.6 ft) from the surface of the container. The actual total dose that a longshoreman would get handling a cask would be quite small due to the fact that a handler would not be present at the surface of the container for long, and the total time near the cask would be quite short. The additional barrier imposed by the standard shipping container would also prevent the longshoreman from being in the near vicinity of the cask. The analysis in the EIS indicates that both the dose and dose rate for the port workers would be low.

Concerns over possible storage of spent nuclear fuel at the port of entry were raised by a number of commentors. *DOE's goal would be to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible. Under normal circumstances, the foreign research reactor spent nuclear fuel would remain at the port for only a few hours (e.g., 2 to 4 hours) and no more than 24 hours. In the very unlikely event that the spent nuclear fuel could not be moved within 24 hours, special provisions to move the fuel to a secure area at the port would be made. Part of the overall plan and agreements with the Department of Defense would include these special provisions.*

Several commentors pointed to recent increases in marine traffic and industrial congestion in the port areas and questioned whether the selection criteria would be affected by these factors. Some cited the need to consider site-specific factors such as hurricanes, severe winds, seismic activity, extreme weather conditions, and sinkholes. *In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay. In order to further assure safety, the U.S. Coast Guard would establish a moving zone of exclusion, which would keep all vessels away from the ship bringing the spent nuclear fuel into port. Coast Guard escort boats would accompany the ship to port. As for accidents, the potential consequences of a port or land transport accident due to an earthquake are represented and bounded by the potential port and land transportation accidents that are assessed in the EIS. Local hazards, such as earthquakes, volcanoes, and mud slides could be accident initiators; however, they would not increase the consequences of the accident, which were found to be low. Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that analyzed for accidents such as challenges to the transportation cask integrity that could be caused by casks falling from a bridge or down an embankment. These kinds of accidents are within the design standards developed by the NRC and by which cask designs are evaluated. The NRC certifies the designs that contain the appropriate level of safety to protect workers, the public, and the environment from the radioactive material being transported. Analysis of the potential impacts associated with the possible existence of sinkholes along potential rail routes was added to the Final EIS in response to public comment.*

S.5.5.5 *Economic Impacts to Candidate Port and Site Communities*

Potential economic impacts on affected port and site communities were the subject of many comments. Of particular concern were the socioeconomic impacts to a community in the event of an accidental release of radiation. Examples of potential impacts cited by commentors include disruptions in normal commerce, loss of business, loss of tourism, devaluation of property, and closure of ports and highway routes. Several port authorities were concerned about the potential for declining business due to the perceived stigma associated with handling nuclear waste materials in their ports, while others viewed handling these shipments positively. The costs of emergency response, cleanup, health care, and potential economic losses associated with accidents or releases were key concerns of several State, Tribal, and local officials. ***The risk associated with shipments of foreign research reactor spent nuclear fuel through any of the ports identified would be less than the risk associated with the handling of other hazardous cargoes due to the rigid criteria established for spent nuclear fuel shipping casks. In fact, no adverse impacts have been observed during the 30 years that foreign research reactor spent nuclear fuel was accepted into the United States. Historically, shipping foreign research reactor spent nuclear fuel through ports has not created a stigma or had an adverse economic impact on business, major industries, tourism, or future business development at ports. DOE does not believe that actions such as permanent road closures would be required for the safe and uneventful transportation of foreign research reactor spent nuclear fuel. Costs of emergency response are covered under insurance that is required of hazardous material carriers. If that level of coverage is exceeded, Price-Anderson and other Federal provisions would cover costs.***

S.5.5.6 *Health Effects and Environmental Risks*

Many commentors raised concerns about health effects and environmental risks that could result from accidents during marine transport, handling operations at ports, ground transportation, and interim management. Of particular concern were the effects of possible radioactive releases into the ocean and rivers, and on highways and railroads; the impacts to fish, wildlife, ecosystems, and drinking water; and the possibility of an increased risk to workers and the public of cancer and genetic defects. ***Human health and safety were primary considerations during the evaluation of environmental effects for the proposed alternatives. Conservative estimates of radiological and nonradiological impacts indicate that risks to the population and workers would be low. The analysis in the EIS indicates that the risks associated with an accident at sea or a port accident would be low. The impacts of the incident-free receipt, handling, and transportation of foreign research reactor spent nuclear fuel would also be extremely low. In over 40 years of spent nuclear fuel transportation, no "Type B" spent nuclear fuel transportation cask has ever been punctured or released any of its radioactive material contents. DOE believes that spent nuclear fuel transportation casks passing through any of the potential ports of entry or any other part of the country would be highly unlikely (i.e., less than a 1 in 10 million chance) to release their contents or adversely affect air or water quality.***

Several commentors questioned the results of the risk analyses in the EIS, suggesting that DOE may have underestimated the risk potential for accidents, radioactive release(s), and exposures to both workers and the public. ***DOE believes that the analyses of risk to people during marine transport and for those who live near potential ports of entry, along transportation routes, and near management sites are conservative (i.e., are likely to overstate the actual risk). These estimates were generated using standard computer codes (e.g.,***

RADTRAN) that have been adopted and used by the Nuclear Regulatory Commission and Department of Transportation for transportation calculations for over 19 years. These computer codes are available for public review.

Some commentors expressed concern about potential health impacts resulting from a cask sinking in deep waters. Many challenged the applicability of the severe accident tests applied to the casks (e.g., crash, fire, drop, immersion), stating that the conditions of real-life accidents were of greater magnitude than the conditions in the tests. For example, commentors cited fires that were alleged to have burned longer and hotter than those used to test the transportation cask and pointed out that the water in Puget Sound is deeper than the cask recovery depth cited in the Draft EIS. ***The EIS presents an evaluation of the consequences of accident scenarios that would result in the sinking of a spent nuclear fuel transportation cask on the continental shelf (water depth of about 200 meters), and in the deep ocean (water depth of more than 200 meters). In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal or inland waters, it would be recovered, even from the deepest portions of the Puget Sound, which reach depths of 305 meters (1,000 feet). The sequence of testing scenarios (i.e., cask drop onto unyielding surface, cask drop on a steel post [puncture], and cask fire) is required by the Nuclear Regulatory Commission as part of the certification of "Type B" spent nuclear fuel transportation casks. These tests conservatively represent a wide range of accident conditions that could occur during transport. The test results indicate that if such accidents were to occur, the cask most likely would not fail, and would not lead to a loss of containment. The cask drop and puncture tests evaluate the resulting impact on the most vulnerable orientation of the cask, and on an unyielding surface, which would be unlikely to occur while the cask was being transported in an International Standards Organization (ISO) approved container. In reference to shipboard fires, the duration of a fire is directly related to the amount of combustibles carried on board. The number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicate that of 1,073 ship collisions in port worldwide, only 11 led to fires, and of those, only 5 caused extensive damage, with only 1 actually causing buckling of structures.***

In regard to the impact a ship fire might have on a spent nuclear fuel transportation cask, there are three facts that mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship fire's intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it is almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of foreign research reactor spent nuclear fuel. The probability of reaching such a temperature is discussed in Attachment D5 to Appendix D of the EIS.

S.5.5.7 Public Involvement Process

A number of comments dealt with DOE's policies and procedures for conducting the public hearings, the duration of the public comment period, the degree to which comments would be considered by DOE in the decisionmaking process, and general distrust of DOE. Several commentors stated that there was insufficient notice and advertising for the public hearings. Many commentors stated the need for additional time to comment on the Draft

EIS. Commentors at the heavily-attended west coast port hearings tended to favor the more traditional, formal public hearing format, and strongly opposed the use of notetakers to summarize hearing issues. In the Tacoma area, commentors urged DOE to hold another hearing to tape record their comments for the record, without allowing for dialogue with DOE representatives. Many State and local officials requested that DOE provide better advance notification to communities that are being considered as candidate ports or management sites so that they have more time to review the Draft EIS. Many individuals stated they had not received the Draft EIS in a timely manner and consequently, had little time to review and comment. Several commentors expressed a desire for increased DOE interaction with local officials and more community participation in DOE's planning and decisionmaking processes.

Notice of the availability of the Draft EIS for public review and comment was published in the Federal Register (60 FR 19899, April 21, 1995). This notice advised concerned parties, including State, Tribal, and local authorities, of the availability of the Draft EIS and the dates and locations of the public hearings on the Draft EIS. In addition, advertisements of the public hearings were placed in local papers prior to their occurrence. The public hearing format adopted by DOE provided an opportunity for interaction between DOE and the public, thus serving to facilitate communication.

In response to public concerns of insufficient time to review the Draft EIS, DOE extended the deadline for submission of written public comments from June 20 to July 20, 1995. DOE considers that this 90-day period was sufficient for public comment. All oral comments presented at each hearing were summarized and have been addressed along with the written comments in Volume 3 of the Final EIS. DOE considers that these actions have provided ample opportunity for the public to comment. Issues raised by the public during the comment period were considered in selection of the preferred alternative for this proposed action. All comments, written and oral, are part of the public record.

S.5.6 Availability of the EIS

Copies of the EIS and the EIS Summary may be obtained by calling DOE's Center for Environmental Management at 1-800-736-3282 (1-800-7-EM DATA). The EIS and EIS Summary may be reviewed at any of the Reading Rooms identified in this Summary.

General questions concerning the NEPA process, under which EISs are prepared, may be addressed to:

Ms. Carol Borgstrom
Office of NEPA Policy and Assistance (EH-42)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585
Telephone (202) 586-4600, or leave message at 1-800-472-2756

Written request for clarifications concerning the Foreign Research Reactor Spent Nuclear Fuel program may be sent to:

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

S.5.7 Record of Decision

The Record of Decision, to be issued no less than 30 days after the Environmental Protection Agency publishes a *Federal Register* Notice of Availability for the Final EIS, will document the decisions made by DOE and the Department of State after the evaluation of the potential environmental impacts of the range of alternatives and appropriate non-environmental factors.

S.5.8 DOE Reading Rooms

A complete copy of the Final EIS and a list of reference documents may be reviewed at any of the public Reading Rooms and information locations listed below.

- Department of Energy Reading Rooms -

Public Reading Room for U.S. Department of Energy Headquarters

Room 1E-190, Forrestal Building
Freedom of Information Reading Room
1000 Independence Avenue, SW
Washington, DC 20585

(202) 586-6020

Public Reading Room for U.S. Department of Energy Oakland Operations Office

Environmental Information Center
1301 Clay Street, Room 700 N
Oakland, CA 94612

(510) 637-1762

Public Reading Room for U.S. Department of Energy Rocky Flats Operations Office

Front Range Community College Library
3645 W. 112th Avenue, Level B
Westminister, CO 80030

(303) 469-4435

Public Reading Room for U.S. Department of Energy Idaho Operations Office

Public Reading Room
1776 Science Center Drive
Idaho Falls, ID 83402

(208) 526-9162

Public Reading Room for U.S. Department of Energy University of Illinois at Chicago Library

Government Documents Section
801 South Morgan Street
Chicago, IL 60607

(312) 996-2738

Public Reading Room for U.S. Department of Energy National Atomic Museum

87117 Wyoming Boulevard, SE (Kirtland AFB)
Albuquerque, NM 87185

(505) 845-4378

Public Reading Room for U.S. Department of Energy Nevada Operations Office

Coordination and Information Center
3084 South Highland Drive
P.O. Box 98521
Las Vegas, NV 89106

(702) 295-0731

Public Reading Room for U.S. Department of Energy Fernald Operations Office

Public Environmental Center
JANTER Building 10845
Hamilton-Cleves Highway
Harrison, OH 44503

(513) 738-0164

Public Reading Room for U.S. Department of Energy Savannah River Operations Office

DOE Public Reading Room
University of South Carolina - Aiken Campus
Grigg-Graniteville Library
2nd Floor
171 University Parkway
Aiken, SC 29801

(803) 641-3320

Public Reading Room for U.S. Department of Energy Oak Ridge Operations Office

Public Reading Room
55 Jefferson Avenue
Oak Ridge, TN 37831

(615) 576-1216

Public Reading Room for U.S. Department of Energy Richland Operations Office

Washington State University Tri-Cities
100 Sprout Road, Room 130 West
Richland, WA 99352

(509) 376-8583

- Other Locations -

Concord Branch Library

2900 Salvio Street
Concord, CA 94519

(510) 646-5455

George A. Smathers Libraries, Library West

University of Florida Library, Room 241
P.O. Box 11701
Gainesville, FL 32611-7001

(904) 392-0367

Jacksonville Public Library

Documents Department
122 North Ocean Street
Jacksonville, FL 32202

(904) 630-2665

Atlanta Public Library

Government Documents Section
1 Margaret Mitchell Square
Atlanta, GA 30303

(404) 730-1700

Reese Library

Augusta College
2500 Walton Way
Augusta, GA 30904-2200

(706) 737-1744

Chatham-Effingham-Liberty Regional Library

2002 Bull Street
Savannah, GA 31401

(912) 234-5127

Boise Public Library

Government Documents Section
715 South Capitol Boulevard
Boise, ID 83702

(208) 384-4023

INEL Oversight Program Library

Idaho Department of Health & Welfare
1410 North Hilton, Third Floor
Boise, ID 83706

(208) 334-0498

Idaho Falls Public Library

457 Broadway
Idaho Falls, ID 83402

(208) 529-1462

Pocatello Public Library

812 East Clark Street
Pocatello, ID 83201

(208) 232-1263

Twin Falls Public Library

Reference Desk
434 Second Street East
Twin Falls, ID 83301

(208) 733-2964

Amargosa Valley Community Library

HCRoute 69, Box 401-T
829 Farm Road
Amargosa Valley, NV 89020

(702) 372-5340

Carson City Public Library

900 North Roop Street
Carson City, NV 89701

(702) 887-2244 or (702) 887-2245

Nye County Nuclear Waste Repository Project Office

P.O. Box 1767
475 St. Patrick Street
Tonopah, NV 89049

(702) 482-8183

Brunswick County Government Center

Mr. Wyman Yelton, City Manager
P.O. Box 249
45 Court House Drive, NE
Bolivia, NC 28422

(910) 253-4331

Pembroke State University Library

1 University Drive
Pembroke, NC 28372

(910) 521-6265

- Other Locations (Continued) -

D. H. Hill Library

North Carolina State University
P.O. Box 7111
Raleigh, NC 27695-7111

(919) 515-3364

New Hanover County Public Library

Attn: Daniel Horn
201 Chestnut Street
Wilmington, NC 28401

(910) 341-4390

Brantford Price Millar Library

Portland State University
934 S.W. Harrison
Portland, OR 97201

(503) 725-4617

Charleston County Main Library

404 King Street
Charleston, SC 29403

(803) 723-1645

South Carolina State Library

1500 Senate Street
Columbia, SC 29201

(803) 734-8666

Berkeley County Library

100 Library Street
Monks Corner, SC 29461

(803) 722-3550

Otranto Regional Library

2261 Otranto Road
North Charleston, SC 29418

(803) 572-4094

Clinton Public Library

118 South Hicks Street
Clinton, TN 37716

(615) 457-0519

Lawson McGhee Public Library

500 West Church Avenue
Knoxville, TN 37902

(615) 544-5750

Memphis/Shelby County Public Library and Information Center

1850 Peabody Avenue
Memphis, TN 38104

(901) 725-8800

Oak Ridge Public Library

Civic Center
Oak Ridge, TN 37830

(615) 482-8455

Rosenberg Library

Attn: Judy Young
2310 Sealy Avenue
Galveston, TX 77550-2296

(409) 763-2526

Houston Public Library

Attn: Social Sciences
500 McKinney
Houston, TX 77002

(713) 247-2222

Hampton Public Library

4207 Victoria Boulevard
Hampton, VA 23669

(804) 727-1154

Newport News Public Library

Grissom Branch
366 Deshazor Drive
Newport News, VA 23602

(804) 886-7896

Kirn Library

301 East City Hall Avenue
Norfolk, VA 23510

(804) 441-2429

- Other Locations (Continued) -

Portsmouth Public Library

Main Branch
601 Court Street
Portsmouth, VA 23704

(804) 393-8501

Owen Science & Engineering Library

Washington State University
Pullman, WA 99164-3200

(509) 335-4181

Seattle Public Library

1000 Fourth Avenue
Seattle, WA 96104

(206) 386-4636

Suzallo Library, SM25

University of Washington Libraries
University of Washington
Seattle, WA 98185

(206) 543-9158

Foley Center

Gonzaga University
East 502 Boone Avenue
Spokane, WA 99258

(509) 328-4220, Extension 3125

Pierce County Library

300 512th Street, East
Tacoma, WA 98446

(206) 536-6500

Tacoma Public Library

1102 Tacoma Avenue South
Tacoma, WA 98402

(206) 591-5666

NEPA TEAM

DOE/EIS-0218F
February 1996

Volume 2

FINAL ENVIRONMENTAL IMPACT STATEMENT

on a

Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Appendix A
Environmental Justice Analysis

United States Department of Energy
Assistant Secretary for Environmental Management
Washington, DC 20585

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Appendix A
Environmental Justice Analysis

A.1 Introduction

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations,* directs Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. Executive Order 12898 also directs the Administrator of the Environmental Protection Agency to convene an interagency Federal Working Group on Environmental Justice. The Working Group is directed to provide guidance to Federal agencies on criteria for identifying disproportionately high and adverse human health or environmental effects on minority and low-income populations. The Working Group has not yet issued the guidance directed by Executive Order 12898, although it has developed working draft definitions. The definitions used in this analysis are based on the draft working definitions. Further, in coordination with the Working Group, DOE is in the process of developing internal guidance on implementing the Executive Order. Because both the Working Group and DOE are still in the process of developing guidance, the approach taken in this analysis may depart somewhat from whatever guidance is eventually issued.

This appendix addresses environmental justice for the acceptance of foreign research reactor spent nuclear fuel containing uranium enriched in the United States. Analyses of environmental justice concerns are provided in three areas: (1) potential ports of entry, (2) potential transportation routes from candidate ports of entry to interim management sites, and (3) areas surrounding potential interim management sites. These analyses lead to the conclusion that the alternatives analyzed in this Environmental Impact Statement (EIS) would result in no disproportionately high and adverse effects on minority populations or low-income communities surrounding the candidate ports, transport routes, or interim management sites.

A.2 Concerns and Definitions

Public comments show a widespread concern for public health and safety because spent nuclear fuel is radioactive. Two related environmental documents (DOE, 1995 and DOE, 1994) have been published recently which address the safety and potential health issues due to transportation and storage of spent nuclear fuel. Analyses of radiological health effects in those documents as well as this EIS (see Chapter 4) demonstrate that the expected health effects are small. In the case of spent nuclear fuel from foreign research reactors, no fatalities are expected due to radiological exposure or traffic accidents. No significant health effects are expected for the general population. Consequently, there would be no disproportionately high or adverse human health effects imposed on any population segment. In the sections below, minority and low-income populations are identified in the areas near potential candidate ports of entry, potential interim management sites, and potential transportation routes. The 1990 census data were used in this appendix as the basis of the analysis (DOC, 1992). This allows equal comparison of data between ports, sites, and routes in different states.

The analysis uses the following draft definitions:

- *Minority* — Individuals classified by the U.S. Bureau of the Census as Negro/Black/African American, Hispanic, Asian and Pacific Islander, American Indian, Eskimo, Aleut, and other non-White persons. The minority population in an affected area is the number of individuals residing in the area who are members of a minority group.

- *Low-Income Community* — An area for which the median household income is 80 percent or below the median household income for the metropolitan statistical area (urban) or county (rural). While "80 percent" is used in this analysis based on definitions used by the U.S. Department of Housing and Urban Development, this percentage may change in the final guidelines under preparation by the Working Group and the Department of Energy.

- *Disproportionately High and Adverse Human Health Effects* — Any human health effects, including cumulative or synergistic effects, on minority or low-income populations which substantially exceed generally accepted levels of risk. This is a draft definition prepared by the Working Group which might change during preparation of the final guidelines.

- *Substantially Affect Human Health* — To impact human health such that there is a measurable incidence of any specific illness, disease, or disorder significantly higher than the national average. This is also a draft definition developed by the Working Group which might change during preparation of final guidelines.

A.3 Environmental Justice in Areas Near the Candidate Ports of Entry

Under normal port activities associated with receipt of the spent nuclear fuel shipments — including harbor activities, unloading the ship, transfer of the spent nuclear fuel casks to truck or train, and movement out of the port city — the dominant radiological impacts were shown in Section 4.2.2 to be the exposures received by the workers in the immediate vicinity of the shipping cask. These individuals include inspectors, shipping cask handlers, and truck drivers. Since the intensity of the radiation from the cask falls off with distance, the doses that might be received by other workers and members of the general population can theoretically be calculated, but would not generally be measurable or distinguishable from natural background radiation.

Potential radiological impacts to people residing near the port are associated with low probability (less than one in a million) accidents that are so severe that the spent nuclear fuel casks rupture and a fire would burn long enough around the cask that some of the radioactive material would be released. In this case, some of the radioactive spent nuclear fuel might be vaporized and lifted by the heat of the fire and carried downwind of the accident location. Where and how far this radioactive material would go before being deposited on the ground would depend on how high the heat from the fire lofts it and the particular weather conditions at the time. Most of this vaporized spent nuclear fuel would be expected to be deposited in the first few miles downwind of the fire but small amounts could be carried out for several tens of miles.

Because the particular details of both the accident conditions (such as the severity of the fire) and the weather conditions at the time of an accident could vary widely, a range of accident conditions and wind directions, wind speeds, and other weather conditions were examined during the evaluation of accident effects (see Section 4.2.2.3). Population impact evaluations were performed for distances out to 80 km (50 mi). Risks of latent cancer deaths were found to range from about 0.003 to 0.000003 latent cancer fatalities (LCF). No latent cancer fatalities would be expected due to accidents at ports.

Containerized spent nuclear fuel casks shipped under the proposed policy would be transferred from the ship at commercial or military ports by personnel experienced in handling containerized cargo, and shipped by truck or rail to one of the five candidate interim management sites. Candidate ports may handle thousands of standard containers each month, unloaded from vessels which can carry up to several thousand casks. The number of casks to be handled would be small in comparison to routine cargo handling, thus having a negligible impact on normal port activities.

As part of the environmental justice analysis, distributions of minority populations and low-income households surrounding candidate ports of entry were estimated from 1990 census data. Although radiological health effects resulting from an accident are calculated at distances up to 80 km (50 mi), the largest radiological effects would usually be expected to occur within roughly a 16-km (10-mi) radius of the accident site. Thus, the distribution of minority and low-income populations is described for circular areas defined by a 16-km (10-mi) radius, centered at each candidate port of entry.

A.3.1 Distribution of Minority Populations Near the Candidate Ports

The minority population characteristics within 16 km (10 mi) of candidate ports of entry for foreign research reactor spent nuclear fuel are presented in Table A-1. For comparison, this table lists minority population features for regions surrounding the ports and for counties which lie partially within the 16-km (10-mi) radius centered at the port. Population characteristics shown in the table were extracted from 1990 census data available from the U.S. Bureau of the Census. The data resolves population characteristics at the "block group level," which generally consists of between 250 and 550 housing units.

With the exception of the Port of Wilmington and 2 military ports, MOTSU (Military Ocean Terminal, SUnny Point) and NWS (Naval Weapons Station) Concord, the percentage of minority populations residing within 16 km (10 mi) of candidate ports exceeds the percentage of minority populations residing within the state. Similarly, the percentage of minority populations residing near the candidate ports exceeds the percentage of minorities residing in counties surrounding the candidate ports. Ports at MOTSU, NWS Concord, Portsmouth, and Newport News are exceptions with larger percentages of minority populations in the surrounding counties.

The racial and ethnic composition of minority populations residing near the candidate ports is shown in Table A-2. In the case of candidate ports located on the east coast, African Americans compose the largest portion of the minority population. Minority populations residing near the candidate ports on the west coast are comprised of a more uniform mixture of African Americans, Asians, Hispanics, and Native Americans. The minority population residing near the Port of Galveston on the Gulf of Mexico is predominately African American and Hispanic.

The spatial distribution of minority populations residing within 16 km (10 mi) of each of the candidate ports is shown in the maps of those ports as presented in Figures A-1 to A-11. The circle shown in each figure has a 16-km (10-mi) radius, centered on the port. As indicated in the legend of each figure, geographical areas are shaded according to the percentage of minority population within the area. Resolution in the figures is at the census block group level. Due to variations in the populations of block groups, the geographical size of any particular block group area is not necessarily proportional to the numerical population. As an example, for ease of enumeration, the U.S. Bureau of the Census may define block group boundaries which actually extend into oceans, bays, or lakes. This allows inclusion in the census data of individuals who reside on boats or offshore houses, a situation particularly predominant in locations such as Galveston (see Figure A-3).

Table A-1 Minority Populations Residing Near the Candidate Ports

Candidate Port	Total Population Residing within 16 km of Port	Minority Population Residing within 16 km of Port	% Minority Population Residing within 16 km of Port	Total Population Residing in Surrounding Counties	Minority Population Residing in Surrounding Counties	% Minority Population Residing in Surrounding Counties	Population Residing in Surrounding State(s)	Minority Population Residing in Surrounding State(s)	% Minority Population Residing in Surrounding State(s)
Charleston, SC:									
Wando Terminal	233,424	82,271	35.2	423,815	145,534	34.3	3,486,703	1,094,792	31.4
NWS Terminal	209,188	73,437	35.1	423,815	145,534	34.3	3,486,703	1,094,792	31.4
Galveston, TX	73,322	36,375	49.6	217,445	72,133	33.2	19,986,510	6,665,631	33.4
Hampton Roads, VA:									
Newport News	430,757	161,317	37.4	1,010,296	400,061	39.6	6,187,358	1,484,501	24.0
Norfolk	681,864	300,179	44.0	1,010,296	400,061	39.6	6,187,358	1,484,501	24.0
Portsmouth	665,700	248,099	37.3	1,010,296	400,061	39.6	6,187,358	1,484,501	24.0
Jacksonville, FL	334,212	123,336	36.9	758,647	203,833	26.9	12,937,926	3,449,230	26.7
MOTSU, NC	7,995	1,496	18.7	50,985	9,835	19.3	6,628,637	1,651,356	24.9
NWS Concord, CA	381,070	110,969	29.1	1,145,248	375,442	32.8	29,760,021	12,666,060	42.6
Portland, OR	356,064	54,704	15.4	1,395,233	138,500	9.9	2,842,321	261,730	9.2
Savannah, GA	155,166	80,361	51.8	344,677	128,206	37.2	9,964,919	3,023,249	30.3
Tacoma, WA	511,575	85,341	16.7	2,123,421	347,788	16.4	4,866,692	637,561	13.1
Wilmington, NC	115,057	27,301	23.7	200,124	44,757	22.4	6,628,637	1,651,356	24.9

Table A-2 Racial and Ethnic Composition for Populations Residing Within 16 km of the Candidate Ports

Candidate Port	Total Pop.	Total Minority Pop.	% Minority Pop.	Amer. Indian, Eskimo or Aleut Pop.	% Amer. Indian, Eskimo or Aleut	Asian or Pacific Islander Pop.	% Asian or Pacific Islander	African Amer. Pop.	% African Amer.	Hispanic Origin Pop.	% Hispanic Origin	Other Race	% Other Race	White	% White
Charleston, SC:															
Wando Terminal	233,424	82,271	35.2	531	0.2	1,804	0.8	76,783	32.9	3,042	1.3	109	0.05	151,143	64.8
NWS Terminal	209,188	73,437	35.1	767	0.4	3,496	1.7	64,961	31.1	4,099	2.0	115	0.05	135,751	64.9
Galveston, TX	73,322	36,375	49.6	262	0.4	1,271	1.7	19,737	26.9	15,012	20.5	90	0.12	36,946	50.4
Hampton Roads, VA:															
Newport News	430,757	161,317	37.4	1,932	0.4	7,872	1.8	138,920	32.3	12,300	2.9	292	0.07	269,441	62.6
Norfolk	681,864	300,179	44.0	2,971	0.4	10,697	1.6	270,729	39.7	15,308	2.2	471	0.07	346,410	50.8
Portsmouth	665,700	248,099	37.3	2,763	0.4	9,612	1.4	221,200	33.2	14,069	2.1	453	0.07	322,815	48.5
Jacksonville, FL	334,212	123,336	36.9	960	0.3	5,456	1.6	108,641	32.5	8,149	2.4	128	0.04	210,815	63.1
MOTSU, NC	7,995	1,496	18.7	32	0.4	7	0.1	1,359	17.0	90	1.1	6	0.08	6,498	81.3
NWS Concord, CA	381,070	110,969	29.1	2,769	0.7	42,788	11.2	26,452	6.9	38,498	10.1	460	0.12	270,102	70.9
Portland, OR	356,064	54,704	15.4	4,086	1.1	12,617	3.5	27,012	7.6	10,632	3.0	355	0.10	301,359	84.6
Savannah GA	155,166	80,361	51.8	370	0.2	1,578	1.0	76,583	49.4	1,734	1.1	94	0.06	74,805	48.2
Tacoma, WA	511,575	85,341	16.7	7,095	1.4	28,321	5.5	32,687	6.4	16,779	3.3	457	0.09	426,231	83.3
Wilmington, NC	115,057	27,301	23.7	534	0.5	587	0.5	25,360	22.0	796	0.7	22	0.02	87,755	76.3

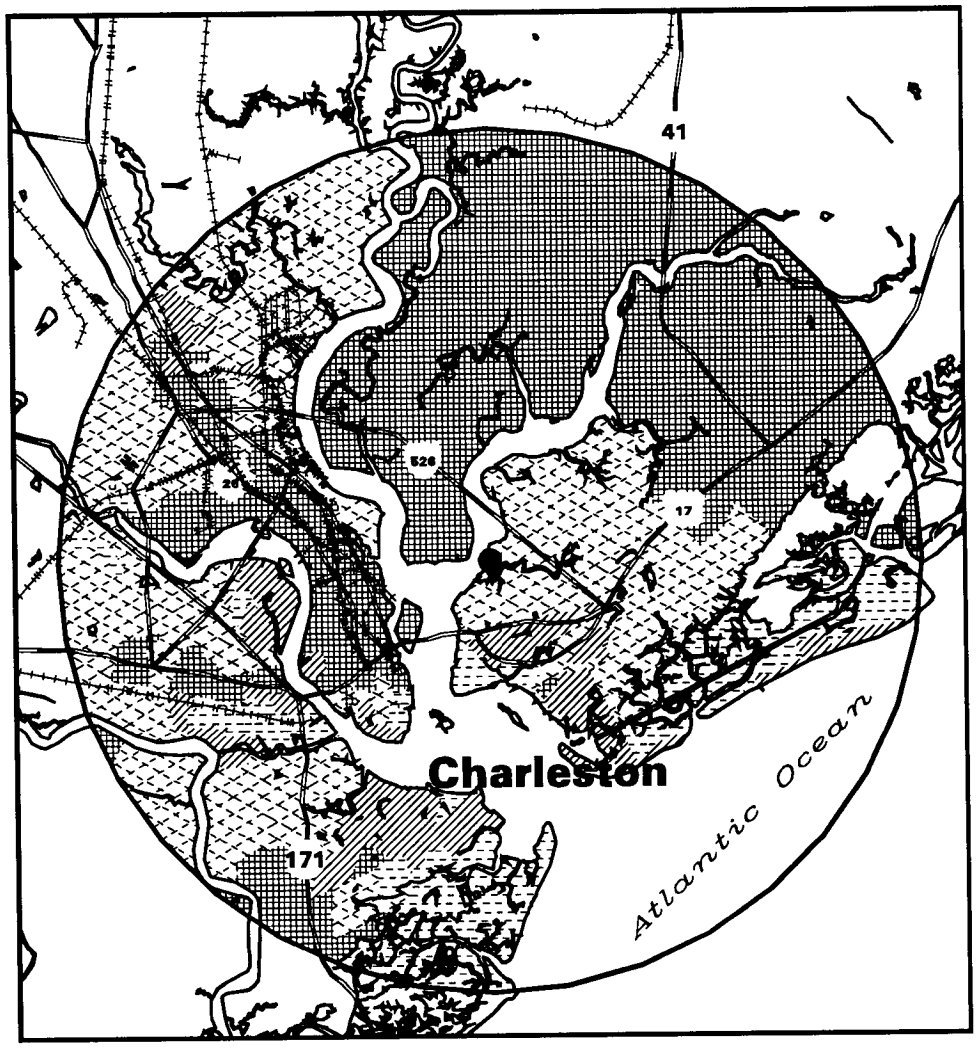


Figure A-1 Distribution of the Minority Population Residing within 16 km of the Wando Terminal, Port of Charleston, South Carolina

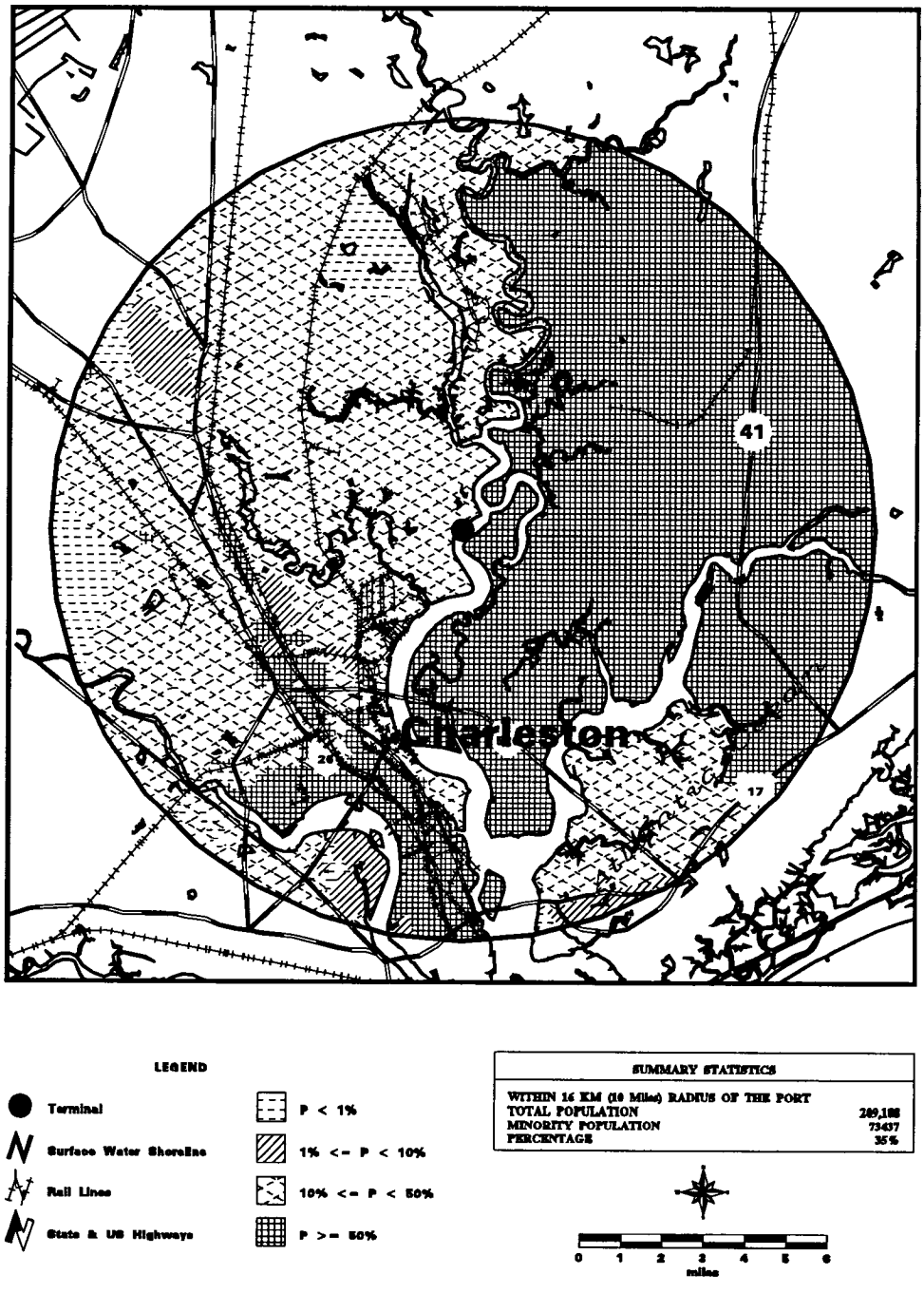
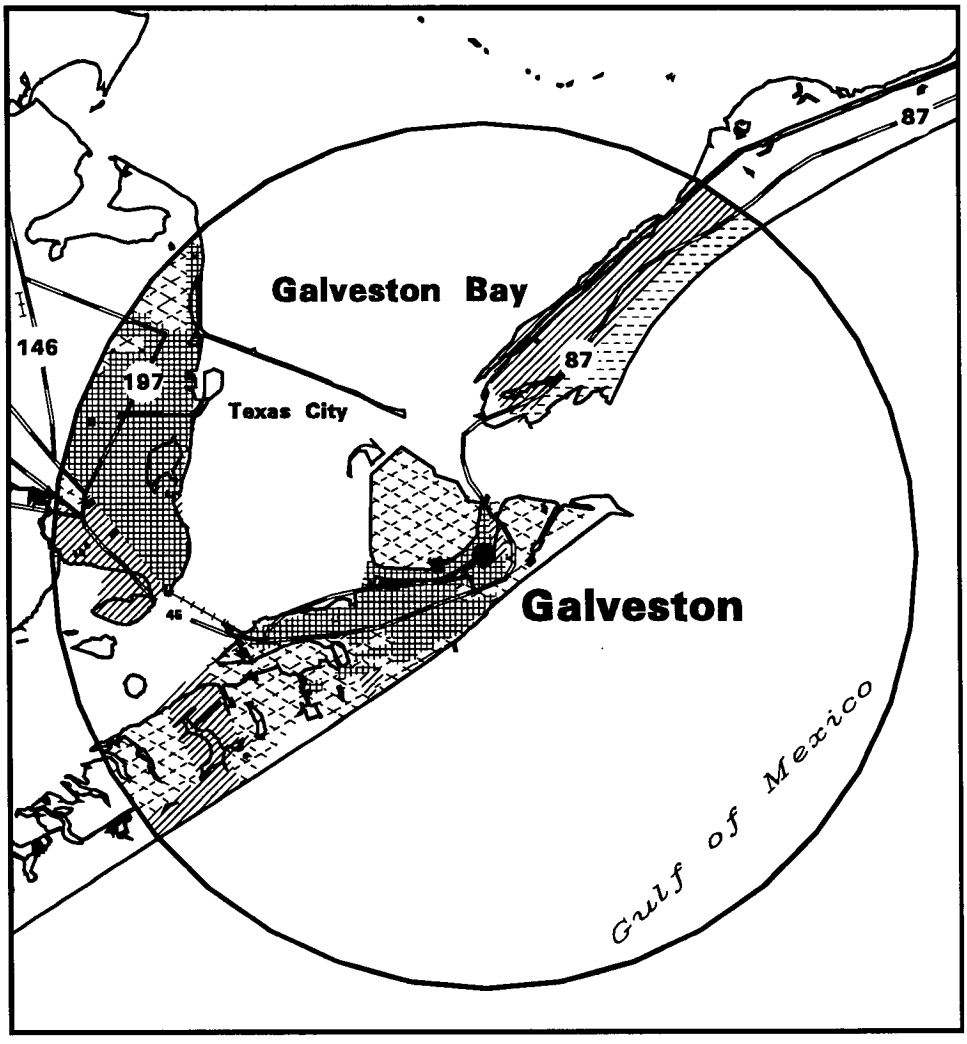


Figure A-2 Distribution of the Minority Population Residing within 16 km of the NWS Charleston, South Carolina



LEGEND

- Terminal
- Surface Water Shoreline
- Rail Lines
- State & US Highways
- P < 1%
- 1% <= P < 10%
- 10% <= P < 50%
- P >= 50%

SUMMARY STATISTICS	
WITHIN 16 KM (10 Miles) RADIUS OF THE PORT	
TOTAL POPULATION	73,322
MINORITY POPULATION	36,375
PERCENTAGE	50%

0 1 2 3 4 5 6
miles

Figure A-3 Distribution of the Minority Population Residing within 16 km of the Port of Galveston, Texas

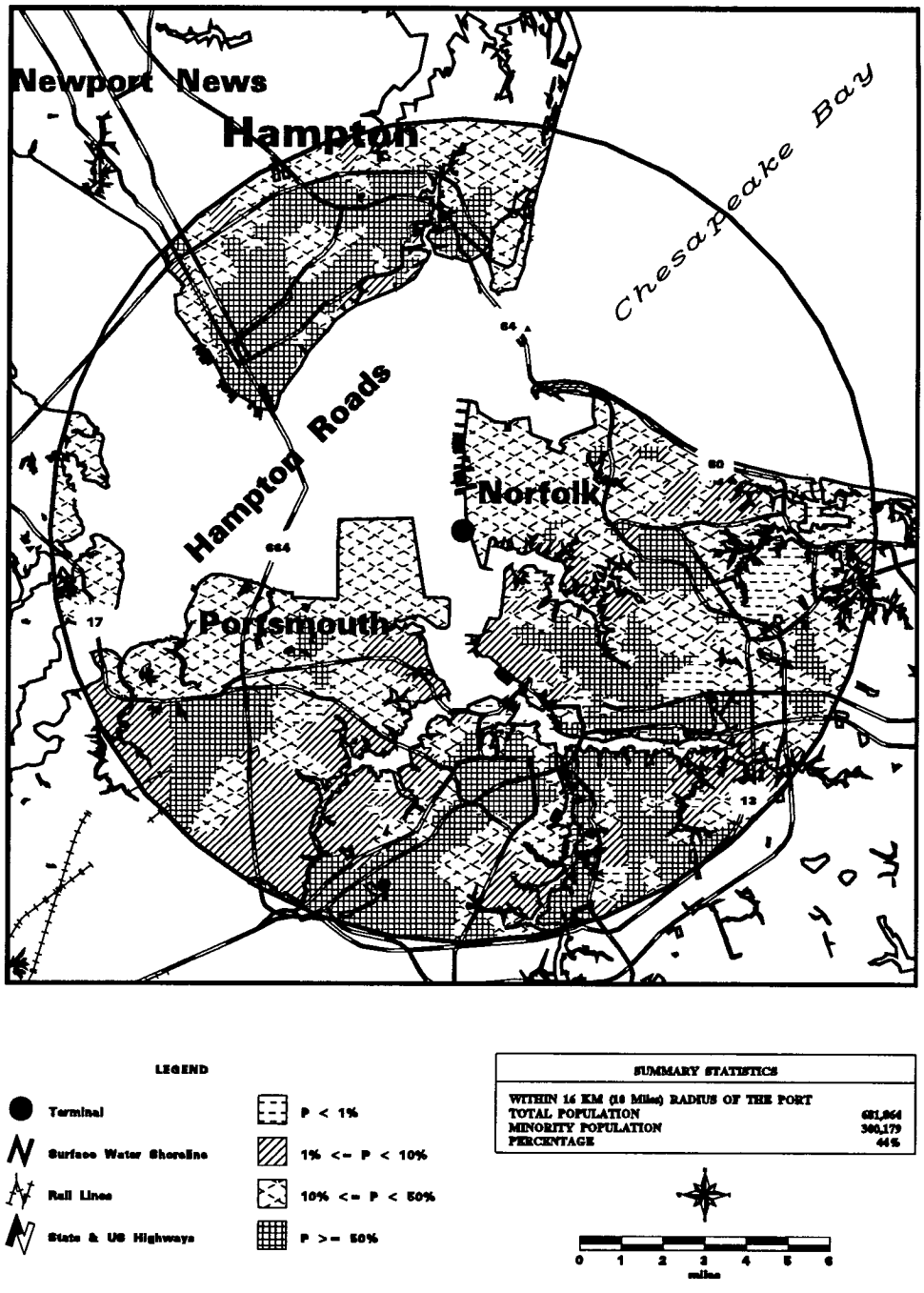


Figure A-4 Distribution of the Minority Population Residing within 16 km of the Port of Hampton Roads: Newport News, Norfolk, and Portsmouth, Virginia Terminals

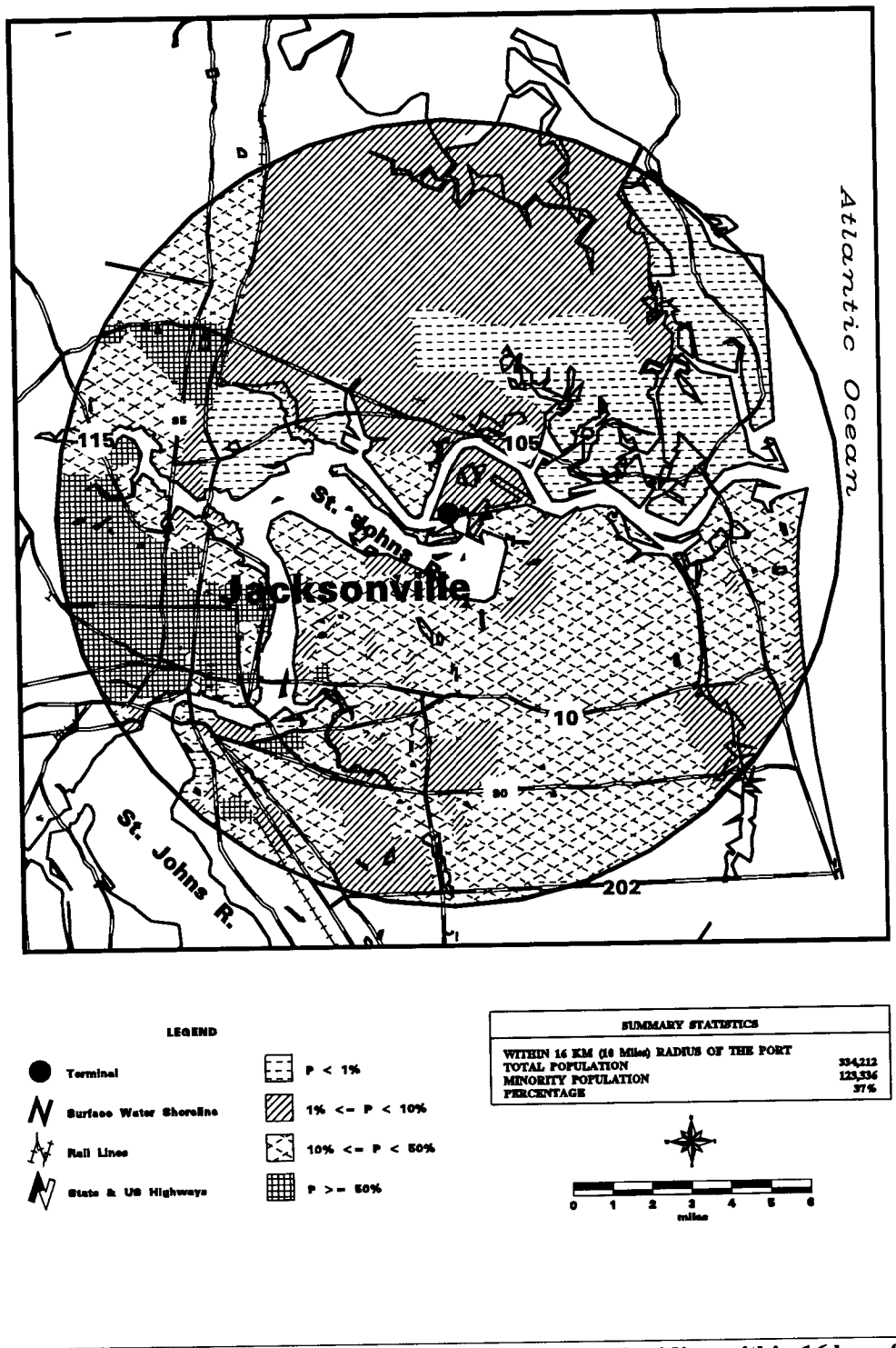


Figure A-5 Distribution of the Minority Population Residing within 16 km of the Port of Jacksonville, Florida

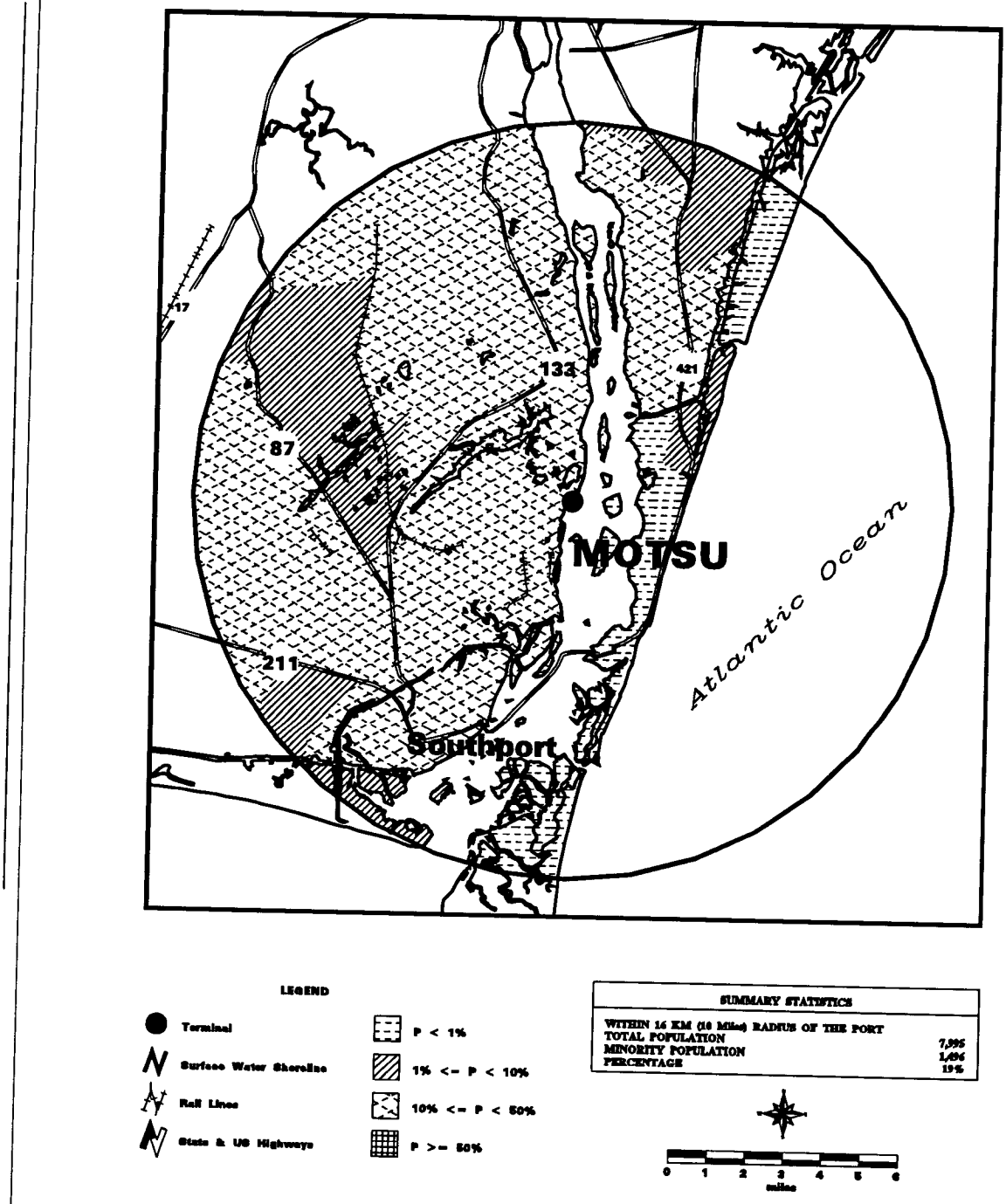


Figure A-6 Distribution of the Minority Population Residing within 16 km of the Port of MOTSU, North Carolina

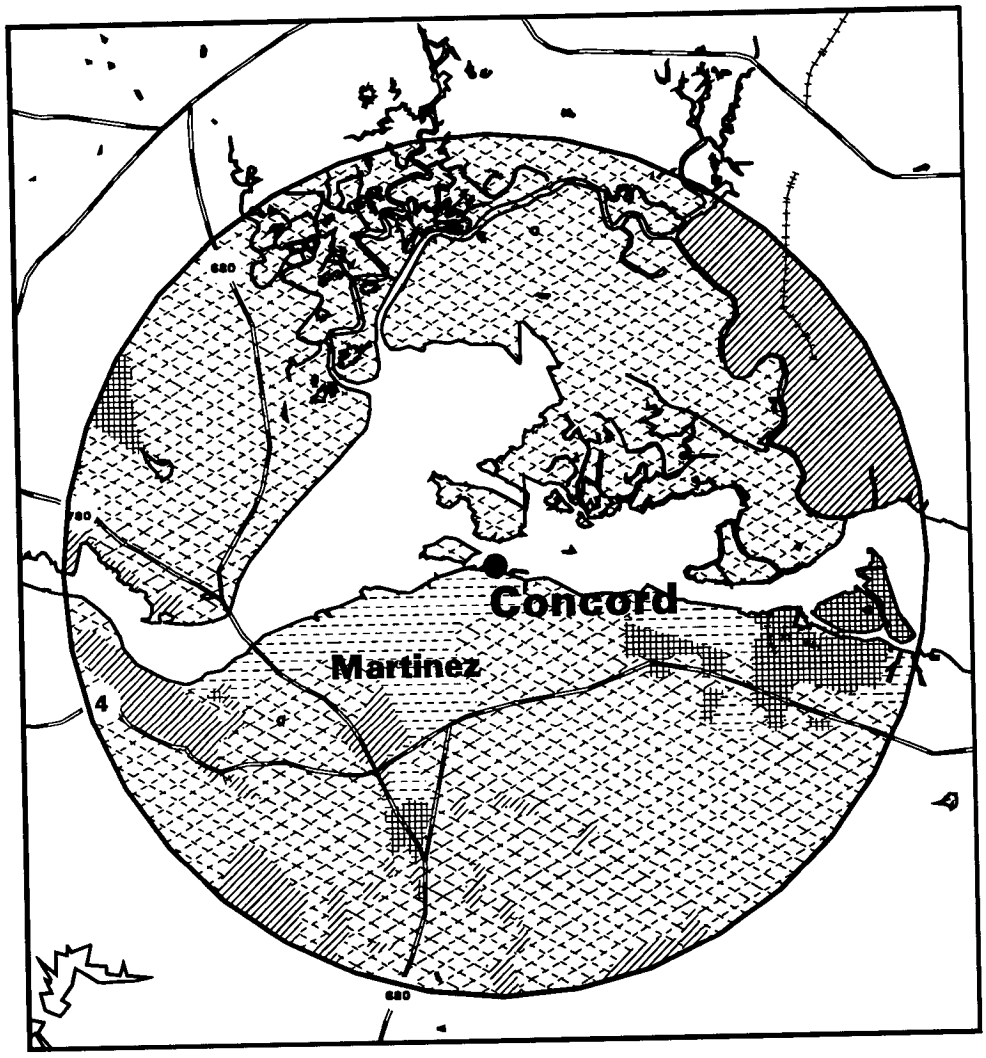


Figure A-7 Distribution of the Minority Population Residing within 16 km of the Port of NWS Concord, California

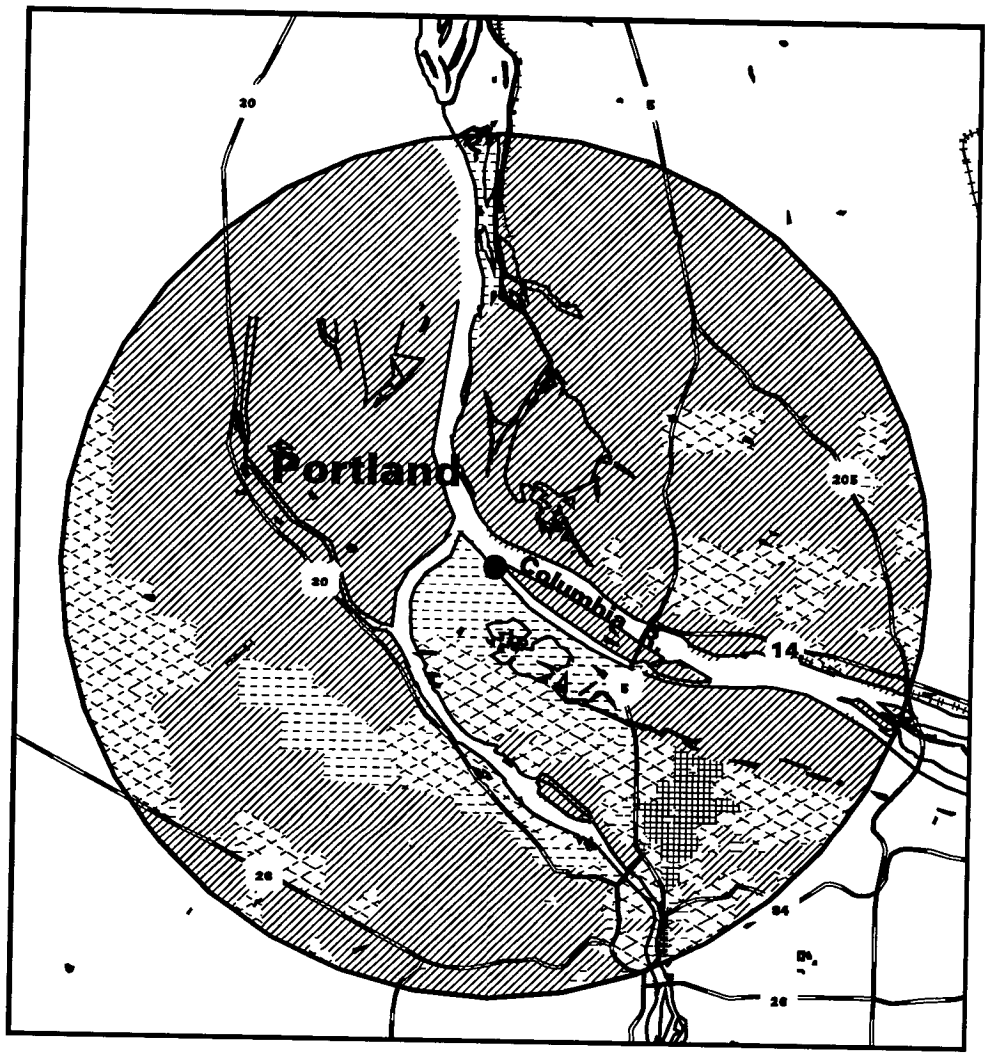


Figure A-8 Distribution of the Minority Population Residing within 16 km of the Port of Portland, Oregon

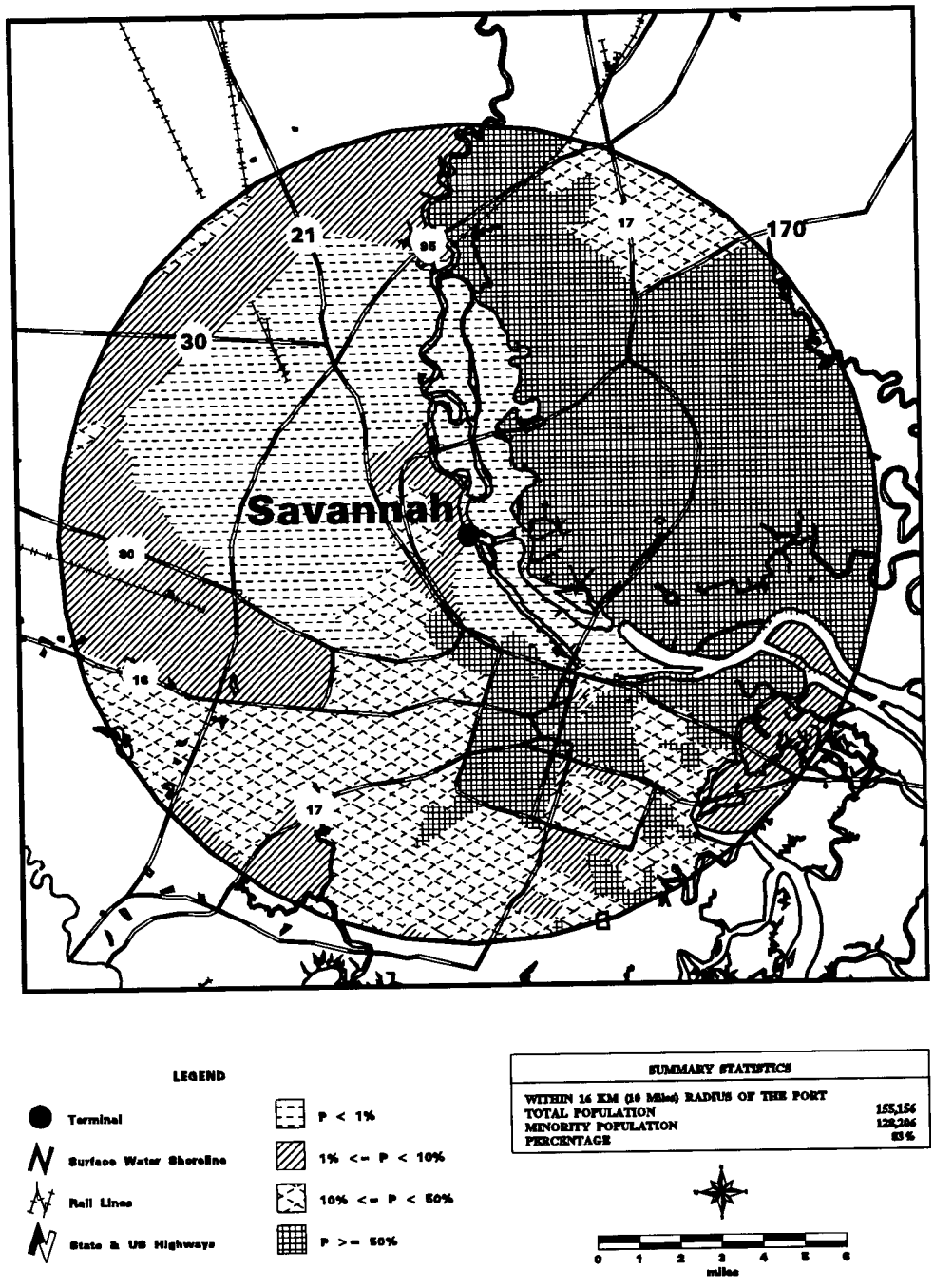


Figure A-9 Distribution of the Minority Population Residing within 16 km of the Port of Savannah, Georgia

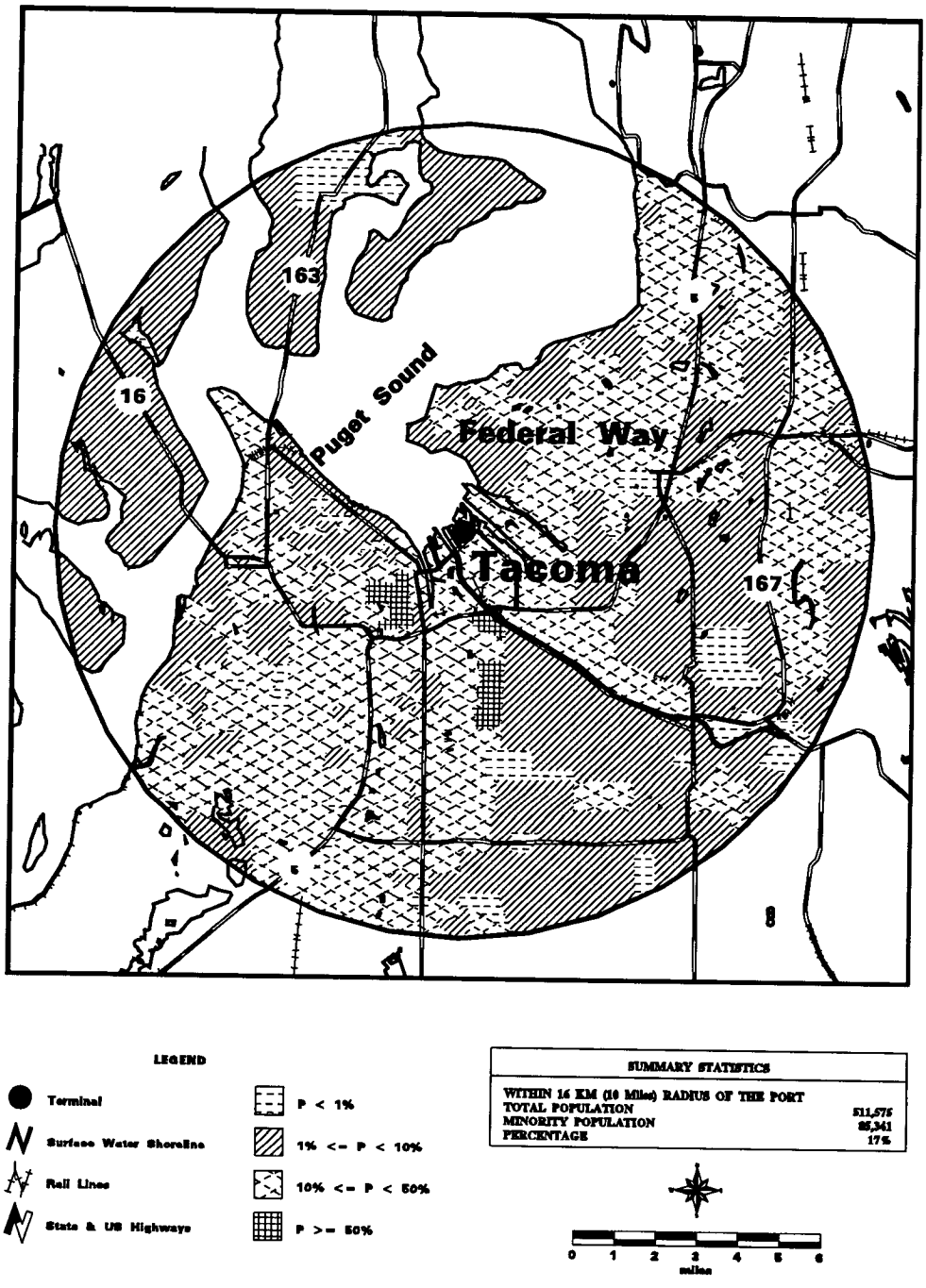


Figure A-10 Distribution of the Minority Population Residing within 16 km of the Port of Tacoma, Washington

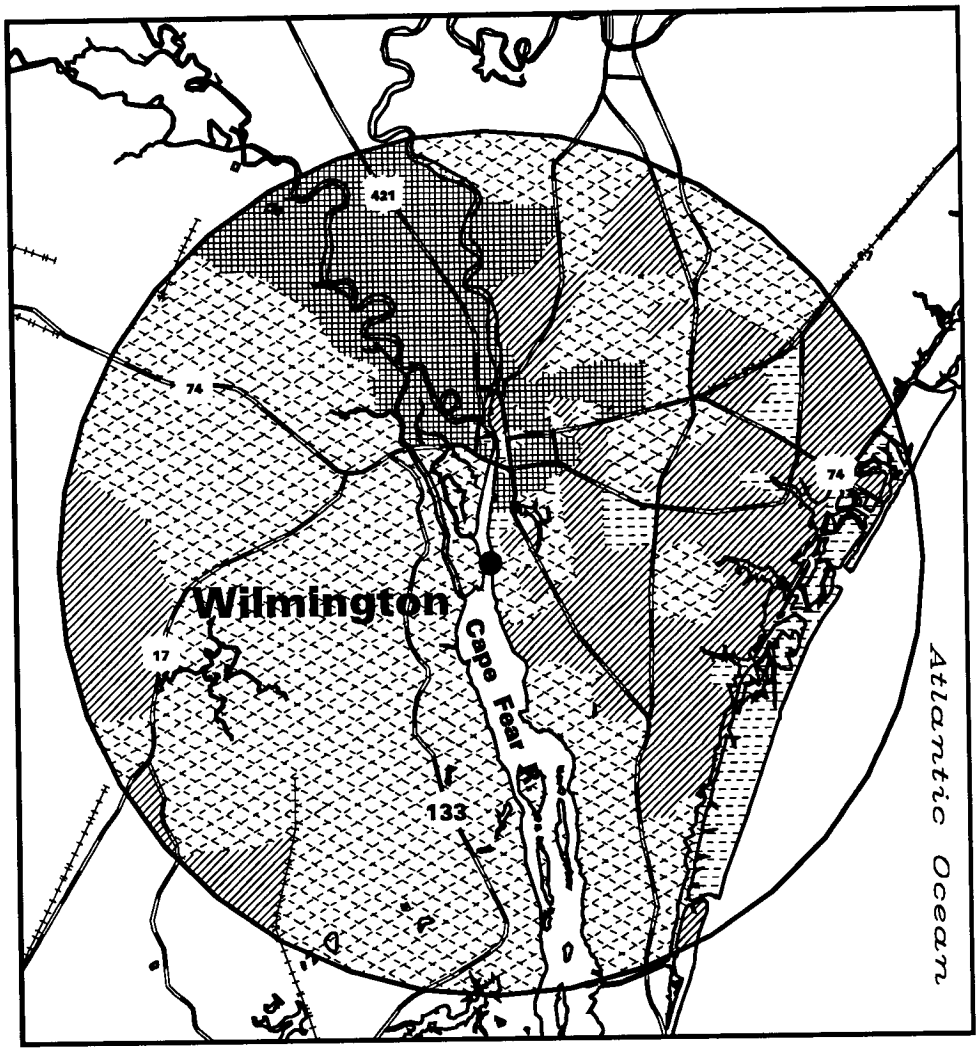


Figure A-11 Distribution of the Minority Population Residing within 16 km of the Port of Wilmington, North Carolina

A.3.2 Distribution of Low-Income Households Near the Candidate Ports

The number of low-income households near the candidate ports is shown in Table A-3. Except for the ports of MOTSU and Hampton Roads, the percentage of low-income households immediately surrounding the port is larger than the percentage of low-income households in the surrounding counties. Similarly, for most of the candidate ports, the percentage of low-income households near the port exceeds the percentage of low-income households in the surrounding state, although the ports of Charleston, MOTSU, Newport News, and NWS Concord are exceptions.

Distributions of low-income households near the candidate ports are shown in the maps of the ports presented in Figures A-12 through A-22. In these figures, geographical areas defined by census block group boundaries are shaded according to the percentage of low-income households within the block group. Since the number of households within a block group varies, the size of a shaded area is not necessarily proportional to the population within that area.

A.4 Environmental Justice Along Transportation Routes

The dominant radiological impacts associated with the normal or incident-free (accident-free) transportation activities would be the exposures received by the workers in the immediate vicinity of the cask, principally the truck drivers or train personnel. These individuals would be the only people receiving a measurable exposure during a routine spent nuclear fuel shipment.

The dose received by an individual near a spent nuclear fuel cask during shipment would be proportional to both the distance from the cask and the time of exposure. As discussed in Chapter 4 and Appendix E, the radiation dose rate from a cask containing spent nuclear fuel decreases with distance from the cask. Individuals living along the transportation routes would therefore be expected to receive low exposures because of both their distance from the cask and their short time of their exposure. While it is possible to make estimates of the collective dose of the population along a route, as in Chapter 4 and Appendix E, these minuscule doses would only be meaningful in the collective sense.

Ground and barge transportation accidents would be expected to result in no additional radiological impacts to the population in the vicinity of the accident. Potential radiological impacts from low probability accidents, which vary considerably, would be dependent on the accident conditions (such as the severity of an associated fire) and the weather conditions at the time of an accident. Since shipping accidents could occur at any location along the routes, it is not possible to identify the racial and economic composition of the populations that might be impacted. In general, however, the principal radiological impacts would be limited to the area within a few miles of the accident location and could be expected to impact a broad mixture of the population in the area.

Tables A-4 and A-5 show minority populations and low-income households, respectively, residing in 800-m (0.5-mi) wide corridors on each side of the road, rail, or barge routes from each of the candidate ports of entry to the Idaho National Engineering Laboratory and the Savannah River Site, both of which could receive spent nuclear fuel in the near term. In these tables, a county is called a "surrounding" county if its boundaries lie at least partially within the 800-m (0.5-mi) corridor. Routes used for this analysis are described in Appendix E.

As a general observation, percentages of minority populations residing along ground transportation routes (Column 7 of Table A-4) from candidate ports on the west coast to the Idaho National Engineering Laboratory are noticeably less than those for transportation from candidate east coast ports to the Savannah River Site. In addition, a higher percentage of minority individuals were found to reside along rail transportation routes than along truck transportation routes. The percentages varied from a minimum

Table A-3 Low-Income Households Residing Near the Candidate Ports

Candidate Port	*Total Households Residing within 16 km of Port*	*Low-Income Households Residing within 16 km of Port*	*% Low-Income Households Residing within 16 km of Port*	*Households Residing in Surrounding Counties*	*Low-Income Households Residing in Surrounding Counties*	*% Low-Income Households Residing in Surrounding Counties*	*Households Residing in Surrounding State(s)*	*Low-Income Households Residing in Surrounding State(s)*	*% Low-Income Households Residing in Surrounding State(s)*
Charleston, SC:									
Wando Terminal	85,851	36,904	43.0	149,358	62,552	41.9	1,258,783	545,937	43.4
NWS Terminal	72,765	32,020	44.0	149,358	62,552	41.9	1,258,783	545,937	43.4
Galveston, TX	29,360	16,607	56.6	81,417	34,984	43.0	6,079,341	2,815,886	46.3
Hampton Roads, VA:									
Newport News	126,789	51,055	40.3	336,638	137,129	40.7	2,294,722	937,123	40.8
Norfolk	206,464	90,723	43.9	336,688	137,129	40.7	2,294,722	937,123	40.8
Portsmouth	175,994	75,147	42.7	336,688	137,129	40.7	2,294,722	937,123	40.8
Jacksonville, FL	125,930	61,052	48.5	290,999	125,610	43.2	5,138,360	2,087,579	40.6
MOTSU, NC	3,071	1,166	38.0	20,094	8,455	42.1	2,517,098	1,067,345	42.4
NWS Concord, CA	143,676	58,344	40.6	415,223	167,426	40.3	10,399,700	4,307,948	41.4
Portland, OR	146,047	66,186	45.3	542,696	222,075	40.9	1,105,362	453,038	41.0
Savannah, GA	57,266	28,960	50.6	125,693	52,772	42.0	3,625,358	1,566,725	43.2
Tacoma, WA	198,458	83,101	41.9	843,736	338,779	40.2	1,875,508	736,285	39.3
Wilmington, NC	45,537	19,491	42.8	79,175	33,226	42.0	2,517,098	1,067,345	42.4

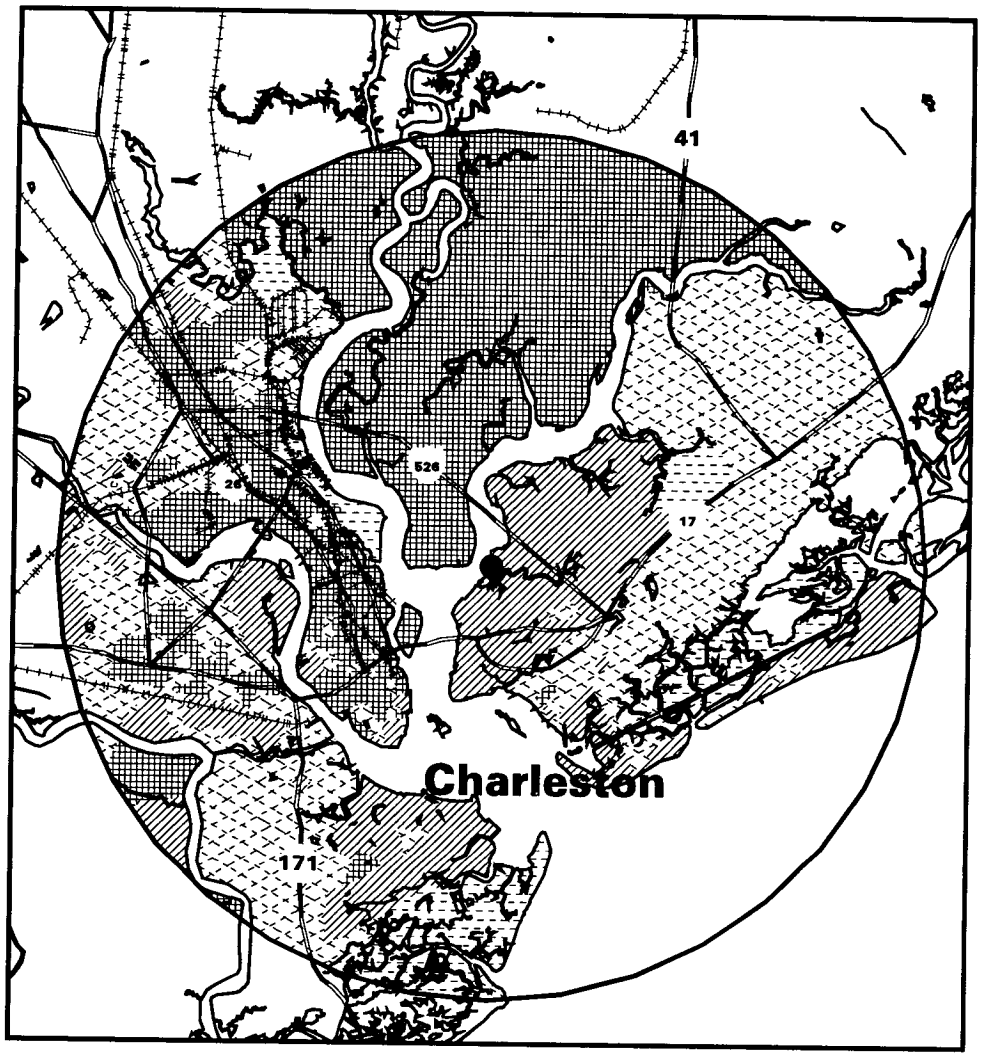


Figure A-12 Distribution of Low-Income Households Residing within 16 km of the Wando Terminal, Port of Charleston, South Carolina

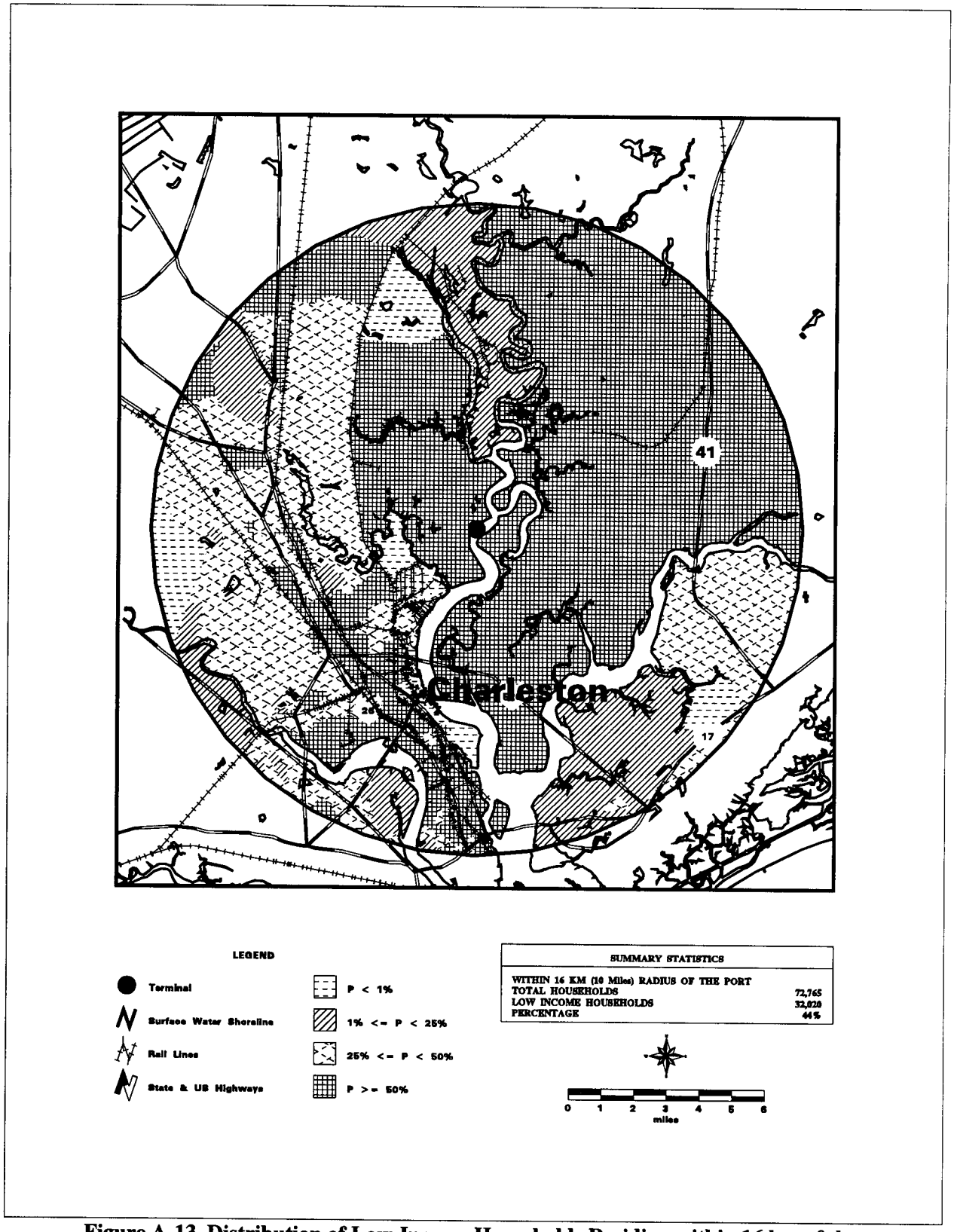


Figure A-13 Distribution of Low-Income Households Residing within 16 km of the NWS Charleston, South Carolina

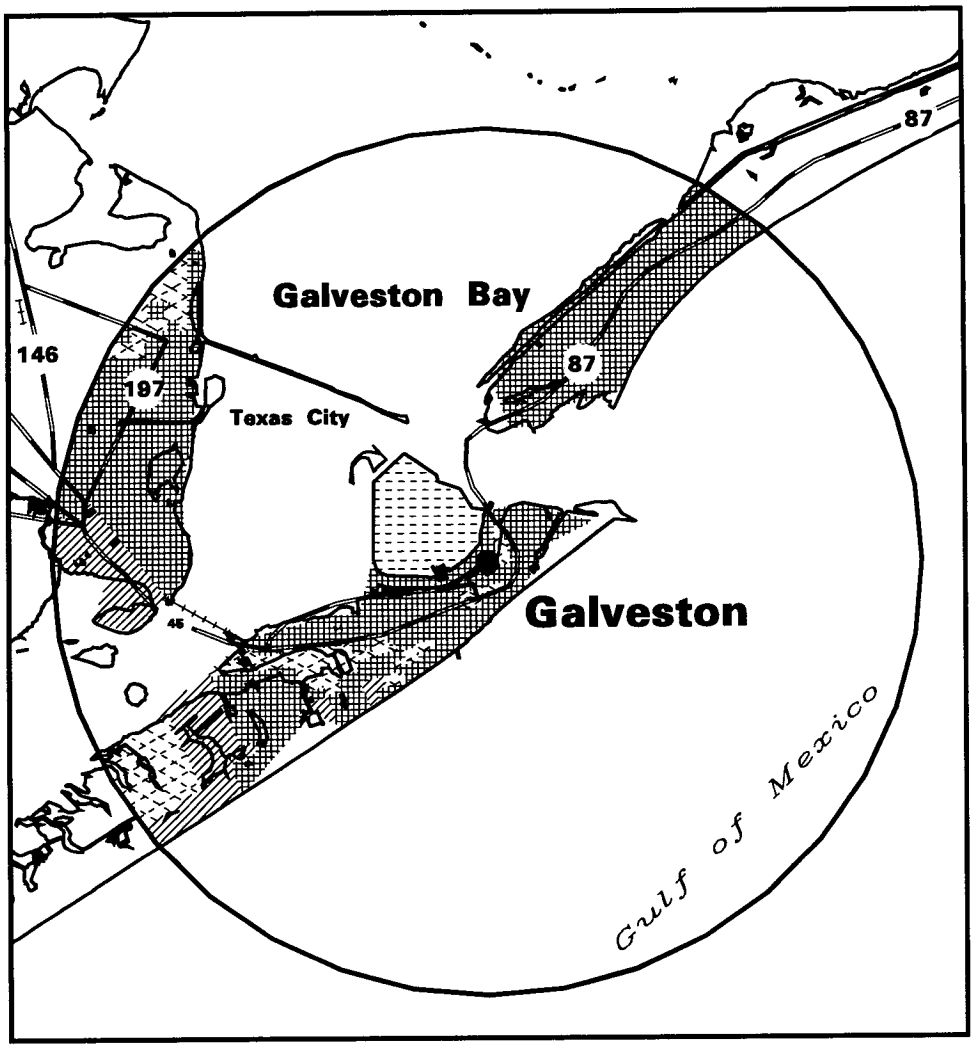


Figure A-14 Distribution of Low-Income Households Residing within 16 km of the Port of Galveston, Texas

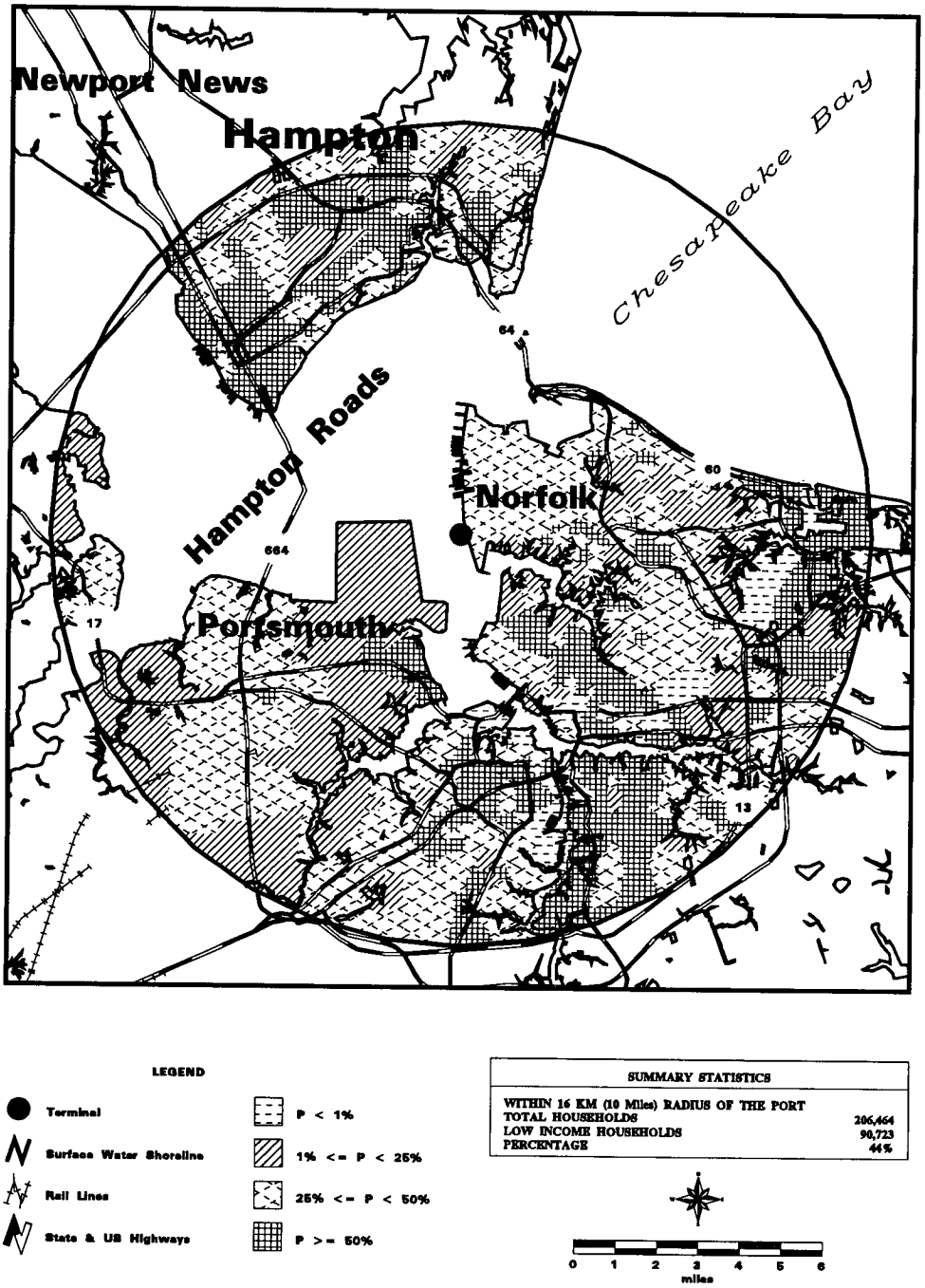


Figure A-15 Distribution of Low-Income Households Residing within 16 km of the Port of Hampton Roads: Newport News, Norfolk, and Portsmouth, Virginia Terminals

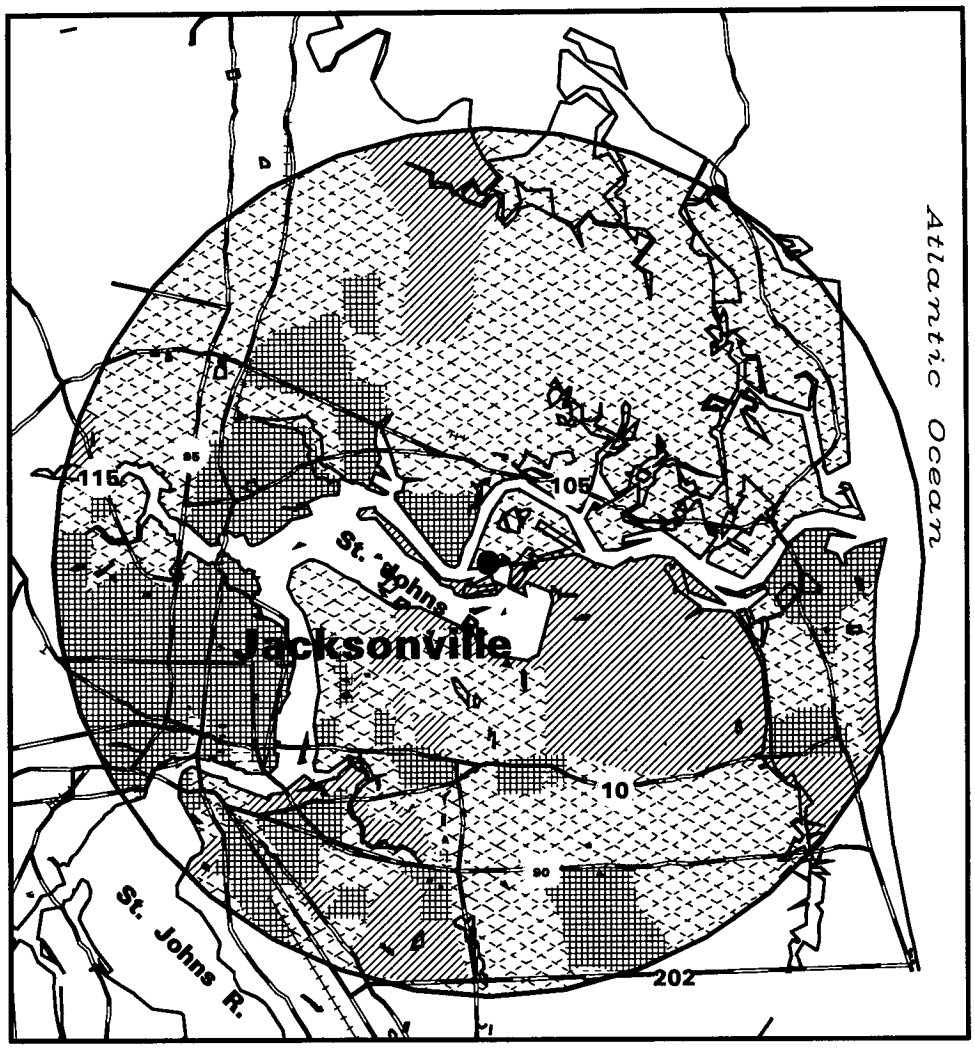


Figure A-16 Distribution of Low-Income Households Residing within 16 km of the Port of Jacksonville, Florida

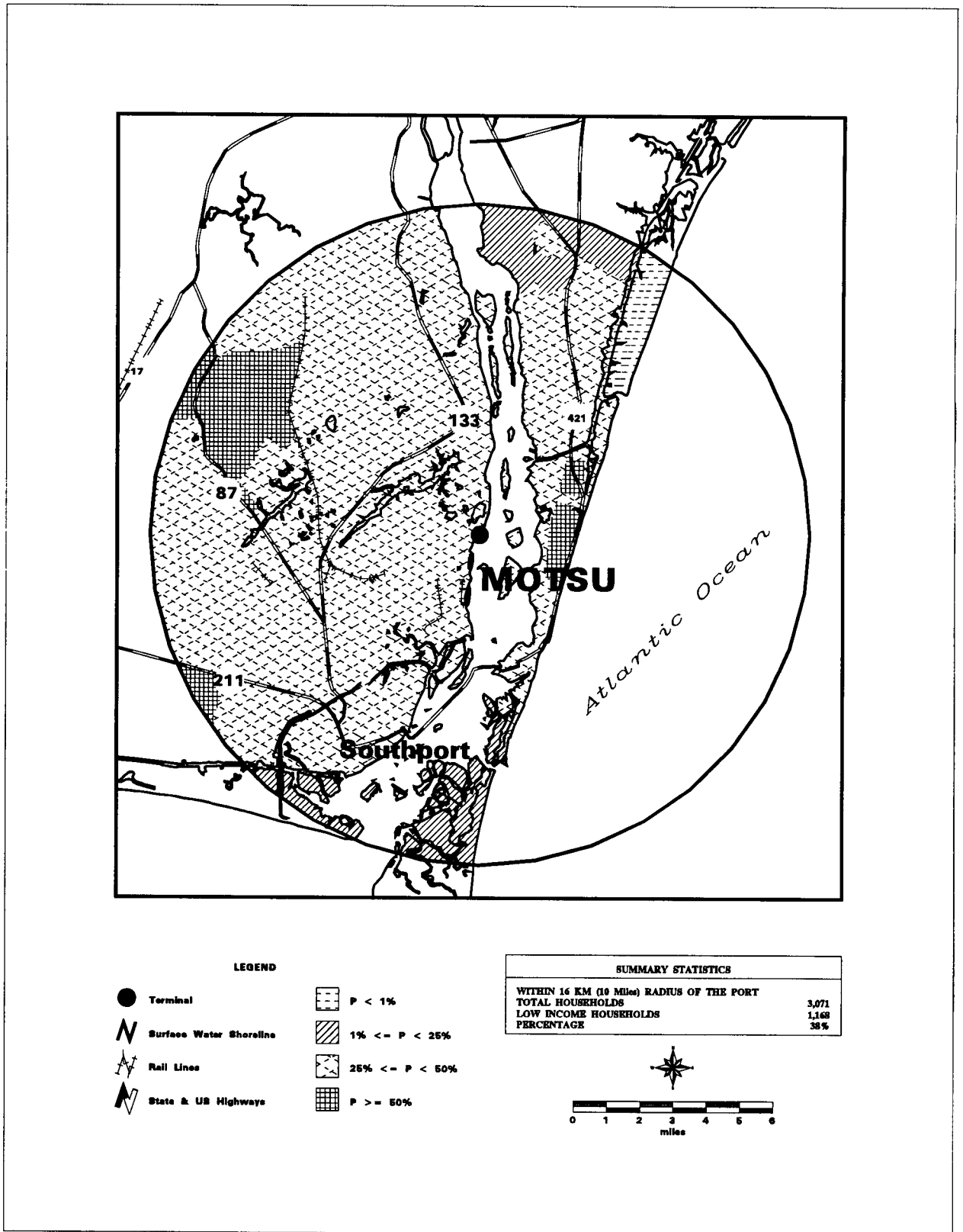


Figure A-17 Distribution of Low-Income Households Residing within 16 km of the Port of MOTSU, North Carolina

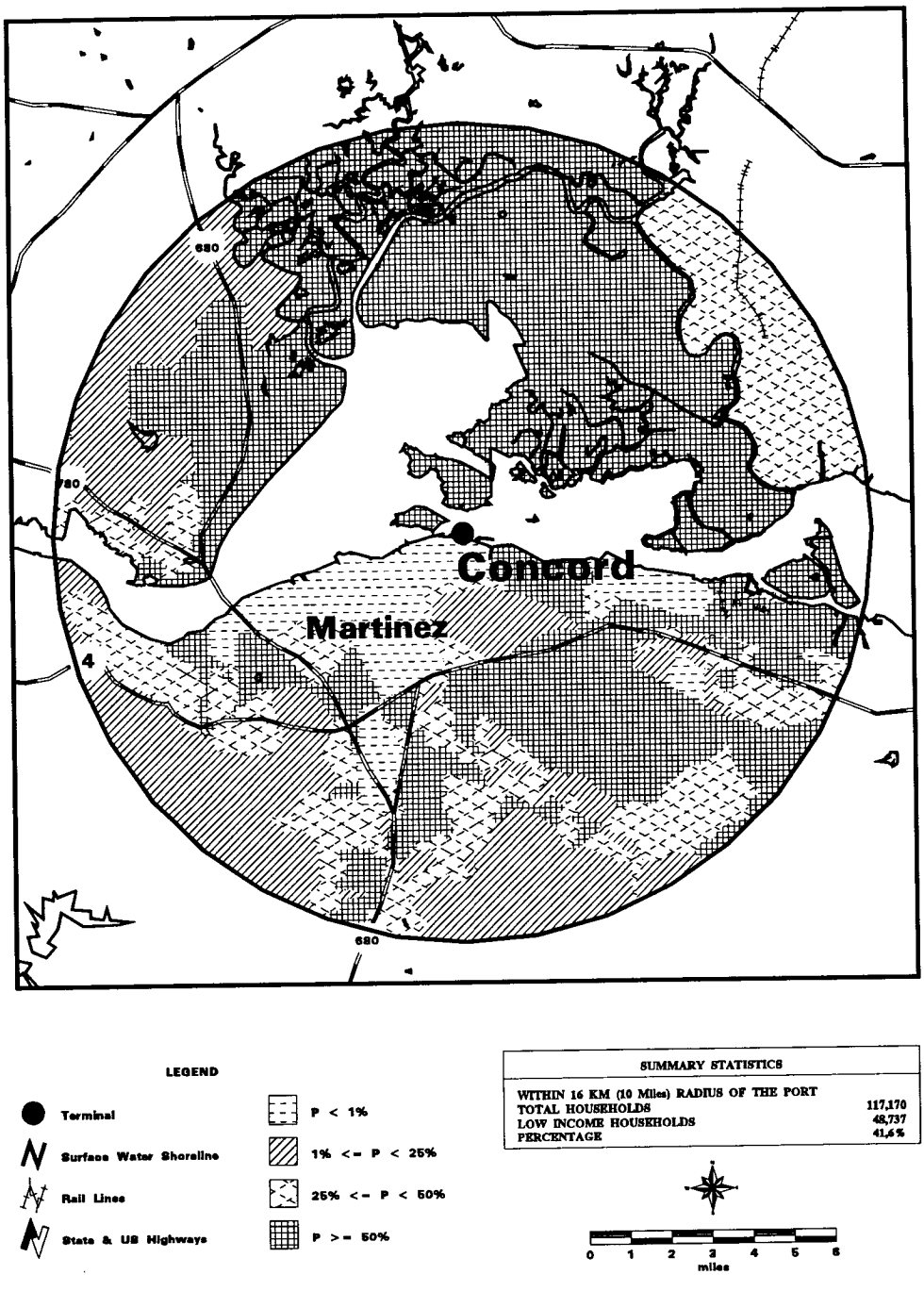


Figure A-18 Distribution of Low-Income Households Residing within 16 km of the Port of NWS Concord, California

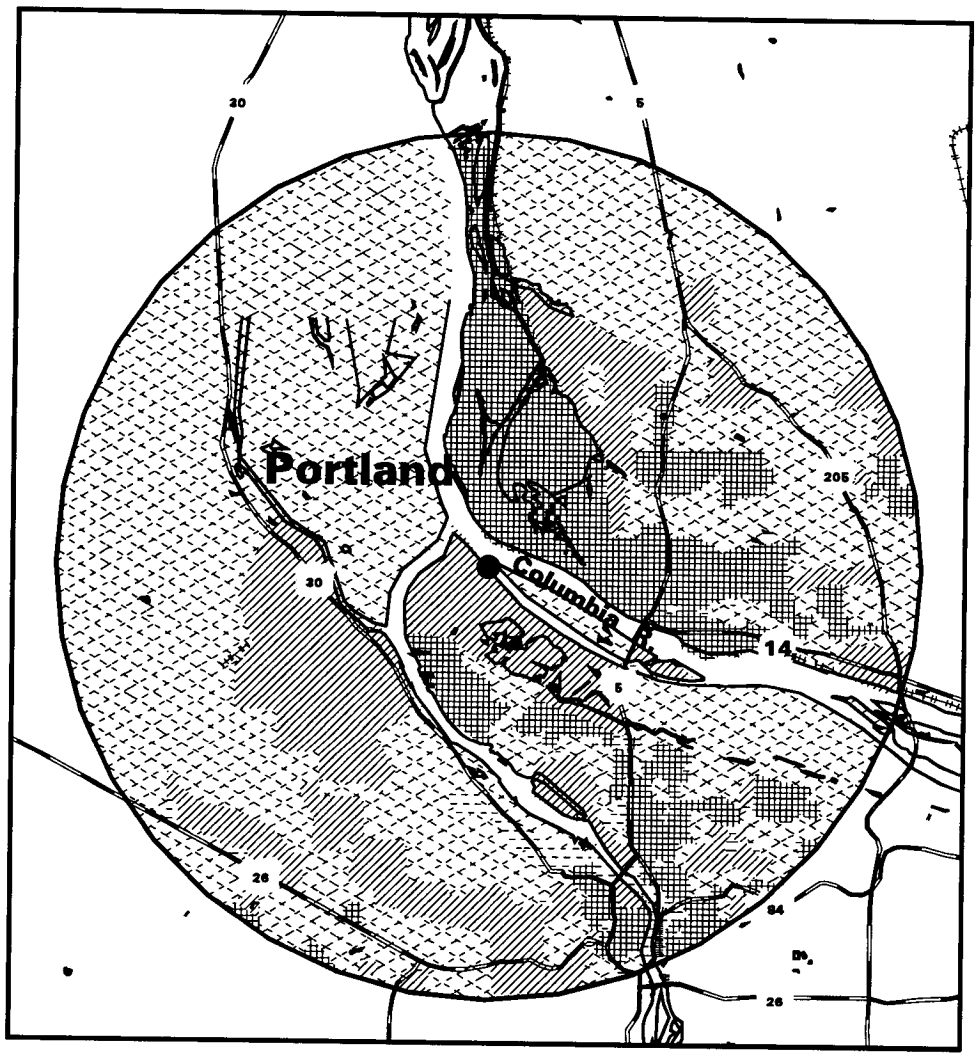


Figure A-19 Distribution of Low-Income Households Residing within 16 km of the Port of Portland, Oregon

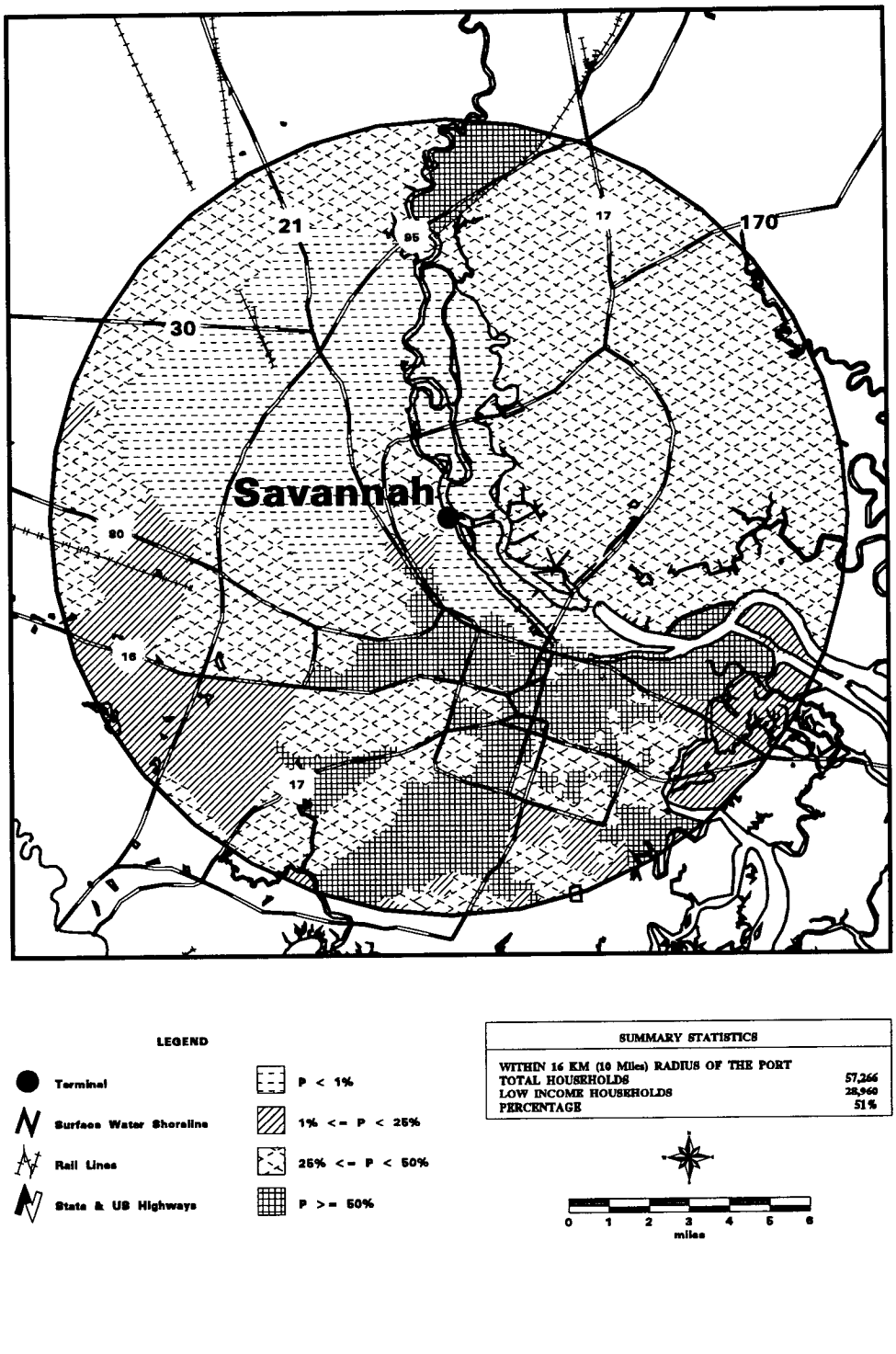
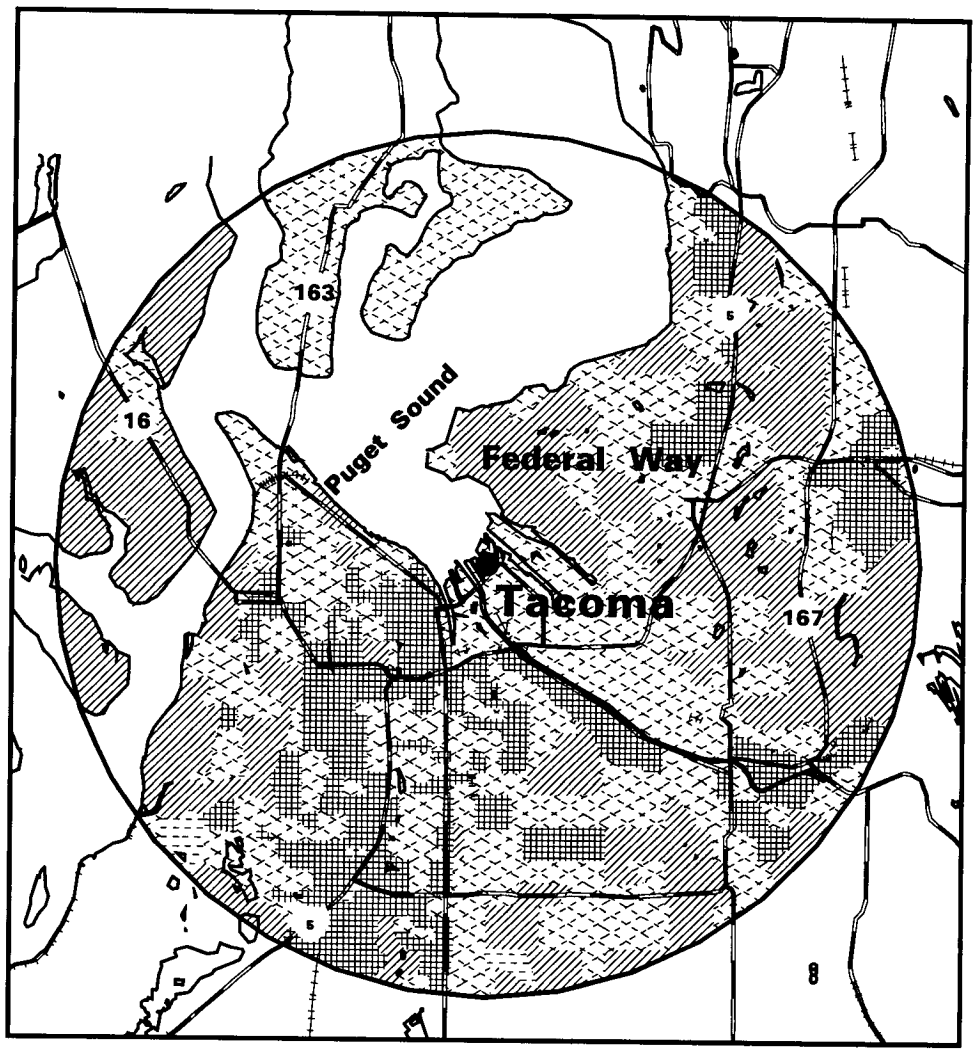


Figure A-20 Distribution of Low-Income Households Residing within 16 km of the Port of Savannah, Georgia



LEGEND

- Terminal
- Surface Water Shoreline
- Rail Lines
- State & US Highways
- P < 1%
- 1% <= P < 25%
- 25% <= P < 50%
- P >= 50%

SUMMARY STATISTICS	
WITHIN 16 KM (10 Miles) RADIUS OF THE PORT	
TOTAL HOUSEHOLDS	198,458
LOW INCOME HOUSEHOLDS	83,101
PERCENTAGE	42%

0 1 2 3 4 5 6
miles

Figure A-21 Distribution of Low-Income Households Residing within 16 km of the Port of Tacoma, Washington

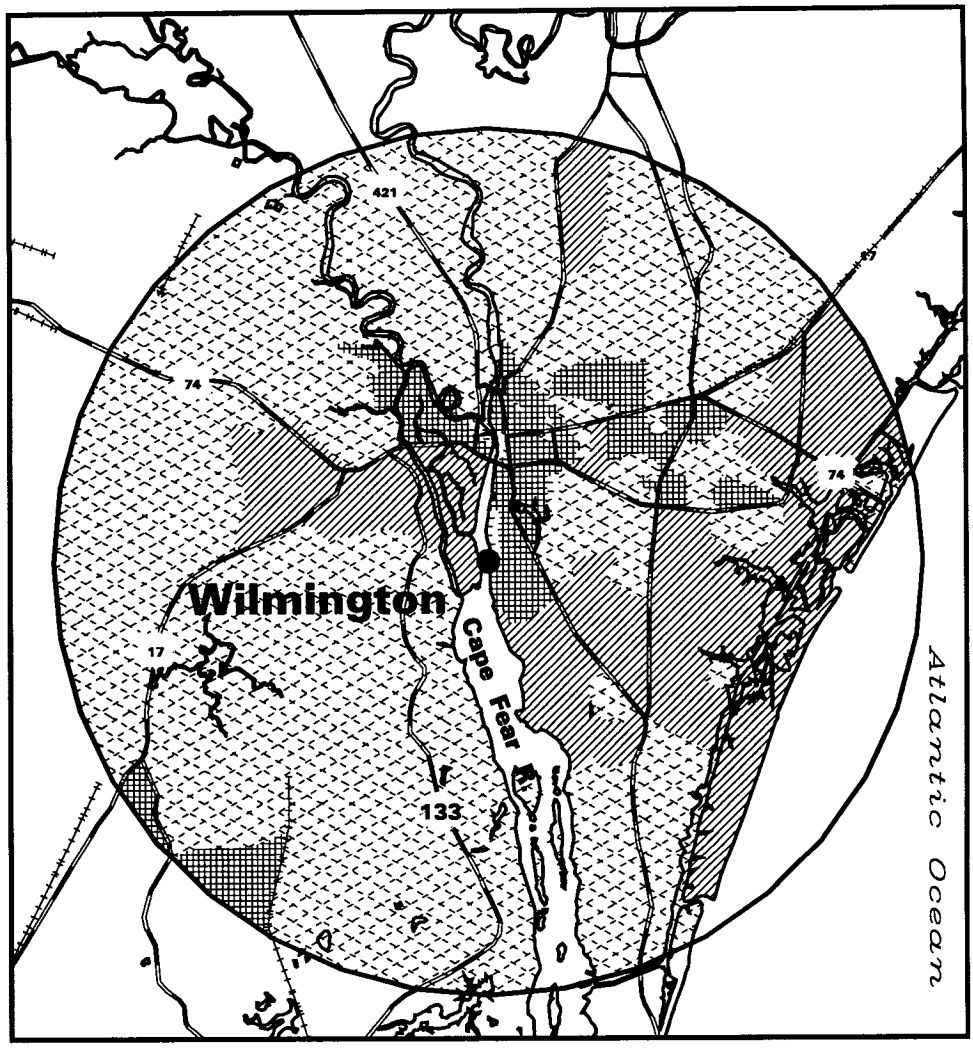


Figure A-22 Distribution of Low-Income Households Residing within 16 km of the Port of Wilmington, North Carolina

Table A-4 Minority Populations Residing Near Ground and Barge Transportation Routes

Route No.	Port	Destination	Mode	Total Pop. Along Route	Minority Pop. Along Route	% Minority Pop. Along Route	Total Pop. in Surrounding Counties	Minority Pop. in Surrounding Counties	% Minority Pop. in Surrounding Counties
	Charleston, SC:								
1	Wando Terminal	INEL	Rail	709,863	177,890	25.1	8,562,589	2,027,753	23.7
2	Wando Terminal	INEL	Truck	514,213	90,978	17.7	8,205,925	1,508,320	18.4
3	Wando Terminal	SRS	Rail	19,633	8,783	44.7	693,370	246,297	35.5
4	Wando Terminal	SRS	Truck	84,729	36,613	43.2	1,180,381	403,989	34.2
5	NWS Terminal	INEL	Rail	709,863	177,890	25.1	8,562,589	2,027,753	23.7
6	NWS Terminal	INEL	Truck	503,081	79,646	15.8	8,205,925	1,508,320	18.4
7	NWS Terminal	SRS	Rail	19,633	8,783	44.7	693,370	246,297	35.5
8	NWS Terminal	SRS	Truck	75,476	31,538	41.8	1,180,381	403,989	34.2
9	Galveston, TX	INEL	Rail	390,876	124,553	31.9	3,794,113	1,006,498	26.5
10	Galveston, TX	INEL	Truck	600,239	205,700	34.3	9,292,668	2,858,758	30.8
11	Galveston, TX	SRS	Rail	528,014	286,872	54.3	8,577,378	3,424,688	39.9
12	Galveston, TX	SRS	Truck	429,057	189,407	44.1	7,965,572	3,038,319	38.1
13	Hampton Roads, VA	INEL	Rail	1,005,972	354,386	35.2	11,758,163	2,982,158	25.4
14	Hampton Roads, VA	INEL	Truck	603,551	115,107	19.1	10,248,206	1,954,088	19.1
15	Hampton Roads, VA	SRS	Rail	221,375	107,613	48.6	2,655,287	984,457	37.1
16	Hampton Roads, VA	SRS	Truck	212,286	98,584	46.4	2,266,251	880,358	38.8
17	Jacksonville, FL	INEL	Rail	697,964	200,596	28.7	8,106,565	1,742,778	21.5
18	Jacksonville, FL	INEL	Truck	622,326	167,802	27.0	10,644,968	2,317,151	21.8
19	Jacksonville, FL	SRS	Rail	52,145	36,707	70.4	1,217,454	388,456	31.9
20	Jacksonville, FL	SRS	Truck	72,821	30,887	42.4	2,154,525	678,172	31.5
21	MOTSU, NC	INEL	Rail	753,535	184,459	24.5	9,084,840	2,087,107	23.0
22	MOTSU, NC	INEL	Truck	515,468	91,325	17.7	9,446,043	1,856,873	19.7
23	MOTSU, NC	SRS	Rail	75,932	33,173	43.7	1,302,260	499,281	38.3
24	MOTSU, NC	SRS	Truck	93,987	40,073	42.6	1,518,891	517,912	34.1
25	NWS Concord, CA	INEL	Rail	344,524	72,137	20.9	4,655,756	973,603	20.9
26	NWS Concord, CA	INEL	Truck	267,109	57,926	21.7	4,655,756	973,603	20.9
27	NWS Concord, CA	SRS	Rail	1,443,296	796,105	55.2	30,242,508	13,433,482	44.4
28	NWS Concord, CA	SRS	Truck	1,240,640	536,731	43.3	28,254,357	11,932,215	42.2

Table A-4 Minority Populations Residing Near Ground and Barge Transportation Routes (Continued)

Route No.	Port	Destination	Mode	Total Pop. Along Route	Minority Pop. Along Route	% Minority Pop. Along Route	Total Pop. in Surrounding Counties	Minority Pop. in Surrounding Counties	% Minority Pop. in Surrounding Counties
29	Portland, OR	HS	Barge	28,430	3,599	12.7	1,099,340	140,872	12.8
30	Portland, OR	INEL	Rail	162,678	26,252	16.1	1,300,552	154,630	11.9
31	Portland, OR	INEL	Truck	124,067	15,463	12.5	1,563,392	172,864	11.1
32	Portland, OR	SRS	Rail	950,116	193,322	20.3	15,663,396	3,695,119	23.6
33	Portland, OR	SRS	Truck	671,113	130,098	19.4	11,149,104	2,395,779	21.5
34	Savannah, GA	INEL	Rail	680,075	178,683	26.3	7,696,157	1,661,208	21.6
35	Savannah, GA	INEL	Truck	574,641	140,293	24.4	9,931,415	2,135,851	21.5
36	Savannah, GA	SRS	Barge	1,715	520	30.3	124,099	56,936	45.9
37	Savannah, GA	SRS	Rail	13,835	11,330	81.9	369,053	151,266	41.0
38	Savannah, GA	SRS	Truck	51,065	18,916	37.0	1,135,620	402,488	35.4
39	Tacoma, WA	INEL	Rail	255,650	45,100	17.6	2,427,856	290,185	12.0
40	Tacoma, WA	INEL	Truck	178,532	29,787	16.7	3,141,728	488,589	15.6
41	Tacoma, WA	SRS	Rail	753,535	184,459	24.5	17,228,536	3,946,748	22.9
42	Tacoma, WA	SRS	Truck	514,955	91,051	17.7	8,850,682	1,470,687	16.6
43	Wilmington, NC	INEL	Rail	753,535	184,459	24.5	9,084,840	2,087,107	23.0
44	Wilmington, NC	INEL	Truck	514,955	91,051	17.7	9,446,043	1,856,873	19.7
45	Wilmington, NC	SRS	Rail	75,932	33,173	43.7	1,302,260	499,281	38.3
46	Wilmington, NC	SRS	Truck	102,951	37,735	36.7	1,518,891	517,912	34.1

INEL = Idaho National Engineering Laboratory, SRS = Savannah River Site, HS = Hanford Site

Table A-5 Low-Income Households Residing Near Ground and Barge Transportation Routes

Route No.	Port	Destination	Mode	Total Households Along Route	Low-Income Households Along Route	% Low-Income Households Along Route	Total Households in Surrounding Counties	Low-Income Households in Surrounding Counties	% Low-Income Households in Surrounding Counties
	Charleston, SC:								
1	Wando Terminal	INEL	Rail	279,468	141,864	50.8	3,256,143	1,359,530	41.8
2	Wando Terminal	INEL	Truck	199,269	81,749	41.0	3,082,221	1,266,095	41.1
3	Wando Terminal	SRS	Rail	7,305	3,358	46.0	242,968	101,094	41.6
4	Wando Terminal	SRS	Truck	31,040	15,664	50.5	419,616	175,993	41.9
5	NWS Terminal	INEL	Rail	279,468	141,864	50.8	3,256,143	1,359,530	41.8
6	NWS Terminal	INEL	Truck	193,945	79,186	40.8	3,082,221	1,266,095	41.1
7	NWS Terminal	SRS	Rail	7,305	3,358	46.0	242,968	101,094	41.6
8	NWS Terminal	SRS	Truck	27,339	13,019	47.6	419,616	175,993	41.9
9	Galveston, TX	INEL	Rail	157,276	83,829	53.3	1,410,581	568,315	40.3
10	Galveston, TX	INEL	Truck	230,042	110,020	47.8	3,471,001	1,440,001	41.5
11	Galveston, TX	SRS	Rail	189,537	103,279	54.5	3,135,368	1,315,512	42.0
12	Galveston, TX	SRS	Truck	157,216	74,900	47.6	2,912,738	1,217,498	41.8
13	Hampton Roads, VA	INEL	Rail	372,127	184,477	49.6	4,350,161	1,774,235	40.8
14	Hampton Roads, VA	INEL	Truck	234,717	98,570	42.0	3,895,065	1,611,870	41.4
15	Hampton Roads, VA	SRS	Rail	83,505	42,094	50.4	963,965	403,155	41.8
16	Hampton Roads, VA	SRS	Truck	80,245	37,427	46.6	782,526	332,806	42.5
17	Jacksonville, FL	INEL	Rail	271,994	140,535	51.7	3,097,768	1,304,381	42.1
18	Jacksonville, FL	INEL	Truck	240,520	106,683	44.4	4,036,596	1,686,985	41.8
19	Jacksonville, FL	SRS	Rail	18,576	10,158	54.7	449,914	193,017	42.9
20	Jacksonville, FL	SRS	Truck	27,436	14,176	51.7	784,169	332,060	42.3
21	MOTSU, NC	INEL	Rail	294,953	148,549	50.4	3,458,175	1,443,995	41.8
22	MOTSU, NC	INEL	Truck	199,145	82,005	41.2	3,591,483	1,507,703	42.0
23	MOTSU, NC	SRS	Rail	28,089	13,791	49.1	465,649	197,699	42.5
24	MOTSU, NC	SRS	Truck	35,670	16,610	46.6	547,984	235,188	42.9
25	NWS Concord, CA	INEL	Rail	128,843	66,118	51.3	1,643,159	675,769	41.1
26	NWS Concord, CA	INEL	Truck	97,241	44,810	46.1	1,643,159	675,769	41.1
27	NWS Concord, CA	SRS	Rail	488,799	257,198	52.6	10,625,645	4,386,618	41.3
28	NWS Concord, CA	SRS	Truck	436,446	184,959	42.4	10,022,988	4,153,610	41.4

Table A-5 Low-Income Households Residing Near Ground and Barge Transportation Routes (Continued)

Route No.	Port	Destination	Mode	Total Households Along Route	Low-Income Households Along Route	% Low-Income Households Along Route	Total Households in Surrounding Counties	Low-Income Households in Surrounding Counties	% Low-Income Households in Surrounding Counties
29	Portland, OR	HS	Barge	11,458	4,582	40.0	428,477	178,142	41.6
30	Portland, OR	INEL	Rail	63,053	29,047	46.1	497,875	206,447	41.5
31	Portland, OR	INEL	Truck	49,120	20,461	41.7	595,780	247,985	41.6
32	Portland, OR	SRS	Rail	368,054	183,842	49.9	5,842,902	2,398,677	41.1
33	Portland, OR	SRS	Truck	261,130	106,936	41.0	4,245,248	1,761,997	41.5
34	Savannah, GA	INEL	Rail	265,122	133,766	50.5	2,932,786	1,231,245	42.0
35	Savannah, GA	INEL	Truck	224,123	97,864	43.7	3,767,606	1,570,456	41.7
36	Savannah, GA	SRS	Barge	595	248	41.7	42,983	18,577	43.2
37	Savannah, GA	SRS	Rail	4,868	2,669	54.8	134,291	56,688	42.2
38	Savannah, GA	SRS	Truck	19,340	9,235	47.8	408,100	171,672	42.1
39	Tacoma, WA	INEL	Rail	98,487	48,094	48.8	917,614	377,168	41.1
40	Tacoma, WA	INEL	Truck	68,303	29,265	42.8	1,212,119	493,235	40.7
41	Tacoma, WA	SRS	Rail	448,663	225,672	50.3	6,455,529	2,633,674	40.8
42	Tacoma, WA	SRS	Truck	223,282	99,101	44.4	3,387,084	1,375,781	40.6
43	Wilmington, NC	INEL	Rail	294,953	148,549	50.4	3,458,175	1,443,995	41.8
44	Wilmington, NC	INEL	Truck	198,884	81,839	41.1	3,591,483	1,507,703	42.0
45	Wilmington, NC	SRS	Rail	28,089	13,791	49.1	465,649	197,699	42.5
46	Wilmington, NC	SRS	Truck	39,759	18,538	46.6	547,984	235,188	42.9

INEL = Idaho National Engineering Laboratory, SRS = Savannah River Site, HS = Hanford Site

of 12.5 percent for transportation by truck from Portland, Oregon to Idaho National Engineering Laboratory to a maximum of 81.9 percent for rail transportation from Savannah, Georgia to the Savannah River Site.

As shown in Column 7 of Table A-5, similar observations are true for percentages of low-income households residing along ground transportation routes. In the case of low-income households, percentages varied from a minimum of 41.0 percent for truck transportation from Portland, Oregon and Charleston, South Carolina to the Savannah River Site and Idaho National Engineering Laboratory, respectively, to a maximum of 54.8 percent for rail transportation from Savannah, Georgia to the Savannah River Site.

Populations residing within 1.6 km of barge routes are numerically very small in comparison with those residing near ground transportation routes. Percentages of minority populations and low-income households residing near barge routes are similar to the percentages for ground transportation modes.

A.5 Environmental Justice in Areas Near the Candidate Management Sites

Under normal management site activities associated with receipt and storage of the spent nuclear fuel, the dominant radiological impacts have been shown to be the exposures received by the site workers in the immediate vicinity of the spent nuclear fuel cask. These individuals would be principally those working within the spent nuclear fuel storage facility. The racial and economic composition of these individuals at each management site that would receive the majority of the dose could vary considerably. Health effects due to normal operations and accidents at the five candidate management sites are presented in Section 4.2.4. No latent cancer fatalities or other fatalities would be expected to result from the handling and storage of spent nuclear fuel from foreign research reactors at the sites. At none of the sites would the radiological impacts of either normal releases or low probability accidental releases of spent nuclear fuel be expected to significantly affect the general population outside the management site boundary, including minority and low-income populations. Consequently, there are no adverse impacts of the proposed action on these groups.

A.5.1 Distribution of Minority Populations Near the Candidate Management Sites

The distribution of minority populations residing in various areas surrounding the candidate interim management sites is presented in Table A-6. This table shows minority populations within an 80-km (50-mi) radius centered at the interim management site. For comparison, minority populations are also shown for the counties surrounding each site. A county was included in the analysis if its boundaries lie at least partially within this circle. As shown in the table, minority populations surrounding the Nevada Test Site and the Idaho National Engineering Laboratory are numerically small in comparison with those surrounding the Hanford Site and the Savannah River Site. The minority population surrounding the Nevada Test Site is relatively large because the boundary of the county containing Las Vegas, NV is within 80 km (50 mi) of the site. The Savannah River Site has the largest percentage of minorities in the surrounding area and surrounding counties.

The racial and ethnic composition of minorities surrounding the candidate interim management sites is illustrated in Table A-7. Hispanics composed nearly 81 percent of the minority population surrounding the Hanford Site at the time of the 1990 census. The Hanford Site is also surrounded by a relatively large percentage (about 8 percent) of Native Americans due to the presence of the Yakama Indian Reservation and tribal headquarters in the State of Washington. The area surrounding the Idaho National Engineering Laboratory has the second smallest percentage of minorities of all the sites. The surrounding minority composition is primarily Hispanic, Native American, and Asian. The Fort Hall Indian Reservation lies

Table A-6 Minority Populations Residing Near the Candidate Interim Management Sites

Candidate Management Site	*Population within 80 km of Site*	*Minority Population within 80 km of Site*	*% Minority Population within 80 km of Site*	*Population in Counties Surrounding Site*	*Minority Population in Counties Surrounding Site*	*% Minority Population in Counties Surrounding Site*
Savannah River Site	566,823	214,016	37.8	944,982	330,078	34.9
Idaho National Engineering Laboratory	176,311	15,449	8.8	265,823	21,828	8.2
Hanford Site	383,934	95,042	24.8	565,871	116,610	20.6
Oak Ridge Reservation	863,758	53,185	6.2	1,220,355	65,346	5.4
Nevada Test Site	12,421	2,005	16.1	777,797	186,714	24.0.

largely within 80 km (50 mi) of the candidate management site at the Idaho National Engineering Laboratory. Hispanics and African Americans compose nearly 85 percent of the minority population surrounding the Nevada Test Site. The total and minority populations residing within 80 km (50 mi) of the Nevada Test Site are ten times smaller than those of each of the other sites. The Oak Ridge Reservation is surrounded by the smallest percentage of minorities among the five candidate management sites. Minorities residing within 80 km (50 mi) of the site comprise approximately 6 percent of the total population, and African Americans make up nearly 75 percent of this minority population. The Savannah River Site has the largest surrounding minority population of the five candidate interim management sites: African Americans compose approximately 94 percent of the minority population residing within 80 km (50 mi) of this site.

Figures A-23 to A-27 show the distribution of minorities residing within 80 km (50 mi) of each of the candidate management sites. These illustrations were obtained from an analysis of 1990 census data using a geographical information system. The data were obtained from U.S. Bureau of the Census Tiger Line files which contain political boundaries and geographical features, and Summary Tape Files which contain demographic information. Data were resolved to the block group level, usually 250 to 550 household units. In the legend of each figure, "P" denotes the percentage of the total population within block groups comprised of minority members. The most heavily shaded areas shown in these figures indicate block groups for which the minority population exceeds 50 percent.

The minority population residing near the Hanford Site is spread throughout the area with concentrations in directions northeast, southeast, and southwest of the site. By contrast, the minority population surrounding the Idaho National Engineering Laboratory resides in quadrants northeast and southeast of the site. None of the block groups located within 80 km (50 mi) of the Nevada Test Site contained 50 percent of minority residents during the 1990 census. Due to the sparse population surrounding the site, block groups would be relatively large in geographical area. Minorities within 80 km (50 mi) of the Savannah River Site reside throughout the area with concentrations south of the site. As discussed above, no significant radiological health effects are expected for workers or the general population surrounding the five candidate interim management sites, including minority or low income workers.

A.5.2 Distribution of Low-Income Households Near the Candidate Management Sites

Table A-8 demonstrates the number of low-income households in areas surrounding the candidate interim management sites. Except for the Nevada Test Site, the number of low-income households immediately surrounding the sites is typical of the corresponding number for surrounding counties. In the case of the Nevada Test Site, the percentage of low-income households in the area surrounding the site is noticeably larger than that for the relatively affluent nearby counties.

Table A-7 Racial and Ethnic Composition of Minority Populations Residing Within 80 km of Candidate Management Sites

Candidate Management Sites	*Total Pop.*	*Total Minority Pop.*	*% Minority Pop.*	*Amer. Indian, Eskimo, or Aleut Pop.*	*% Amer. Indian, Eskimo, or Aleut*	*Asian or Pacific Islander Pop.*	*% Asian or Pacific Islander*	*African Amer. Pop.*	*% African Amer.*	*Hispanic Origin Pop.*	*% Hispanic Origin*	*Other Race*	*% Other Race*	*White*	*% White*
SRS	566,823	214,016	37.8	1,136	0.2	5,557	1.0	201,302	35.5	5,874	1.0	145	0.0	352,807	62.2
INEL	176,311	15,449	8.8	3,977	2.3	1,753	1.0	505	0.3	9,075	5.1	138	0.1	160,862	91.2
HS	383,934	95,042	24.8	7,913	2.1	5,296	1.4	4,331	1.1	76,933	20.0	568	0.1	288,891	75.2
ORR	863,758	53,185	6.2	2,985	0.3	4,695	0.5	40,695	4.7	4,518	0.5	290	0.0	810,573	93.8
NTS	12,421	2,005	16.1	273	2.2	49	0.4	634	5.1	1,048	8.4	0	0.0	10,415	83.8

SRS = Savannah River Site, INEL = Idaho National Engineering Laboratory, HS = Hanford Site, ORR = Oak Ridge Reservation, NTS = Nevada Test Site

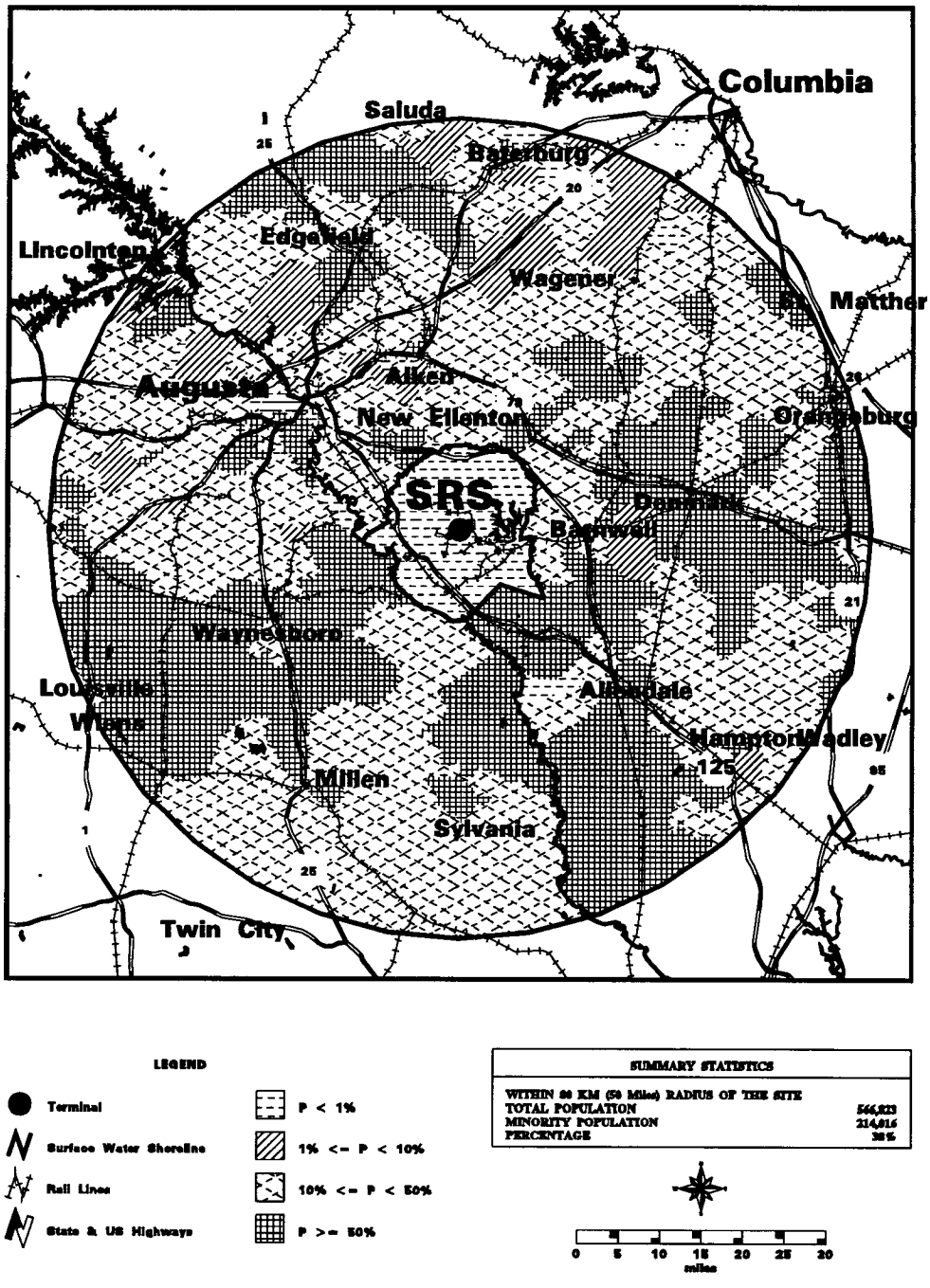


Figure A-23 Distribution of the Minority Population Residing within 80 km of the Savannah River Site

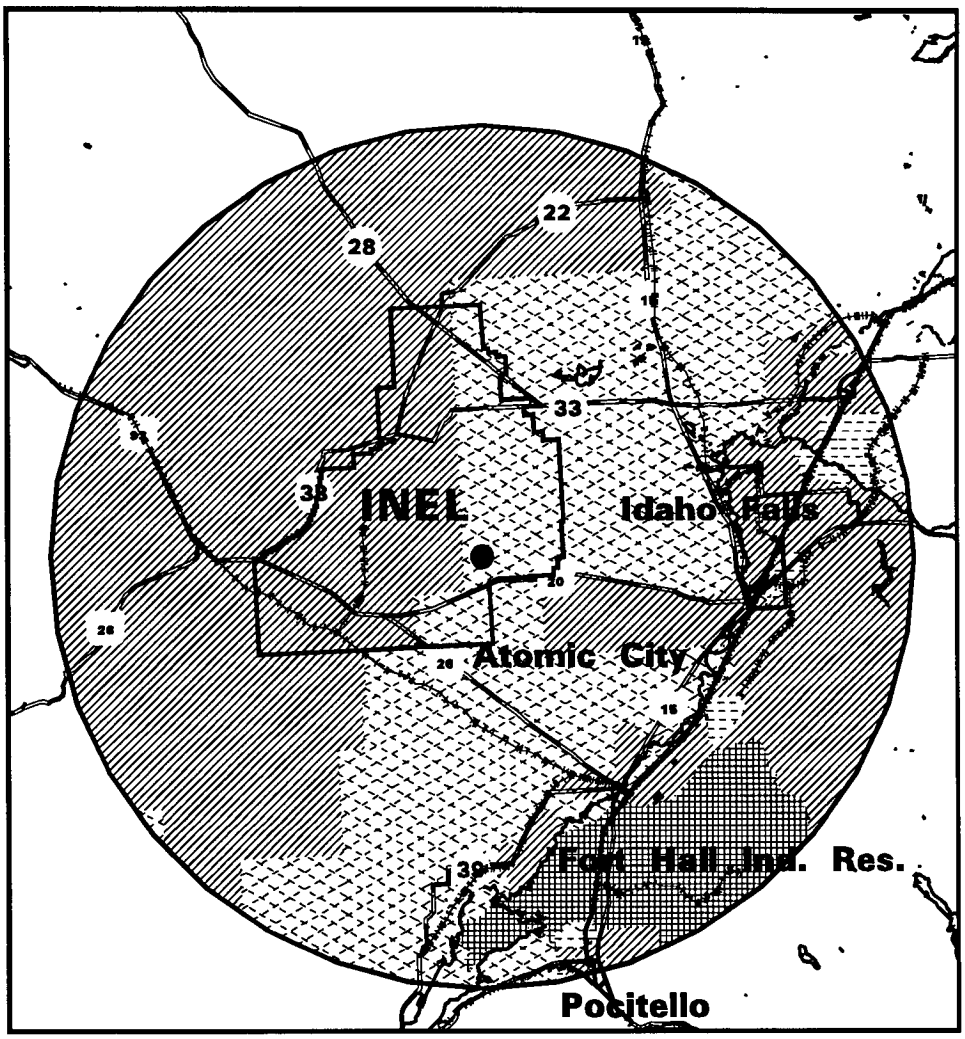


Figure A-24 Distribution of the Minority Population Residing within 80 km of the Idaho National Engineering Laboratory

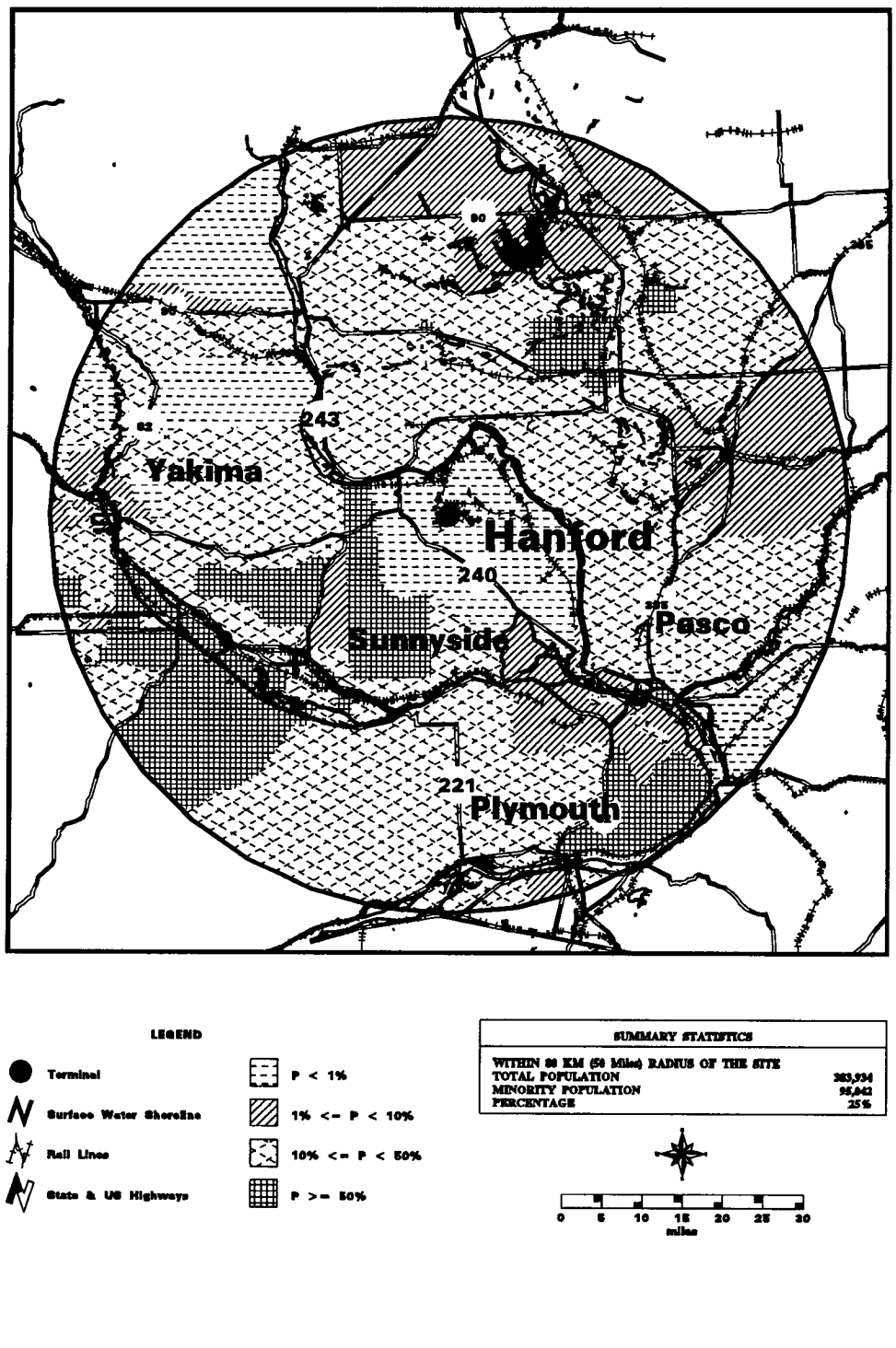


Figure A-25 Distribution of the Minority Population Residing within 80 km of the Hanford Site

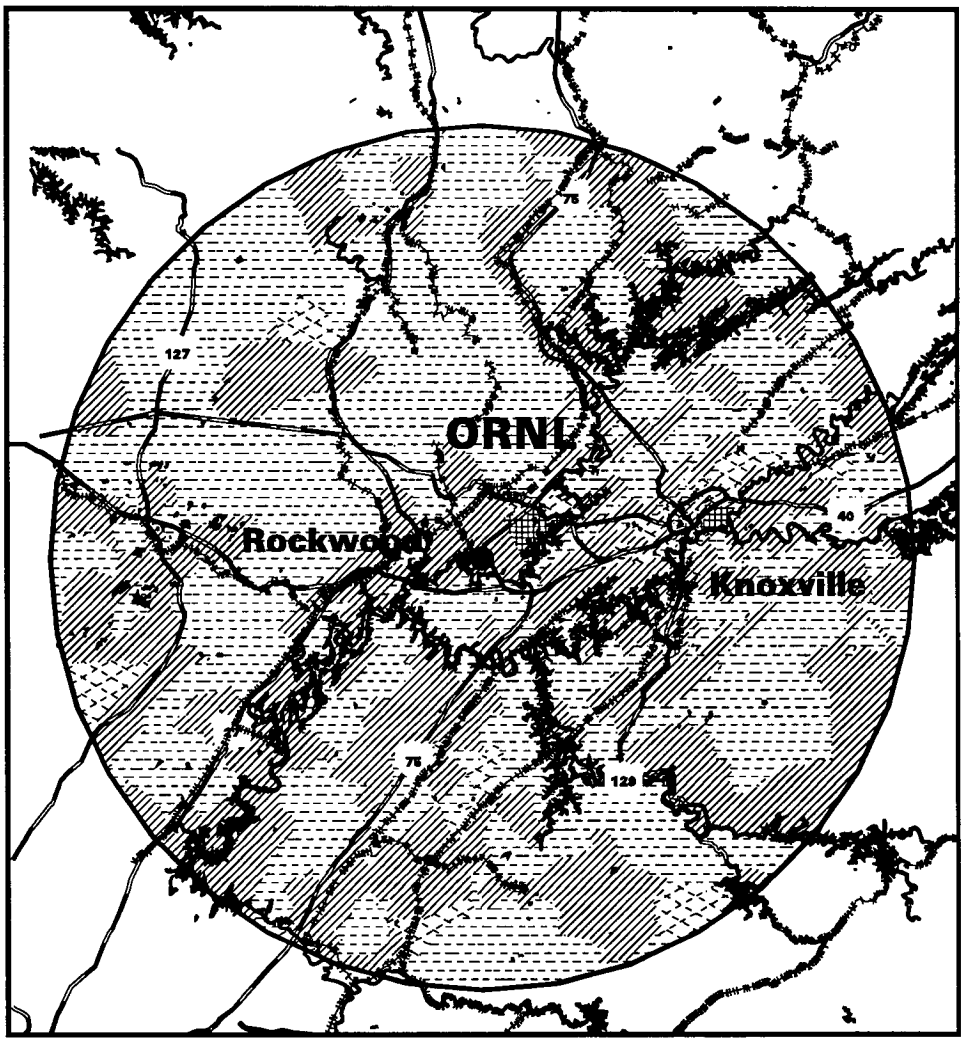


Figure A-26 Distribution of the Minority Population Residing within 80 km of the Oak Ridge Reservation

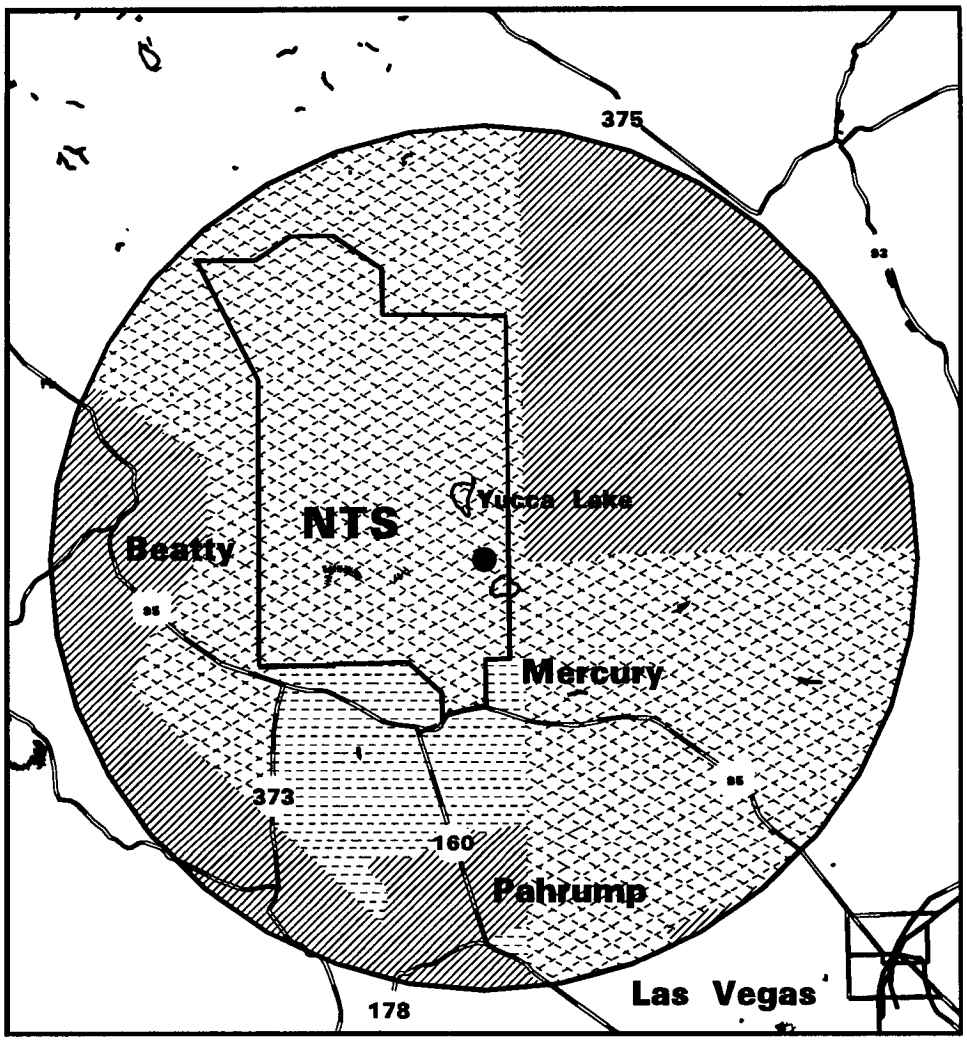


Figure A-27 Distribution of the Minority Population Residing within 80 km of the Nevada Test Site

Table A-8 Low-Income Households Near the Candidate Interim Management Sites

Candidate Management Site	*Households within 80 km of Site*	*Low-Income Households within 80 km of Site*	*% Low-Income Households within 80 km of Site*	*Households in Counties Surrounding Site*	*Low-Income Households in Counties Surrounding Site*	*% Low-Income Households in Counties Surrounding Site*
Savannah River Site	197,937	82,930	41.9	332,193	137,883	41.5
Idaho National Engineering Laboratory	55,109	22,452	40.7	87,723	36,821	42.0
Hanford Site	136,496	57,667	42.2	204,501	86,693	42.4
Oak Ridge Reservation	335,589	147,537	44.0	468,276	206,898	44.2
Nevada Test Site	4,194	2,024	48.3	301,810	119,625	39.6

Figures A-28 through A-32 show the distribution of low-income households within 80 km (50 mi) of each of the candidate interim management sites. The symbol "P" in each legend represents the percentage of low-income households. The heaviest shading indicates where these households total 50 percent or more.

For the Hanford Site, the Idaho National Engineering Laboratory, and the Nevada Test Site, block groups containing 50 percent or more low-income households lie largely south of the site. Low-income households reside throughout the 80-km (50-mi) radius, centered at the Savannah River Site. For the proposed action, no disproportionately high adverse effects are projected for low-income households in the vicinity of the interim management sites.

Characterization of minority and low-income populations residing within a geographical area is sensitive to the basic definitions and assumptions used in conducting the analysis to identify them. Both the Interagency Working Group and DOE are in the process of preparing final guidelines for use in the evaluation of environmental justice. In the absence of final guidance, the definitions and approaches being used by and within Federal agencies could vary. For example, this Final EIS and the Programmatic SNF&INEL EIS present demographic characterizations obtained from the same Census Bureau data base, but use different definitions and assumptions.

The differences in the definitions and assumptions between the Programmatic SNF&INEL EIS and the Foreign Research Reactor (FRR) Spent Nuclear Fuel (SNF) Final EIS are as follows:

1. Although both of these EISs use the same 1990 U.S. Census Bureau data base, the Programmatic SNF&INEL EIS uses data aggregated at the census tract level (2,500 to 8,000 persons) while this Final EIS uses data aggregated at the block group level (250 to 550 housing units).

2. In some cases, census blocks or tracts lie partly within the area being analyzed (i.e., within the 80-km (50-mi) radius circle around a potential spent nuclear fuel management site). Since the exact distribution of the populations within such blocks or tracts is not available, the data is insufficient to allow a precise count. To address this situation, the Programmatic SNF&INEL EIS includes a low-income or minority population in its analyses if 50 percent or more of the tract falls within an 80-km (50-mi) radius around the site being considered. In similar situations, this Final EIS assumes that the general population and the minority population are distributed uniformly throughout a block group, and includes the fraction of the low-income or minority population that corresponds to the fraction of the census block group area that falls within the 80-km (50-mi) radius circle.

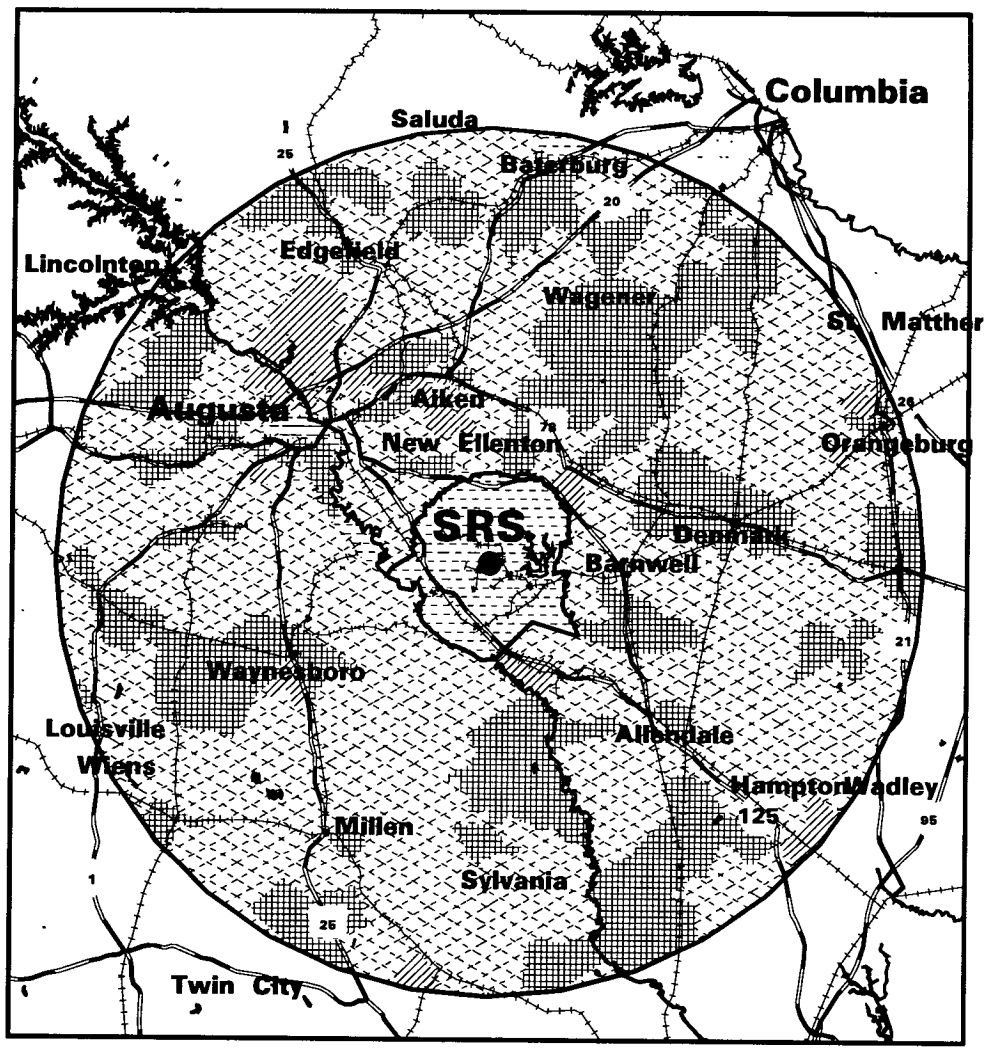


Figure A-28 Distribution of Low-Income Households Residing within 80 km of the Savannah River Site

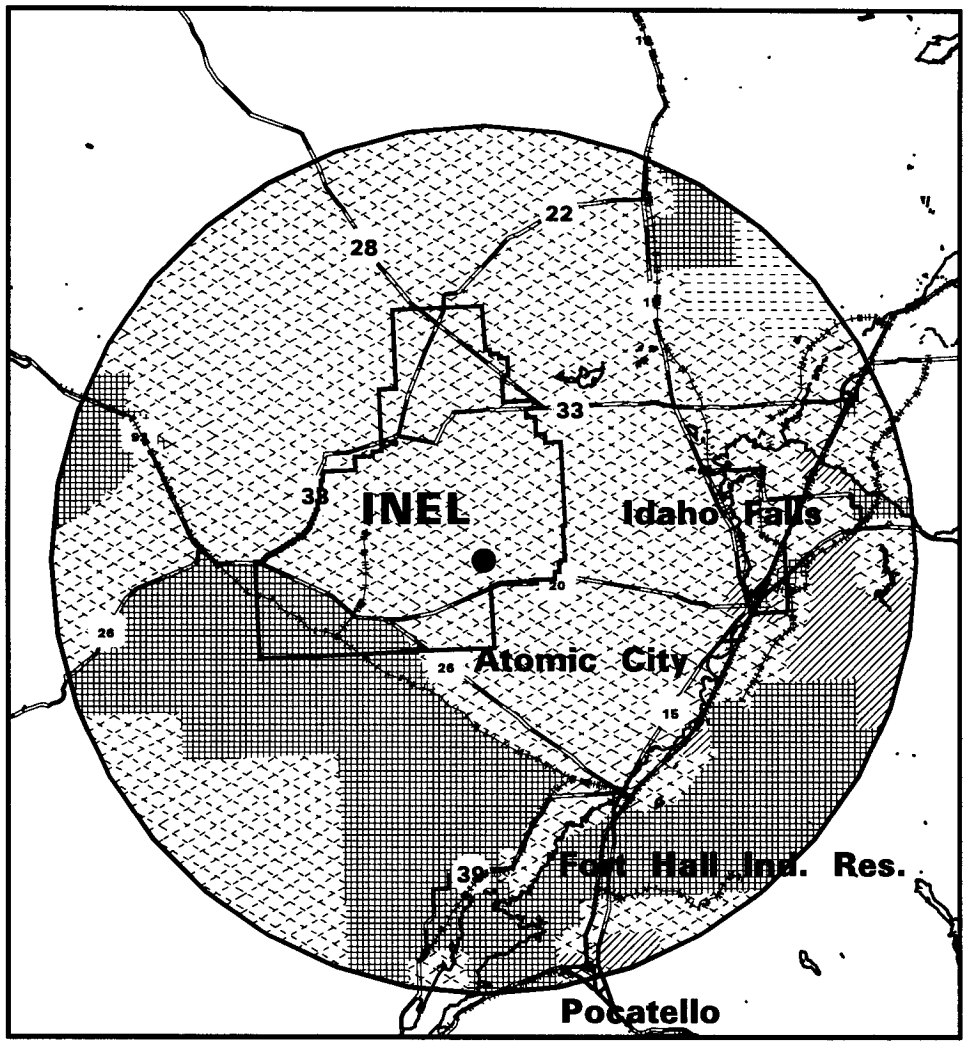


Figure A-29 Distribution of Low-Income Households Residing within 80 km of the Idaho National Engineering Laboratory

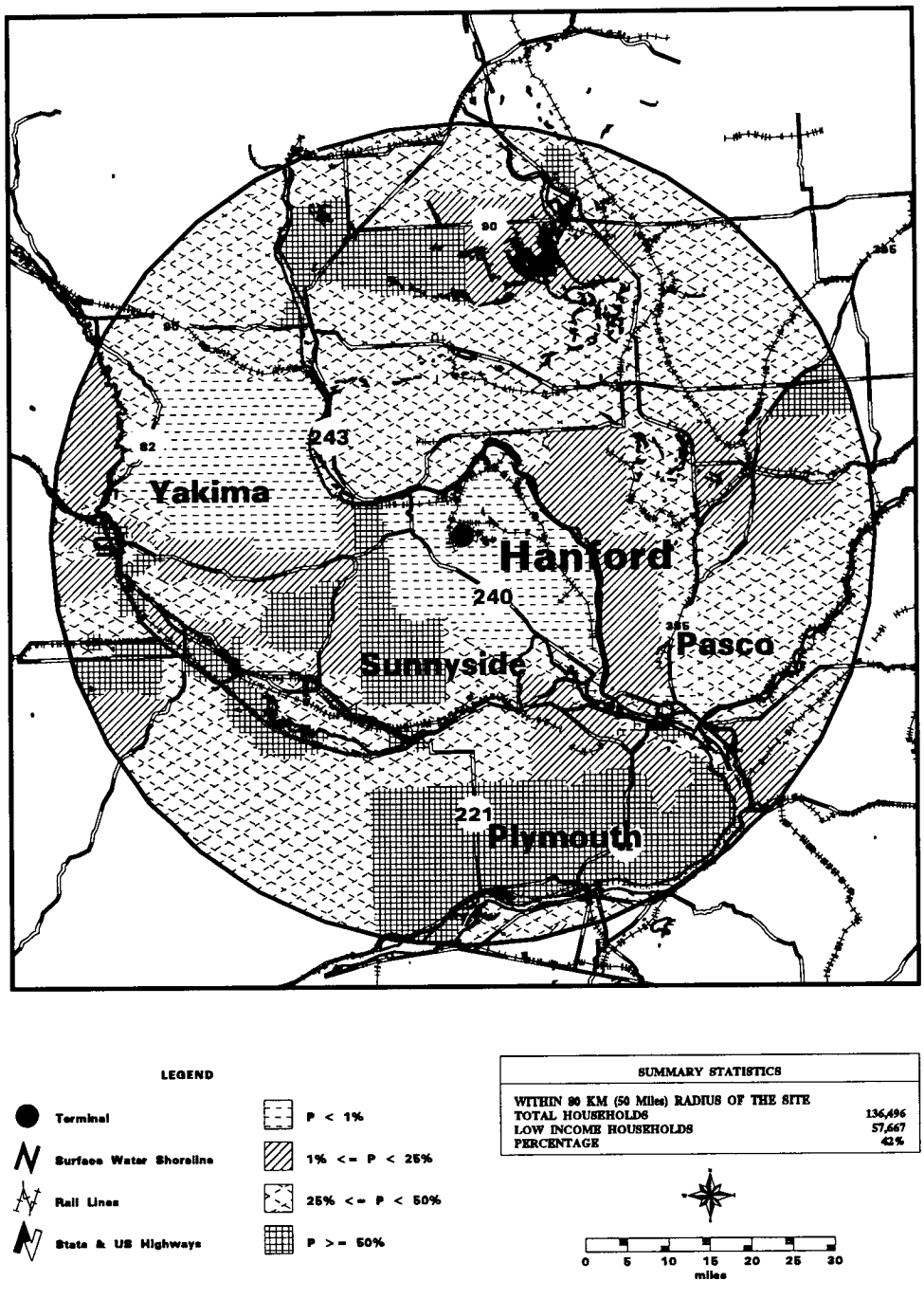


Figure A-30 Distribution of Low-Income Households Residing within 80 km of the Hanford Site

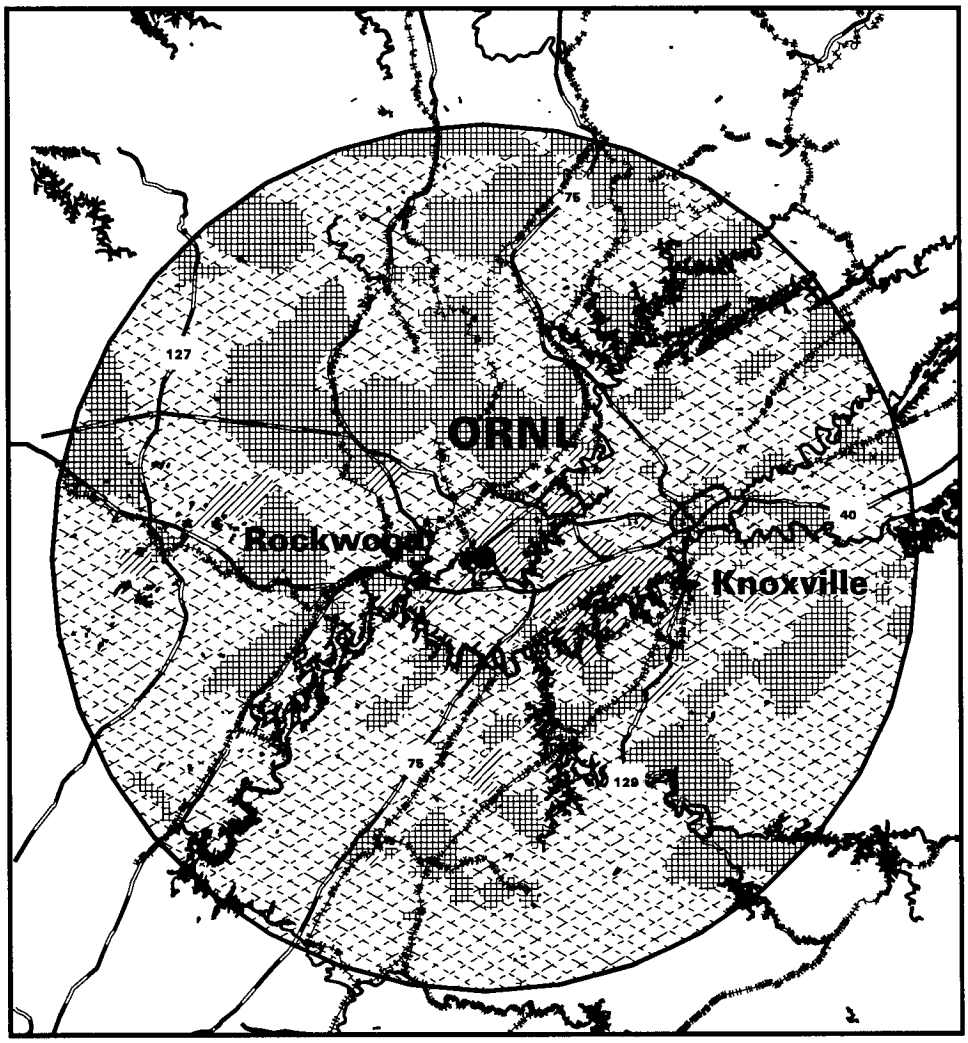


Figure A-31 Distribution of Low-Income Households Residing within 80 km of the Oak Ridge Reservation

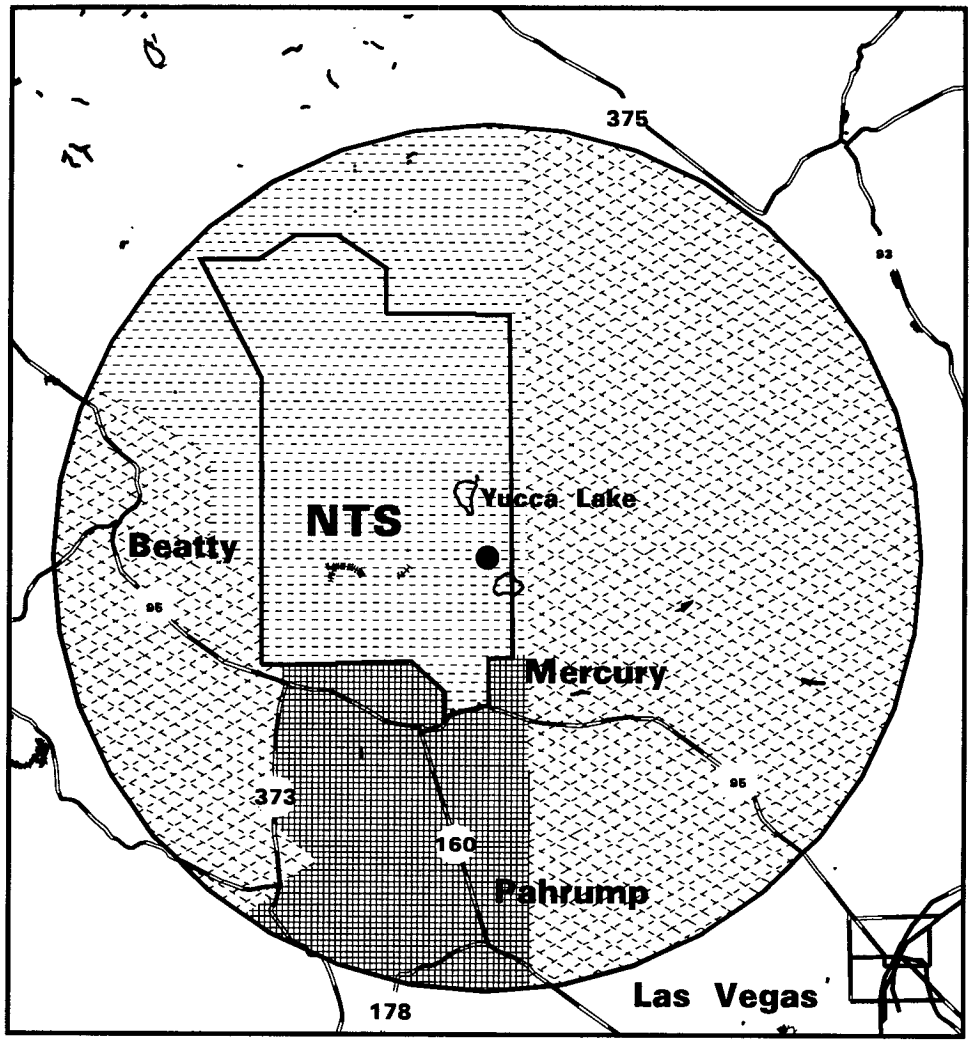


Figure A-32 Distribution of Low-Income Households Residing within 80 km of the Nevada Test Site

3. The Programmatic SNF&INEL EIS defines low-income populations as those in a poverty status as determined annually by the U.S. Census Bureau, based on the Consumer Price Index, and aggregated by the thresholds set forth by the Census Bureau (i.e., a group of people and/or a community experiencing common conditions of exposure or impact, in which 25 percent or more of the population is characterized as living in poverty), a method used by the U.S. Environmental Protection Agency. This Final EIS uses the definition of low-income community established by the U.S. Department of Housing and Urban Development (given in Section A.2 above). Both definitions are permitted under the draft guidance developed by the Interagency Working Group.

These different definitions and assumptions have resulted in differences in the characterization of low-income and minority populations. The two sets of data are summarized in Tables A-9 and A-10 and the most significant differences are discussed below.

Table A-9 Comparison of the Programmatic SNF&INEL EIS's and the FRR SNF Final EIS's Minority Characterization Results

Candidate Management Site	*Total Individuals Residing within 80 km (50 mi)*		*Minority Individuals Residing within 80 km (50 mi)*		*% of Minority Individuals Residing within 80 km (50 mi)*	
	Programmatic SNF&INEL EIS	*FRR SNF Final EIS*	*Programmatic SNF&INEL EIS*	*FRR SNF Final EIS*	*Programmatic SNF&INEL EIS*	*FRR SNF Final EIS*
Savannah River Site	619,959	566,823	233,955	214,016	37.7	37.8
Idaho National Engineering Laboratory	172,366	176,311	11,722	15,449	6.8	8.8
Hanford Site	370,807	383,934	75,381	95,042	20.3	24.8
Oak Ridge Reservation	867,231	863,758	49,742	53,185	5.7	6.2
Nevada Tests Site	11,918	12,421	759	2,005	6.4	16.1

FRR SNF = Foreign Research Reactor Spent Nuclear Fuel

Table A-10 Comparison of the Programmatic SNF&INEL EIS's and the FRR SNF Final EIS's Low-Income Characterization Results

Candidate Management Site	*Total Population Residing within 80 km (50 mi)*		*Low-Income Group Residing within 80 km (50 mi)*		*% of Low-Income Group Residing within 80 km (50 mi)*	
	Programmatic SNF&INEL EIS (Individuals)	*FRR SNF Final EIS (Households)*	*Programmatic SNF&INEL EIS (Individuals)*	*FRR SNF Final EIS (Households)*	*Programmatic SNF&INEL EIS*	*FRR SNF Final EIS*
Savannah River Site	619,959	197,937	107,764	82,930	17.4	41.9
Idaho National Engineering Laboratory	172,366	55,109	23,416	22,452	13.6	40.7
Hanford Site	370,807	136,496	65,584	57,667	17.7	42.2
Oak Ridge Reservation	867,231	335,589	134,661	147,537	15.5	44.0
Nevada Tests Site	11,918	4,194	1,474	2,024	12.4	48.3

FRR SNF = Foreign Research Reactor Spent Nuclear Fuel

The minority populations identified are reasonably consistent between the Programmatic SNF&INEL EIS and the FRR SNF Final EIS, except for results obtained at the Nevada Test Site (the largest proportional difference) and the Hanford Site (the largest difference in numbers of individuals), as shown in Table A-9. The range in results for both locations is due to the different aggregations of the demographic data used (census tracts vs. blocks), and the differences in the methods used to account for the population of tracts or groups lying only partly within the area being analyzed, as discussed above. For example, both sites are

located in rural or sparsely populated regions so that census tracts surrounding the sites are relatively large in geographical area. In addition, the outskirts of Las Vegas, Nevada begin approximately 80 km (50 mi) from the Nevada Test Site, making the analysis particularly sensitive to differences in treatment of census tracts or block groups that lie partly within a circle of an 80-km (50-mi) radius centered at that site. Most areas within the zone of impact of the Nevada Test Site are restricted access and unpopulated land.

As a result of the different definitions used for identification of low-income populations, the results of these analyses are markedly different, as shown in Table A-10. Both sets of data are correct. They simply reflect the fact that different definitions and assumptions can result in different characterizations of low-income populations.

The approach to evaluating environmental justice used in this document may change as a result of future guidance issued by the Interagency Working Group or DOE. Nevertheless, as demonstrated by the different approaches discussed above, the conclusions are not expected to change because the impacts resulting from the proposed action under all alternatives present no significant risk to the potentially affected populations. As a result, no disproportionately high and adverse effects would be expected for any particular segment of the population, including minority and low-income populations.

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NEPA TEAM

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February 1996

Volume 2

FINAL ENVIRONMENTAL IMPACT STATEMENT

on a

Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Appendix B
Foreign Research Reactor Spent Nuclear Fuel Characteristics and Transportation Casks

United States Department of Energy
Assistant Secretary for Environmental Management
Washington, DC 20585

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Appendix B
Foreign Research Reactor Spent Nuclear Fuel Characteristics and Transportation Casks

B.1 Spent Nuclear Fuel Characteristics

This section presents relevant characterization and other information on foreign research reactor spent nuclear fuel that could be managed under the proposed action. The information includes:

- Estimated amounts of spent nuclear fuel;
- A list of research reactors and foreign countries from which the spent nuclear fuel would originate;
- A description of fuel type design along with important characteristics regarding fuel design, geometry, and burnup;
- A description of the radionuclide inventories for the bounding spent nuclear fuel type; and
- An estimation of the number of foreign research reactor spent nuclear fuel shipments.

B.1.1 Estimated Amount of Spent Nuclear Fuel

The proposed action is for the U.S. Department of Energy (DOE) and Department of State to adopt a policy to manage foreign research reactor spent nuclear fuel which contains uranium enriched in the United States in a manner consistent with the goals of the U.S. nuclear weapons nonproliferation policy (see Chapter 2). The amount of spent nuclear fuel from foreign research reactors that would be managed during the policy period (1995-2005) is approximately 19.2 metric tons of heavy metal (MTHM) with a volume of approximately 110 m^3 (4,100 ft^3) representing approximately 22,700 elements[1] (see Tables B-1 and B-2). Tables B-1 and B-2 provide an estimate of the total amount of spent nuclear fuel that is currently stored or could be generated in each country by late 2005 (Matos, 1994). These tables also provide the estimated number of shipments expected from each country. The number of shipments is a key parameter in evaluating the potential risks associated with the handling and transportation of foreign research reactor spent nuclear fuel (see Section B.1.6). It should be noted that the number of spent nuclear fuel elements and the number of shipments presented for each country in this appendix are estimates based on projections of the numbers of elements to be discharged from foreign research reactors in each country listed over a 10-year period into the future. These estimates are intended to conservatively bound the total number of foreign research reactor spent nuclear fuel elements and shipments associated with the proposed policy. However, the actual distribution of elements and shipments among the listed countries might change, within the limits of the total numbers of elements and shipments listed, based on actual experience gained during the lifetime of any policy that may be established.

---

1 *Various fuel forms and geometries are used in the foreign research reactors (see Section B.1.3). In order to reduce confusion, each individual spent nuclear fuel is called a spent nuclear fuel "element." An element could be an assembly, a rod, a pin, or a cluster of rods or pins.*

Table B-1 Estimated Number of Aluminum-Based Spent Nuclear Fuel Elements of U.S.-Origin Generated by Foreign Research Reactor Operators by January 2006

Country	*Estimated Number of Spent Nuclear Fuel Elements*	*Initial Mass of Uranium (kg)*[b]	*Estimated Number of Shipments*
Argentina[a]	283	71	9
Australia	975	427	9
Austria	157	191	5
Belgium	1,766	730	59
Brazil[a]	155	99	5
Canada	2,831	4,478	116
Chile[a]	58	12	2
Colombia[a]	16	2	1
Denmark	660	529	22
France	1,962	3,442	149
Germany	1,504	909	49
Greece[a]	239	113	8
Indonesia[a]	198	236	6
Iran[a]	29	6	1
Israel	192	111	6
Italy	150	43	5
Jamaica[a]	2	1	1
Japan	2,981	3,134	99
Korea (South)[a]	168	321	7
Netherlands	1,488	1,404	49
Pakistan[a]	82	16	3
Peru[a]	29	39	1
Philippines[a]	50	24	2
Portugal[a]	88	54	3
South Africa[a]	50	10	2
Spain (from Scotland)[c]	40	16	1
Sweden	1,113	1,374	37
Switzerland	159	128	5
Taiwan	127	66	4
Thailand[a]	31	5	1
Turkey[a]	69	89	2
United Kingdom	12	4	1
Uruguay[a]	19	18	1
Venezuela[a]	120	82	4
Total	**17,803**	**18,184**	**675**

[a] *Countries other than high-income economies (World Bank, 1994). These are considered to be "developing" countries.*

[b] *To derive uranium mass in pounds, multiply the amount by 2.2.*

[c] *40 spent nuclear fuel elements of Spain's JEN-1 Reactor core are stored in Dounreay, Scotland.*

In addition, in this Environmental Impact Statement (EIS), DOE is considering potential management of highly-enriched uranium (HEU) and low enriched uranium (LEU) target materials from three countries: Canada, Belgium, and Indonesia. These countries have used, and will be using, target fuels which contain U.S.-origin enriched uranium to produce molybdenum-99 (^{99}Mo), which decays to technetium-99 (^{99}Tc), a medical isotope. The amount of target materials that is expected to be brought back to the United States would contain about 556 kg of uranium in 56 to 140 shipments (see Section B.1.5 for detail).

Table B-2 Estimated Number of TRIGA Reactor Spent Nuclear Fuel Elements of U.S.-Origin Generated by Foreign Research Reactor Operators by January 2006

Country	Estimated Number of Spent Nuclear Fuel Elements	Initial Mass of Uranium (kg)[b]	Estimated Number of Shipments
Austria	106	20	3
Bangladesh[a]	100	49	3
Brazil[a]	75	14	3
Finland	171	33	6
Germany	358	68	12
Indonesia[a]	245	47	8
Italy	386	72	13
Japan	326	62	11
Korea (South)[a]	336	64	11
Malaysia[a]	94	47	3
Mexico[a]	186	35	6
Philippines[a]	128	79	4
Romania[a]	1,451	189	48
Slovenia[a]	393	75	13
Taiwan	144	86	5
Thailand[a]	136	35	4
Turkey[a]	79	15	2
United Kingdom	90	17	3
Zaire[a]	136	26	4
Total	**4,940**	**1,033**	**162**

[a] *Countries other than high-income economies (World Bank, 1994). These are identified as "developing" countries.*

[b] *To derive uranium mass in pounds, multiply the amount by 2.2.*

The information provided in Tables B-1 and B-2, with regards to the number of spent nuclear fuel elements and the amount of initial mass of uranium, is based on the following assumptions and considerations as compiled by J. Matos of Argonne National Laboratory (Matos, 1994).

B.1.1.1 Fuel Type

Under the "Offsite Fuels Policy" that was in effect during 1988, DOE accepted aluminum-based and Training, Research, Isotope, General Atomic (TRIGA) research reactor fuels[2] for disposition (DOE 1986, and 1987). The "Offsite Fuels Policy" and the current proposed policy pertain to irradiated fuels from foreign nuclear research reactors other than those involved in the conduct of research and development activities leading to demonstration of the practical value of such reactors for industrial or commercial purposes. Specifically, the "Offsite Fuels Policy" and the proposed policy apply solely to the following types of reactor fuels:

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2 *Aluminum-based fuel is aluminum-clad and has an active fuel region that consists of an alloy of uranium and aluminum or a dispersion of uranium-bearing compound (e.g., $UA1_x$, U_3O_8, U_3Si_2, U_3Si) in aluminum. TRIGA fuel consists of an alloy of uranium and zirconium and is clad in either aluminum, incoloy, or stainless steel.*

1. Aluminum-clad reactor fuels where the uranium-235 (^{235}U) content is equal to or greater than 20 percent, by weight, of the total uranium content (i.e., HEU fuel). The active fuel region of these fuels may be configured as uranium-aluminum alloy, uranium-oxide[3] or uranium-aluminide. Spent nuclear fuels containing significant quantities of uranium-233 (^{233}U) are excluded from receipt.

2. Aluminum-clad reactor fuels where the ^{235}U content is less than 20 percent by weight of the total uranium content (i.e., LEU fuel). The active fuel regions of these fuels may be configured as uranium-silicide, uranium-aluminide or uranium-oxide. Fuels containing significant quantities of ^{233}U are excluded from receipt.

3. Aluminum-, incoloy-, or stainless steel-clad, uranium-zirconium hydride (other than ^{233}U) TRIGA fuel types.

In addition to the aluminum-based and TRIGA fuel types discussed above, U.S.-origin enriched uranium is also used in the fuel elements of several fast reactors and other special purpose reactors, in the UO_2 rodded fuel assemblies of several thermal research reactors, and in thermal homogeneous liquid and solid fueled reactors. The enrichment of the uranium ranges from 2 percent to 93 percent. These fuels do not qualify for management under the proposed policy because they were not included in the fuel types that were eligible for return to the United States under the "Offsite Fuels Policy" that was in effect in 1988.

B.1.1.2 Data Sources and Assumptions

Information on current spent nuclear fuel inventories containing U.S.-origin enriched uranium at foreign research reactors and temporary storage facilities was obtained from several sources: (1) questionnaires sent out by DOE and returned by foreign research reactor organizations in 1993 and 1994, (2) data summarized from irradiated fuel questionnaires sent out by and returned to the International Atomic Energy Agency in 1993 and 1994, and (3) Reduced Enrichment for Research and Test Reactors (RERTR) Program information on foreign research reactor fuel inventories, operation, and fuel cycles. Additional information on reactor fuel characteristics and reactor operation was obtained from directories of nuclear research reactors published by the International Atomic Energy Agency (IAEA, 1989).

Beginning with irradiated fuel inventory data, several assumptions were made, first to normalize the data to a common starting date of January 1996, and then to estimate the number of irradiated fuel elements in reactor cores and the number of spent nuclear fuel elements that could be generated during the 10-year policy period (1995-2005). These assumptions are:

1. Most foreign research reactors will continue operation during the 10-year policy period. If a permanent shutdown date has been specified by the research reactor operator, irradiated fuel was accumulated to that date only.

2. The number of irradiated fuel elements in each reactor core was determined from available reports and publications, or estimated. The estimated number of spent nuclear fuel elements covered under the proposed policy includes the inventory within the core of each research reactor at the end of the policy period. This would account for fuel elements in the reactor core of research reactors that shut down during, or at the end of, the policy period.

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3 *This uranium-oxide composition refers to aluminum-clad fuel plates or tubes containing dispersions of U_3O_8 in aluminum. It does not include fuels containing UO_2 pellets clad in aluminum, zircaloy, stainless steel, or other materials.*

3. Known current and planned shutdowns for prolonged periods of maintenance and refurbishment have been incorporated into the estimates.

4. Dates for conversion from HEU to LEU fuel have been estimated, and the enrichment change was incorporated into the inventory data.

5. Estimated irradiated fuel inventories have been included for reactors that are under construction and plan to begin operation before the Record of Decision date (assumed here to be December 31, 1995) of the proposed policy using U.S.-origin enriched uranium.

6. Spent nuclear fuel from previously shutdown reactors with fuel in temporary storage has been included.

B.1.1.3 Foreign Research Reactors Eligible for Inclusion in this EIS

There are 104 research and test reactors located in 41 foreign countries that possess aluminum-based and TRIGA fuels containing U.S.-origin enriched uranium. These foreign research reactors are listed in Tables B-3 through B-5. Table B-3 lists 76 reactors that possess aluminum-based fuel only. These foreign research reactors are arranged in a number of categories that depend on each reactor's LEU conversion status. Table B-4 lists 25 foreign research reactors that possess TRIGA fuel only. Table B-5 lists three foreign research reactors that were converted from HEU aluminum-based fuel to LEU TRIGA fuel and thus possess both aluminum-based and TRIGA spent nuclear fuels.

B.1.1.4 Developing Countries

For purposes of this EIS, developing countries are defined as countries having other than high-income economies, on the basis of per capita Gross Domestic Product, by the World Bank (World Bank, 1994). Two countries, Zaire and Taiwan, were not listed in the World Bank report. Zaire is considered here to have a low-income economy; and Taiwan, with an estimated per capita Gross Domestic Product of $10,900 (1994), is considered to have a high-income economy. The countries shown below qualify as developing countries according to this criterion:

List of Developing Countries

Low Income Economies	*Lower Middle Income Economies*		*Upper Middle Income Economies*	
Bangladesh	Chile	Romania	Argentina	Slovenia
Indonesia	Colombia	Thailand	Brazil	South Africa
Pakistan	Iran	Turkey	Greece	South Korea
Zaire	Jamaica		Malaysia	Uruguay
	Peru		Mexico	Venezuela
	Philippines		Portugal	

B.1.2 General Characteristics of Nuclear Fuels and Spent Nuclear Fuel

Nuclear fuels consist of fissile materials that produce a net increase in neutrons when they absorb neutrons, and fertile materials that produce fissile material when they absorb neutrons. The principal fissile materials are ^{235}U, Plutonium-239 (^{239}Pu), and ^{233}U (Plutonium-241 or ^{241}Pu is also of some importance). The principal fertile materials are uranium-238 (^{238}U) and Thorium-232 (^{232}Th) (Plutonium-240 or ^{240}Pu and uranium-234 or ^{234}U also play roles as fertile materials). The only fissile

Table B-3 Foreign Research and Test Reactors that Possess Only Aluminum-Based Fuel Containing HEU and LEU of U.S.-Origin

	Reactor	Country	Power, MW	Fuel Geometry	Initial Enrichments[a] Wt-% ^{235}U, U.S. Origin			Comment (see Note)
					Enr.1	Enr.2	Enr.3	
HEU Reactors Fully- or Partially-Converted to LEU Fuel								
1	RA-3	Argentina	3	Plates	90	-	-	(1)
2	ASTRA	Austria	10	Plates	93	45	20	
3	IEA-R1	Brazil	2	Plates	93	-	20	
4	NRU	Canada	125	Pin Cluster	93	-	20	
5	DR-3	Denmark	10	Tubes	93	85	20	
6	OSIRIS	France	70	Plates	-	-	20	
7	FRG-1	Germany	5	Plates	93	-	20	
8	NRCRR	Iran	5	Plates	93	-	-	(2)
9	JMTR	Japan	50	Plates	93	45	20	
10	PARR	Pakistan	5	Plates	92	-	-	(2)
11	R2	Sweden	50	Plates	93	-	20	
HEU Reactors that Have Ordered LEU Fuel Elements for Conversion								
12	GRR-1	Greece	5	Plates	93	-	20	(3)
13	HOR	Netherlands	2	Plates	93	-	20	(3)
14	TR-2	Turkey	5	Plates	93	-	20	(3)
HEU Reactors that Can Be Converted to LEU Fuel								
15	RA-6	Argentina	0.5	Plates	90	-	-	
16	HIFAR	Australia	10	Tubes	80	60	20	(3)
17	SAR-GRAZ	Austria	0.01	Plates	90	-	20	
18	MNR	Canada	2	Plates	93	-	20	
19	Slowpoke - Alberta	Canada	0.02	Pin Bundle	93	-	-	
20	Slowpoke - Halifax	Canada	0.02	Pin Bundle	93	-	-	
21	Slowpoke - Montreal	Canada	0.02	Pin Bundle	93	-	-	
22	Slowpoke - Saskatchewan	Canada	0.02	Pin Bundle	93	-	-	
23	Slowpoke - Toronto	Canada	0.02	Pin Bundle	93	-	-	
24	LA REINA	Chile	5	Plates	80	-	-	
25	IAN-R1	Colombia	0.03	Plates	90	-	-	
26	EOLE	France	0.01	Plates	93	-	-	
27	MINERVE	France	0.003	Plates	93	-	-	
28	SCARABEE	France	20	Plates	93	-	-	
29	Strasbourg - Cronenbourg	France	0.1	Plates	90	-	-	
30	Ulyssee - Saclay	France	0.1	Plates	90	-	-	
31	BER-II	Germany	10	Plates	93	-	20	(3)
32	FRJ-2	Germany	23	Tubes	80	-	20	(3)
33	FRM	Germany	4	Plates	93	45	-	
34	IRR-1	Israel	5	Plates	93	-	20	(3)
35	Slowpoke	Jamaica	0.02	Pin Bundle	93	-	-	
36	JMTRC	Japan	0	Plates	93	45	-	
37	JRR-4	Japan	3.5	Plates	93	-	20	(3)
38	KUCA	Japan	0	Plates	93	45	-	
39	KUR	Japan	5	Plates	93	-	20	(3)
40	UTR Kinki	Japan	0	Plates	90	-	-	
41	HFR Petten	Netherlands	45	Plates	93	-	20	(3)
42	LFR	Netherlands	0.03	Plates	93	-	-	
43	RPI	Portugal	1	Plates	93	-	20	
44	SAFARI	S. Africa	20	Plates	93	-	-	(4)

	Reactor	Country	Power, MW	Fuel Geometry	Initial Enrichments[a] Wt-% ^{235}U, U.S. Origin			Comment (see Note)
					Enr.1	Enr.2	Enr.3	
45	R2-0	Sweden	1	Plates	90	-	-	
46	ZPRL	Taiwan	0.01	Plates	93	-	20	
HEU Operating Reactors that Cannot be Converted with Current Technology								
47	BR-2	Belgium	60	Tubes	90-93	-	-	
48	ORPHEE	France	14	Plates	93	-	-	
49	RHF	France	57	Involute Plates	93	-	-	
HEU Operating Reactors Announced to be Shutdown								
50	SILOE	France	35	Plates	93	45	20	
51	SILOETTE	France	0.1	Plates	93	-	-	
52	FMRB	Germany	1	Plates	93	-	-	
53	FRG-2	Germany	15	Plates	90 - 93	-	20	
54	JRR-2	Japan	10	Plates	93	45	-	
55	UTR 300	U. K.	0.3	Plates	90	-	-	
Shutdown Reactors Possessing HEU Fuel								
56	MOATA	Australia	-	Plates	90	-	-	
57	BR-02	Belgium	-	Tubes	90	-	-	
58	NRX	Canada	-	Pin Cluster	93	-	-	
59	PTR	Canada	-	Plates	93	-	-	
60	Slowpoke - Kanata	Canada	-	Pin Bundle	93	-	-	
61	MELUSINE	France	-	Plates	93	-	-	
62	GALILEO	Italy	-	Plates	89	-	-	
63	ISPRA-1	Italy	-	Plates	90	-	-	
64	RANA	Italy	-	Plates	90	-	20	
65	JEN-1	Spain	-	Plates	79	-	20	(5)
66	SAPHIR	Switzerland	-	Plates	93	45	20	
LEU Operating Reactors Possessing Only LEU Fuel								
67	RA-0	Argentina	0.01	Plates	-	-	20	
68	Argonauta	Brazil	0.2	Plates	-	-	20	
69	RSG-GAS30	Indonesia	30	Plates	-	-	20	
70	JRR-3M	Japan	20	Plates	-	-	20	
71	TTR-1	Japan	0.1	Plates	-	-	20	
72	RP-10	Peru	10	Plates	-	-	20	
73	KMRR	S. Korea	30	Pin Cluster	-	-	20	(6)
LEU Shutdown Reactors Possessing Only LEU Fuel								
74	THAR	Taiwan	-	Plates	-	-	20	
75	RU-1	Uruguay	-	Plates	-	-	20	
76	RV-1	Venezuela	-	Plates	-	-	20	

[a] *Initial enrichments, in weight-% ^{235}U, of the fuels possessed or anticipated to be possessed by each reactor. Only fuels containing uranium of U.S.-origin are included.*

Note:

(1) *Converted to LEU fuel of Soviet origin.*

(2) *Converted to LEU fuel of Chinese origin.*

(3) *Use of fuel containing LEU of U.S.-origin is anticipated to begin before 2001.*

(4) *Currently uses HEU of South African origin.*

(5) *JEN-1 fuel is currently being stored in Dounreay, Scotland.*

(6) *The KMRR reactor in South Korea began operation using LEU aluminum-based fuel in January 1995.*

Table B-4 Foreign Research and Test Reactors that Possess Only TRIGA Fuel Containing HEU and LEU of U.S.-Origin

	Reactor	Country	Power, MW	Fuel Geometry	Initial Enrichments[a] Wt-% ^{235}U, U.S. Origin		
					Enr.1	Enr.2	Enr.3
Reactors Possessing HEU Fuel							
1	Vienna	Austria	0.25	Rods	70	-	20
2	Salazar	Mexico	1	Rods	70	-	20
3	SSR	Romania	14	Rods	93	-	20
4	Ljubljana	Slovenia	0.25	Rods	70	-	20
5	Seoul #2	S. Korea	2	Rods	70	-	20
Reactors Possessing LEU Fuel							
6	Dhaka	Bangladesh	3	Rods	-	-	20
7	Belo Horiz.	Brazil	-	Rods	-	-	20
8	Helsinki	Finland	0.25	Rods	-	-	20
9	Hannover	Germany	-	Rods	-	-	20
10	Heidelberg	Germany	0.25	Rods	-	-	20
11	Mainz	Germany	0.1	Rods	-	-	20
12	Bandung	Indonesia	1	Rods	-	-	20
13	Yogyakarta	Indonesia	0.1	Rods	-	-	20
14	Pavia	Italy	0.25	Rods	-	-	20
15	Rome	Italy	1	Rods	-	-	20
16	Mushashi Inst	Japan	0.1	Rods	-	-	20
17	NSRR-Tokai	Japan	0.3	Rods	-	-	20
18	Rikkyo U.	Japan	0.1	Rods	-	-	20
19	Kuala Lumpur	Malaysia	1	Rods	-	-	20
20	ACPR	Romania	0.5	Rods	-	-	20
21	Seoul #1	S. Korea	0.25	Rods	-	-	20
22	Istanbul	Turkey	0.25	Rods	-	-	20
23	Imp Chem Ind.	U. K.	0.25	Rods	-	-	20
24	TRICO II	Zaire	1	Rods	-	-	20
Shutdown Reactors							
25	TRICO I	Zaire	-	Rods	-	-	20

[a] *Initial enrichments, in weight-% ^{235}U, of the fuels possessed by each reactor. Only fuels containing uranium of U.S.-origin are included.*

Table B-5 Foreign Research and Test Reactors that Possess Both Aluminum-Based and TRIGA Fuel Containing HEU and LEU of U.S.-Origin.

	Reactor	Country	Power, MW	Fuel Geometry	Initial Enrichments[a] Wt-% ^{235}U, U.S. Origin		
					Enr.1	Enr.2	Enr.3
1	PRR-1	Philippines	3	TRIGA Rods	-	-	20
			-	Plates	93	-	20
2	THOR	Taiwan	1	TRIGA Rods	-	-	20
			-	Plates	93	-	
3	TRR-1	Thailand	2	TRIGA Rods	-	-	20
			-	Plates	90	-	-

[a] *Initial enrichments, in weight-% ^{235}U, of the fuels possessed by each reactor. Only fuels containing uranium of U.S.-origin are included.*

Note:
All three of these reactors have been converted from plate-type, aluminum-based HEU fuel to TRIGA LEU fuel. The PRR-1 reactor in the Philippines possesses both HEU and LEU cores of plate-type aluminum-based fuel elements.

material that occurs in nature in a significant quantity is ^{235}U. Natural uranium consists of 0.711 weight percent (w/o) ^{235}U, 99.283 w/o ^{238}U; and 0.0055 w/o ^{234}U as a negligible trace constituent. Uranium-235 is the only fissile material used in foreign research reactors.

In a research reactor, the fuel matrix typically consists of enriched uranium metal in an alloy of aluminum or zirconium hydride. The enriched uranium may contain up to 93 weight percent ^{235}U. The fuel matrix form is either plates (flat or curved), tubes made of three curved plates, or pellets combined into rods. The cladding is the encapsulation (typically aluminum or stainless steel) that surrounds the fuel for confinement and protection. The structural part of a fuel element holds fuel plates or tubes in the proper configuration and directs coolant flow (light or heavy water) over the fuel. Structural parts are usually aluminum. The fuel rods do not require additional structural parts. The size of a fuel element ranges from approximately 1 kg (2.2 lb) to more than 100 kg (220 lb), and lengths range from 76 to 300 cm (2.5 to 9 ft).

As the fuel in a reactor is irradiated, it undergoes nuclear transmutations that cause its composition to change. In the reactor, the fissionable materials in the fuel undergo a process called "fission reaction." Fission reaction occurs when an atom of ^{235}U interacts with a free neutron causing the ^{235}U atom to split into two lighter nuclei which are referred to as "fission products." The fission reaction also results in the release of heat and additional free neutrons that are available to sustain the fission reaction or to maintain criticality. In addition to fission products, heavier elements such as plutonium and other isotopes of uranium are formed when uranium in the fuel absorbs free neutrons rather than undergoing the fission process. The changes in composition of the fuel bring about changes in the fission reaction rate of the fuel. As the reactor operation continues, the fission reaction rate decreases and eventually the reactor will no longer remain critical unless some spent nuclear fuels are replaced with fresh fuels. The discharged fuel is called "spent nuclear fuel." The extent of change in the composition of the fuel is expressed in terms of "burnup," in either percent (atom percent) of fissile material consumed, or the number of megawatt days of heat released per element (or per metric ton of uranium).

When initially discharged from the reactor, spent nuclear fuel is highly radioactive and generates a significant amount of heat. Therefore, the spent nuclear fuel must be stored in a wet pool that provides both shielding and cooling environments. The cooling is required in order to prevent the spent nuclear fuel from being damaged by the heat that fission products generate, and the shielding is needed to protect the workers who handle the fuel.

The quantity of radioactive material in spent nuclear fuel, and the resulting heat generation, decreases over time because of decay of fission products in the spent nuclear fuel. Radioactive decay refers to a process whereby the radioactive elements undergo nuclear transformations that ultimately convert them to stable (nonradioactive) elements. Many fission products formed during reactor operation have short half-lives (the time required for a quantity of radioactive material to decrease to one-half of its original amount) and others remain radioactive for tens to thousands of years. The high initial quantities of fission products in the spent nuclear fuel put the greatest requirements on providing shielding and cooling during the first few months after the spent nuclear fuel is discharged from the reactor. The rapid decay of short half-lived radioactive material leads to reduction of the amount of radioactive material in the spent nuclear fuel over time. This, in turn, reduces the need for continued storage of the spent nuclear fuel in a wet pool. After about 1 year, the heat generation rate in a spent nuclear fuel element decreases to about one percent of the level present at the time of its discharge from the reactor, and this heat generation rate would not damage the spent nuclear fuel if it is stored in a "dry" cask in preparation for transportation and dry storage.

B.1.3 Foreign Research Reactor Spent Nuclear Fuel Designs

Foreign research reactors use a number of different fuel designs. These designs can be organized into five categories: (1) plate-type design, (2) concentric tube-type design, (3) pin-type design, (4) special-type design, and (5) rod-type design. The first four designs are aluminum-based fuel while the fifth is a TRIGA type. The first two fuel types (plate-and tube-type fuels) are known as material test reactor (MTR) fuels. The following summarizes specific characteristics of the different types of fuel named above.

B.1.3.1 Plate-Type Design

This type of fuel design is used in the majority of foreign research reactors. The thermal power of these reactors ranges from 1 MW to 50 MW. Figures B-1 and B-2 show typical fuel elements using this type of fuel design. The number of fuel plates in an element varies between 6 and 23, and the initial ^{235}U content varies between 37 g (1.3 oz) and 420 g (14.8 oz) per element. Similarly, the average burnup of a discharged spent nuclear fuel varies between 15 and 76 percent (^{235}U atom percent). The uranium enrichment in this type of fuel varies from just below 20 to 93 percent.

The following provides additional information on a typical plate-type spent nuclear fuel element which was used in a 50 MW foreign research reactor, as shown in Figure B-2.

The fuel element is made of an alloy of 23 percent by weight of 93 percent enriched uranium in aluminum with a thin (0.38 mm) aluminum cladding. Each fuel element contains 19 fuel plates. The nominal dimensions and weights of each fuel plate and the fuel element are:

	Fuel Plate	*Element*	*Element (cut)*
Dimensions (mm):			
Length	778	1,200	800
Width	70.8	77.0	77.0
Height	1.27[a]	77.0	77.0
Weight (g):			
^{235}U	15	285	285
Total	202	--	5,500
Burnup:			
^{235}U (g)	~3	60	60

[a] *Thickness*

The cut element reflects that portion of the fuel element that contains fuel material. The aluminum nose cone and the aluminum top section of the fuel element are cut to reduce the size of the spent nuclear fuel prior to shipment. This action is usually performed at the foreign research reactor site if the site is equipped to do so. The cutting is necessary to pack more cut elements in a transportation cask, and also since some casks cannot accommodate the whole element length.

B.1.3.2 Concentric Tube Design

This type of fuel design is used in four foreign research reactors: Australian (HIFAR), Belgian (BR-2), Japanese (JRR-2) and Danish (DR-3). The Belgian reactor is a 125 MW reactor, and the other three are each 10 MW. Figure B-3 shows a typical fuel element using concentric tube (tubular) fuel type. The number of fuel tubes in an element varies between 4 and 6, and the initial ^{235}U content varies between

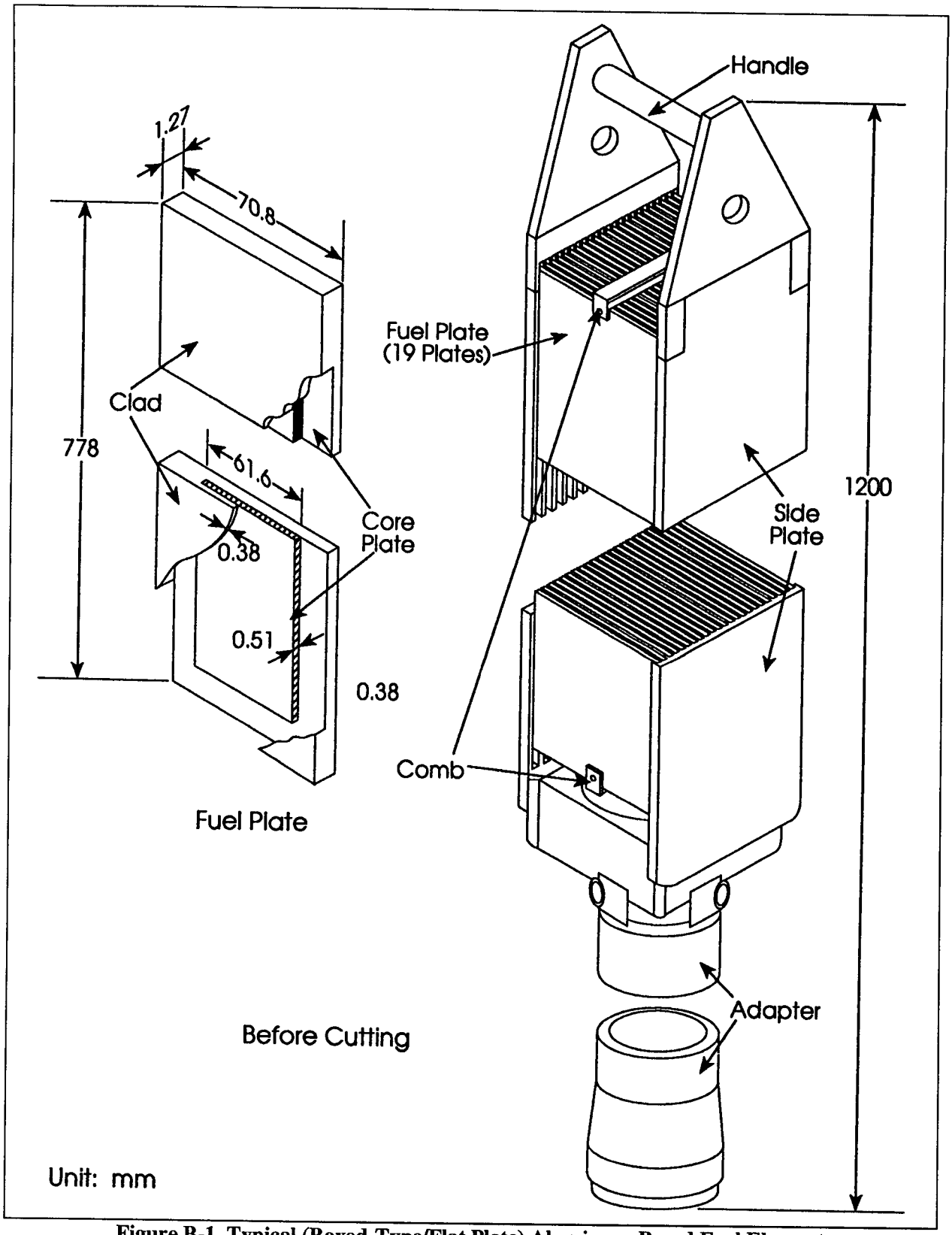


Figure B-1 Typical (Boxed-Type/Flat Plate) Aluminum-Based Fuel Element Schematic

Part No.	Name of Part	Material	Number
1	Bottom Adapter	Aluminum Alloy	1
2	Top Adapter	Aluminum Alloy	1
3R	Side Plate	Aluminum Alloy	1
3L	Side Plate	Aluminum Alloy	1
4	Outer Fuel Element	U-Al Alloy	2
5	Inner Fuel Element	U-Al Alloy	15
6	Comb	Aluminum Alloy	1
7	Comb Pin	Aluminum Alloy	1

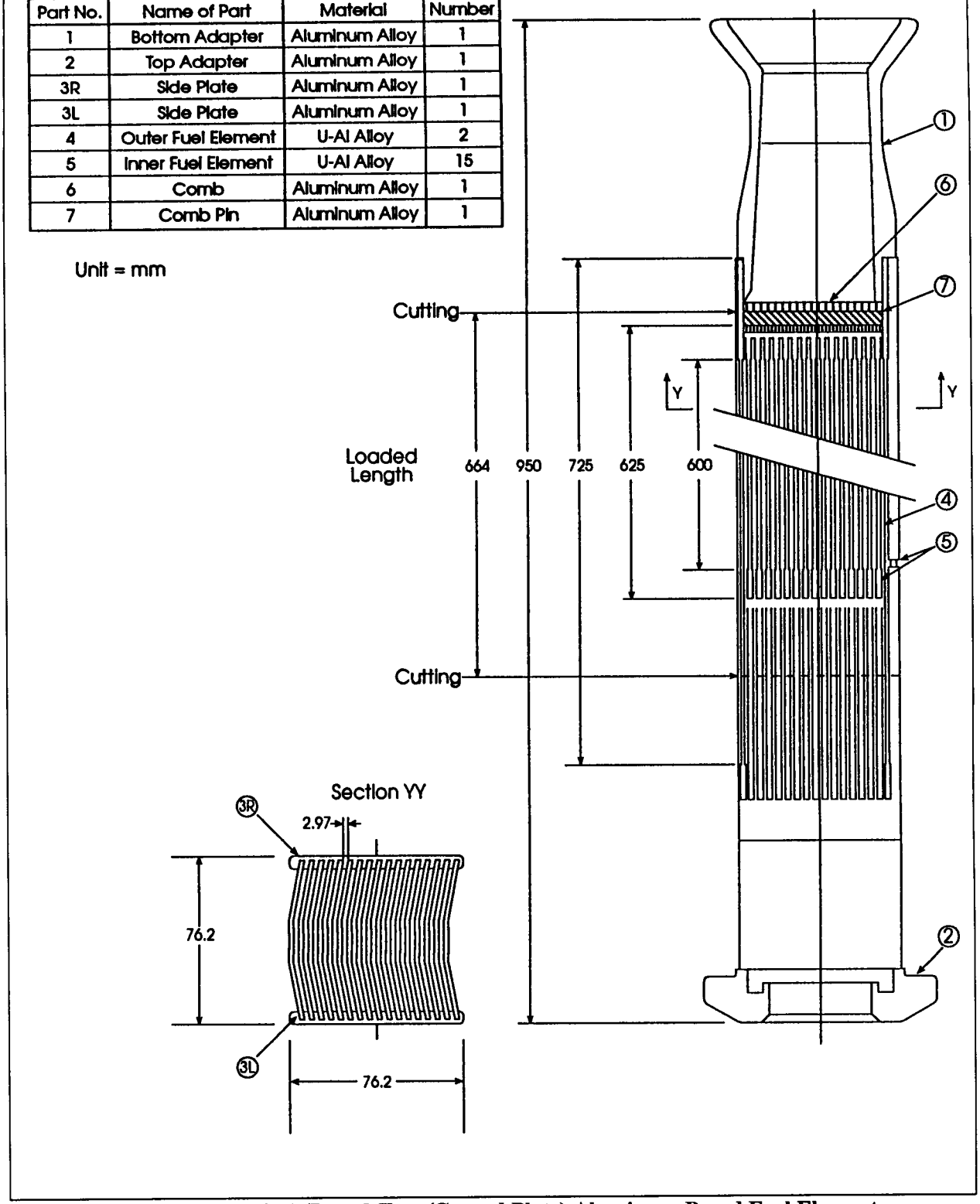
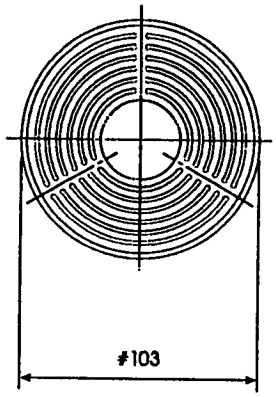


Figure B-2 Typical (Boxed-Type/Curved Plate) Aluminum-Based Fuel Element Schematic

Part No.	Name of Part	Material	Number
1	Bottom Adapter	Aluminum Alloy	1
2	Top Adapter	Aluminum Alloy	1
3	Outer Cylinder	Aluminum Alloy	1
4	Plate	Aluminum Alloy	3
5	Fuel Plate	———	5x3
6	Inner Layer Plate	Aluminum Alloy	3
7	Top Capsule Guide	Aluminum Alloy	1
8	Comb Plate	Aluminum Alloy	3
9	Capsule Guide	Aluminum Alloy	1
10	Comb	Aluminum Alloy	3

Unit = mm



Section AA

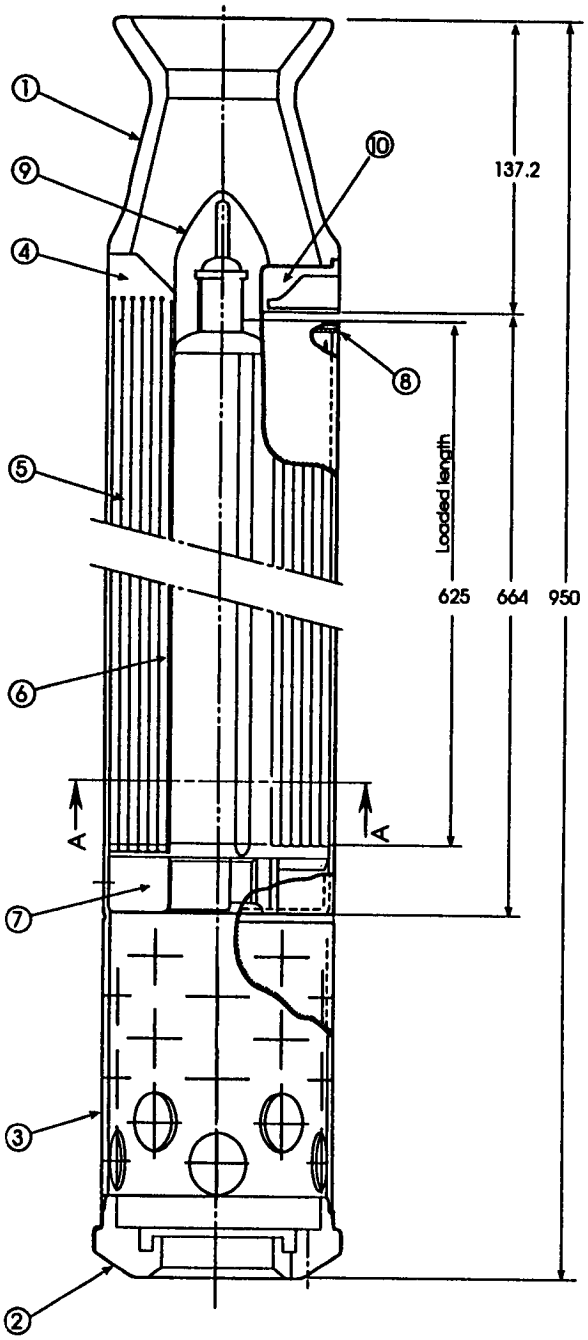


Figure B-3 Typical (Tube-Type) Aluminum-Based Fuel Element Schematic

150 g (5.3 oz) and 400 g (14.6 oz) per element. The average burnup of discharged spent nuclear fuels from these reactors ranges between 47 and 55 percent (^{235}U atom percent). The uranium enrichment used in this fuel varies from just below 20 to 93 percent.

The following provides additional information on a typical tubular type spent nuclear fuel element (shown in Figure B-3) that was used in a 10 MW reactor.

This fuel element initially contains 220 g (7.7 oz) ^{235}U, and consists of 5 concentric fuel tubes. Each tube is made of three curved fuel plates. The fuel is an alloy of uranium in aluminum with a thin (0.38 mm) aluminum cladding. Five different curved fuel plate width sizes with 1.27 mm (0.05 in) thickness and 625 mm (24.6 in) height are used. The overall outside diameter of the outermost tube is 103 mm (4 in). The plate width and the ^{235}U content for each plate size are:

Plate Number	*1*	*2*	*3*	*4*	*5*
Width (mm)	57.9	66.9	75.8	84.8	93.7
^{235}U (g)	10.70	12.70	14.60	16.60	18.60

The overall dimensions of a cut element, leaving the fuel portion intact, are 103 mm (4 in) outside diameter and 664 mm (25.4 in) in length, with an overall weight of approximately 6,000 g (13.2 lbs).

B.1.3.3 Pin-Type Design

Three types of foreign research reactors use pin-type design fuel. They are: the Canadian Safe LOW POwer critical [K] Experiment (SLOWPOKE) (20 kW power); the Canadian NRU (125 MW power) and South Korean KMRR (30 MW) reactors; and the Romanian TRIGA (14 MW) reactors. Among these reactors, the SLOWPOKE fuel pins are the smallest in size and uranium content. The NRU and KMRR reactor fuels are considered special type fuel, and the Romanian reactor fuels are TRIGA or rod-type fuel. Special-type and rod-type materials are discussed below.

The SLOWPOKE reactor fuel pins have an outside diameter of 4.73 mm (0.2 in), a length of 220 mm (8.7 in), and contain 93 percent enriched uranium fuels. The ^{235}U content of each pin is 2.8 g (0.1 oz). The maximum fuel burnup of discharged spent nuclear fuels is about 2 percent (^{235}U atom percent) in 10 to 20 years of reactor operation.

The SLOWPOKE spent nuclear fuel pins are usually bundled together in 10 to 15 pins per bundle. In the past, this fuel was shipped to Savannah River Site in 50.8-mm (2-in) outside diameter, 2.9-m- (9.6-ft-) long canisters containing between 150 to 160 pins per canister.

B.1.3.4 Special-Type Design

Special-type design fuels are used in the French RHF (57 MW power), Canadian NRU (125 MW power) and NRX (24 MW power), and the South Korean KMRR (30 MW) reactors. The fuel type in the Canadian research reactors consists of clusters of about 3-m- (9.84-ft-) long uranium aluminum alloy fuel pins clad in aluminum. The initial ^{235}U content of each fuel cluster varies between 491 g (17.3 oz) and 545 g (19.2 oz). The current operating reactor (NRU) uses a fuel element that consists of a cluster of 12 long pins containing 491 g (17.3 oz) of ^{235}U per cluster. Each fuel pin has an overall length of 296 cm (116.5 in), and the fuel portion is 274.3 cm (107.9 in) long. The fuel cluster including the flow tube is cut to a length of 292.6 cm (115.2 in) before shipment. The average burnup of discharged spent nuclear fuels from an NRU reactor is about 76 percent (^{235}U atom percent). Figure B-4 shows a 12-pin cluster NRU fuel element. The fuel in the South Korean research reactor consists of two types of fuel clusters; one is

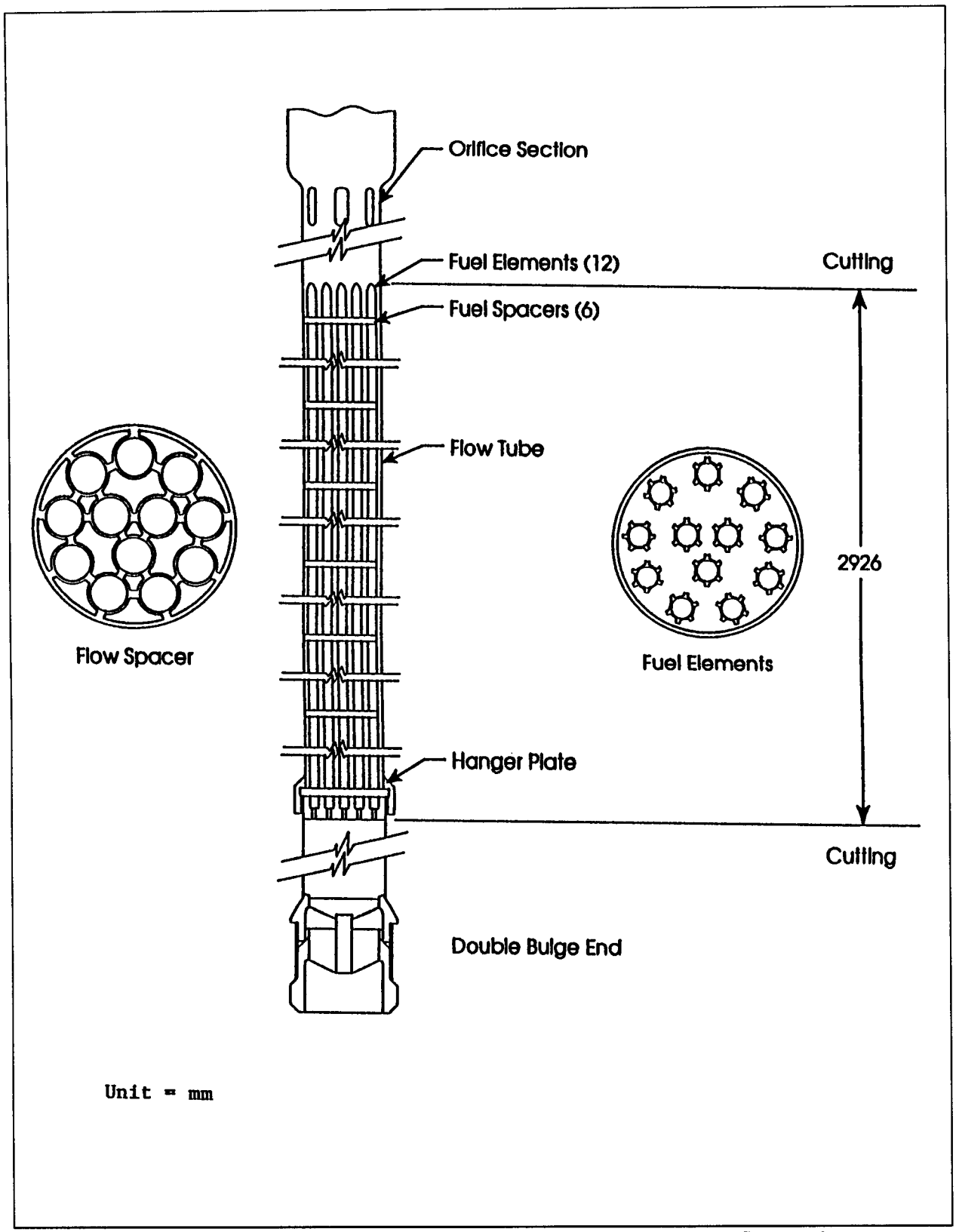


Figure B-4 Typical NRU Type (Aluminum-Based) Fuel Element Schematic

18 pins per cluster with an initial ^{235}U content of 248 g (8.7 oz). The second is 36 pins per cluster with an initial ^{235}U content of 435 g (1 lb). The expected burnup of a discharged spent nuclear fuel from this reactor is approximately 65 percent (^{235}U atom percent).

The fuel used in the RHF research reactor is an annular-type fuel element. The RHF research reactor uses only one fuel element at a time. The RHF fuel element contains 9.2 kg (20.3 lbs) of uranium, enriched to 93 percent, in ^{235}U in 280 involute fuel plates made of uranium aluminum alloy (UAl_3-Al) clad in aluminum. The weight of a cut element is about 100 kg (220 lbs). The fuel is in the annulus of two aluminum tubes: the inner tube has an outside diameter of 274 mm (10.8 in), and the outer tube has an outside diameter of 414 mm (16.3 in). The expected average burnup of a discharged spent nuclear fuel is 36 percent (^{235}U atom percent). Figure B-5 shows a schematic drawing of a configuration of annular fuel element similar to that of RHF fuels.

B.1.3.5 Rod-Type Design

This fuel type design is used in TRIGA research reactors. These research reactors have power ranging from 100 kW to 14 MW. The TRIGA fuel is mainly made up of three basic types of fuel elements: aluminum-clad elements, stainless steel-clad elements, and incoloy-clad elements. All aluminum-clad elements and stainless steel-clad elements are 38.1-mm (1.5-in) diameter by 762-mm- (30-in-) long rods including end fittings (see Figure B-6). The incoloy-clad elements are of the same length, but with a smaller diameter, ranging from 13.7 mm (0.54 in) to 30.7 mm (1.2 in). The 13.7-mm (0.54-in) fuel is currently being used in the Romanian TRIGA research reactor. The fuel is a solid, homogeneous mixture of uranium zirconium hydride alloy. A 6.35-mm (0.25-in) hole is drilled through the center of the active fuel section to facilitate hydriding; a zirconium rod is inserted in this hole after hydriding is complete.

The aluminum-clad elements are the original TRIGA fuel rods that are still in use at some foreign research reactors. The active part of the aluminum-clad fuel element contains about 8 percent by weight of uranium enriched to just below 20 percent ^{235}U. The hydrogen-to-zirconium atom ratio is approximately 1.0. The initial loading of ^{235}U is about 38 g (1.3 oz). The average burnup of this type of fuel is about 8 percent. Each rod weighs 3.2 kg (7.04 lbs) on the average.

The current standard TRIGA fuel rods are the stainless steel-clad elements. The fuel content of the stainless steel element can vary according to the type used. The fuel content of a standard rod consists of 8 to 9 percent by weight of 19.95 percent enriched uranium [about 39 g (1.4 oz) of ^{235}U] in zirconium hydride, with a hydrogen-to-zirconium atom ratio of 1.7. Another type, known as FLIP, contains 8.5 percent by weight of 70 percent enriched uranium [137 g (4.8 oz) of ^{235}U]. The annular core pulsed reactor fuel type contains 12 percent by weight of just below 20 percent enriched uranium [about 54 g (1.9 oz) of ^{235}U] in zirconium hydride with a hydrogen-to-zirconium ratio of 1.7. The expected average burnup of the discharged spent nuclear fuel is approximately 15 percent. Each rod weighs 3.6 kg (7.9 lbs) on the average.

The incoloy-clad element has a longer active fuel length [558.8 mm (22 in) compared to 381 mm (15 in) for standard stainless steel-clad]. The fuel section consists of four pellets, each 139.7-mm (5.5-in) long, and contains approximately 45 percent by weight of uranium enriched to 20 percent [approximately 54 g (1.9 oz) of ^{235}U] in zirconium hydride. There are no graphite reflectors within this element. Instead, a 76.2-mm (3-in) spring is inserted at the top and bottom of the element, and stainless steel end fixtures are attached to both ends of the can. The expected average burnup of this fuel in the Romanian TRIGA reactor is about 52 percent.

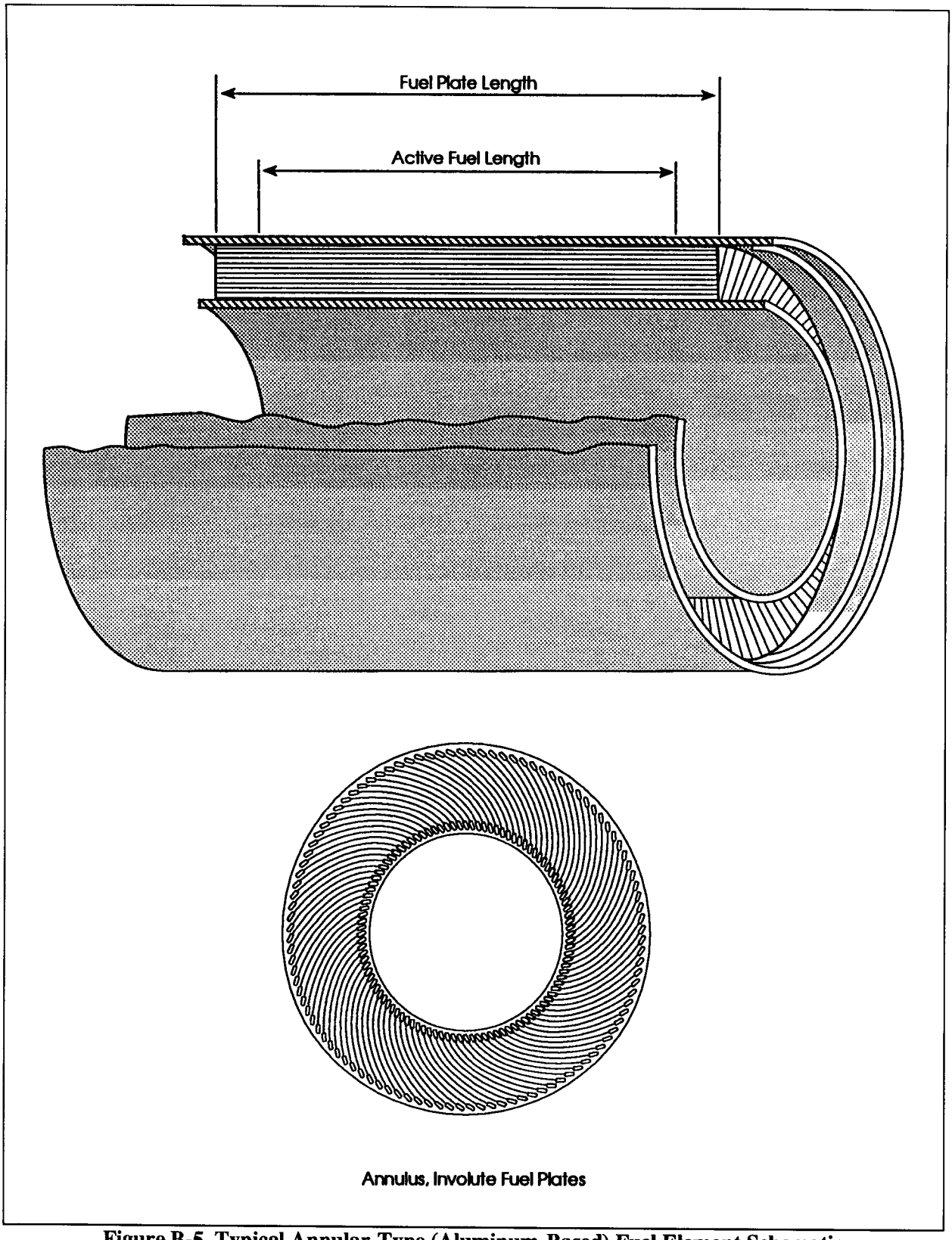


Figure B-5 Typical Annular-Type (Aluminum-Based) Fuel Element Schematic

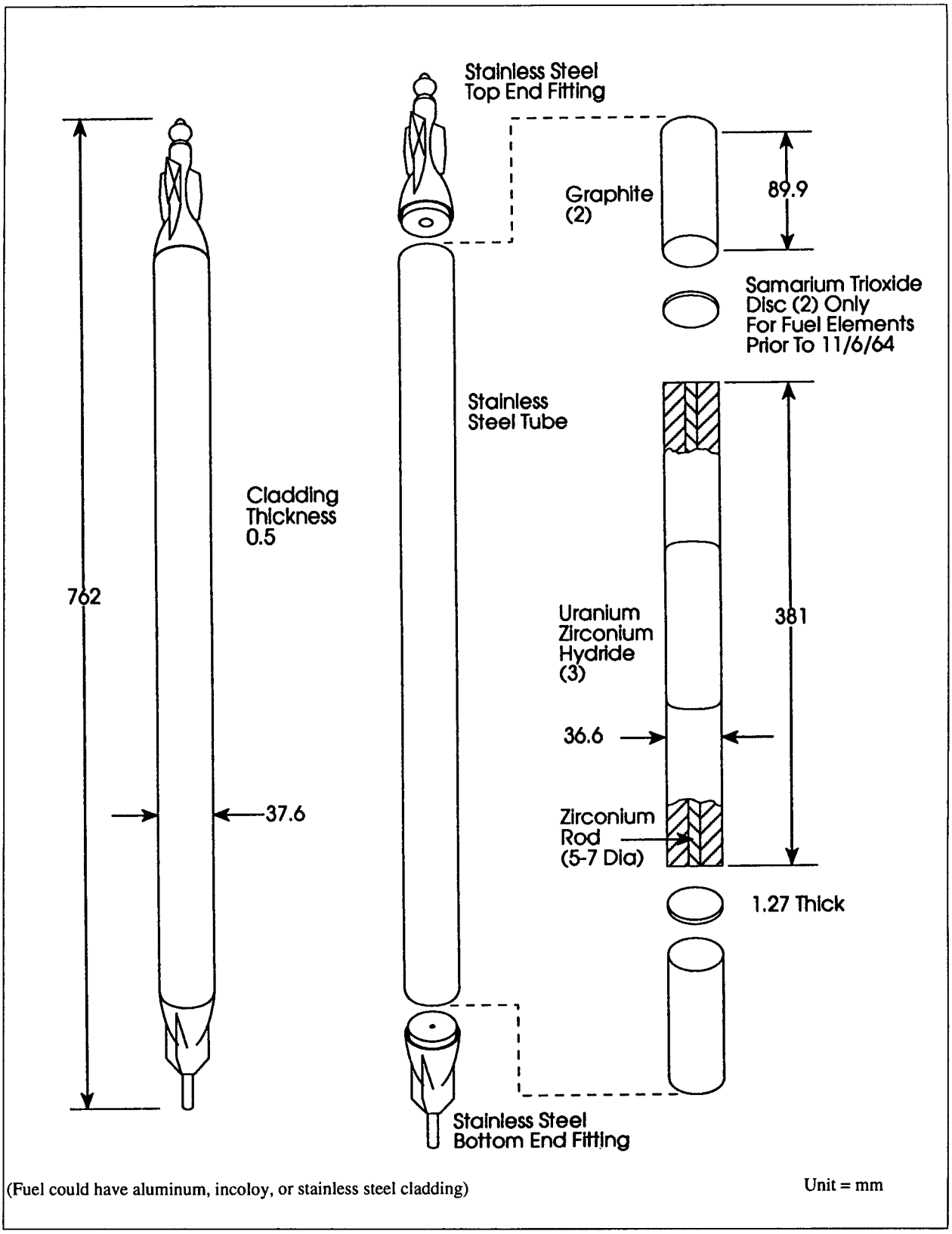


Figure B-6 Typical TRIGA Fuel Element Schematic

B.1.4 Description of the Bounding Radionuclide Inventory

The spent nuclear fuel radionuclide concentration (or inventory) is directly related to the initial mass of fuel (fissile and fertile), the level of burnup, and the cooling period (or decay period) following fuel discharge from the reactor. The fuel burnup is a function of the fuel position inside the reactor core resulting in some fuels burning more than others. A well-designed fuel management program, however, reduces burnup variations among fuel elements. The radionuclide generation in an irradiated fuel is a function of reactor power level and the duration of irradiation process. Research reactors have irregular irradiation profiles, and are typically operated at various power levels. For the calculation of the radionuclide inventory, each fuel element was assumed to have been burnt uniformly and continuously at full reactor power before its discharge. These assumptions maximize the radionuclide inventories of the spent nuclear fuel. As stated earlier, the cooling or decay time after fuel discharge from the reactor determines the amount of radionuclides that remains in the spent nuclear fuel.

Based on the discussion in Section B.1.3, the foreign research reactor spent nuclear fuels were grouped into three classes and four fuel categories for the determination of bounding radionuclide inventories. This subdivision was created in order to provide a better representation of potential radionuclide inventories associated with each type of fuel. This subdivision also provides a means for identifying the type of transportation casks needed, and estimating the number of spent nuclear fuel shipments. The radionuclide inventories per shipment are needed as input to marine and ground transportation and cask handling impact analyses.

The selected fuel types for the determination of bounding radionuclide inventories are:

1. ***Special.*** These are aluminum-based fuels that are neither TRIGA nor MTR. Special fuels are also different in size and geometry.

   1a. *Single Element Reactors.* Spent nuclear fuel from research reactors that operate with one element (e.g., RHF of France). These spent nuclear fuels contain several kg of ^{235}U and require special shipping baskets, casks, and transportation analyses.

   1b. *NRU Type Spent Nuclear Fuel.* Spent nuclear fuel from Canadian Research Laboratories' research reactors (e.g., NRU, and NRX) that require special transportation analysis. These spent nuclear fuels are geometrically different from an MTR-type and TRIGA spent nuclear fuel both in cross section and length, and require special shipping arrangements in addition to being transported overland by truck or rail.

2. ***MTR Spent Nuclear Fuel.*** This category covers all MTR-type spent nuclear fuels. These spent nuclear fuels have similar geometrical characteristics and use common type transportation casks.

3. ***TRIGA Spent Nuclear Fuel.*** Spent nuclear fuel from TRIGA reactors. These spent nuclear fuels also have almost similar geometrical characteristics and use common types of transportation casks.

In the case of special-type fuel, the bounding spent nuclear fuels are the RHF of France and the NRU of Canada. For the identification of a bounding spent nuclear fuel within the MTR and TRIGA fuel types, a series of ORIGEN2 (Croff, 1980) computer runs was made using different spent nuclear fuels within each fuel type. ORIGEN2 generates the radionuclide inventory in a spent nuclear fuel based on the fuel burnup, initial fissile and fertile inventory, and decay time. The radionuclide inventories of selected bounding

spent nuclear fuel within each fuel type were determined assuming that the spent nuclear fuel has been cooled for a specified period after its discharge from the reactor. In order to maximize the radionuclide inventory per transportation cask, a review of the potential casks was performed. It was determined that the use of IU-04 (Pegase) transportation casks, maximizes the radioactive inventory and requires the shortest cooling period (maximum of 1 year) (see Section B.1.6). Based on this review, the cooling period for each bounding spent nuclear fuel was determined. The bounding spent nuclear fuels for MTR and TRIGA type fuel are found to be BR-2 type spent nuclear fuel, and a spent nuclear fuel from a 3-MW TRIGA reactor burning 31g (1.1 oz) of ^{235}U in 3 years, respectively. The bounding TRIGA spent nuclear fuel identified here is a theoretical bounding fuel for this category.

Table B-6 provides a list of the radioactive isotopes and their inventories for selected bounding spent nuclear fuel types. The list of isotopes is generated from ORIGEN2 output based on the following criteria:

1. All isotopes (from a list of 270 elements) that could have a potential to contribute 1 mrem from inhalation and ingestion are considered. The estimates of dose associated with each isotope intake were based on the effective committed dose equivalent factors provided in DOE/EH-0071 (DOE, 1988).

2. Once all isotopes were selected, those that contribute to 99.9 percent of total health hazard were chosen.

3. Isotopes such as ^{85}Kr, ^{235}U, and ^{238}U were added to the list as historically significant isotopes, although they do not meet the above criteria.

It is important to note that the radionuclide inventories identified here are for calculational purposes only. The majority of the spent nuclear fuels would have lower radionuclide inventories than what is identified here, and the likelihood of a full cask containing maximum inventory during the acceptance policy period would be low. By the time the policy would become effective in late 1995, there could be about 10,000 spent nuclear fuel elements, of which 80 percent would have had more than 2 years of cooldown (decay). The number of spent nuclear fuels that receive maximum burnup used in the estimation of the radionuclide inventory is very small when compared to the total number of the spent nuclear fuel elements estimated in each fuel category.

B.1.5 Characteristics and Radionuclide Inventories of Target Materials

Under Implementation Alternative 1 to Management Alternative 1 of the proposed action, DOE would plan to manage target material. The total amount of target material is estimated to be about 0.56 MTHM having a volume of 6.5 m^3 (230 ft^3). Target materials are residual materials from target fuels that have been irradiated in a research reactor to produce ^{99}Mo, which decays to ^{99}Tc, a medical isotope. Four countries (Canada, Belgium, Argentina, and Indonesia) use target fuel containing U.S.-origin enriched uranium for the production of medical isotopes. Canada, Argentina, and Belgium currently use aluminum-based targets containing HEU, and Indonesia currently uses a target that consists of a layer of HEU oxide (UO_2) material plated on the interior surface of a stainless steel tube. The distribution of target materials from these countries includes: 0.525 MTHM from Canada; 0.029 MTHM from Belgium; 0.0014 MTHM from Indonesia; and 0.0011 MTHM from Argentina. A target fuel is irradiated to a burnup level of about 3 percent (^{235}U atoms percent) before being discharged from the reactor. Once the target fuel is removed from the reactor, within a short period the fuel is dissolved and ^{99}Mo is separated from the solution. The residual material is then decayed. Prior to shipment, the residual materials are transformed to an acceptable form.

Table B-6 Bounding Radionuclide Inventories per Element for Selected Fuel Categories (Curies)

Isotope	*Fuel Category*			
	BR-2	*RHF*	*NRU*	*TRIGA*
Tritium	2.40	37	3.95	0.328
Krypton 85	68.7	1,070	113	9.10
Strontium 89	1,133	17,600	405	68.8
Strontium 90	578	8,930	967	79
Yttrium 90	578	8,930	967	79
Yttrium 91	2030	31,400	842	115
Zirconium 95	2,972	46,300	1,410	163
Niobium 95	6,111	94,900	3,060	320
Ruthenium 103	247	3,770	60.0	21.1
Rhodium 103m	247	3,770	60.0	21.1
Ruthenium 106	597	9,160	767	63.5
Rhodium 106m	597	9,160	767	63.5
Tin 123	11.9	184	10.0	0.978
Antimony 125	24.7	381	38.0	2.98
Tellurium 125m	5.89	90.6	9.21	0.718
Tellurium 127m	24.6	382	18.4	1.40
Tellurium 129m	5.25	79.8	0.958	0.578
Cesium 134	456	4,000	1,480	29.0
Cesium-137	572	8,870	958	79.8
Cerium 141	159	2,440	277	175
Cerium 144	8,667	135,000	10,600	633
Praseodymium 144	8,667	135,000	10,600	633
Promethium 147	1,342	24,600	1,240	175
Promethium 148m	2.10	29.2	0.0583	1.17
Europium 154	17.2	163	56.3	1.05
Europium 155	3.61	45.6	10.2	0.565
Uranium 234	0.0000254	0.000374	0.0000654	0.00000453
Uranium 235	0.000383	0.0109	0.000253	0.000199
Uranium 238	0.00000947	0.000206	0.00000111	0.000163
Plutonium 238	1.78	10.3	11.3	0.0760
Plutonium 239	0.0511	0.0889	0.0138	0.0138
Plutonium 240	0.0333	0.421	0.0101	0.0523
Plutonium 241	7.89	67.7	2.95	5.33
Americium 241	0.0110	0.0967	0.00517	0.0102
Americium 242m	0.0000292	0.000155	0.0000250	0.000225
Americium 243	0.000120	0.00376	0.000146	0.0000110
Curium 242	0.0486	0.127	0.0429	0.131
Curium 244	0.0369	0.00926	0.0113	0.000178
Total (Curies)	35,129	546,000	34,700	2,740
Thermal (Watts)	147	2,250	150	10.4

There are currently two methods for preparing the residual materials containing aluminum for transport. The first method is calcining and canning the material with the existing aluminum, and the second is a method that first removes aluminum from the residual materials and then oxidizes the remains. The final products are then canned. A process similar to the latter is used for the Indonesian target materials. Since

the Indonesian target materials do not contain aluminum, no aluminum separation is needed. In this case, a precipitation process is used to separate the target materials from the solution. The precipitated materials are then dried and canned in preparation for transport.

The canned material from the first process contains 40 grams (1.4 oz) of ^{235}U per can. The second process allows a higher amount of ^{235}U, 200 g (7 oz), to be packed in a similar can. Can material could be aluminum or stainless steel. In the past, the target material was shipped to the Savannah River Site in aluminum cans 64 mm (2.5 in) in diameter and 280 mm (11 in) long. The use of the first process would result in a total 140 shipments of this material to the United States, and the second process would result in a total of 57 shipments. These number of shipments were estimated based on an assumption that the target material cans would be in transportation casks that would not contain other types of spent nuclear fuel. However, in all likelihood, with small amounts of target materials (such as Indonesia and Argentina), would not ship a partially filled transportation cask when other spent nuclear fuel could be added to fill the cask. Therefore, these estimates represent an upper bound on the total number of the target material shipments. The radionuclide inventory of a target material can containing from 40 to 200 g (1.4 to 7 oz) of ^{235}U, and that of a transportation cask containing this material, is given in Table B-7. This inventory is estimated based on 1 year decay time of the target material solution before the canning process.

B.1.6 Foreign Research Reactor Spent Nuclear Fuel Shipment Estimates

Tables B-1 and B-2 provide the estimated number of foreign research reactor spent nuclear fuel shipments from each country. These estimates were based on a set of assumptions that maximize the potential impacts from transportation. Review of the potential transportation casks identified eight casks with various capabilities (see Section B.2.2). These casks are certified to accommodate between 1 and 126 spent nuclear fuel elements per cask based on a variety of cask cavity configurations. Each transportation cask can be certified to ship different fuel types by using various baskets in the cask cavity. For example, a transportation cask like IU-04 has been certified to accommodate several different fuel types by using various baskets in the cask cavity. On the other hand, a cask like LHRL-120 is currently certified to accommodate only one specific fuel type (Australian HIFAR fuel). Based on this review, IU-04 was identified as the bounding cask (highest curies content for the number of elements shipped per cask) for the transportation accident analyses.

In an attempt to capture various types of spent nuclear fuel, maximize the amount of radionuclides per cask, and allow for potential partial cask shipments, for the purposes of the analyses in this EIS, the following assumptions were made to estimate the number of shipments for each type of fuel:

1. The number of shipments for MTR-type spent nuclear fuel elements was estimated based on 30 elements per cask. The radionuclide inventory per cask was estimated based on a full cask, that is, 36 spent nuclear fuel elements of the bounding MTR-type (BR-2 fuel) per cask. One exception: for the Australian spent nuclear fuel, cask LHRL-120 which was built specifically for this fuel was used for estimating the number of shipments. The allowed radionuclide inventory in this cask is the smallest of all casks identified. Nonetheless, each of the LHRL-120 casks was assumed to contain the same quantity of radionuclide inventories as that of a cask containing 36 elements of the bounding MTR-type spent nuclear fuel.

2. The number of shipments for NRU-type spent nuclear fuel was estimated based on 24 NRU elements per cask. The radionuclide inventories per cask were also based on 24 NRU elements per cask.

Table B-7 Radionuclide Inventories of Target Material per Can and per Transportation Cask (Curies)

Isotope	Curies for 40 g ^{235}U per Can	Curies for 200 g ^{235}U per Can	Cask Curies with 40 g per Can	Cask Curies with 200 g per Can
Strontium 89	4.06E+00	2.03E+01	1.95E+02	4.87E+02
Strontium 90	3.28E+00	1.64E+01	1.58E+02	3.94E+02
Yttrium 90	3.28E+00	1.64E+01	1.58E+02	3.94E+02
Yttrium	9.18E+02	3.84E+01	3.69E+02	9.22E+02
Zirconium 95	1.18E+01	5.90E+01	5.67E+02	1.42E+03
Niobium 95	2.53E+01	1.27E+02	1.21E+03	3.04E+03
Ruthenium 103	7.4E-01	3.72E+00	3.57E+01	8.93E+01
Rhodium 103m	7.5E-01	3.73E+00	3.58E+01	8.95E+01
Ruthenium 106	3.11E+00	1.55E+01	1.49E+02	3.73E+02
Rhodium 106m	3.11E+00	1.55E+01	1.49E+02	3.73E+02
Tin 123	6.0E-02	2.8E-01	2.70E+00	6.74E+00
Antimony 125	1.4E-01	6.8E-01	6.51E+00	1.63E+01
Tellurium 125m	3.0E-02	1.6E-01	1.56E+00	3.91E+00
Tellurium 127m	1.1E-01	5.6E-01	5.39E+00	1.35E+01
Tellurium 129m	1.0E-02	7.0E-02	6.7E-01	1.68E+00
Cesium 134	1.0E-02	6.0E-02	6.1E-01	1.53E+00
Cesium-137	3.26E+00	1.628E+01	1.56E+02	3.91E+02
Cerium 141	4.2E-01	2.11E+00	2.03E+01	5.07E+01
Cerium 144	4.53E+01	2.27E+02	2.18E+03	5.44E+03
Praseodymium 144	4.57E+01	2.29E+02	2.20E+03	5.49E+03
Promethium 147	1.07E+01	5.36E+01	5.14E+02	1.29E+03
Promethium 148m	5.06E-04	2.53E-03	2.43E-02	6.07E-02
Europium 154	1.65E-03	8.23E-03	7.90E-02	1.97E-01
Europium 155	6.97E-02	3.49E-01	3.35E+00	8.37E+00
Uranium 234	1.42E-07	7.09E-07	6.81E-06	1.70E-05
Uranium 235	8.29E-05	4.15E-04	3.98E-03	9.95E-03
Uranium 238	1.50E-06	7.52E-06	7.22E-05	1.80E-04
Plutonium 238	3.33E-06	1.67E-05	1.60E-04	4.00E-04
Plutonium 239	6.15E-04	3.08E-03	2.95E-02	7.38E-02
Plutonium 240	1.43E-05	7.13E-05	6.85E-04	1.71E-03
Plutonium 241	1.48E-04	7.38E-04	7.09E-03	1.77E-02
Americium 241	2.42E-07	1.21E-06	1.16E-05	2.91E-05
Americium 242m	4.43E-12	2.22E-11	2.13E-10	5.32E-10
Americium 243	3.07E-12	1.54E-11	1.47E-10	3.69E-10
Curium 242	1.43E-09	7.15E-09	6.86E-08	1.72E-07
Curium 244	3.40E-12	1.70E-11	1.63E-10	4.08E-10
Total (Curies)	1.69E+02	8.30E+02	7.97E+03	1.99E+04
Thermal (Watts)	6.8E-01	3.40E+00	3.26E+01	8.160E+01

3. The number of shipments for RHF type spent nuclear fuel was estimated based on one element per cask. The bounding cask can only accommodate one bounding spent nuclear fuel element per cask.

4. The number of shipments for TRIGA spent nuclear fuel was estimated based on 30 elements per cask. The radionuclide inventories per cask were based on 40 elements of bounding TRIGA spent nuclear fuel element per cask.

Table B-8 provides a list of radionuclide inventories per transportation cask for selected fuel categories.

Table B-8 Bounding Radionuclide Inventories per Transportation Cask for Selected Fuel Categories (Curies)

Isotope	*Fuel Category*			
	BR-2	*RHF*	*TRIGA*	*NRU*
Tritium	86.4	37.0	13.1	94.8
Krypton 85	2,470	1,070	364	2,710
Strontium 89	40,800	17,600	2,750	9,720
Strontium 90	20,800	8,930	3,160	23,200
Yttrium 90	20,800	8,930	3,160	23,200
Yttrium 91	73,000	31,400	4,580	20,200
Zirconium 95	107,000	46,300	6,500	33,800
Niobium 95	220,000	94,900	12,800	73,400
Ruthenium 103	8,900	3,770	844	1,440
Rhodium 103m	8,900	3,770	844	1,440
Ruthenium 106	21,500	9,160	2,540	18,400
Rhodium 106m	21,500	9,160	2,540	18,400
Tin 123	427	184	39.1	240
Antimony 125	890	381	119	912
Tellurium 125m	212	90.6	28.7	221
Tellurium 127m	887	382	55.8	442
Tellurium 129m	189	79.8	23.1	23.0
Cesium 134	16,400	4,000	1,160	35,400
Cesium 137	20,600	8,870	3,190	23,000
Cerium 141	5,740	2,440	7,000	6,650
Cerium 144	312,000	135,000	25,300	254,000
Praseodymium 144	312,000	135,000	25,300	254,000
Promethium 147	48,300	24,600	7,000	29,800
Promethium 148m	75.6	29.2	46.8	1.40
Europium 154	620	163	41.8	1,350
Europium 155	130	45.6	22.6	245
Uranium 234	0.000914	0.000374	0.000181	0.00157
Uranium 235	0.0138	0.0109	0.00794	0.00606
Uranium 238	0.000341	0.000206	0.00650	0.0000267
Plutonium 238	64.2	10.3	3.04	270
Plutonium 239	1.84	0.0889	0.551	0.332
Plutonium 240	1.20	0.421	2.09	0.242
Plutonium 241	284	67.7	213	70.9
Americium 241	0.396	0.0967	0.407	0.124
Americium 242m	0.00105	0.000155	0.00900	0.000600
Americium 243	0.00433	0.00376	0.000438	0.00351
Curium 242	1.75	0.127	5.25	1.03
Curium 244	1.33	0.00926	0.00713	0.270
Total (Curies)	1,260,000	546,000	110,000	833,000
Thermal (Watts)	5,290	2,250	416	3,600
Number of casks by January 2006	473	86	162	116

B.1.7 Amount of Foreign Research Reactor Spent Nuclear Fuel In Implementation Alternative 2a of Management Alternative 1

Under this implementation alternative (see Section 2.2.2.2), DOE would adopt an alternative policy duration of 5 years (1995-2000). The amount of spent nuclear fuel expected under this alternative is approximately 18,800 elements, containing approximately 13 MTHM, and having a volume of 87 m^3 (3,300 ft^3). Tables B-9 and B-10 provide an estimate of the total amount of spent nuclear fuel that would be available (i.e., currently stored or to be generated) in each country by January 2001 (Matos, 1994). These tables also provide the estimated number of shipments expected from each country. The breakdown of the number of shipments in terms of the four bounding fuel categories (as defined in Section B.1.4) are: 377 of BR-2, 56 of RHF, 154 TRIGA, and 91 of NRU type fuel shipments.

B.1.8 Distribution of Foreign Research Reactor Spent Nuclear Fuel by Fuel Type and Geography

This section summarizes the estimated amount of foreign research reactor spent nuclear fuel, in terms of fuel type and geography,[4] that could be received under different implementation alternatives of Management Alternative 1 to the proposed action. The estimated amount of spent nuclear fuel for the two policy durations (i.e., a 10-year and a 5-year spent nuclear fuel generation period) are provided in Tables B-1 and B-9, for aluminum-based fuels, and in Tables B-2 and B-10 for TRIGA fuels. These tables provide a breakdown of the estimated amount of spent nuclear fuel to be accepted from each country. Table B-11 summarizes the same information given in the above tables by fuel type and geography. The information provided in this table is the basis for the calculations of transportation (ground and marine) impacts under the basic implementation of Management Alternative 1, the proposed action to manage foreign research reactor spent nuclear fuel in the United States.

DOE is also considering a Management Alternative 3, which is a hybrid of Management Alternatives 1 and 2. Under this Management Alternative as described in Section 2.4, some of the foreign research reactor spent nuclear fuels would be reprocessed overseas, and the remaining spent nuclear fuels would be brought back to be managed in the United States. Overseas reprocessing is considered only for countries that currently have the technology and capability to store research reactor fission product high- or intermediate-level wastes. The countries that can accept research reactor fission product wastes, based on the historical evidence, are: Belgium, France, Germany, Italy, Spain, Switzerland, and the United Kingdom. Under this Management Alternative, DOE would encourage the reprocessing of aluminum-based spent nuclear fuels from the research reactors in the above countries at western European reprocessing facilities (i.e., at Dounreay Scotland, and/or other locations) and that the recovered ^{235}U be blended down and used as LEU fuel. Reprocessing spent nuclear fuels from the above countries overseas would reduce the amount of foreign research reactor spent nuclear fuels that would be managed in the United States. Table B-12 provides a distribution of the remaining foreign research reactor spent nuclear fuels by fuel type and geography that would be brought to the United States under this Hybrid Alternative. As indicated in this table, the reduction only affects spent nuclear fuels entering through the East Coast of the United States (compare Tables B-11 and B-12). It is important to note that the existing overseas reprocessing facilities have not separated ^{235}U from TRIGA fuels. This does not mean that these facilities will not be able to process TRIGA fuels in the near future. At least one facility has stated that it has a specialty plant that can reprocess small quantities of TRIGA spent nuclear fuels (UKAEA, 1994). If this

4 *Geography refers to that amount of spent nuclear fuel that is expected to arrive at an East Coast or a West Coast port of entry to the United States. Spent nuclear fuel shipments from foreign research reactors located in Europe, Africa, Middle East, and Eastern part of Central and South America are designated as East Coast shipments. All others are designated as West Coast shipments.*

Table B-9 Estimated Number of Aluminum-Based Spent Nuclear Fuel Elements of U.S.-Origin Generated by Foreign Research Reactor Operators by January 2001

Country	*Estimated Number of Spent Nuclear Fuel Elements*	*Initial Mass of Uranium, (kg)*[b]	*Estimated Number of Shipments*
Argentina[a]	283	71	9
Australia	795	247	7
Austria	130	147	4
Belgium	1,391	569	46
Brazil[a]	155	99	5
Canada	2,243	3,058	92
Chile[a]	58	12	2
Colombia[a]	16	2	1
Denmark	485	372	16
France	1,432	2,110	102
Germany	1,111	471	37
Greece[a]	199	73	6
Indonesia[a]	138	164	4
Iran[a]	29	6	1
Israel	153	34	5
Italy	150	43	5
Jamaica[a]	2	1	1
Japan	2,401	2,219	80
Korea (South)[a]	98	187	4
Netherlands	1,141	678	38
Pakistan[a]	82	16	3
Peru[a]	29	39	1
Philippines[a]	50	24	2
Portugal[a]	79	51	3
South Africa	50	10	2
Spain[c] (from Scotland)	40	16	1
Sweden	864	915	29
Switzerland	159	128	5
Taiwan	127	66	4
Thailand[a]	31	5	1
Turkey[a]	50	51	2
United Kingdom	12	4	1
Uruguay[a]	19	18	1
Venezuela[a]	120	82	4
Total	**14,122**	**11,988**	**524**

[a] *Countries other than high-income economies (World Bank, 1994). These are considered to be "developing" countries.*

[b] *To derive uranium mass in pounds, multiply the amount by 2.2*

[c] *40 spent nuclear fuel elements of Spain's JEN-1 reactor core are stored in Dounreay, Scotland.*

capability is acquired, then the amount of spent nuclear fuel to be managed in the United States would be lower than that indicated in Table B-12 by 834 TRIGA spent nuclear fuel elements containing 157 kg of LEU heavy metal resulting in 28 less shipments to the eastern coast of the United States by January 2005.

Table B-10 Estimated Number of TRIGA Reactor Spent Nuclear Fuel Elements of U.S.-Origin Generated by Foreign Research Reactor Operators by January 2001

Country	*Estimated Number of Spent Nuclear Fuel Elements*	*Initial Mass of Uranium (kg)*[b]	*Estimated Number of Shipments*
Austria	102	19	3
Bangladesh[a]	100	49	3
Brazil[a]	75	14	3
Finland	171	33	6
Germany	338	64	11
Indonesia[a]	233	44	7
Italy	343	64	11
Japan	321	61	11
Korea (South)[a]	320	61	11
Malaysia[a]	89	44	3
Mexico[a]	175	33	6
Philippines[a]	120	74	4
Romania[a]	1,451	189	48
Slovenia[a]	318	60	10
Taiwan	134	80	4
Thailand[a]	136	35	4
Turkey[a]	69	13	2
United Kingdom	89	17	3
Zaire[a]	132	25	4
Total	**4,716**	**979**	**154**

[a] *Countries other than high-income economies (World Bank, 1994). These are identified as "developing" countries.*

[b] *To derive uranium mass in pounds, multiply the amount by 2.2.*

If additional countries were to be able to accept research reactor fission product waste, additional spent nuclear fuels could be reprocessed overseas. This would reduce the amount of spent nuclear fuel to be managed in United States even further.

B.2 Transportation Casks

Spent nuclear fuel elements are transported in stainless steel packages called transportation casks, or just casks.

B.2.1 Transportation Cask Regulations

This section discusses the international and domestic regulations on transportation cask design, performance, certification, use, and transport.

B.2.1.1 International Regulations

To ensure public safety worldwide, the international community has adopted regulations for the transport of radioactive materials. The international authority for these regulations is the International Atomic Energy Agency. The emphasis of the International Atomic Energy Agency regulations for radioactive materials transport is package integrity. As promulgated in International Atomic Energy Agency Safety

Table B-11 Summary of the Distribution of Foreign Research Reactor Spent Nuclear Fuel by Fuel Type and Geography

	January 2001					January 2006				
	No. of Elements	No. of Shipments	Initial Kg U	HEU Kg U	LEU Kg U	No. of Elements	No. of Shipments	Initial Kg U	HEU Kg U	LEU Kg U
All Countries:										
1. Aluminum-Based	14,122	524	11,988	3,992	7,995	17,803	675	18,184	4,531	13,650
East[a]	10,395	419	9,024			13,186	544	13,919		
West[a]	3,727	105	2,963			4,617	131	4,263		
2. TRIGA	4,716	154	980	79	901	4,940	162	1,033	83	950
East	3,088	101	499			3,245	107	528		
West	1,628	53	481			1,695	55	505		
Developing Countries:										
1. Aluminum-Based	1,488	52	911	155	756	1,686	59	1,195	157	1,038
East	1,084	38	480			1,152	40	561		
West	404	14	431			534	19	634		
2. TRIGA	3,218	105	642	77	565	3,359	109	674	81	593
East	2,045	67	302			2,134	70	319		
West	1,173	38	340			1,225	39	355		

[a] *East refers to the eastern United States ports of entry. Spent nuclear fuel shipments from foreign research reactors located in Europe, Africa, Middle East, and eastern part of Central and South America are designated as East Coast shipments. All others are designated as West Coast shipments.*

Table B-12 Distribution of Foreign Research Reactor Spent Nuclear Fuel by Fuel Type and Geography for the Hybrid Alternative

	January 2001					January 2006				
	No. of Elements	No. of Shipments	Initial Kg U	HEU Kg U	LEU Kg U	No. of Elements	No. of Shipments	Initial Kg U	HEU Kg U	LEU Kg U
All Countries:										
1. Aluminum-Based	9,839	328	8,650	2,259	6,391	12,210	406	12,912	2,263	10,646
East[a]	6,112	223	5,687			7,593	275	8,645		
West[a]	3,727	105	2,963			4,617	131	4,263		
2. TRIGA	4,716	154	980	79	901	4,940	162	1,033	83	950
East	3,088	101	499			3,245	107	528		
West	1,628	53	481			1,695	55	505		
Developing Countries:										
1. Aluminum-Based	1,488	52	911	155	756	1,686	59	1,195	157	1,038
East	1,084	38	480			1,152	40	561		
West	404	14	431			534	19	634		
2. TRIGA	3,218	105	642	77	565	3,359	109	674	81	593
East	2,045	67	302			2,134	70	319		
West	1,173	38	340			1,225	39	355		

[a] *East Refers to the eastern United States ports of entry. Spent nuclear fuel shipments from foreign research reactors located in Europe, Africa, Middle East, and eastern part of Central and South America are designated as East Coast shipments. All others are designated as West Coast shipments.*

Series 6, radioactive materials must be transported in specially designed transportation casks that minimize the potential consequences of transportation accidents. Transportation cask designs must demonstrate their capability to ensure containment and to provide shielding by testing or analysis to the extent required by these regulations. Under International Atomic Energy Agency regulations, spent nuclear fuel transportation cask integrity must be demonstrated by successful performance during a sequence of tests that simulate accident conditions. These tests include being dropped onto an unyielding surface, dropped onto a steel post, subjected to extremely high temperatures of 800°C (1475°F) for 30 minutes, and submersed in water. Cask designs that meet these performance criteria are issued a "Certificate of Compliance" by a delegated national authority, referred to as the "Competent Authority." The Competent Authority is responsible for certifying casks that are designed or used within its "national boundary." The Competent Authority for the United States is the Department of Transportation.

To be used outside the country of origin, transportation casks must have a Certificate of Competent Authority from the country of intended use. As the Competent Authority, the Department of Transportation is responsible for granting a Certificate of Competent Authority to foreign-designed transportation casks intended for use in the United States.

B.2.1.2 Domestic Regulations

Regulations for the transport of radioactive materials in the United States are issued by the Department of Transportation, and are codified in Title 49 of the Code of Federal Regulations Parts 171-178 (49 CFR §171-178). These regulations reference accepted standards promulgated by organizations such as the International Atomic Energy Agency, the International Civil Aviation Organization, the International Air Transport Agency, the International Maritime Organization, and the U.S. Nuclear Regulatory Commission (NRC). Federal standards are updated periodically to reflect new information and to remain current with international standards, to minimize delays in international traffic, and avoid duplication of effort.

The regulation authority for radioactive materials transport is jointly shared by the Department of Transportation and NRC. As outlined in a 1979 Memorandum of Understanding with NRC, the Department of Transportation specifically regulates the carriers of spent nuclear fuel and the conditions of transport, such as routing, handling and storage, and vehicle and driver requirements. The Department of Transportation also regulates the labeling, classification, and marking of all spent nuclear fuel packages. NRC regulates the packaging and transport of spent nuclear fuel for its licensees, which include commercial shippers of spent nuclear fuel. In addition, NRC sets the standards for packages containing fissile materials and spent nuclear fuel. A detailed discussion of Federal design and performance regulations for transportation cask begins with Section B.2.1.3.

DOE policy requires compliance with applicable Federal regulations regarding domestic shipments of spent nuclear fuel. Accordingly, DOE has adopted the requirements of 10 CFR §71, "Packaging of Radioactive Material for Transport and Transportation of Radioactive Material Under Certain Conditions," and 49 CFR §171-179, "Hazardous Material Regulations." Foreign research reactor spent nuclear fuel shipments are subject to regulations set by the Department of Transportation and NRC.

B.2.1.3 Cask Design Regulations

Spent nuclear fuel is transported in robust "Type B" transportation casks that are certified for transporting radioactive materials. These transportation casks are subject to stringent design, fabrication and operating requirements imposed by the Competent Authority for the country of origin. Casks designed and certified for spent nuclear fuel transportation within the United States must meet the applicable requirements of

NRC for design, fabrication, operation, and maintenance as contained in 10 CFR §71. These regulations generally conform to International Atomic Energy Agency regulations that are presented in the International Atomic Energy Agency Safety Series 6 manual.

Cask design and fabrication can only be done by approved vendors with established quality assurance programs (10 CFR §71.101). Cask and component suppliers or vendors are required to obtain and maintain documents that prove the materials, processes, tests, instrumentation, measurements, final dimensions, and cask operating characteristics meet the design basis established in the Safety Analysis Report for Packaging for the cask, and that the cask will function as designed.

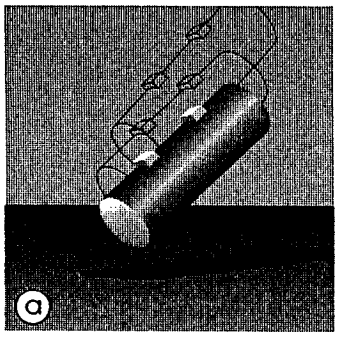
Regardless of where a transportation cask is designed, fabricated, or certified for use, it must meet certain minimum performance requirements (10 CFR §71.71-71.77). The primary function of a spent nuclear fuel transportation cask is to provide containment, criticality control, and shielding. Regulations require that casks must be operated, inspected, and maintained to high standards, ensuring their ability to contain their contents in the event of a transportation accident (10 CFR §71.87). There are no documented cases of a release of radioactive materials from spent nuclear fuel shipments even though thousands of shipments have been made by road, rail, and water transport modes. Further, a number of obsolete casks have been tested under severe accident conditions to demonstrate their adherence to design criteria without failure. Such tests have demonstrated that transportation casks are not only fabricated to a very high factor of safety; they are even sturdier than required.

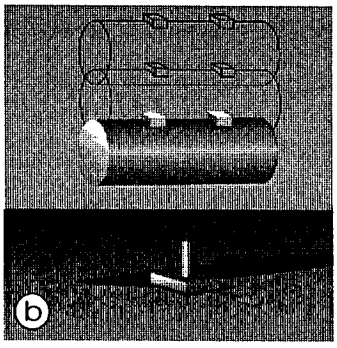
Transportation casks are built out of heavy, durable structural materials, such as stainless steel. These materials must ensure cask performance under a wide range of temperatures (10 CFR §71.43). In addition to the structural materials, shielding is provided to limit radiation levels at the surface and at prescribed distances from the surface of transportation casks (10 CFR §71.47). Shielding typically consists of dense material such as lead or depleted uranium. In some cases, additional materials are added to provide neutron shielding such as water-filled outer jackets, or highly hydrogenous materials such as polyethylene. The cask cavity is configured to hold various contents including spent nuclear fuel assemblies. The assemblies are supported by internal structures or baskets that provide shock and vibration resistance, establish minimum spacing and criticality control through the use of nuclear poison materials such as boron-impregnated metals, and heat transfer to maintain the temperature of the contents within the limits specified in the Safety Analysis Report for Packaging.

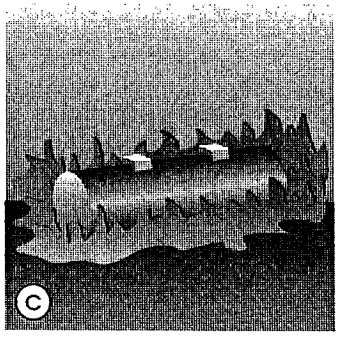
Finally, to limit impact forces and minimize damage to the structural components of a cask in the event of a transportation accident, impact-absorbing structures may be attached to the exterior of the cask. These are usually composed of balsa wood, foam, or aluminum honeycomb that is designed to readily deform upon impact to absorb impact energy. All of these components are designed to work together in order to satisfy the regulatory requirements for a cask to operate under normal conditions of transportation and maintain its integrity in an accident.

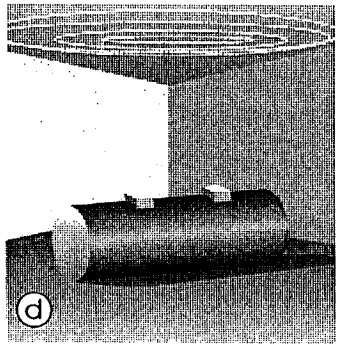
Design Certification

For certification, transportation cask must be shown by analysis and/or test to withstand a series of hypothetical accident conditions. These conditions have been internationally accepted as simulating damage to transportation casks that could occur in most reasonably foreseeable accidents. The impact, fire, and water-immersion tests are considered in sequence to determine their cumulative effects on one package. These accident conditions are described in Figure B-7. The NRC recently issued revised regulations, 10 CFR Part 71, governing the transportation of radioactive materials. These regulations become effective on April 1, 1996 (NRC, 1995). The revised regulations conform with those of the International Atomic Energy Agency and current legislative requirements. The revised regulations









Standards for Spent Fuel Casks

For certification by the NRC, a cask must be shown by test or analysis to withstand a series of accident conditions. These conditions have been internationally accepted as simulating damage to spent fuel casks that could occur in most severe credible accidents. The impact, fire, and water-immersion tests are considered in sequence to determine their cumulative effects on one package. A separate cask is subjected to a deep water-immersion test. The details of the tests are as follows:

Impact

Free Drop (a) – The cask drops 30 feet onto a flat, horizontal, unyielding surface so that it strikes at its weakest point.

Puncture (b) – The cask drops 40 inches onto a 6-inch-diameter steel bar at least 8 inches long: the bar strikes the cask at its most vulnerable spot.

Fire (c)

After the impact tests, the cask is totally engulfed in a 1475°F thermal environment for 30 minutes.

Water Immersion (d)

The cask is completely submerged under at least 3 feet of water for 8 hours. A separate cask is completely immersed under 50 feet of water for 8 hours.

Figure B-7 Standards for Transportation Casks (NRC, 1987)

affecting "Type B" casks require that a spent nuclear fuel transportation cask with activity greater than 10^6 curies be designed and constructed so that its undamaged containment system would withstand an external water pressure of 290 psi, or immersion in 200 m (656 ft) of water, for a period of not less than one hour without collapse, buckling, or allowing water to leak into the cask. Except for the addition of the deep water immersion test, the regulations applicable to the transportation of foreign research reactor spent nuclear fuel are unchanged.

Under the Federal certification program, a "Type B" packaging design must be supported by a Safety Analysis Report for Packaging, which demonstrates that the design meets Federal packaging standards. The Safety Analysis Report for Packaging must include a description of the proposed packaging in sufficient detail to identify the packaging accurately and provide the basis for evaluating its design. The Safety Analysis Report for Packaging must provide the evaluation of the structural design, materials properties, containment boundary, shielding capabilities, and criticality control, and present the operating procedures, acceptance testing, and maintenance program. Upon completion of a satisfactory review of the Safety Analysis Report for Packaging by NRC to verify compliance to the regulations, a Certificate of Compliance is issued.

B.2.1.4 Transportation Regulations

To assure that the transportation cask is properly prepared for transportation, trained technicians perform numerous inspections and tests (10 CFR §71.87). These tests are designed to ensure that the cask components are properly assembled and meet leak-tightness, thermal, radiation, and contamination limits. The tests and inspections are clearly identified in the Safety Analysis Report for Packaging and/or the Certificate of Compliance for each cask. Casks can only be operated by registered users who conduct operations in accordance with documented and approved quality assurance programs meeting the requirements of the regulatory authorities. Records must be maintained that document proper cask operations in accordance with the quality requirements of 10 CFR §71.91. Reports of defects or accidental mishandling must be submitted to NRC.

B.2.1.4.1 Communications

Proper communication assists in assuring safe preparation and handling of transportation casks. Communication is provided by labels, markings, placarding, and shipping papers or other documents. Labels (49 CFR §172.403) applied to the cask document the contents and the amount of radiation emanating from the cask exterior (transport index). The transport index lists the ionizing radiation level (in mrem/hr) at a distance of 1 m (3.3 ft) from the cask surface.

In addition to the label requirements, markings (49 CFR Subpart D and §173.471) should be placed on the exterior of the cask to show the proper shipping name and the consignor and consignee in case the cask is separated from its original shipping documents (40 CFR §172.203). Transportation casks are required to be permanently marked with the designation "Type B," the owner's (or fabricator's) name and address, the Certificate of Compliance number, and the gross weight (10 CFR §71.83).

Placards (49 CFR §172.500) are applied to the transport vehicle or freight container holding the transportation cask. The placards indicate the radioactive nature of the contents. In the United States, spent nuclear fuel is a Highway Route Controlled Quantity which must be placarded according to 49 CFR §172.507. Placards provide the first responders to a traffic or transportation accident with initial information about the nature of the contents.

Shipping papers should have entries identifying the following: the name of the shipper, emergency response telephone number, description of spent nuclear fuel, and the shipper's certificate as described in 49 CFR §172 Subpart C.

In addition, drivers of motor vehicles transporting spent nuclear fuel must have training in accordance with the requirements of 49 CFR §172.700. The training requirements include: familiarization with the regulations, emergency response information, and the spent nuclear fuel communication programs required by the Occupational Safety and Health Administration. Drivers are also required to have training on the procedures necessary for safe operation of the vehicle used to transport the spent nuclear fuel.

B.2.1.4.2 Marine Transport

Relevant regulations applying to transport of spent nuclear fuel by vessel are found in 10 CFR §71 and 73, and 49 CFR §176. The U.S. Coast Guard, part of the Department of Transportation, inspects vessels for compliance with applicable regulations and requires 24-hour prenotification (33 CFR §160.207, 211, and 213).

49 CFR §171.12 (d) states that: "Radioactive materials being imported into or exported from the United States, or passing through the United States in the course of being shipped between places outside the United States, may be offered and accepted for shipment in accordance with International Atomic Energy Agency *Regulations for the Safe Transport of Radioactive Materials, Safety Series No. 6, 1985 Edition.*" Compliance with certain specified conditions of this section is required. For example, highway route controlled quantities of radioactive material must be shipped in accordance with appropriate provisions of the hazardous materials regulations and a Certificate of Competent Authority must be obtained, with any necessary revalidations. A Certificate of Competent Authority fulfills the International Atomic Energy Agency requirement for multilateral approval for a shipment of "Type B" packages in international commerce.

49 CFR §176.5 details the application of the regulations to vessels: "...this subchapter applies to each domestic or foreign vessel when in the navigable waters of the U.S., regardless of its character, tonnage, size, or service, and whether self-propelled or not, whether arriving or departing, underway, moored, anchored, aground, or while in drydock."

49 CFR §176.15 provides for enforcement of 49 CFR Subchapter C: "(a) An enforcement officer of the U.S. Coast Guard may at any time and at any place, within the jurisdiction of the U.S., board any vessel for the purpose of enforcement of this subchapter and inspect any shipment of hazardous materials as defined in this subchapter." Provision is also made in this section to detain a vessel which is in violation of the hazardous materials regulations.

The U.S. Coast Guard may accept a certificate of loading issued by the National Cargo Bureau, Inc., as evidence that the cargo is stowed in conformity with law and regulatory requirements. The National Cargo Bureau, Inc., is a nonprofit organization directed by Government and industry representatives (49 CFR §176.18). 49 CFR §176.18 authorizes inspectors of the National Cargo Bureau, Inc., to assist the Coast Guard in administering the hazardous materials regulations. Their functions are as follows:

"(1) Inspection of vessels for suitability for loading hazardous materials;

(2) Examination of stowage of hazardous materials;

(3) Making recommendations for stowage requirements of hazardous materials cargo; and,

(4) Issuance of certificates of loading setting forth that the stowage of hazardous materials is in accordance with the requirements of 46 U.S.C. 170 and its subchapter."

Detailed requirements for radioactive materials are located in 49 CFR §176 Subpart M of the Hazardous Materials Regulations. General radioactive material stowage requirements state that "(b) A package of radioactive materials which in still air has a surface temperature more than 5°C (9°F) above the ambient air may not be overstowed with any other cargo. If the package is stowed under the deck, the hold or compartment in which it is stowed must be ventilated," (49 CFR § 176.700).

Except for exclusive-use shipments, requirements relating to transport indexes state that:

". . . the number of freight containers with packages of radioactive materials contained therein must be limited so that the total sum of the transport indexes in the containers in any hold or defined deck area does not exceed 200, and:

(1) The sum of transport indexes for any individual freight container, or group of freight containers, does not exceed 50; and,

(2) Each freight container or group of freight containers is (are) handled and stowed in such a manner that groups are separated from each other by a distance of at least six m (20 ft)," [49 CFR § 176.704(c)].

Section 176.76(a) includes provision for freight containers with hazardous materials to be carried onboard a vessel in accordance with the following:

" (1) The material must be in proper condition for transportation according to the requirements of this subchapter;

(2) All packages in the transport vehicle or container must be secured to prevent movement in any direction. However, vertical restraint is not required if the shape of the packages and the stuffing pattern precludes shifting of the load;

(3) Bulkheads made of dunnage which extend to the level of the cargo must be provided unless the packages are stowed flush with the sides or ends;

(4) Dunnage must be secured to the floor when the cargo consists of dense materials or heavy packages."

Each freight container must be placarded as required by 49 CFR §172 Subpart F of the Hazardous Materials Regulations [176.76(f)].

Section 176.80 requires that radioactive materials be segregated from other hazardous materials so that they do not interact dangerously in an accident, or alternatively, requires that the radioactive material be in separate holds when stored under deck. In 49 CFR §176.83(b), a table is provided (Table II) that specifies the minimum separation distances for different classes of hazardous materials onboard a vessel. A minimum horizontal separation distance of 3 m (10 ft) projected vertically from the reference package is required. For specified hazardous materials, the "separate from" requirement means that the materials must be placed in separate holds when stowed under deck.

B.2.1.4.3 Ground Transport

Overland shipments (by railcar or by truck) are regulated by a variety of the Department of Transportation and NRC regulations dealing with packaging, notification, escorts, and communications. In addition, there are specific regulations for carriage by rail and carriage by truck.

When provisions are made to secure a package so that its position within the transport vehicle remains fixed during transport, with no loading or unloading between the beginning and end of transport, a package shipped overland in exclusive-use closed transport vehicles may not exceed the following radiation levels as provided in 49 CFR §173.441(b):

- 1,000 mrem/hr on the external package surface;
- 200 mrem/hr at any point on the outer surface of the vehicle;
- 10 mrem/hr at any point 2 m from the vertical planes projected from the outer edges of the vehicle;
- 2 mrem/hr in any normally occupied position in the vehicle, except that this provision does not apply to private motor carriers when the personnel are operating under a radiation protection program and wear radiation-exposure monitoring devices.

The shipper of record must comply with the requirements of 10 CFR §71.5 and §73.37. Section 71.5 provides that all overland shipments must be in compliance with the Department of Transportation and NRC regulations; these regulations provide for security of irradiated reactor fuel. General requirements include: providing notification to NRC in advance of each shipment, developing a shipping plan, providing escort instructions, establishing a communications center to be staffed 24 hours a day, making arrangements with local law enforcement agencies along the route for their response (if not using law enforcement personnel as escort), ensuring that the escorts are trained in accordance with Section 73.37 Appendix D, and ensuring that escorts make notification calls every 2 hours to the communications center. Additional requirements include having two armed escorts within heavily populated areas (when not in heavily populated areas, only one escort is needed) and the capability of communicating with the communications center and local law enforcement agencies through a radiotelephone or other NRC approved means of two-way voice communication.

The shipper of record, as required by 49 CFR §173.22, provides physical security measures for spent nuclear fuel shipments equivalent to those of NRC. The shipper, or the shipper's agent, provides notification for unclassified spent fuel shipments to State officials.

B.2.1.4.3.1 Rail Transport

Rail transportation requirements for radioactive materials are contained in 49 CFR §174. Briefly, for rail shipments of spent nuclear fuel the following additional requirements apply:

- railcars carrying radioactive materials must be segregated from other cars within a train, and cannot be next to other placarded hazardous materials (49 CFR §174.85) or occupied engines or cabooses; and
- hazardous materials shipments (including radioactive) must be expedited (49 CFR §174.14).

In addition, Association of American Railroad Interchange rules require that spent nuclear fuel be shipped only on railcars meeting certain construction and packaging retention requirements (AAR Rule 88A 1d). Rail routing has not been regulated by the Department of Transportation because the railroads are privately-owned companies. However, rail routes used for spent nuclear fuel shipping must be approved by NRC under a physical security plan (10 CFR §73.37).

B.2.1.4.3.2 Truck Transport

Truck transportation requirements for radioactive materials are contained within 49 CFR §177.800. In addition to requirements for securement and segregation by total transport index (50), there are road routing requirements as well. For carriage by truck, the carrier will use interstate highways or State-designated preferred routes for movement of radioactive materials in conformity with the Department of Transportation rulemaking, Docket HM-164. These regulations, found in 49 CFR Subpart D, establish routing and driver training requirements for highway carriers of packages containing "highway-route-controlled quantities" of radioactive materials. Spent nuclear fuel shipments constitute such quantities. The Department of Transportation also issues road operating requirements for radioactive materials shipments, including parking and operating rules. Primarily, these rules require trucks to stop and undergo visual inspection by the driver every 160 km (100 mi). Domestic road routing must also be approved by NRC under a physical security plan.

Many State and local governments have established their own rules, specifying such things as prenotification requirements, time-of-day restrictions, routes, and special equipment. State and local regulations that unnecessarily burden, delay, or ban shipments of radioactive materials will be preempted under the Hazardous Materials Transportation Act. The Department of Transportation rules make routing designation by appropriate State agencies enforceable by the Federal Government according to a determination by the Department of Transportation that such route designations are likely to result in further reduction of radiological risk.

B.2.2 Potential Transportation Casks

This section provides a description of the transportation casks that could be used for marine and ground transport of foreign research reactor spent nuclear fuel. The casks were identified from a review of the "Directory of National Competent Authorities' Approval Certificates for Package Design, Special Form Material, and Shipment of Radioactive Material, 1993 Edition," and the RAMPAC (radioactive material package) database for certified radioactive materials packaging (NRC, 1993). The review included only those transportation casks with current "Type B" designations for spent nuclear fuel.

B.2.2.1 Marine Transport

Table B-13 identifies the potential transportation casks for marine transport of foreign research reactor spent nuclear fuel. Each of these casks has both a certification from the country of origin and a certificate of competent authority from the Department of Transportation, which is designated as the Competent Authority for the United States. Except for the Unifetch, each of the casks has been previously used or accepted for use by DOE.

Table B-13 Proposed Transportation Casks for Marine Transport

Transportation Cask	Certificate	DOE Experience	Country of Origin
LHRL-120	USA/0389/B(U)F	Yes	Australia
GNS-11	USA/0381/B(U)F	Yes	Germany
TN-1	USA/0316/B(U)F	Yes	Germany
IU-04	USA/0100/B(U)F	Yes	France
TN-7 (TN-7/2)	USA/0130/B(U)F	Yes	Germany
NAC-LWT	USA/9225/B(U)F	Yes	United States
Unifetch	GB/1113/B(M)F	No	Great Britain
Goslar	USA/0094/B(M)F	Yes	Germany

Table B-14 summarizes the essential characteristics of the marine transportation casks for foreign research reactor spent nuclear fuel, such as physical dimensions, weight, type, and quantity of spent nuclear fuel elements each cask can accommodate, cooling time before shipment, maximum activity content in a cask, and the maximum initial ^{235}U content of each element. A summary of important characteristics of these casks is also provided after Table B-14.

Table B-14 Transportation Cask Design Characteristics for Marine Transport

Shipping Cask	Weight (MT)	^{235}U g/Elements	Fuel Type	Number of Elements per Cask	Cooling Time (Days)/Activity per Cask (kCi)	Cask Dimensions (mm)
LHRL-120	21.4	150-170	MTR tubular (HIFAR)	114	2,557/80	H: 3,400 D: 2,300
GNS-11	13.6	173 323	Tubular MTR Boxed-type MTR	21-28 33	180/41 180/27	H: 1,460 D: 1,185
TN-1	18.4	NA	Boxed-type MTR	126	NA	H: 2,910 D: 950
IU-04	18.9	Varied: 150-8600	Special Tubular Boxed-type MTR TRIGA Spent Nuclear Fuel	1 36-40 40-44	about one yr/1,250	H: 2,240 D: 1,880
TN-7 (TN-7/2)	25.5 (24.5)	290 8,500	Tubular-Boxed type MTR Special	60-64 2	250-1,780/2,000 310/2,000	H: 3,155 D: 1,030
NAC-LWT	23.2	17,575 Natural* 354	Commercial PWR Commercial BWR Metallic Rod Boxed-type MTR	1 - PWR 2 - BWR 15 - Met. Rods 42	730 - PWR 730 - BWR 365 - Met. Rods 1,095	H: 5,100 D: 1,120
Unifetch	16.9	405 170	Tubular Boxed-type MTR	24 40	90/45.4 90/123	H: 2,100 D: 1,800
Goslar	10.9	320	Boxed-type MTR	13	120/960	H: 1,460 D: 1,190

**Natural = Maximum initial U^{235} is 0.711 weight percent*
NA = Not Available
PWR = Pressurized Water Reactor
BWR = Boiling Water Reactor

LHRL-120

The LHRL-120 consists of a cylindrical cask surrounded by an impact limiter supported on cradles attached to a skid that is bolted to the base of a shipping container. The cask is a right circular cylinder with two concentric walls of steel for structural strength, with the annular area between the walls. The inner shell forms the containment.

The cask is built of inner and outer shells welded to the bottom end closure plate and top bolt ring, and secured by a bolted lid with a double o-ring seal. The annular space between the shells is filled with lead and supplementary lead shielding plates are provided on the bottom end closure plate and lid. The cask has two external lifting trunnions and, except for the high strength steel bolts, lead shielding, and synthetic rubber o-ring, is constructed of stainless steel plugs.

The impact limiter consists of a steel shell filled with dense polyurethane foam arranged to provide energy absorption and thermal insulation.

During transport, the cask body is completely enclosed by an impact limiter which provides both thermal and impact protection. The impact limiter is constructed in two pieces which bolt together and surround the cask body. LHRL-120 is designed for passive cooling by means of cooling tubes that penetrate the impact limiter. Tubes in the bottom half also transfer loads to the cradles. The cask and the impact limiter are secured to the skid by two tie-down straps and restraints. The skid is bolted to the base of an open conventional shipping container and is in turn enclosed by a steel weather cover fitting inside the end walls of the container and bolted to the container base. The container has standard International Standards Organization lifting arrangements and is approved under the international convention for safe containers.

The length and diameter of the cask with the impact limiter are 3.4 m (134 in) and 2.3 m (91 in), respectively. The total mass of the cask with contents, impact limiter, skid and tie-downs is 21.36 metric tons (47,080 lb) and the gross mass of the package including lift yoke, bolt tooling, tool box, weather cover and shipping container is approximately 24 metric tons (52,800 lb).

The cask was designed by Eggers, Ridelhalgh, and Partners of Columbus, Ohio for spent nuclear fuel from the High Flux Australian Research Reactor (HIFAR).

Permitted Contents:

Irradiated spent nuclear fuel elements with a minimum decay period of 7 years	
Maximum number of fuel elements per package	120[a]
Maximum fuel mass	554 kg (1,200 lb)
Maximum decay heat	290 Watts
Maximum mass of both baskets (empty)	891 kg (1,965 lb)
Maximum activity of package	80,000 Ci ($3.0 \times 10^{+15}$ Bq)
Transport Index	50

[a] *The maximum number allowed is 114.*

Two identical baskets are authorized for the LHRL-120 cask in a 1 x 2 array, (i.e., in a stacked configuration). The baskets are constructed exclusively of aluminum alloys 6061 and 6063. Each basket contains 60 cells, each providing an 11-cm- (4.3-in-) diameter by 65-cm- (25.75-in-) high cylindrical

cavity for each fuel assembly. Only 57 of the cells are loaded with fuel elements; the 3 center-most positions are left unloaded. The nominal wall thickness of the cell is 6.4 mm (0.25 in). Maximum mass of both baskets tiers (empty) is 891 kg (1,965 lb).

GNS-11

The GNS-11 consists of a welded stainless steel/lead construction which is tightly closed with a primary lid. The cask body can be closed at the lid region with a protection plate. The spent nuclear fuel elements fit into a fuel basket which is inserted in the cask cavity. The cask is an upright circular cylinder with two concentric walls of steel for structural strength with the annular area between the walls filled with lead for radiation shielding. The inner steel shell forms the containment.

The containment system is formed by the cask body, the primary lid including elastomer seal rings, plugs, and boltings. During transport, hood shaped impact limiters consisting of steel plates with a soft wood filling are attached to the top and bottom of the cask. In the upper region, two trunnions are screwed to the cask body for handling. The cask has the following external dimensions:

Diameter (without impact limiters)	1,185 mm (46.7 in)
Diameter (with impact limiters)	1,355 mm (53.4 in)
Height (cask body)	1,460 mm (57.5 in)
Height (with impact limiters)	1,780 mm (70 in)

The cask body is protected during transport by top and bottom impact limiters while the cask is secured vertically on its low-boy transporter. The cask weighs about 13.6 metric tons (30,000 lb). The cask can be used to ship up to 28 tubular-type MTR elements and up to 33 box-type MTR elements with initial ^{235}U enrichment of up to 93 percent. In addition, the cask can also be used to transport other types of irradiated hardware. This cask is shown in Figure B-8.

Since the temperature on the outside of the package may exceed 50°C (122°F) and the transport index can be greater than 10, the package is to be transported as a full load or as a closed load. Therefore, a maximum of two casks could be fixed in a shipping container. The cask was designed and manufactured by the German company Gessellschaft fur Nuklear-Behalte GmbH. There are currently two GNS-11 casks available for use.

Permitted Contents:

Three different fuel baskets are authorized for use with this cask. These accommodate various types and amounts of fuel:

1. A maximum of 21 or 28 (depending on the type of fuel basket used) irradiated tubular MTR fuel elements consisting of 3 to 5 concentrically arranged fuel tubes, with the following further specifications per fuel element:

Maximum initial enrichment	80 percent
Chemical form	U-Al alloy
Maximum initial mass of ^{235}U	173.4 g (6 oz)
Maximum initial quantity of uranium	217.0 g (7.5 oz)
Maximum active length	61 cm (24 in)
Maximum diameter of outer tube	10.3 cm (4 in)
Minimum cooling time	180 days

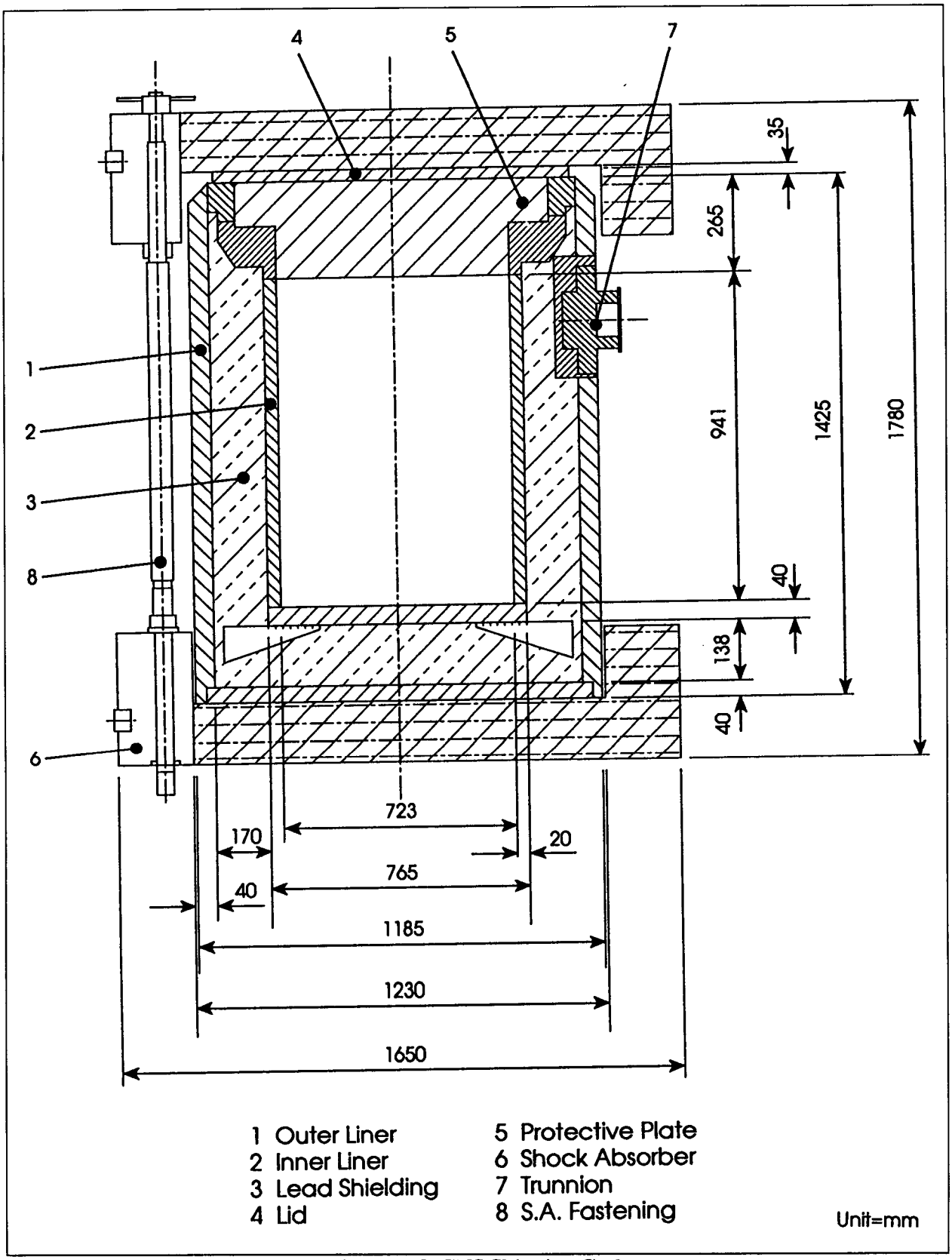


Figure B-8 GNS Shipping Cask

Thermal power (average)	maximum 76 Watts (for 21 fuel elements per cask)
Thermal power (average)	maximum 57 Watts (for 28 fuel elements per cask)
Maximum activity	40.5 kCi (1.5 PBq)

2. A maximum of 33 irradiated boxed-type MTR fuel elements, each containing a maximum of 23 aluminum-based fuel plates, with the following further specifications per fuel element:

Maximum initial enrichment	93 percent
Maximum initial mass of ^{235}U	268 g (9.3 oz)
Maximum initial mass of uranium	335 g (11.6 oz)
Active length	maximum 61 cm (24 in)
Cross-sectional area	approx. 81 x 76 mm (3.2 x 3.0 in)
Minimum cooling time	180 days
Thermal power (average)	maximum 48.5 Watts
Maximum activity	27 kCi (1 PBq)

3) A maximum of 33 irradiated boxed-type MTR-fuel elements each containing a maximum of 23 aluminum-based LEU fuel plates (containing dispersed U_3Si_2 or U_3O_8) with the following further specifications per fuel element:

Maximum initial enrichment	20 percent
Maximum initial mass of ^{235}U	323 g (11.2 oz)
Maximum initial mass of uranium	1,635 g (3.6 lbs)
Active length	maximum 61 cm (24 in)
Cross-sectional area	approx. 81 x 76 mm (3.2 x 3 in)
Minimum cooling time	360 days
Thermal power (average)	maximum 48.5 Watts
Activity	maximum 27 kCi (1 PBq)

TN-1

The TN-1 is a cylindrical double-walled steel container with lead and plaster for shielding. It is constructed of steel structural shells with the annulus between them filled with lead for gamma shielding and plaster as a heat shield. Additional heat insulation and impact resistance is provided by impact limiters. The cask, with the impact limiters, weighs 18.37 metric tons (40,500 lb). The internal cavity can accommodate three baskets, one on top of the other, each filled with up to 42 boxed-type MTR fuel elements of initial ^{235}U enrichment of up to 94 percent.

The containment system is formed by the cask body, lid with its "elastomer" seals and bolts, and three sealing plates with "elastomer" seal rings in the cask body via the quick connections.

Physical dimensions of TN-1 are as follows:

	Without Shock Absorber	*With Shock Absorber*
Width	950 mm (37.4 in)	1,284 mm (50.6 in)
Height	920 mm (36.2 in)	1,254 mm (49.4 in)
Length	2,910 mm (114.6 in)	3,075 mm (121 in)

TN-1 is designed by the French company Cogema. It is shipped in the horizontal position with the top and bottom impact limiters attached. The TN-1 cask is shown in Figure B-9.

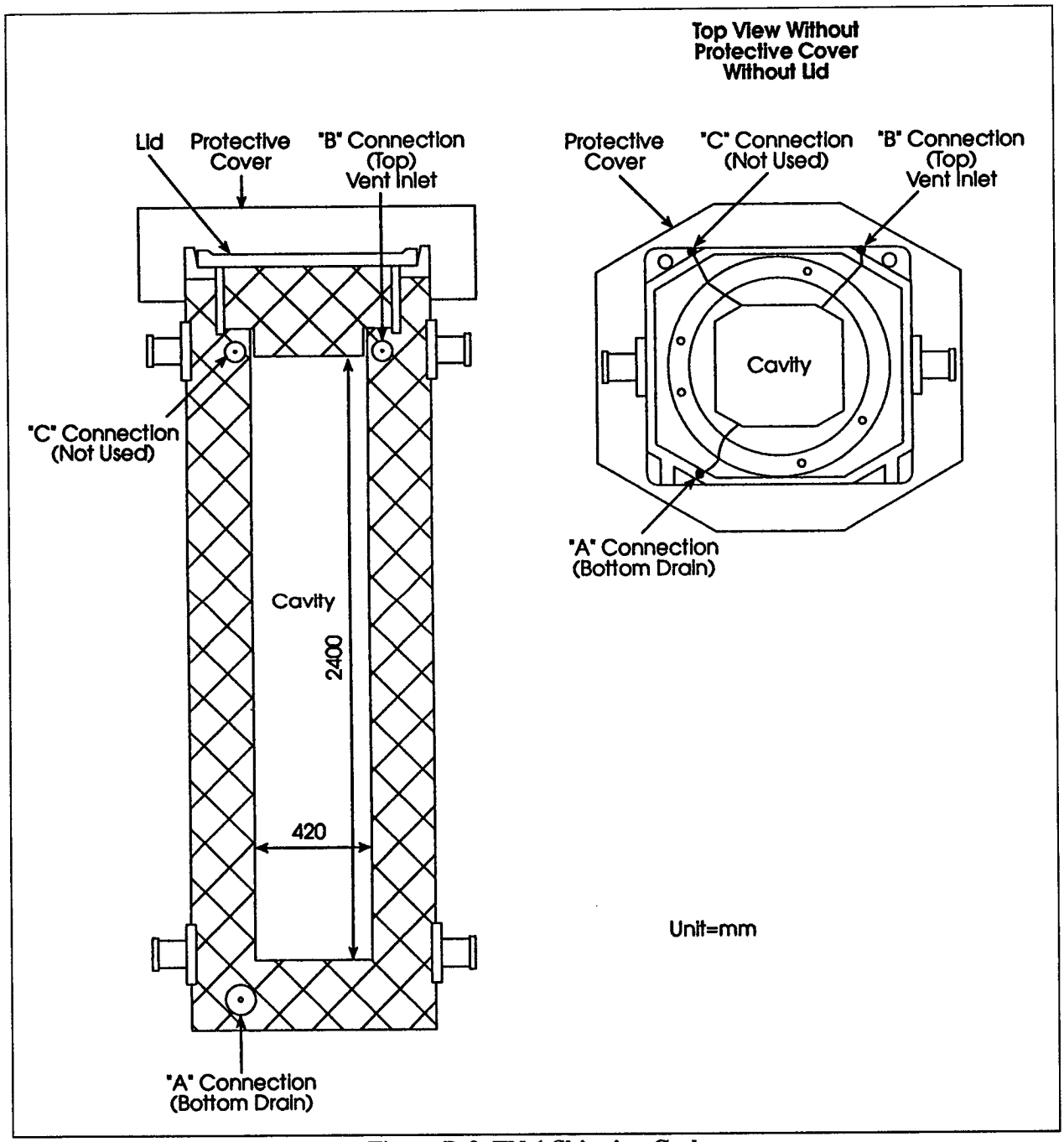


Figure B-9 TN-1 Shipping Cask

IU-04

The IU-04, also known as Pegase, consists of a body built of two stainless steel shells enclosing a lead shield. The inner confinement shell and the lead shield form a solid unit constituting the body. The outer shell is provided with a base plate filled with asbestos and is fitted with cooling fins. A layer of plaster is placed between the bottom of the outer shell and the lead. The steel lid is filled with lead and plaster. There are two pipe systems connecting the inner tank to the outside.

The cask is a right circular cylinder with two concentric walls of steel for structural strength with the annular area between the walls filled with lead for radiation shielding. The inner steel shell forms the containment. The IU-04 inner cavity can accommodate a variety of baskets which may be used to transport both MTR and TRIGA spent nuclear fuel. The cask weighs approximately 18.9 metric tons (41,670 lb). It is transported in the vertical position on the pallet, with top and bottom impact limiters to protect it in the event of an accident.

There is a main protective cover of stainless steel filled with balsa wood of two different densities. There are covers of mild steel protecting the pipe outlets which are filled with plaster. Like TN-1, this cask was also designed by Cogema. The IU-04 cask is shown in Figure B-10.

The cask is authorized to be used with various baskets designed for different types of spent nuclear fuel. The following summarizes a selected number of baskets designed for IU-04 casks:

1. Basket AA-267 - consists of cylindrical aluminum grid, 960 mm (37.8 in) high, containing 40 channels of square cross section, 84 x 84 mm (3.3 x 3.3 in), and 4 channels of cross section, 72 x 72 mm (2.83 x 2.83 in). The grid is surrounded by an aluminum belt with outside diameter of 795 mm (31.3 in). The aluminum contains two percent boron. The bottom end is covered by a 15-mm- (0.6-in-) thick aluminum plate welded to the cylindrical belt. It contains drain orifices.

Diameter	795 mm (31.3 in)
Total Height	1,030 mm (40.6 in)
Useful Height	960 mm (37.8 in)
Approx. Weight	360 kg (793.7 lbs)

A total of 44 MTR boxed-type (72 x 72 mm cross section) fuel elements can be put in this basket. The maximum allowed residual thermal power per element is less than 80 Watts.

2. Basket TN-9083 - consists of a block of stainless steel containing five percent boron. The basket is 895 mm (35.2 in) long and has 36 lodgments of 81 x 87 mm (3.2 x 3.4 in) cross section, bored to a diameter of 98 mm (3.9 in). The bottom is covered by a plate, 12 mm (0.5 in) thick, fastened to the block by screws. The bottom plate contains drain orifices of 50 mm (2 in) diameter. The dimensions of the basket are as follows:

Base Height	90 mm (3.5 in)
Diameter	796 mm (31.3 in)
Total Height	907 mm (35.7 in)
Useful Height	895 mm (35.2 in)
Approx. Weight	1,410 kg (3,108 lbs)

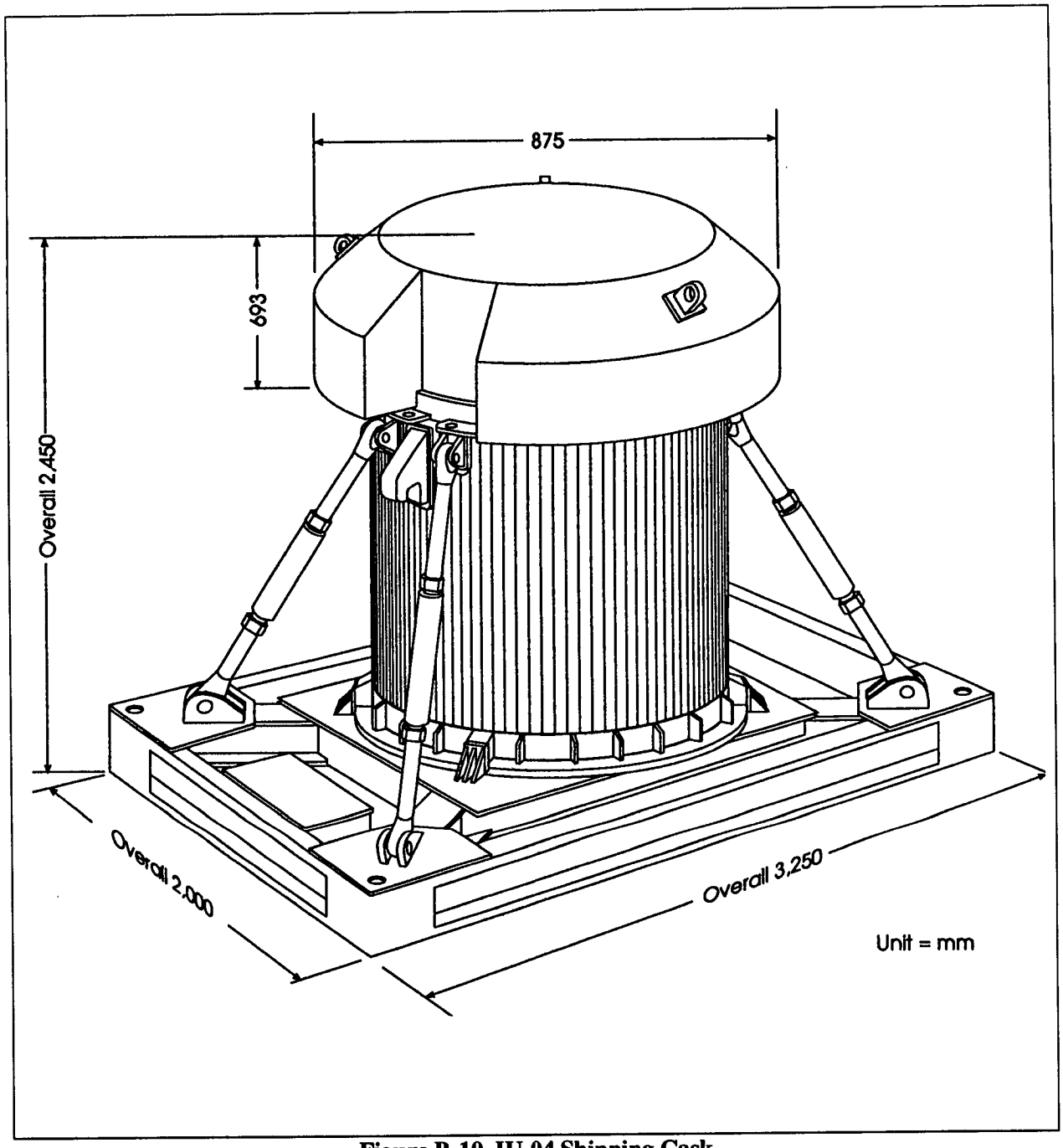


Figure B-10 IU-04 Shipping Cask

A maximum of 36 MTR tubular type fuel elements can be put in this basket. The maximum residual thermal power of each spent nuclear fuel must be less than 132 Watts.

Basket TN-9083 can also be used for TRIGA spent nuclear fuel. The maximum ^{235}U content of each TRIGA spent nuclear fuel element must be less than 40 g (1.4 oz).

3. Basket AA-49 - consists of 5 sectors of Copper-Cadmium alloy (at least 2 percent Cadmium by weight) with 5 square channels of 84 x 84 mm (3.3 x 3.3 in) and 1 channel of 71.5 x 71.5 mm (2.8 x 2.8 in), and a central core in stainless steel with a system for fastening the sectors.

Diameter	800 mm (31.5 in)
Total Height	1,030 mm (40.6 in)
Useful Height	970 mm (38.2 in)
Approx. Weight	2,500 kg (5,511 lbs)

Basket AA-49 accommodates 30 fuel elements of 93 percent enrichment from BR-2 with a maximum allowable residual power of 266 Watts per element.

4. Basket AA-50 - consists of 6 sectors of Copper-Cadmium alloy (at least 2 percent Cadmium by weight) with 6 channels of rectangular cross section 86 x 77.5 mm (3.4 x 3.1 in), and a central core in stainless steel with a system for fastening the sectors.

Diameter	800 mm (31.5 in)
Total Height	1,030 mm (40.6 in)
Useful Height	970 mm (38.2 in)
Approx. Weight	1,996 kg (4,400 lbs)

Basket AA-50 accommodates 36 boxed-type MTR fuel elements of up 93 percent enrichment. Maximum allowable residual power per each element is 200 Watts.

5. Basket AA-117 - is fabricated in Z2-CN-18-10 stainless steel with a base plate 10 mm (0.4 in) thick drilled with water drain holes in the center, 4 vertical posts 10 mm (0.4 in) thick bolted to the base plate and connected together by 3 circular spacers. Basket AA-117 accommodates 1 fuel element of 93.5 percent enrichment from RHF with a maximum allowable residual thermal power of less than 3,000 Watts.

Diameter	797 mm (31.4 in)
Total Height	1,030 mm (40.6 in)
Useful Height	420 mm (16.5 in)
Approx. Weight	165 kg (364 lbs)

TN-7 (TN-7/2)

The TN-7 consists of a cylindrical stainless steel exterior container with corresponding stainless steel lid with an integrated lead shielding; four trunnions; one bottom shock absorber; and a stainless steel, concentric cylindrical interior container, which together with its lead constitutes the "tight enclosure." Between the interior and the exterior container there is a lead shielding, 185 mm (7.3 in) thick at the sides, and 170 mm (6.7 in) thick at the lid. This shielding is surrounded by a humid cement thermal insulation. Within the interior container, up to four racks can be stacked upon each other for the admissible contents mentioned above.

The cask is a right circular cylinder with two concentric walls of steel for structural strength. The annular area between the steel walls is filled with lead for radiation shielding. The inner steel shell forms the containment.

The cask weighs about 25.5 metric tons (56,220 lb). The TN-7 was originally designed for the transportation of short light water reactor spent nuclear fuel but has the capability to accommodate the highly-enriched MTR spent nuclear fuel. In this capacity, the 4 baskets that fit in the inner cavity can accommodate up to 15 tubular or 16 box-type MTR fuel elements each.

The cask is transported in the horizontal position with top and bottom impact limiters providing protection in the event of an accident.

The TN-7/2 is very similar in design and dimension to the TN-7. The TN-7/2 is used to transport the same types and quantities of spent nuclear fuel as the TN-7. In addition, it can be used to transport up to 64 box-type MTR spent nuclear fuel elements or 2 RHF special spent nuclear fuel elements. The TN-7/2 is transported the same way as the TN-7. There is one TN-7 cask available for use at the present time. This cask has been designed by the German company Transnuklear GmbH.

Permitted contents:

1) Up to four insert racks, containing per rack:

   - maximum 15 irradiated tubular-type MTR fuel elements, each containing a maximum of 250 g (8.7 oz) of uranium enriched between 80 and 93 percent with a maximum of 200 g (6.9 oz) of ^{235}U in the form of a U-Al alloy, with a minimum cooling time of 250 days and a maximum activity of 40 kCi (1.48 PBq), or

   - maximum 16 irradiated Boxed-type MTR fuel elements, each containing a maximum of 363 g (12.6 oz) of uranium enriched between 80 and 93 percent, with a maximum of 290 g (10.1 oz) of ^{235}U in the form of a U-Al alloy, with a minimum cooling time of 1,780 days and a maximum activity of 20 kCi (740 TBq).

The racks can be combined within a cask, provided that the maximum thermal powers do not exceed 125 Watts per fuel element; 1,125 kW per rack; and 4.5 kW per cask.

OR

2) Up to two irradiated RHF type fuels, or a fuel containing a maximum number of 280 fuel plates each, with an active fuel length of about 900 mm (35.4 in), containing originally a maximum of 9.32 kg (20.6 lbs) of uranium enriched to 93 percent of ^{235}U with a maximum of 8.67 kg (19.1 lbs) of ^{235}U in the form of a U-Al alloy per element.

Maximum activity per fuel element	1,000 kCi (37 PBq)
Thermal output per fuel element	maximum 2.25 kW
Cooling time	310 days

TN-7 is authorized as Fissile Class II with a minimum Transport Index of 8.3 per package.

NAC-LWT

NAC-LWT is a steel encased lead shielded transportation cask. The cask body consists of a 19-mm- (0.75-in-) thick stainless steel inner shell, a 146-mm- (5.75-in-) thick lead gamma shield, a 30-mm- (1.2-in-) thick stainless steel outer shell, and a neutron shield tank. The inner and outer shells are welded

to a 101.6-mm- (4-in-) thick stainless steel bottom and forging. The cask bottom consists of a 76.2-mm- (3-in-) thick, 52.7-cm- (20.75-in-) diameter lead disk enclosed by a 88.9-mm- (3.5-in-) thick stainless steel plate and bottom end forging. The cask lid is a 287-mm- (11.3-in-) thick ring stainless steel stepped design, secured to a 362-mm- (14.25-in-) thick ring forging with twelve 25.4-mm- (1-in-) diameter bolts. The cask seal is a metallic O-ring. A second teflon O-ring and a test port are provided to leak test the seal. Other penetrations in the cask cavity include the fill and drain ports, which are sealed with port covers and teflon O-rings. The cask weighs about 22.4 metric tons (51,200 lb) including a maximum of 1.75 metric tons (4,000 lb) weight of fuel and basket.

The neutron shield tank consists of a 6.1-mm- (0.24-in-) thick stainless steel shell with 12.7-mm- (0.50-in-) thick end plates. The neutron shield region is 416.5 cm (164 in) long and 127 mm (5 in) thick. The neutron shield tank contains an ethylene glycol/water solution that is 1 percent boron by weight.

The overall dimensions of the package, with impact limiters, are 5.9 m (232 in) long by 165.1 cm (65 in) diameter. The cask cavity is 4.52 m (178 in) long and 340 mm (13.4 in) in diameter, having a volume of about 0.41 m^3 (14.5 ft^3). The cask is equipped with aluminum honeycomb impact limiters. The top impact limiter has an outside diameter of 165.7 cm (65.25 in) and a maximum thickness of 71.9 cm (28.3 in). Both impact limiters extend 30.5 cm (12 in) along the side of the cask body. The cask is transported in the horizontal position.

NAC-LWT is designed to transport one pressurized water reactor assembly, two boiling water reactor assemblies, up to 15 metallic fuel rods, or 42 boxed-type MTR foreign research reactor spent nuclear fuel with a proper basket design. There are several NAC-LWT casks available which could be used to transport foreign research reactor spent nuclear fuel. It is designed by the Nuclear Assurance Corporation in the United States.

Unifetch

Unifetch was originally designed for the transport of the spent nuclear fuel from the BR-2 (Belgium reactor). The cask weighs about 18.6 metric tons (41,000 lbs) and can accommodate either 24 or 40 spent nuclear fuel elements. The cask is transported in the vertical position. Unifetch is designed by Transport Technology in the United Kingdom.

Permitted Contents:

Two types of baskets are designed for Unifetch:

1) Baskets with maximum capacity of 24 fuel elements: Irradiated BR-2 nuclear fuel elements, assembled from plates, consisting of an inner core of natural or enriched uranium alloyed with aluminum contained within an aluminum cladding.

Fuel core thickness	0.51 mm (0.02 in)
Maximum pre-irradiation mass of ^{235}U	405 g (14.1 oz)
Maximum mass per unit length of ^{235}U/assembly	5.495 g/cm (0.5 oz/in)
Maximum decay heat per fuel element	10.7 Watts
Maximum decay heat per package	260 Watts
Minimum fuel active length	737 mm (29 in)
Maximum fuel active cross section	5,384.56 mm^2 (8.35 in^2)
Cladding thickness	0.38 mm (0.01 in)
Maximum activity of package	45.4 kCi (1.68 PBq)
Minimum cooling time	90 days

2) Baskets with maximum capacity of 40 fuel elements: Irradiated MTR boxed type nuclear fuel elements, assembled from plates, consisting of an inner core of natural or enriched uranium alloyed with aluminum contained within an aluminum cladding.

Maximum mass of ^{235}U per element	170 g (6.7 in)
Maximum mass of ^{235}U in the shield	1,265 g (2.8 lbs)
Maximum decay heat per fuel element	11.5 Watts
Maximum decay heat per package	460 Watts
Minimum fuel active length	58.42 cm (23 in)
Maximum activity of package	123.3 kCi (4.56 PBq)
Minimum cooling time	90 days

GOSLAR

The Goslar cask is a double-walled right circular cylindrical steel container that uses lead shielding in the annulus between the inner containment and outer structural container. The Goslar-Behatler was previously used to transport boxed-type MTR elements with ^{235}U enrichment between 20 percent and 93 percent from several foreign research reactors to the United States.

Goslar was designed and fabricated by Transnuklear GmbH. It weighs approximately 10.9 metric tons (24,000 lb) and has inner cavity dimensions of 483 mm (19 in) diameter x 960 mm (37.8 in) tall. Exterior dimensions, including impact limiters, are 1,185 mm (46.4 in) diameter and 1,460 mm (57.4 in) height.

Permitted Contents:

Three different fuel configurations are authorized to be used with this cask. These accommodate various types and amounts of fuel:

1) A maximum of 13 irradiated MTR fuel elements (consisting of flat or curved fuel plates) with the following further specifications per fuel element:

Maximum initial enrichment	93 percent
Chemical form	U-Al alloy
Maximum initial mass of ^{235}U	320 g (11.1 oz)
Minimum cooling time	120 days
Thermal power	maximum 300 Watts
Maximum activity	89.2 kCi (3.3 PBq)
Thermal power	maximum 3,200 Watts per cask
Maximum activity	960 kCi (35.5 PBq) per cask

2) A maximum of 13 irradiated boxed-type MTR fuel elements, with the following further specifications per fuel element:

Maximum initial enrichment	45 percent
Maximum initial mass of ^{235}U	323 g (11.2 oz)
Minimum cooling time	120 days
Thermal power	maximum 300 Watts
Maximum activity	89.2 kCi (3.3 PBq)
Thermal power	maximum 3,200 Watts per cask
Maximum activity	960 kCi (35.5 PBq) per cask

3) A maximum of 13 irradiated MTR fuel elements with a total of 10.4 kg (22.9 lbs) of uranium enriched between 17 to 80 percent with a maximum of 1.755 kg (3.9 lbs) of ^{235}U, with the following further specifications per fuel element:

Maximum initial enrichment	80 percent
Maximum initial mass of ^{235}U	135 g (4.7 oz)
Minimum cooling time	200 days
Thermal power	maximum 1 Watt
Activity	maximum 300 Ci (.0111 PBq)

B.2.2.2 Ground/Intersite Transport

Table B-15 identifies the transportation casks for ground/intersite transport of foreign research reactor spent nuclear fuel. Each of these casks has a valid certificate for use in the United States. Although some of these transportation casks are not currently certified for the shipment of research reactor spent nuclear fuel similar to that from foreign research reactors, it is anticipated that all of the casks could be recertified to accept such material.

Table B-15 Transportation Casks for Ground Transport

Transportation Cask	*Certificate Number*	*DOE Experience*	*Country of Origin*
NLI-10/24	USA/9023/B( )F	No	United States
IF-300	USA/9001/B( )F	Yes	United States
BMI-1	USA/5957/B(U)F	Yes	United States
GE-2000	USA/9228/B(U)F	No	United States
TN-8	USA/9015/B( )	Yes	Germany
NLI-1/2	USA/9010/B( )F	Yes	United States
NAC-LWT	USA/9225/B(U)F	Yes	United States

Design information for ground transportation casks is summarized in Table B-16. Additional narrative summary information on each of theses casks is also provided below. Although no numbers are given for each cask capacity in terms of number of foreign research reactor spent nuclear fuel elements, it has been estimated that the space for each pressurized water reactor element (assembly) can accommodate 12 to 16 foreign research reactor spent nuclear fuel elements.

NLI-10/24

The Nuclear Assurance Corporation NLI-10/24 is a railcar transported stainless steel transportation cask. The cask is 519.4 cm (204.5 in) long, 234.8 cm (96 in) diameter, and weighs 72.5 metric tons (159,000 lb) empty. Radioactive shielding is provided by lead, water, depleted uranium, and a high temperature polymer. The cask is authorized to contain either 10 pressurized water reactor or 24 BWR irradiated uranium-oxide fuel assemblies.

Table B-16 Transportation Cask Design Characteristics for Ground Transport

Transportation Cask	*Empty Weight (metric tons)*	*Fuel Type*	*Number of Elements /Cask*	*Decay Heat Generation (kW)*	*Cooling Time (Days)*	*Cask Dimensions (mm)*
NLI-10/24[a]	77.5	PWR or BWR	10 PWR/ 24 BWR	70	150	H: 5,995 D: 2,440
IF-300[a]	43.1	PWR or BWR	7 PWR/ 17 BWR	11.7	120	H: 5,335 D: 1,625
BMI-1	9.9	MTR boxed-type	24	1.5	90	H: 1,864 D: 856
GE-2000	12.7	HFIR[b] Irradiated fuel	1	0.6	120	H: 3,340 D: 1,829
TN-8[a] (TN-9)[a]	16.3 (16.3)	PWR (BWR)	3 (7)	35.5 (24.4)	150 (150)	H: 5,740 D: 1,700
NLI-1/2	21	PWR or BWR	1 PWR/ 2 BWR	10.6/ 10.6	150/ 120	H: 4,953 D: 1,200
NAC-LWT[a]	23.2	PWR or BWR MTR	1 PWR/ 2 BWR 15	2.5/ 1.1 1	730 365	H: 5,080 D: 1,120

[a] *Currently does not have proper certification for foreign research reactor spent nuclear fuel use.*

[b] *High Flux Isotope Reactor fuel is similar to that of RHF fuel.*

PWR = Pressurized Water Reactor
BWR = Boiling Water Reactor

IF-300

The General Electric IF-300 is a stainless steel encased, depleted uranium transportation cask. The cask is 533.4 cm (210 in) long, 162.6 cm (64 in) in diameter, and weighs 43.1 metric ton (95,000 lb) empty. Radioactive shielding is provided by depleted uranium, stainless steel, and a water-ethylene glycol mixture. The cask is permitted to ship 7 pressurized water reactor or 17 boiling water reactor irradiated uranium-oxide fuel assemblies. The IF-300 transportation cask is illustrated in Figure B-11.

BMI-1

The BMI-1 cask is a truck transported, steel-encased, lead shielded transportation cask. The basic body is a right circular cylinder measuring 1.86 m (73.37 in) high and 0.85 m (33.37 in) in diameter. The cask weighs about 9.9 metric tons (21,860 lb) empty. The cask is permitted to ship 24 MTR boxed-type irradiated fuel assemblies. DOE, the authorized user of the BMI-1, lends it almost exclusively for the domestic shipment of research reactor fuel. As such, its design includes eight licensed basket and canister combinations, including one for TRIGA fuel with an initial enrichment up to 93 percent. These fuels are very similar to those used by the foreign research reactors. The BMI-1 cask is illustrated in Figure B-12.

GE-2000

The GE-2000 is a truck transported, stainless steel transportation cask. It is constructed from stainless steel shells and uses lead as a shielding material. The cask is 3.34 m (131.5 in) long, 1.8 m (72 in) in diameter, and weighs about 12.7 metric tons (28,000 lb) fully loaded. Current authorized contents include irradiated fuel rods and by-product, source, or special nuclear material. The GE-2000 cask is used primarily for domestic shipments of research reactor spent nuclear fuel. It is currently being certified for

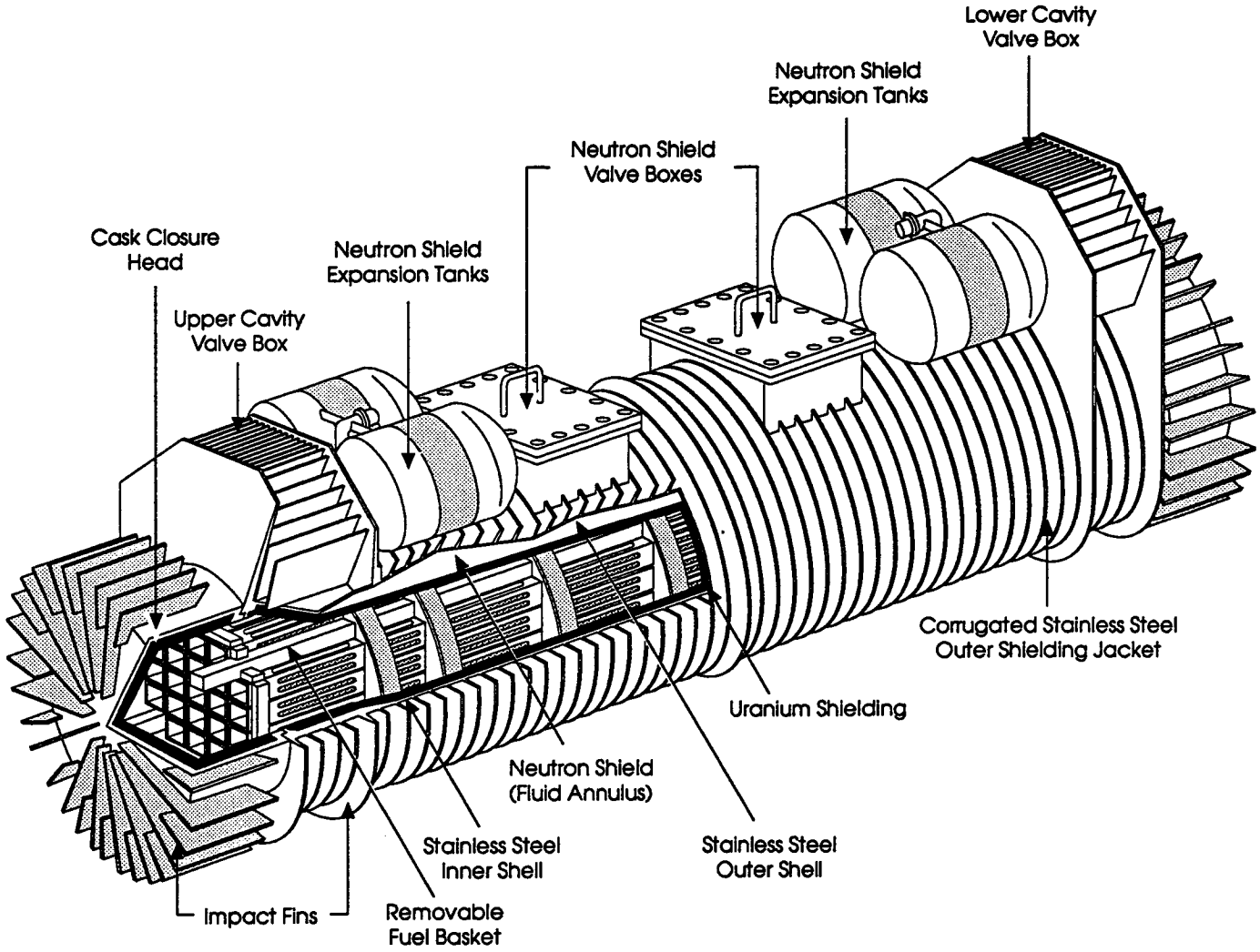


Figure B-11 IF-300 Shipping Cask

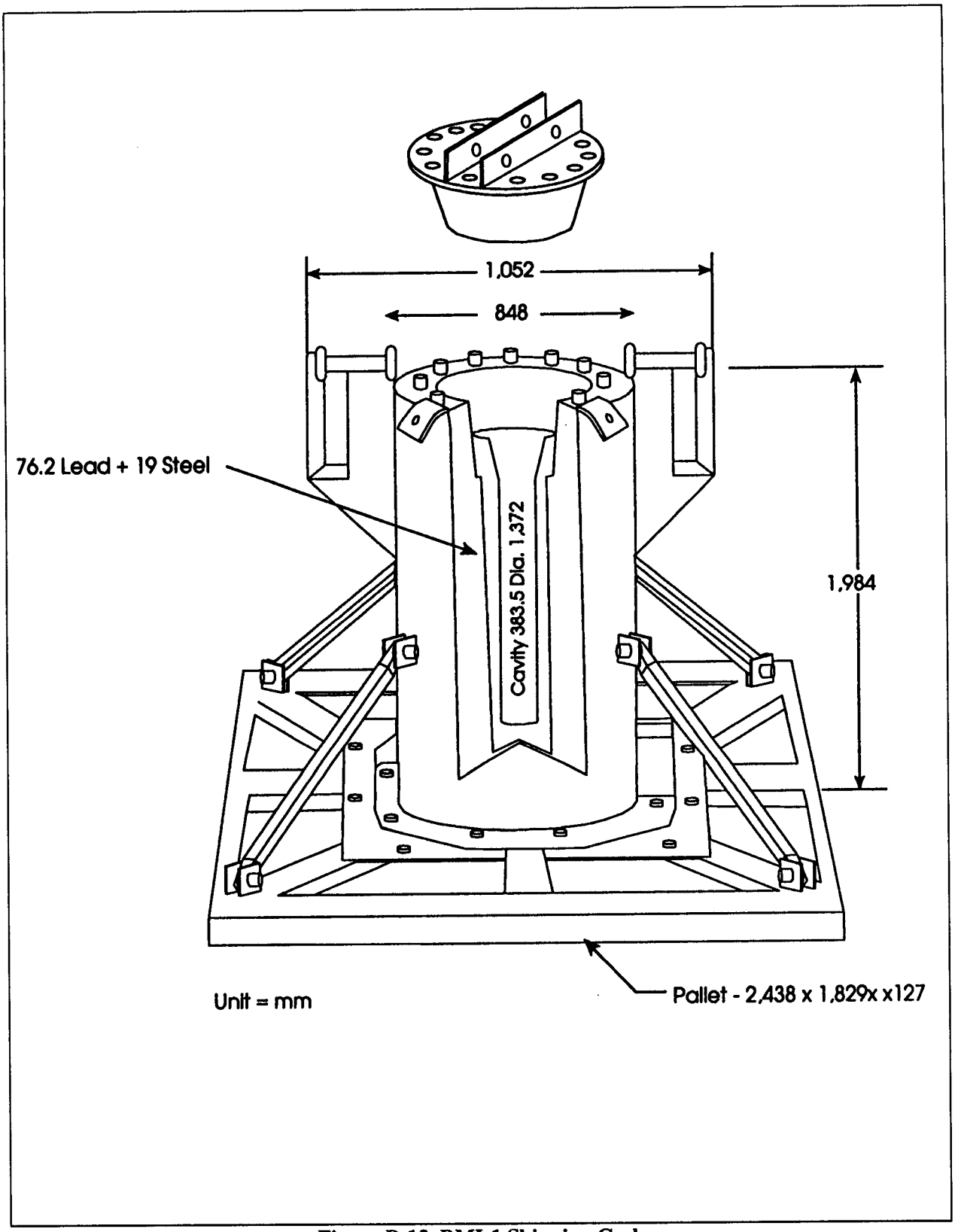


Figure B-12 BMI-1 Shipping Cask

use at the Oak Ridge National Laboratory for shipments of high flux isotope reactor fuel, which is almost similar in geometry to that used in RHF (see Section B.1.3) reactor but contains more ^{235}U fuel. The GE-2000 is illustrated in Figure B-13.

TN-8 (TN-9)

The Transnuclear TN-8 is a lead, steel, and resin shielded right cylinder, stainless steel transportation cask. The cask is 561.3 cm (221 in) long, 170 cm (67 in) in diameter, and weighs 16.3 metric tons (36,000 lb) empty. The TN-8 is permitted to ship three pressurized water reactor irradiated fuel assemblies. The TN-9 transportation cask is nearly identical to the TN-8, however, it is permitted to ship seven BWR irradiated fuel assemblies. These casks are classified as overweight truck casks in highway transport.

NLI-1/2

The Nuclear Assurance Corporation NLI-1/2 is a depleted uranium, water, and lead shielded transportation cask, encased in stainless steel. Shielding is provided by depleted uranium, lead, and a borated water-ethylene glycol mixture. The cask measures 495.3 cm (195 in) long, 120 cm (47.125 in) in diameter, and weighs 21 metric tons (49,250 lb) empty. It is permitted to ship either 1 pressurized water reactor or 2 boiling water reactor irradiated fuel assemblies. The NLI-1/2 is a legal weight truck cask that has been used at the Savannah River Site for the receipt of Taiwanese foreign research reactor spent nuclear fuel as recently as 1990. The NLI-1/2 is illustrated in Figure B-14.

NAC-LWT

The Nuclear Assurance Corporation NAC-LWT is a truck transported, steel-encased, lead shielded transportation cask. Radioactive shielding is provided by stainless steel and lead. The cask measures 508 cm (200 in) long, 165.1 cm (65 in) in diameter, and weighs 22.4 metric tons (51,200 lb) full. The cask is permitted to ship either one pressurized water reactor or two boiling water reactor irradiated fuel assemblies. This cask is also certified for the transport of Taiwanese foreign research reactor spent nuclear fuel. The NAC-LWT is nearly identical to the NLI-1/2.

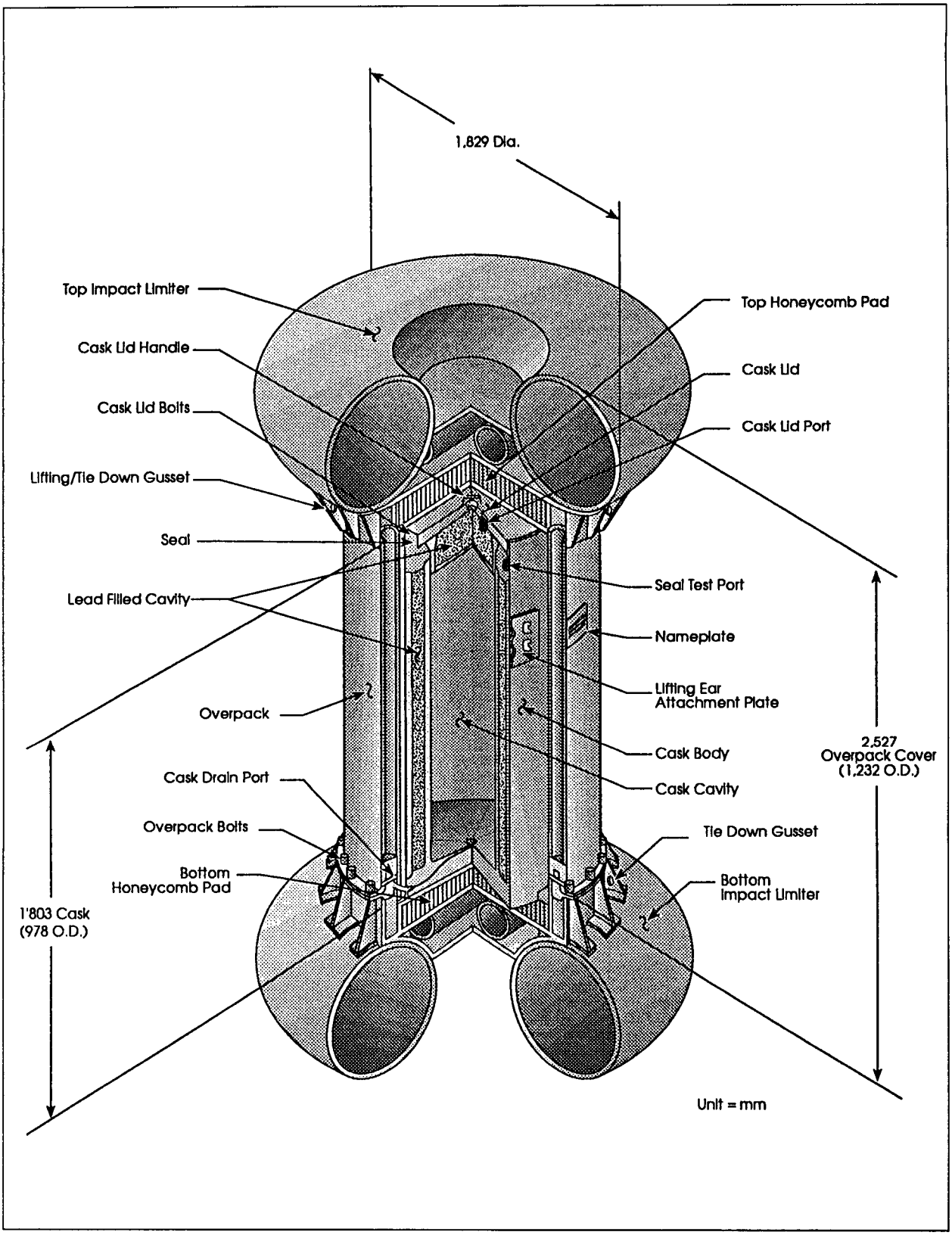


Figure B-13 GE-2000 Shipping Cask

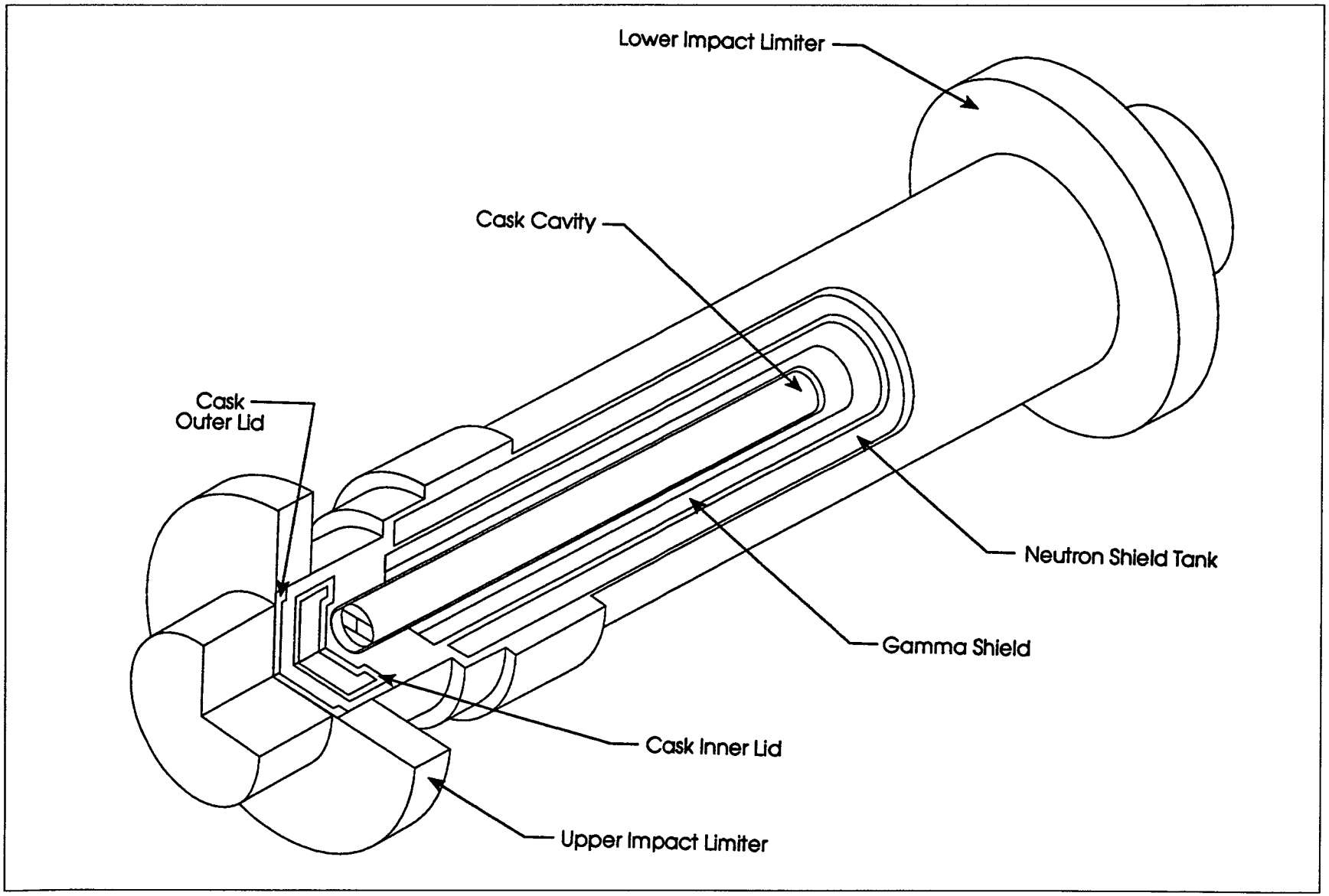


Figure B-14 NLI-1/2 Shipping Cask

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NEPA TEAM

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Volume 2

FINAL ENVIRONMENTAL IMPACT STATEMENT

on a

Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Appendix C
Marine Transport and Associated Environmental Impacts

United States Department of Energy
Assistant Secretary for Environmental Management
Washington, DC 20585

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Appendix C
Marine Transport and Associated Environmental Impacts

C.1 Introduction

Shipment of any material via ocean transport entails risks to both the ship's crew and the environment. The risks result directly from transportation-related accidents and, in the case of radioactive or other hazardous materials, also include exposure to the effects of the material itself.

This appendix provides a description of the approach used to assess the risks associated with the transport of foreign research reactor spent nuclear fuel from a foreign port to a U.S. port(s) of entry. This appendix also includes a discussion of the shipping configuration of the foreign research reactor spent nuclear fuel, the possible types of vessels that could be used to make the shipments, the risk assessment methodology (addressing both incident-free and accident risks), and the results of the analyses. Analysis of activities in the port(s) is described in Appendix D.

The incident-free and accident risk assessment results are presented in terms of the per shipment risk and total risks associated with the basic implementation of Management Alternative 1 and other implementation alternatives. In addition, annual risks from incident-free transport are developed.

C.2 Scope

This appendix addresses the modes of marine transportation and the nonradiological and radiological risks associated with marine transportation.

Transportation Modes: Marine transport of foreign research reactor spent nuclear fuel could occur via a combination of four types of vessels: container ships, roll-on/roll-off vessels, general cargo (breakbulk) vessels, or purpose-built vessels. In the incident-free analysis, it was assumed that all shipments would be made on breakbulk vessels. Breakbulk cargo vessel speeds are typical of the four types of cargo vessels considered, which means that the breakbulk vessel time enroute, (i.e., from port of origin to port of entry) is representative of the four vessel types. The ship speed selected for the analysis, 15 knots or 17.3 mph, is at the lower end of the range of speeds for commercial cargo vessels. This, in turn, maximizes the radiation dose received by the ship's crew, which bounds the incident-free risk. No vessel type assumption is necessary for the analysis of the impacts associated with the accident conditions, since these impacts are essentially independent of the type of ship.

Nonradiological Impacts: These risks were assessed as resulting in a negligible impact on the health of the public and workers. The limited number of shipments (less than a thousand individual spent nuclear fuel containers) would not result in a significant change in the number of ocean crossings by transport vessels. Regardless of the ship selection – general cargo, container, roll-on/roll-off, or purpose-built vessel – a negligible increase in the exposure of the public to exhaust emissions or transportation-related accidents would occur.

More than 56,000 port calls of ships engaged in foreign trade are made at U.S. ports each year (DOC, 1994). The basic implementation of Management Alternative 1 would result in the addition of less than 50 round trip voyages by vessel per year; the actual number of voyages that might occur would be dependent on the manner in which the policy, if adopted, was implemented. On average, less than

60 foreign research reactor spent nuclear fuel casks would be required to be shipped each year to fulfill the basic implementation shipping needs. These shipments could be made on regularly scheduled commercial cargo vessels. Alternatively, these shipments could be made in a chartered vessel, where the transportation casks would be the only cargo onboard the vessel.

If commercial cargo vessels were used, the shipment of foreign research reactor spent nuclear fuel transportation casks would not result in additional voyages specifically for the transport of the foreign research reactor spent nuclear fuel. The approximately 60 transportation casks per year would be part of the general cargo carried by the ships. As discussed in Section C.3.1.2, container vessels typically have a capacity in the range of 800 to 1,000 containers, while some carry many more. General cargo vessels tend to be somewhat smaller, but still have capacities equivalent to several hundred containers. Each foreign research reactor spent nuclear fuel transportation cask is assumed to be shipped within a container. Therefore, for the tens of thousands of vessels received at U.S. ports each year, each carrying hundreds of containers, or their equivalent, the basic implementation alternative would add approximately 60 containers per year. This is equivalent to much less than the capacity of one cargo vessel.

If chartered vessels were to be used for the shipment of the foreign research reactor spent nuclear fuel, the number of shipments required per year would depend on the number of transportation casks loaded into each vessel. Many factors would affect this number, such as the size of the ship, the availability of the ship, originating point for the shipments, and the readiness of foreign research reactor operators to ship the spent nuclear fuel. Estimates of the number of transportation casks that could be shipped on a single vessel are in the range of two to eight. This range results in estimates of between 30 and less than 10 shipments per year. Thirty shipments involve less than 0.001 of the total number of port calls by vessels engaged in foreign trade received at U.S. ports each year.

A combination of the two means of shipping the foreign research reactor spent nuclear fuel, commercial cargo and charter vessels, would result in somewhat fewer additional voyages by cargo vessels than the use of dedicated vessels alone. The use of five chartered voyages (carrying eight casks each) in combination with commercial cargo vessels could result in more than half of the foreign research reactor spent nuclear fuel casks being transported on chartered vessels. These five chartered voyages would represent less than 0.0001 of the number of vessels received at U.S. ports.

Regardless of the types of ships selected, there would be negligible impact on the marine environment including endangered species or habitats because of the negligible increase in ship traffic.

Radiological Impacts: The risks resulting from the radioactive nature of the shipments are addressed for both incident-free and accident transportation conditions. The radiological risks associated with the incident-free shipping conditions would be the potential exposure of the members of the crew to external radiation in the vicinity of the packaged fuel. No other public exposure is considered, due to the relative isolation of the material from the general public during all phases of the marine transport of the spent nuclear fuel. The potential exposure to radiation due to accidents is assessed for the marine environment in the event of the loss of a cask at sea and the consequent release of the cask's inventory into the marine environment. Only the marine exposure pathway is considered in detail, as the relative isolation from land and populated areas of the material during almost all of the voyage would minimize direct exposure through air pathways. Additionally, since the damaged cask is assumed to be lost at sea (and if not lost at sea, any airborne release would be deposited on the ocean surface), the marine pathway is likely to have more severe consequences.

All radiologically-related impacts on humans are calculated in terms of committed dose and associated health effects in the exposed populations. The radiation dose calculated is the total effective dose equivalent (EDE), which is the sum of the EDE from the external radiation exposure and the 50-year committed EDE from internal radiation exposure. The EDE is the sum of the tissue and organ-weighted dose equivalents for all irradiated tissues and organs. The committed EDE considers the initial exposure and the effects of radioactive decay and elimination of the radionuclide through ordinary metabolic processes over the 50-year period. Radiation doses are presented in units of person-rem for collective population and rem or mrem (equal to 0.001 rem) for individuals. The impacts are further expressed as health risks, primarily in terms of latent cancer fatalities (LCFs). The health risk conversion factors were derived from International Commission of Radiological Protection Publication 60 (ICRP, 1991). See Chapter 4 of this Environmental Impact Statement (EIS) for a more detailed discussion of radiation dose and risk.

C.3 Selection of Modes and Routes

C.3.1 Modes of Transportation

This section describes the possible shipping configurations of the cask and the types of vessels that could be used for ocean transport. In general, the shipping configuration of the cask conforms to the type of vessel to be used in ocean transport. The purpose of this section is to assist in understanding the specific operations or handling issues that arise in the various cask shipping configurations or in the use of specific vessel types.

Currently, the preferred method of commercial transport aboard ocean vessels is to mount casks in metal containers, sometimes called "International Standards Organization containers." Typically, containerized casks are transported on smaller general cargo vessels rather than on large vessels specifically designed for container transport.

As described in Section C.3.1.2, non-containerized transport is feasible, but is not generally used. An exception is the shipment of casks in purpose-built ships, which are specifically designed to accommodate radioactive material casks. Purpose-built ships for cask transport are described in Section C.3.1.2.

C.3.1.1 Cask Transport Configurations

This section describes the three configurations of casks for transport. The casks may be containerized, mounted on a wheeled trailer, or free-standing. Typically, containerized casks are mounted in a 6.1-m (20-ft) container, since casks rarely exceed 5.8 m (19 ft) in length. Wheeled cask trailers are usually dedicated trailers that have unique hardware used to secure the cask to the trailer frame. Free-standing casks are mounted on a skid, pallet, or cradle to facilitate handling the cask in intermodal transfer and in stowage.

Containerized Cask Configuration: Casks may be transported within International Standards Organization containers to take advantage of standardized port container lifting gear and vessel and transporter container tiedowns. The International Standards Organization container is a steel box that conforms to a set of standard dimensions, and has standard tiedown and lift points. The standard height and width is 2.4 m (8 ft). There are two standard lengths, 6.1 m and 12.2 m (20 ft and 40 ft). The four corners of the container are structural posts that have lifting points at the top and tiedown points at the bottom. These containers are commonly used to move all manner of goods transported by vessel and, because of the standardized dimensions and lifting points, can be rapidly transferred between the dock and the vessel.

Lifting, stowage, and transfer of containers is described in Appendix D.

Casks are mounted within the container using specially designed supports in the container floor. These supports mate with the tiedown structure of the cask to secure it to the container.

Figure C-1 shows a spent nuclear fuel cask being loaded into an International Standards Organization container. Containers may be either completely enclosed using a removable top, as shown in Figure C-1, or have open sides and top. Usually, an enclosed container is used with a cask that is certified for transport with a "personnel barrier." As its name implies, the personnel barrier is a structure that surrounds the cask in transport, to preclude inadvertent personnel contact with the cask surface. The barrier is a required feature if the cask surface can exceed about 52°C (125°F) in non-exclusive-use transport. The cask may become warm in transport due to the decay heat of the spent nuclear fuel within the cask. Usually, the barrier is constructed of expanded metal screen or other lightweight material. Casks that do not require a barrier may be mounted in open containers. In either case, the floor of the container is specially designed to support the weight of the cask, and to incorporate the tiedown fixtures of the cask. The tiedowns may be unique, as those shown in Figure C-1, or they may be bolts that secure the skid, pallet, or cradle to the floor of the container.

Since the introduction of International Standards Organization containers, shipment of spent nuclear fuel in casks mounted in containers has become the preferred configuration. Use of containers provides an improvement in the ease of securing the cask to the vessel. It also permits the use of standard container handling and transport equipment that is used at many ports.

Roll-On/Roll-Off Cask Configuration: Casks can be transported by vessel on a wheeled trailer that allows the cask to be rolled onto the vessel, and at the destination, rolled off. The cask (on its own unique, dedicated trailer) is moved on and off the vessel using a standard truck tractor or wheeled tug across a ramp extending between the vessel and the dock.

A few shipments have been made to the United States from Europe using casks mounted on their own dedicated trailers. However, current Federal regulations (49 CFR 176.76(b)) restrict trailered hazardous cargo (such as spent nuclear fuel) to transport on a trailership (roll-on/roll-off), trainship, ferry vessel, or car float. This regulation would preclude shipment of trailered casks containing spent nuclear fuel on general cargo, or other vessels. It has been assumed that the foreign research reactor spent nuclear fuel will be shipped as containerized cargo, not mounted on trailers. Use of containers will not limit the type of vessel that can be selected for transport.

Free-Standing Cask Configurations: Casks could be transported as a free-standing package. In this configuration, the cask would be mounted on a skid, pallet, or cradle to facilitate both lifting and tiedown. A pallet is usually required because casks have unique tiedowns and lift points that may not be readily accommodated by more common rigging and stowage bindings. The pallet is usually designed to provide a means of attaching the cask to the transport trailer or railcar. The cask is usually either attached to the pallet by bolting at the cask tiedown fixtures, or by the use of specially designed turn buckle cables.

Free-standing casks have previously been transported on general cargo vessels that carry cargo as "breakbulk." Breakbulk cargo is any cargo that is handled individually and may be containerized or otherwise unitized.

Shipments of free-standing casks are no longer routinely made, primarily because the securing of the cask to the vessel is considered to be somewhat less certain than that obtained with International Standards Organization containers, and because of the risk of damage to the cask in handling and stowage.

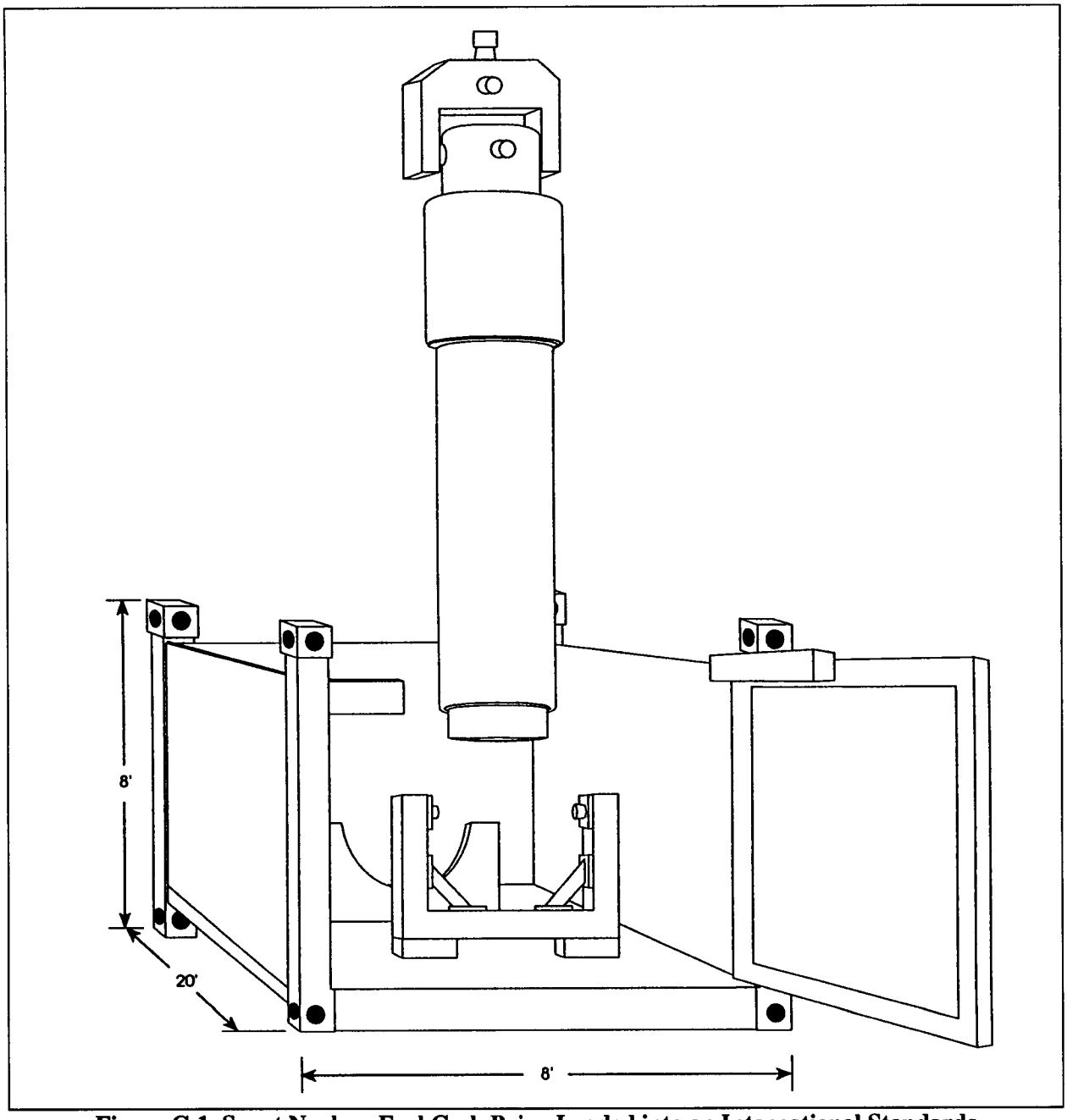

Figure C-1 Spent Nuclear Fuel Cask Being Loaded into an International Standards Organization Container

Recently, several purpose-built ships have been placed in service that transport casks in a free-standing (non-containerized) configuration. Purpose-built vessels are described in Section C.3.1.2. These dedicated vessels incorporate holds containing structural tiedowns designed to mate with the cask, and which provide additional shielding from radiation. The purpose-built vessels are operated by crews both trained in radiological safety and with a radiological control program in place.

C.3.1.2 Vessel Types, Cask Handling Requirements, and Methods of Service

This section describes the four principal types of vessels that could be used for the transport of casks. The vessel types include container, roll-on/roll-off, general cargo (also called breakbulk), and purpose-built vessels.

Each of these types of vessel have somewhat different handling requirements for the cargo they carry. Cask handling and equipment requirements are also described.

Individual shipments could be made by scheduled commercial vessel, or by charter vessel. Vessels on scheduled routes generally call on the more important ports. Scheduled vessels also typically call at intermediate ports between a given origin and destination.

Because of the general public aversion to nuclear materials, there has been a marked decrease in the number of steamship lines that will accept spent nuclear fuel cargoes in scheduled service. Also, many foreign ports and some U.S. ports do not currently permit docking or handling of spent nuclear fuel shipments, either en route or as a destination. This has led to an increased reliance on spent nuclear fuel ocean transport by chartered vessel. Vessels for charter are available from any number of steamship lines. Generally, smaller general cargo (breakbulk) vessels are used for charter shipments.

Container Vessels: Container vessels are typically large ships that are specifically intended for the transport of International Standards Organization containers (Figure C-2). Modern container ships can transport up to about 5,000 containers, although a more typical capacity is in the range of 800 to 1,000. A principal advantage of container vessels, because of standardization of containers, is that the vessel can be rapidly loaded or off loaded at those ports equipped with container gantry cranes. Containers can be removed from (or placed on) the vessel at an average rate of about 45 containers per hour. At well equipped container vessel ports, two cranes are used to move containers. Smaller container vessels may be equipped with an onboard crane allowing calls at ports that are less well equipped.

Because of cost, the only container ships generally used to transport spent nuclear fuel are in scheduled service. Smaller general cargo vessels are more suitable to chartered service, and these vessels accommodate containers.

Roll-On/Roll-Off Vessels: Roll-on/roll-off vessels are vehicle carriers (Figure C-3) used for the ocean transport of cars and trucks. The vessels are loaded and unloaded using a ramp between the vessel and dock. Ordinarily, the vessel carries its own ramp, which is deployed by an on-board crane, hydraulic cylinders, or chain drives. The ramp may extend from the stern of the vessel or from a hatch in the side hull of the vessel. At docks intended for roll-on/roll-off service, additional ramps may be deployed from the dock to expedite loading or unloading. For ocean transport, the trailers are lashed to the deck(s) of the vessel using ratchet or turnbuckle type bindings to fixed securement points in the deck. It is likely that a roll-on/roll-off capable vessel could be leased, should a roll-on/roll-off capability be required.

General Cargo (Breakbulk) Vessels: General cargo vessels (Figure C-4) are small-to-medium sized ships (compared to container vessels) that typically call on less well developed or equipped ports. They have on-board jib or boom type cranes that can be used to load or unload the ship. As the name implies, these vessels are intended to accommodate a wide variety of cargoes. Since the advent of the widespread use of containers, most of these ships are equipped with International Standards Organization lock fixtures to secure containers to the ship deck(s) and to each other. If necessary, containers can be lifted on and off these ships by using four-legged slings between the corners of the container and the hook of the crane. Because of the versatility of these vessels, casks configured for containerized or free-standing transport can be accommodated.

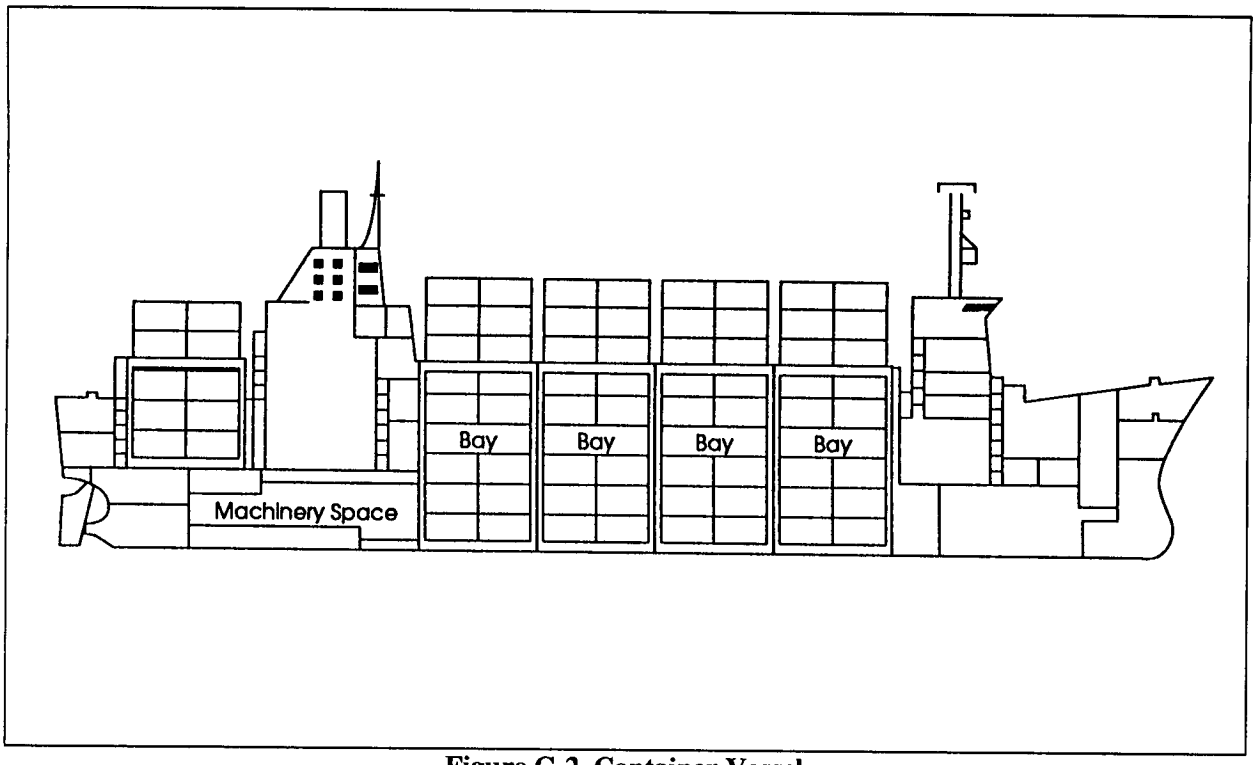

Figure C-2 Container Vessel

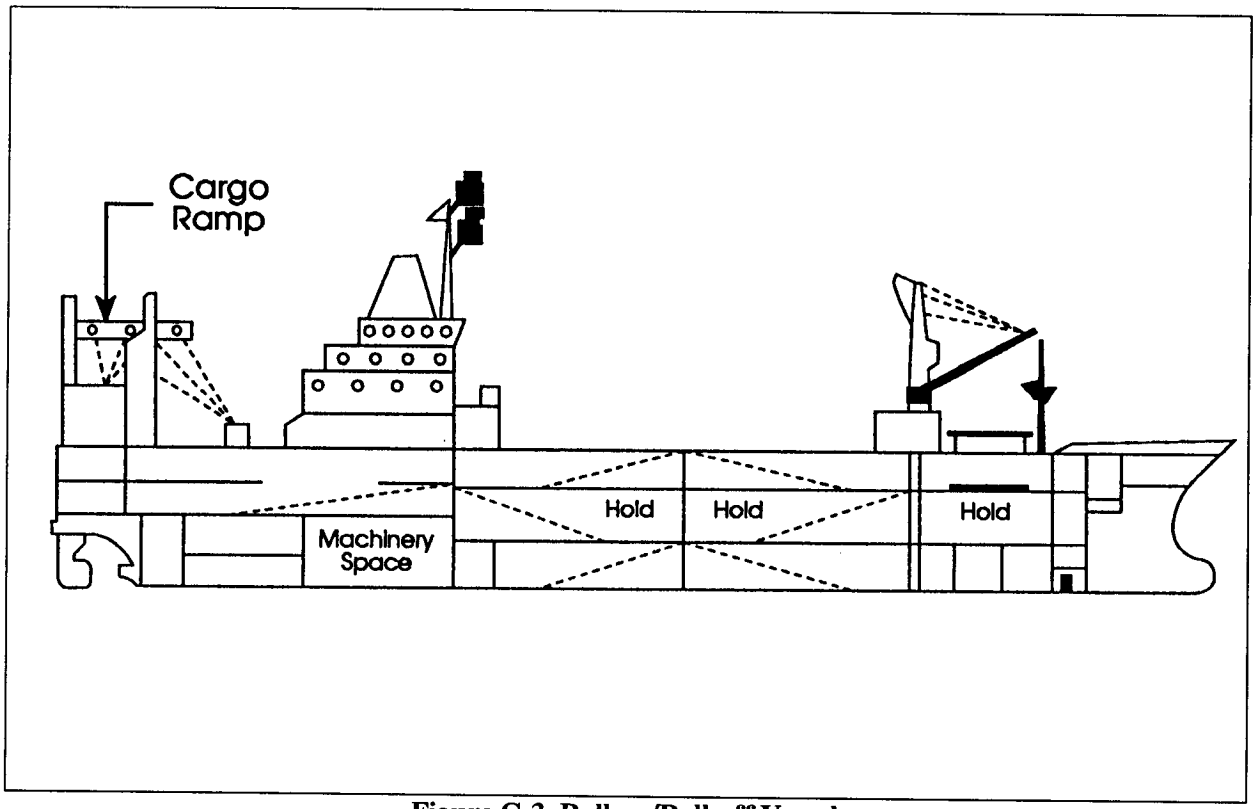

Figure C-3 Roll-on/Roll-off Vessel

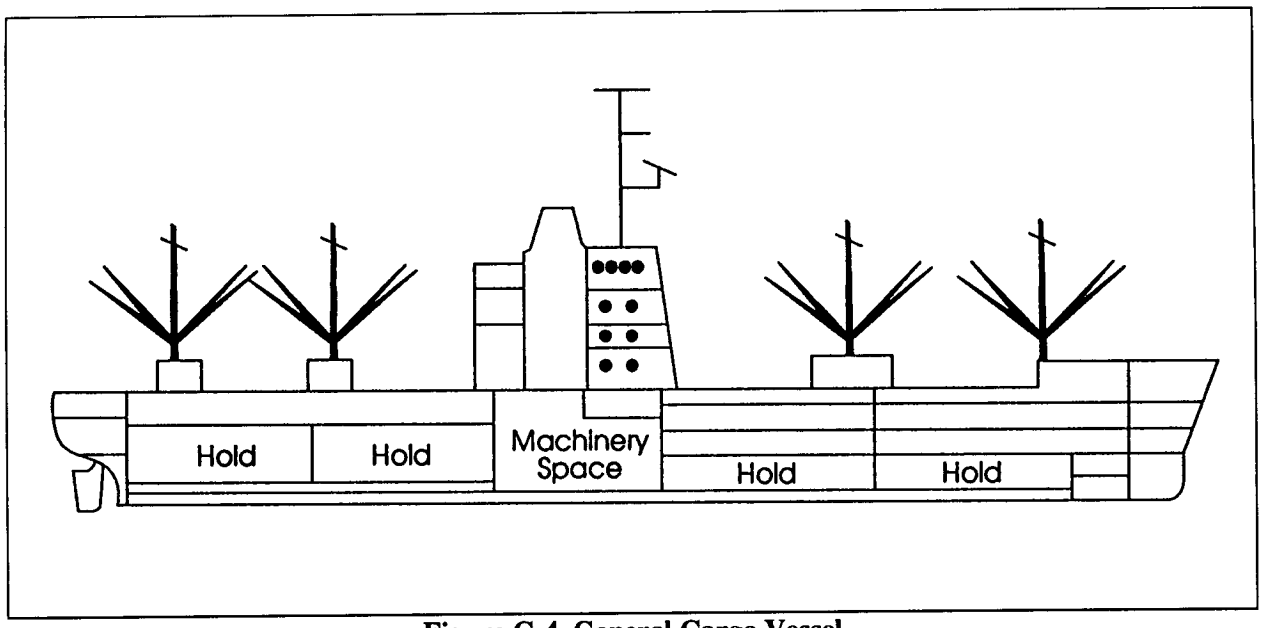

Figure C-4 General Cargo Vessel

Free-standing casks would be palletized for transport on a general cargo vessel. For stowage, the pallet would be lashed to the vessel hold or deck using conventional chains or binders. Pallets do not have standard tiedown fixtures, so there is wide variability in the specific tiedown requirements for each pallet design. Also, there is variability in provisions for lifting the pallet. The standard tiedown configuration of containers eliminates much of this variability. Consequently, containerized cask handling has resulted in an increase in the use of this configuration for the shipment of casks, and there has been a significant reduction in the number of casks shipped in the free-standing configuration.

General cargo ships have been routinely available for chartered shipment of containerized casks containing spent nuclear fuel from any number of U.S. or foreign ship lines. Because there are a comparatively small number of casks that are available for use, chartered small general cargo vessels are an option to scheduled service.

Purpose-Built Vessels: Purpose-built vessels, as used here, are those vessels specifically designed to transport spent nuclear fuel casks (Figure C-5). These vessels are not used for the transport of any other cargo and they operate as dedicated vessels. Casks are loaded directly into the holds of the vessel because the cargo compartments contain the hardware needed to mate with the tiedown fixtures of the cask. If the vessel has no crane, dockside cranes are used for loading and unloading. The cargo compartments are typically intended to handle a specific cask, and other casks cannot be used without modification to the tiedown mechanisms. For the relatively efficient transport of spent nuclear fuel, the casks normally used are very large. They are intended for the transport of power reactor spent nuclear fuel, and have a loaded weight on the order of 90 to 115 metric tons (99 to 126.5 tons). Commercial docks are not normally used, but most could be without significant problems.

The vessels have double bottoms and hulls, watertight compartments, and collision damage resisting structures within the hull. The vessel crew is trained in the handling of the cargo and in emergency response. These vessels also incorporate security features and satellite tracking systems.

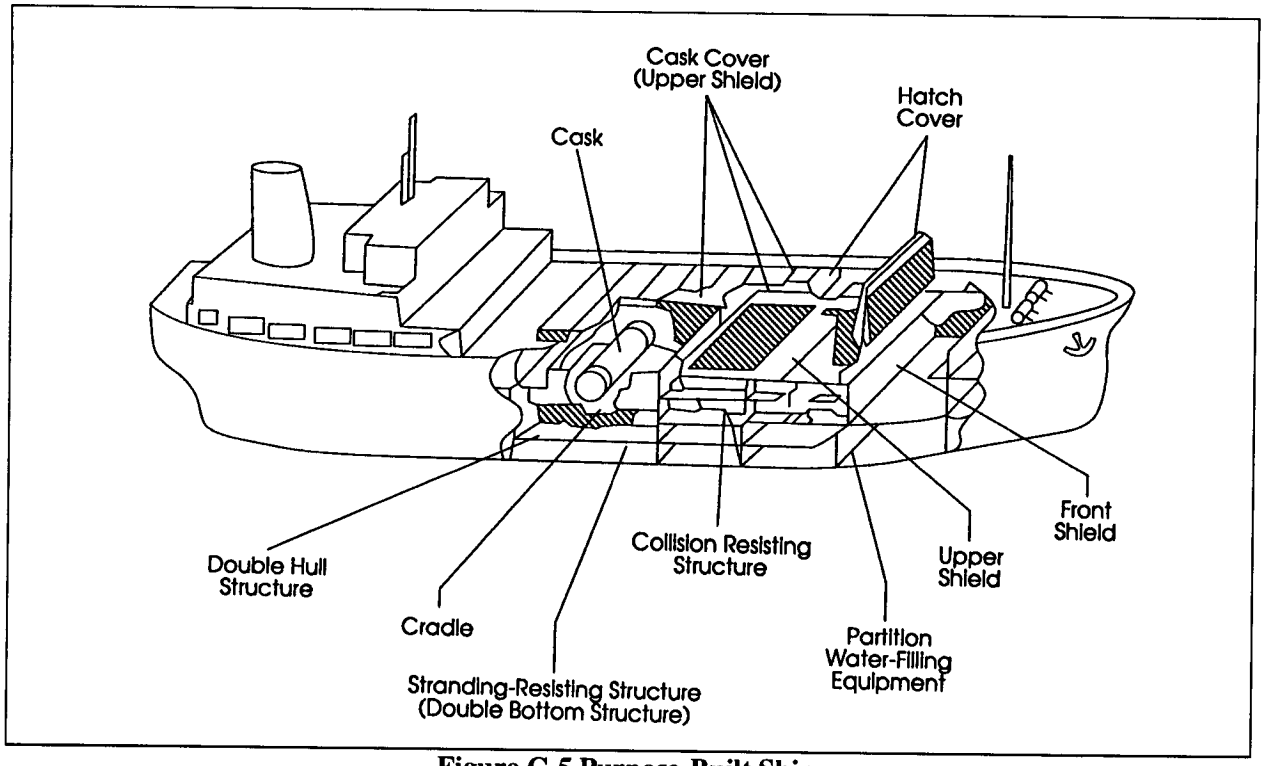

Figure C-5 Purpose-Built Ship

At present, purpose-built vessels are operated by Nuclear Transport Services of Japan, by the Swedish Nuclear Fuel and Waste Management Company, and by British Nuclear Fuels, Limited. They are used to move spent nuclear fuel from operating nuclear power plants to spent nuclear fuel reprocessing facilities operated by Cogema and British Nuclear Fuels, Limited; or, in the case of Sweden, to the repository in Forsmark. There are no U.S.-owned purpose-built vessels for spent nuclear fuel transport.

C.3.2 Identification of Routes

The foreign research reactor spent nuclear fuel that might be transported by sea under the proposed action could originate from 40 different countries. For calculation of shipping distances to the United States, shipping routes were selected to represent the transport of the fuel from a convenient port in the country of origin (for land-locked nations a port near the country of origin was selected) to both an East Coast and a West Coast U.S. port. Norfolk, VA, and Los Angeles, CA, were selected as the two port cities for use in determining a representative distance from the country of origin to the East and West Coasts of the United States. These distances were then combined to generate an average shipping distance between the country of origin and the United States. By using a city on both coasts of the United States to determine an average distance between ports, the analysis considers the possibility that shipments of foreign research reactor spent nuclear fuel would not necessarily be made to the closest U.S. port and, in fact, may be shipped to the "opposite" coast.

Table C-1 is a compilation of the distances for shipments from each of the countries that may participate in this program (except Canada) to the ports on both U.S. coasts. All route distances were obtained by using normal shipping lanes (DMA, 1991). For some of the shipments that might be received at the "opposite" U.S. coast port, the use of the Panama Canal was assumed. Other than the shipping requirements

Table C-1 Voyage Data

Country of Origin	Distance East (nautical miles)	Distance West (nautical miles)	Average Distance (nautical miles)	Voyage Duration (days)	Number of Casks	Number of Voyages
Argentina	5,824	7,265	6,545	21.2	9	5
Australia	12,728	6,511	9,620	29.7	9	5
Austria	5,026	8,955	6,991	22.9	8	4
Bangladesh	10,017	9,384	9,701	31.0	3	2
Belgium	3,582	7,782	5,682	19.3	59	30
Brazil	4,723	8,109	6,416	20.8	8	4
Chile	4,438	4,808	4,623	16.3	2	1
Colombia	2,174	3,265	2,720	11.1	1	1
Denmark	3,990	8,190	6,090	20.4	22	11
France	3,181	7,287	5,234	18.0	149	75
Finland	4,453	8,653	6,553	21.7	6	3
Germany	3,919	8,119	6,019	20.2	61	31
Greece	4,685	8,614	6,650	22.0	8	4
Indonesia	10,566	8,392	9,479	30.3	14	7
Iran	12,013	11,783	11,898	36.6	1	1
Israel	5,366	9,295	7,331	23.9	6	3
Italy	4,336	8,265	6,301	21.0	18	9
Jamaica	1,279	3,507	2,393	10.2	1	1
Japan	9,504	4,839	7,172	23.4	110	55
Korea (South)	10,480	5,229	7,855	25.3	18	9
Malaysia	10,417	7,867	9,142	28.9	3	2
Mexico	1,772	1,501	1,637	7.6	6	3
The Netherlands	3,582	7,782	5,682	19.3	49	25
Pakistan	11,460	10,749	11,105	34.4	3	2
Peru	3,172	3,655	3,414	13.0	1	1
Philippines	11,169	6,530	8,850	28.1	6	3
Portugal	3,129	7,550	5,340	18.3	3	2
Romania	5,353	9,282	7,318	23.8	48	24
Slovenia	4,172	8,372	6,272	20.9	13	7
South Africa	6,790	9,385	8,088	26.0	2	1
Spain	3,303	7,564	5,434	18.6	1	1
Sweden	4,331	8,531	6,431	21.4	37	19
Switzerland	5,026	8,955	6,991	22.9	5	3
Taiwan	11,732	7,093	9,413	29.7	9	5
Thailand	13,169	7,775	10,472	33.1	5	3
Turkey	5,002	8,931	6,967	22.9	4	2
United Kingdom	3,101	7,301	5,201	18.5	4	2
Uruguay	5,710	7,171	6,441	20.9	1	1
Venezuela	1,687	3,757	2,722	11.1	4	2
Zaire	5,864	8,583	7,224	23.6	4	2
Totals					**721**	**371**
Average				**21.3**		

Distance East - Distance in nautical miles from country of origin to Norfolk, Virginia
Distance West - Distance in nautical miles from country of origin to Los Angeles, California
Average Distance - Distance in nautical miles from country of origin to both U.S. ports
Voyage Duration - Average distance divided by 15 knots per hour plus additional days for busy way points (i.e., Panama Canal) and three days for additional stops
Number of Casks - Total casks from country of origin
Number of Voyages - Number of trips required assuming two casks per voyage

applicable to the entire journey, there are no known restrictions for spent nuclear fuel passing through either the Suez or Panama Canals. Figure C-6 provides a representation of the shipping routes selected for these shipments, although other normal shipping routes may be used.

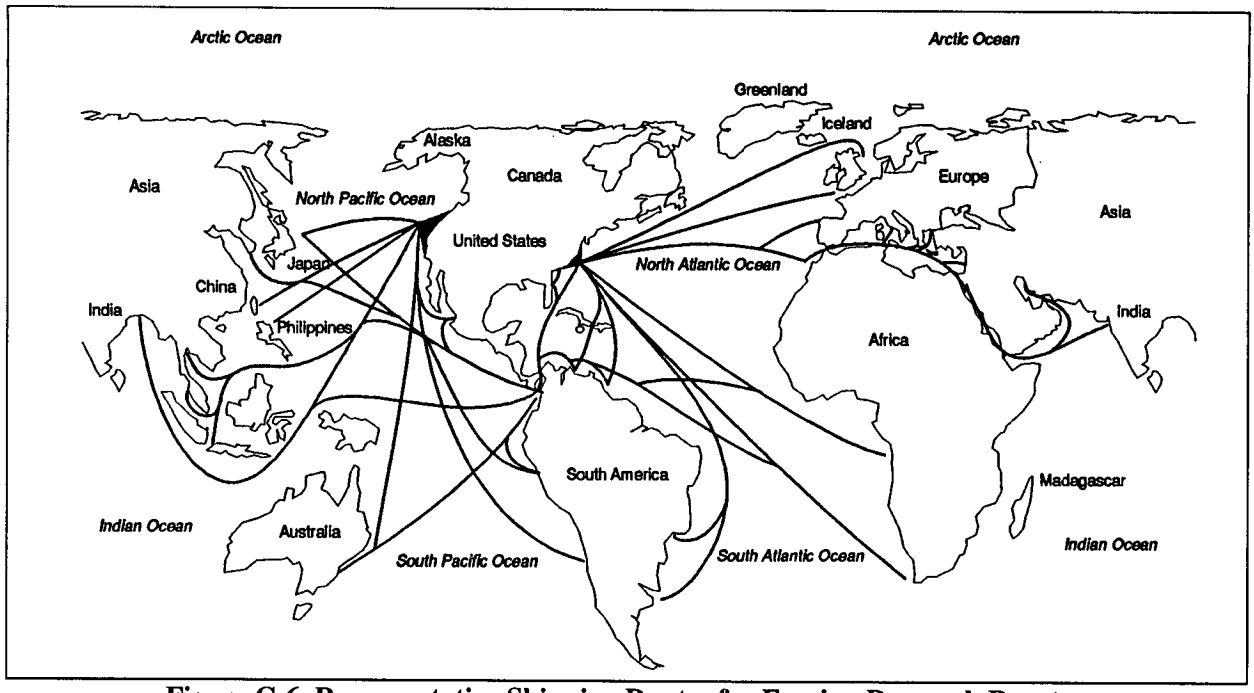

Figure C-6 Representative Shipping Routes for Foreign Research Reactor Spent Nuclear Fuel

C.4 Incident-Free Impacts: Methods and Results

C.4.1 Incident-Free Risk Assessment Methodology

External radiation from an intact transportation cask must be below specified limits that control the exposure of the handling personnel and general public. The U.S. limits are set forth in 49 CFR 173. The limit of interest established therein is 10 mrem per hour at any point 2 m (6.6 ft) from the vertical planes projected by the outer lateral surfaces of the transport vehicle. This limit is associated with an "exclusive-use" shipment, which is a shipment in which no other cargo is loaded in the container used for the foreign research reactor spent nuclear fuel transportation cask and the container is not off-loaded and restowed in transit, except as directed by the shipper. This does not mean that the vessel is used exclusively for foreign research reactor spent nuclear fuel. All shipments within this program are expected to fall within this category.

In general, much of the foreign research reactor spent nuclear fuel to be received will have been out of the reactor for a significant amount of time prior to shipment, resulting in external dose rates much less than the regulatory limit. Past shipments of research reactor fuel have not approached the 49 CFR 173 limit (many, in fact, had dose rates of much less than 1 mrem per hour at 1 m). Due to the scope of this program and the possibility that some of the spent nuclear fuel may be shipped with shorter "cooldown" times than previous shipments, an analysis using typical historical dose rates may not be fully representative of all shipments. Therefore, the analysis has been performed assuming a dose rate (1) at the above-cited regulatory limit, and (2) derived from measurements taken during earlier foreign research

reactor spent nuclear fuel shipments. Appendix F, Section F.5, provides a discussion of the development of the exposure dose rate versus distance relationship for a transportation cask having a dose rate at the selected exclusive-use regulatory limit.

The application of the 10 mrem per hour at 2 m (6.6 ft) exclusive-use regulatory dose limit and the "historical" dose rates provide two significant estimates for the assumed external dose rates. The exposure derived from the use of the selected regulatory limit for the dose rate is an estimate of the maximum exposure that could result from the shipments. The estimate derived from the "historical" data is closer to an expected value for the incident-free impacts. Therefore, the results of these two analyses provide an estimate of the range of incident-free impacts from the shipment of the foreign research reactor spent nuclear fuel.

The primary impact of incident-free marine transport of spent nuclear fuel is on the crews of the ships used to carry the casks. Members of the general public and marine life would not receive any measurable dose from the spent nuclear fuel during marine transport. In addition to the protection provided by the transportation casks, further protection for the general public and marine life is provided by the location of the cask in the ship (that is, the distance from the cask to the outer surface of the ship) and the ship's structure. From the outside of the ship, the foreign research reactor spent nuclear fuel shipments would be indistinguishable from any other commercial shipment. Under incident-free conditions of transport, public exposure would be limited to the ship's crew exposure, and the ship's crew exposure is limited to crew members exposed during the loading and offloading of the casks and to crew members who, on a daily basis, inspect cargo (to ensure secure stowage) and the vessel.

The type of vessel assumed to be used for transport of the spent nuclear fuel is a U.S. crewed breakbulk vessel with services not obtained on a charter basis. Breakbulk vessels typically have a number of holds, decks within each hold for carrying cargo, and their own cargo handling equipment that could be used for loading spent nuclear fuel casks. The flexibility of these vessels may be required to pick up spent nuclear fuel at some countries, since container vessel facilities may not be available.

The spent nuclear fuel cask is assumed to be in a container for ease of handling. With this assumption, the vessel with the longest cargo handling times for containerized cargo would be a breakbulk vessel. Differences in cask handling time is the key factor contributing to the differences between the incident-free impact of shipments of foreign research reactor spent nuclear fuel on different types of vessels. (See Appendix D, Section 4, for details of handling times). Therefore, the selection of this type of vessel results in a conservative estimation of the dose to the crew during transit and will bound the estimate of crew dose for any ship type selected for transport of the spent nuclear fuel.

Two different sets of assumptions have been made to assess the incident-free impacts of the shipment of foreign research reactor spent nuclear fuel. The first set of assumptions addresses the use of regularly scheduled commercial cargo vessels for the shipments. When using regularly scheduled commercial vessels, the assumption is made that two casks per vessel will be carried on each freighter, except in cases where the number of casks from a country of origin is an odd number, which would result in one shipment of only one cask. While it is likely that in some cases more than two casks per shipment could be coordinated at the same time, it is expected that the assumption of two casks per vessel should bound the incident-free analysis. The analysis assumes that both spent nuclear fuel casks are loaded into the same hold, resulting in a dose to the crew from the first cask loaded while the second cask is being loaded. This results in the crew being exposed from two sources at the same time for loading or unloading one of the two casks. Should more than two spent nuclear fuel casks be shipped on the same vessel, it has been assumed that the cargo loading would be limited to two spent nuclear fuel casks per hold. The crew would not receive any additional dose from the third, fourth, etc., cask while engaged in activities in the hold with

the first two spent nuclear fuel casks. The radiological exposure to the crew for a shipment of many casks would be equivalent to the radiological exposure due to multiple shipments of fewer casks. For example, if four casks are shipped on a single vessel, the crew dose for that single shipment would be equal to the crew dose from two shipments of two casks each.

The second set of assumptions addresses the use of a chartered cargo vessel for the shipment of the foreign research reactor spent nuclear fuel. Use of a chartered vessel (either a chartered commercial freighter or a purpose-built vessel) could result in the shipment of more than two casks per voyage. Economic considerations would suggest that a larger number of casks be shipped per voyage. For this analysis it has been assumed that eight transportation casks would be shipped on a chartered vessel. Consistent with the assumption made for the regularly scheduled commercial vessel, it has been assumed that the transportation casks would be loaded two to a hold. Again, this results in doses to the crew from the first cask loaded during activities associated with the loading of the second cask in the hold.

During loading operations, both on the regularly scheduled commercial and chartered vessels, it is assumed that five members of the ship's crew (Chief Mate, Mate on Watch, Bosun, and two Seamen) will be present during loading and securing of the spent nuclear fuel casks. While longshoremen will most likely be used for the cargo handling activity, ship's crew will be present, and therefore the crew dose resulting from this activity has been included in the analysis. Table C-2 shows the crew member distances from the spent nuclear fuel shipping cask and the duration of the crew members' exposure for each crew member during the time leading up to the stowage of the cask prior to setting sail for the ocean voyage. The distances and times are based on vessel loading activities for a two-cask-per-hold shipment. The total dose (based on the selected exclusive-use regulatory limit external dose rate of 10 mrem per hour at 2 m or 6.6 ft from the surface of the container) for each individual is calculated for each shipment. Since two casks are assumed to be shipped in each hold, when quantities allow, the condition exists for loading and securing of a cask to take place in the vicinity of another cask. The additional dose received by working around a cask already in the hold are accounted for in Table C-2. This was accomplished by increasing the exposure rate by a factor of 1.5 for the activities associated with securing the second cask. As listed, the estimated exposure represents the crew exposure for the regularly scheduled commercial vessel, which has been assumed to be limited to a total of two transportation casks. The exposure for each listed crew member in a chartered vessel would be four times these values, since the eight casks are assumed to be loaded into four holds.

Table C-2 Ship Crew Exposure During Loading of a Hold Containing Two Foreign Research Reactor Spent Nuclear Fuel Casks (Based on Regulatory Dose Limits)

	Tasks						
	Rail to Hold			*Secure Cask*			
Crew Member	*Distance[a] (m)*	*Exposure Rate[b] (mrem/hr)*	*Time (min)*	*Distance[a] (m)*	*Exposure Rate[b] (mrem/hr)*	*Time (min)*	*Total Dose per Loading[c] (person-rem)*
Chief Mate	20	1	5	5.5	3.5	60	0.009
Mate on Watch	20	1	5	8	2.1	60	0.005
Bosun	20	1	5	5.5	3.5	60	0.009
Seaman (2)	20	1	5	5.5	3.5	60	0.018

[a] *Distance is the average distance of the crew member from the spent nuclear fuel cask during the entire duration of that activity.*

[b] *Exposure rate is calculated based on 10 mrem/hr at 2 m (6.6 ft) from the shipping container surface.*

[c] *Includes the exposure from the first loaded casks for activities associated with securing the second cask. The exposure rate for securing the second cask is 1.5 times the listed rate.*

While at sea, the crew dose is limited to those individuals who enter the ship's hold during transit. At all other times, the crew is shielded from the spent nuclear fuel cask by the decking and other structures of the vessel. The number of entries and inspections is a function of the voyage distance from the port of loading to the port of offloading (the U.S. port of entry for the foreign research reactor spent nuclear fuel). Since the port of offloading is unknown at this time, voyage distances were determined for each country of origin to a West and East Coast port of the United States. The average of these two distances was then calculated. Table C-1 shows the countries of origin, the number of casks, the distances to the East and West Coast ports, the average voyage distance, the days of travel, and the estimated number of casks and shipments for the basic implementation of Management Alternative 1. Because the actual shipping schedule is unknown, the average annual number of shipments was estimated. The length of a voyage was determined by assuming that the vessel would have an average speed of 15 knots for the entire duration of the voyage. In addition, intermediate port stops would be made, and additional travel time was added to account for portions of the voyage during which the vessel would not be expected to have a speed of 15 knots, (i.e., passage through busy locations, such as the Panama Canal).

Once a day while at sea or in port, the Chief Mate, the Bosun, and an Engineer are assumed to enter each cargo hold to inspect the bilges and verify the lashings for the containers. Table C-3 describes the times required for these activities, the distances from the casks during the activity, and doses received from the casks during the activity (based on the selected exclusive-use limit of external dose rate of 10 mrem per hour at 2 m or 6.6 ft from the surface of the container) for each of these individuals. The total dose due to inspection activities is a function of the voyage duration and the number of holds that contain foreign research reactor spent nuclear fuel casks.

Table C-3 Ship Crew Exposure Per Hold During At-Sea Inspections (Based on Regulatory Dose Limits)

Crew Member	*Distance[a] (m)*	*Dose Rate[b] (mrem/hr)*	*Time (min)*	*Dose per Daily Inspection[c] (mrem)*
Chief Mate	5.5	7.0	20	2.3
Bosun	5.5	7.0	20	2.3
Engineer	5.5	7.0	20	2.3

[a] *Distance is the average distance of the crew member from the spent nuclear fuel cask during the entire duration of that activity.*

[b] *Dose rate includes the sum of the effect of two casks in hold.*

[c] *For a ship carrying two casks on a voyage duration of 21 days, the daily inspection dose to a crew member would total 48.3 mrem.*

In the analysis, two possible routes for the shipment of the spent nuclear fuel are considered. In the first, when a regularly scheduled commercial vessel is used, two intermediate port stops are assumed to add three additional days to the voyage, and therefore three additional hold inspections. The possibility of the ship having intermediate port stops must be considered in the event that a regularly scheduled commercial vessel is used for the shipment of the foreign research reactor spent nuclear fuel since the shipment is being made as part of a commercial cargo shipment. Such shipments are not limited to a single port of call. Based on the information provided in Table C-1, the average duration of a voyage would be 21 days, which includes three days for intermediate port calls. The second route accounts for using chartered ships or regularly scheduled commercial ships for which the first port of call is the port of entry for the foreign research reactor spent nuclear fuel. For this route, no intermediate port stops are included, so the travel times listed in Table C-1 were reduced by three days, making the average duration of the voyage approximately 18 days. If a ship carrying foreign research reactor spent nuclear fuel were to encounter

mechanical problems or extreme weather and was forced to make an unscheduled port call, the incident-free radiation exposure to the ship's inspection crew would slightly increase as a result of the additional duration of the voyage. People in the refuge port would not receive any exposure because the foreign research reactor spent nuclear fuel would remain on the ship and would not be handled.

Once at the port of entry, all casks of the spent nuclear fuel would be off loaded. Table C-4 describes the estimated dose (based on the selected exclusive-use limit of an external dose rate of 10 mrem per hour at 2 m or 6.6 ft from the surface of the container) received by crew members involved in the offloading activities associated with the offloading of a single hold, that is, two casks. These doses are the same as those received during the loading phase of the transport activity. Once the spent nuclear fuel cask is over the rail of the ship, the ship's crew would not be in close proximity to it. As a result, no ship crew personnel are assumed to be involved with any of the activities associated with disengaging the spent nuclear fuel container from the handling gear or in securing the container to any transport vehicle used to move the container off the pier.

Table C-4 Ship Crew Exposure During Offloading of a Hold Containing Two Foreign Research Reactor Spent Nuclear Fuel Casks (Based on Regulatory Dose Limits)

Crew Member	Tasks						Total Dose per Loading[c] (person-rem)
	Rail to Hold			Secure Cask			
	Distance[a] (m)	Exposure Rate[b] (mrem/hr)	Time (min)	Distance[a] (m)	Exposure Rate[b] (mrem/hr)	Time (min)	
Chief Mate	20	1	5	5.5	3.5	60	0.009
Mate on Watch	20	1	5	8	2.1	60	0.005
Bosun	20	1	5	5.5	3.5	60	0.009
Seaman (2)	20	1	5	5.5	3.5	60	0.018

[a] *Distance is the average distance of the crew member from the spent nuclear fuel cask during the entire duration of that activity.*

[b] *Exposure rate is calculated based on 10 mrem/hr at 2 m (6.6 ft) from the shipping container surface.*

[c] *Includes the exposure from the first loaded casks for activities associated with the first cask. The exposure rate for securing the first cask is 1.5 times the listed rate.*

Tables C-5 and C-6 summarize the total crew doses for the shipment activities on a per shipment basis, annually, and for all of the shipments in the program. The maximum individual and total population doses are based on the selected exclusive-use regulatory limit external dose rate of 10 mrem per hour at 2 m or 6.6 ft from the surface of the container. Table C-5 summarizes the crew doses if regularly scheduled commercial vessels were used for all foreign research reactor spent nuclear fuel shipments. Table C-6 summarizes the crew doses if chartered vessels were used for all foreign research reactor spent nuclear fuel shipments. The reduction in the program crew-doses for the dedicated vessels is a result of the reduced transit time associated with the chartered vessels due to the fact that they do not make intermediate port calls. In situations where the services of a ship are obtained on a non-exclusive-use basis, the maximum allowable annual dose to a member of the ship's crew would be 100 mrem per year [based on Nuclear Regulatory Commission (NRC) and U.S. DOE limits on the exposure of members of the public].

As shown in Table C-5, the maximum individual dose per shipment on a regularly scheduled commercial vessel is 66 mrem to the Chief Mate and Bosun, a dose well below the 100 mrem per year limit. If the assumption was made that the same vessel and crew was used for as many shipments as possible in one year, the maximum individual dose to a crew member would be approximately 600 mrem. This assumes

Table C-5 Total Regularly Scheduled Commercial Ship's Crew Exposure for Marine Transport of Foreign Research Reactor Spent Nuclear Fuel Casks (Based on Regulatory Dose Limits and Assuming Intermediate Port Stops)

Crew Member	*Maximum Individual Exposure per Trip (mrem)*	*Maximum Individual Exposure per Year[a] (mrem)*	*Program Dose Total (All Ships' Crews) (person-rem)*
Chief Mate	66	599	24.8
Mate on Watch	11	98	4.0
Bosun	66	599	24.8
Seaman (2)	18	158	13.1
Engineer	49	441	18.2
Total			**84.9**

[a] *Exposure per year based on nine voyages per year, two casks per voyage.*

Table C-6 Total Chartered Ship's Crew Exposure for Marine Transport of Foreign Research Reactor Spent Nuclear Fuel Casks (Based on Regulatory Dose Limits and Assuming No Intermediate Port Stops)

Crew Member	*Maximum Individual Exposure per Trip (mrem)*	*Maximum Individual Exposure per Year[a] (mrem)*	*Program Dose Total (All Ships' Crew) (person-rem)*
Chief Mate	238	1,668	21.7
Mate on Watch	43	303	3.9
Bosun	238	1,668	21.7
Seaman (2)	70	492	12.8
Engineer	168	1,176	15.3
Total			**75.4**

[a] *Exposure per year based on seven trips per year, eight casks per voyage (two casks per hold).*

nine trips per year based on the average voyage length of all shipments and results in the ships' crew being exposed to the foreign research reactor spent nuclear fuel shipments for 189 days a year. Since travel time to a port of loading would be required, and most ship crews are rotated on a three or six month basis, the assumption of nine trips should bound the dose for any individual members of dedicated crews, even when trips are shorter than the assumed average of 21 days. The annual dose of approximately 600 mrem exceeds the 100 mrem annual limit for a member of the general public, and would therefore require mitigation. See the end of this section for a discussion of mitigation.

Due to the larger number of casks on a chartered vessel, the largest annual dose to a crew member is estimated to be approximately 1,668 mrem (approximately 1.7 rem). This is based on an estimated exposure of 238 mrem per voyage and seven voyages per year. Seven voyages per year using a chartered vessel is sufficient to ship all transportation casks to be shipped in an average year. It has been assumed that the 721 shipments would be made over a 13-year period. The exposure total for the marine transport portion of the program can be expressed as the number of LCFs that are calculated to result from doses received during the policy period, if the basic implementation of Management Alternative 1 of the proposed action were adopted. For a regularly scheduled commercial vessel, the exposure of approximately 84.9 person-rem translates to 0.034 LCFs. The total exposure associated with the shipment of the foreign research reactor spent nuclear fuel on a chartered vessel, approximately 76.4 person-rem, translates into 0.031 LCFs.

Use of a chartered vessel results in a reduction of approximately ten percent in the total population exposure and corresponding risk to the ships' crews under the basic implementation of Management Alternative 1. This difference is due to the shorter voyage duration when a chartered vessel is used. From Tables C-2 through C-4, it is apparent that the largest doses to the ship's crew are a result of the daily

inspection of the cargo holds. The three day reduction in the voyage duration (gained when a chartered vessel is used) reduces the dose received from the daily inspections and results in the ten percent difference between the use of regularly scheduled commercial and chartered vessels.

Tables C-7 through C-11 present the results of the above analysis with one change. The exposure and crew doses are calculated based on the "historical" external dose rate data developed from measurements taken during earlier shipments of research reactor spent nuclear fuel (a dose rate of 2.25 mrem per hour at 1 m or 3.3 ft from the surface of the shipping cask, which is equivalent to 1 mrem per hour at 2 m or 6.6 ft from the cask surface). See Appendix F, Section F.5 for the data used to derive this historical dose rate. Although this "historical" data are based on distance from the surface of the cask, it has conservatively been assumed in this analysis that this dose rate represents the dose at distances from the surface of the container in which the cask is shipped. This set of calculations was performed in order to provide additional perspective about the risks associated with the foreign research reactor spent nuclear fuel program. Use of the exclusive-use regulatory limit for the external dose rate ensures that the estimates discussed previously are upper bounds on the potential risks to the ship's crew from incident-free transport of the spent nuclear fuel. Use of the historical data provides an estimate that is closer to the expected risks associated with the shipment of all of the foreign research reactor spent nuclear fuel. Although the exact external dose rates cannot be determined in advance for all shipments, most should be similar to those for shipments made in the past. Therefore, the "historical" external dose rates should be a more accurate prediction of the risks resulting from the shipment of all 721 casks.

In this analysis, all other assumptions regarding voyage length, crew activity (time and distance from the spent nuclear fuel cask), number of shipments, and the assumptions made to estimate annual doses remained the same as in the analysis performed using the external dose rates derived from the exclusive-use regulatory limit of 10 mrem per hour at 2 m (6.6 ft) from the surface of the shipping container.

Using the historic dose rates, the maximum dose to an individual per regularly scheduled commercial vessel shipment would be 6.6 mrem, and the annual maximum individual dose would be 60 mrem (this dose is calculated assuming that the same crew member is involved in nine separate voyages transporting two spent nuclear fuel casks each during a single year). These doses are an order of magnitude lower than the corresponding doses calculated using the exclusive-use regulatory external dose rates. The calculated maximum individual dose is well below the maximum allowable annual dose to a member of the public of 100 mrem.

Use of a chartered vessel for the shipments, versus the use of a regularly scheduled commercial vessel, would result in a ten percent reduction in the total ships' crews doses. The use of a chartered vessel would result in annual exposure at slightly less than twice the public dose limits for exposure to radiation established by both DOE and NRC (100 mrem per year).

The dose total for the marine transport portion of the entire program can be expressed as the number of LCFs that are calculated to result from exposures of that size. For a regularly scheduled commercial vessel a total exposure of approximately 8.5 person-rem translates to 0.0034 LCFs. The total calculated exposure associated with the shipment of the foreign research reactor spent nuclear fuel on a chartered vessel, approximately 7.6 person-rem, translates into 0.0030 LCFs.

The results of these analyses indicate that, in some circumstances, some individual crew members could receive doses that exceed the limit established by DOE and the NRC for exposure of a member of the public, especially when the dose rate from the casks are assumed to be at the regulatory limit. It is anticipated that for most shipments, the external dose rate for the loaded transportation case would be near

Table C-7 Ship Crew Exposure During Loading of a Hold Containing Two Foreign Research Reactor Spent Nuclear Fuel Casks (Based on Historical Cask Dose Rates)

Crew Member	Tasks						Total Dose per Loading[c] (person-rem)
	Rail to Hold			Secure Cask			
	Distance[a] (m)	Exposure Rate[b] (mrem/hr)	Time (min)	Distance[a] (m)	Exposure Rate[b] (mrem/hr)	Time (min)	
Chief Mate	20	0.1	5	5.5	0.35	60	0.0009
Mate on Watch	20	0.1	5	8	0.21	60	0.0005
Bosun	20	0.1	5	5.5	0.35	60	0.0009
Seaman (2)	20	0.1	5	5.5	0.35	60	0.0018

[a] *Distance is the average distance of the crew member from the spent nuclear fuel cask during the entire duration of that activity.*

[b] *Exposure rate is calculated based on 2.25 mrem/hr at 1 m (3.3 ft) from the shipping container surface.*

[c] *Includes the exposure from the first loaded cask for activities associated with securing the second cask. The exposure rate for securing the second cask is 1.5 times the listed number.*

Table C-8 Ship Crew Exposure Per Hold During At-Sea Inspections (Based on Historical Cask Dose Rates)

Crew Member	Distance[a] (m)	Dose Rate[b] (mrem/hr)	Time (min)	Dose per Daily Inspection[c] (mrem)
Chief Mate	5.5	0.7	20	0.23
Bosun	5.5	0.7	20	0.23
Engineer	5.5	0.7	20	0.23

[a] *Distance is the average distance of the crew member from the spent nuclear fuel cask during the entire duration of that activity.*

[b] *Includes the effect of two casks in the hold.*

[c] *For a ship carrying two casks on a voyage duration of 21 days, the total dose to a crew member conducting daily inspections would be estimated at 4.8 mrem.*

Table C-9 Ship Crew Exposure During Offloading of a Hold Containing Two Foreign Research Reactor Spent Nuclear Fuel Casks (Based on Historical Cask Dose Rates)

Crew Member	Tasks						Total Dose per Loading[c] (person-rem)
	Rail to Hold			Secure Cask			
	Distance[a] (m)	Exposure Rate[b] (mrem/hr)	Time (min)	Distance[a] (m)	Exposure Rate[b] (mrem/hr)	Time (min)	
Chief Mate	20	0.1	5	5.5	0.35	60	0.0009
Mate on Watch	20	0.1	5	8	0.21	60	0.0005
Bosun	20	0.1	5	5.5	0.35	60	0.0009
Seaman (2)	20	0.1	5	5.5	0.35	60	0.0018

[a] *Distance is the average distance of the crew member from the spent nuclear fuel cask during the entire duration of that activity.*

[b] *Exposure rate is calculated based on 2.25 mrem/hr at 1 m (3.3 ft) from the shipping container surface.*

[c] *Includes the exposure from the last off loaded cask during activities associated with the first off loaded cask. The exposure rate for securing the first cask is 1.5 times the listed rate.*

Table C-10 Total Regularly Scheduled Commercial Ships Crew Exposure for Marine Transport of Foreign Research Reactor Spent Nuclear Fuel Casks Assuming Intermediate Port Stops (Based on Historical Cask Dose Rates)

Crew Member	*Maximum Individual Exposure per Trip (mrem)*	*Maximum Individual Exposure per Year[a] (mrem)*	*Dose Total (All Ships' Crew) (person-rem)*
Chief Mate	6.6	60	2.5
Mate on Watch	1.1	10	0.4
Bosun	6.6	60	2.5
Seaman (2)	1.8	16	1.3
Engineer	4.9	44	1.8
Total			**8.5**

[a] *Exposure per year based on nine trips per year.*

Table C-11 Total Chartered Ships Crew Exposure for Marine Transport of Foreign Research Reactor Spent Fuel Casks Assuming No Intermediate Port Stops (Based on Historical Cask Dose Rates)

Crew Member	*Maximum Individual Exposure per Trip (mrem)*	*Maximum Individual Exposure per Year[a] (mrem)*	*Dose Total (All Ships' Crew) (person-rem)*
Chief Mate	24	167	2.2
Mate on Watch	4.3	30	0.4
Bosun	24	167	2.2
Seaman (2)	7.0	49	1.3
Engineer	17	118	1.5
Total			**7.6**

[a] *Exposure per year based on seven trips per year.*

the historic dose rates, which would not cause any personnel to exceed radiation exposure limits for the public. However, the existence of some shipments with external dose rates closer to the exclusive-use regulatory limit suggests that DOE should provide a means to assure that individual crew members do not receive doses in excess of the public dose limits. As a minimum, the program should establish administrative procedures that will maintain records of the dose rates associated with each shipment and the ports of departure and entry for the shipment. The measurement of interest for the record keeping would be the external dose rates outside the container, which houses the transportation cask, since the crew does not enter the container. (It should be noted that the analysis using the historical data did not consider the reduction in external dose rate due to the distance from the cask to the container surrounding the transportation cask.) These measurements can be used to identify shipments that would result in crew exposures above those calculated based on the historical spent nuclear fuel transportation external dose rate. By tracking this information, DOE would be able to identify if and when additional precautions to reduce individual exposures should be taken (i.e., restricting the use of crew members who are near the annual dose limit from further shipments that year). DOE would also include a clause in the contract for shipment of the foreign research reactor spent nuclear fuel requiring other crew members be used if any crew member approaches a 100 mrem dose in any year.

C.4.2 Incident-Free Marine Impacts of Policy Alternatives

Two implementation subalternatives to Management Alternative 1 and one subalternative under Management Alternative 2 of the proposed action were identified that could impact the incident-free marine risk calculations that were performed for the basic implementation (Chapter 2 describes the alternatives and subalternatives of Management Alternative 1 and the subalternatives of Management

Alternative 2). The implementation subalternative of accepting spent nuclear fuel only from developing countries would result in a reduction in the amount of spent nuclear fuel transported by ship. Table C-12 lists the countries that are considered developing countries and the number of shipments that would be required to transport their spent nuclear fuel to the United States.

Table C-12 Voyage Data for Acceptance of Foreign Research Reactor Spent Nuclear Fuel from Developing Nations Only

Port	*Voyage Duration (days)*	*Number of Casks*	*Number of Trips*
Argentina	21.2	9	5
Bangladesh	31.0	3	2
Brazil	20.8	8	4
Chile	16.3	2	1
Colombia	11.1	1	1
Greece	22.0	8	4
Indonesia	30.3	14	7
Iran	36.6	1	1
Jamaica	10.2	1	1
Korea (South)	25.3	18	9
Malaysia	28.9	3	2
Mexico	7.6	6	3
Pakistan	34.4	3	2
Peru	13.0	1	1
Philippines	28.1	6	3
Portugal	18.3	3	2
Romania	23.8	48	24
Slovenia	20.9	13	7
South Africa	26.0	2	1
Thailand	33.1	5	3
Turkey	22.9	4	2
Uruguay	20.9	1	1
Venezuela	11.1	4	2
Zaire	23.6	4	2
Totals		**168**	**90**
Average	**23**		

Under the implementation subalternative of using a policy duration of five years for the acceptance of foreign research reactor spent nuclear fuel, the number of transportation casks of foreign research reactor spent nuclear fuel requiring ocean transport would be reduced to 586. Appendix B presents the derivation of the total number of shipments (ocean transport plus land transport from Canada) estimated in this alternative.

Subalternative 1b (overseas reprocessing) under Management Alternative 2 also has the capability to impact the results of the incident-free marine risk analysis since it involves shipment of the vitrified waste to a storage facility in the United States. Under this subalternative to Management Alternative 2, eight transportation cask shipments of vitrified waste would be made to the United States.

In addition, a Hybrid Alternative was analyzed. In the Hybrid Alternative, those countries (for this option, assumed to be Belgium, France, Germany, Italy, Spain, Switzerland, and the United Kingdom) that have the capability to store high-level waste would be encouraged to reprocess the aluminum-based research reactor spent nuclear fuel and to accept for management the resulting high-level waste. The United States

would accept for management the research reactor spent nuclear fuel from those countries deemed not to have the high-level waste storage capability, and all TRIGA fuel. This Hybrid Alternative includes all countries identified in Table C-1 except for those seven nations just listed. Under this Hybrid Alternative, 452 shipments of spent nuclear fuel are assumed to be sent to the United States, excluding shipments of Canadian origin.

The incident-free marine risks associated with the two implementation subalternatives of Management Alternative 1 and the subalternative of Management Alternative 2 are discussed in the following sections.

Management Alternative 1, Implementation Subalternative 1a — Acceptance of Foreign Research Reactor Spent Nuclear Fuel Only from Developing Countries: This implementation subalternative of Management Alternative 1 would result in the shipment of 168 casks of foreign research reactor spent nuclear fuel. The assumptions used in the analysis of the incident-free marine impact of the basic implementation of Management Alternative 1 have been used in the analysis of this implementation subalternative. This implementation subalternative has been analyzed using the "exclusive-use" shipment regulatory transportation cask external dose rates. To compare this implementation subalternative to the basic implementation, it is only necessary to perform the analysis using one estimate of the external dose rate of the transportation cask. The relationship between the calculated impact of the two implementation subalternatives using the regulatory external dose rate would be the same as that calculated using the "historical" data. Therefore, the use of the one dose rate provides a sufficient point of comparison between the two alternatives.

The assumptions that have not changed between the analysis for the basic implementation and this implementation subalternative include the following:

- The same types of vessels should be available for use, so, the option for using chartered or regularly scheduled commercial vessels was examined, and
- The activities associated with the loading of the foreign research reactor spent nuclear fuel, the daily inspections of the cargo during the voyage, and the offloading of the foreign research reactor spent nuclear fuel do not change simply because there is a reduction in the number of shipments to be made.

The average duration of the voyages from these developing countries to the United States is slightly longer than the average for the voyages associated with the basic implementation. As shown in Table C-12, the average duration is 23 days (for a regularly scheduled commercial vessel) versus the 21 days in the basic implementation. For a chartered vessel, the voyage duration is three days less (i.e., 20 days). The longer average voyage duration results in an increase in the total of the daily inspection-related crew doses of approximately 4.6 mrem per crew member involved in the inspection. The inspection dose for a 23-day voyage would be 52.9 mrem (2.3 mrem times 23 days) per inspector.

The population dose to the ship's crew, per voyage, can be derived from the data contained in Tables C-5 and C-6. Incorporating the increase in the inspection dose into the data from Table C-5, the individual doses on a regularly scheduled commercial vessel would be 71 mrem to the Chief Mate and the Bosun, 11 mrem to the Mate on Watch, 18 mrem to each of two Seamen, and 54 mrem to the Engineer. The population (ship's crew) dose per shipment would be 242 mrem. If a chartered vessel is used (carrying eight transportation casks instead of two for the regularly scheduled commercial vessel), the corresponding doses are 257 mrem to the Chief Mate and the Bosun, 43 mrem to the Mate on Watch, 70 mrem to each of two Seamen, and 187 mrem to the Engineer. The population (ship's crew) dose per shipment would be 885 mrem.

The 168 cask-shipments, requiring 90 ocean voyages using regularly scheduled commercial cargo vessels (up to 23 voyages using chartered vessels), represent approximately 24 percent of the total number of shipments in the basic implementation. The total population (ship's crew) exposure resulting from this implementation subalternative would be approximately 27 percent of the exposure calculated for the basic implementation. The difference in these two percentages is a direct result of the longer average duration of ocean crossings. The total population exposure for the implementation subalternative, assuming that regularly scheduled commercial vessels are used, would be approximately 22.0 person-rem, and would be approximately 20.3 person-rem if chartered vessels are used. These population exposures translate into a risk to the ship's crew of 0.0091 LCF and 0.0081 LCF, respectively. As discussed in Section 4.1, the relationship between a dose and LCFs for workers (ship's crew) is that a 1 rem dose equates to 0.0004 LCFs.

Management Alternative 1, Implementation Subalternative 2a — Acceptance of Foreign Research Reactor Spent Nuclear Fuel for Five-Year Policy Duration: As stated above, this implementation subalternative results in the shipment of 586 casks of foreign research reactor spent nuclear fuel. The assumptions used in the analysis of the incident-free marine impact of the basic implementation have been used in the analysis of this implementation subalternative. This implementation subalternative has been analyzed using the "exclusive-use" shipment regulatory transportation cask external dose rates. To compare this implementation subalternative to the basic implementation it is only necessary to perform the analysis using one external dose rate. The relationship between the calculated impact of the implementation subalternative and the basic implementation using the regulatory external dose rate would be the same as that calculated using the "historical" data. Therefore, the use of the one dose rate provides a sufficient point of comparison.

The assumptions that have not changed between the analysis for the basic implementation and this implementation subalternative include the following:

- The same types of vessels should be available for use, and the option for using chartered or regularly scheduled commercial vessels was examined;
- The average voyage duration that was used in the analysis of the incident-free marine risk for the basic implementation was used for this implementation subalternative. The 586 shipments represent approximately 81 percent of the shipments made under the basic implementation and the distribution of shipments from the different countries of origin is similar to that modeled for the basic implementation; and
- The activities associated with the loading of the foreign research reactor spent nuclear fuel transportation casks, the daily inspections of the cargo during the voyage, and the offloading of the foreign research reactor spent nuclear fuel transportation casks do not change simply because there is a reduction in the number of shipments to be made.

Because there are no differences between the per-shipment activities in this implementation subalternative and the basic implementation, the per-voyage crew exposures will not differ from those presented in Tables C-5 and C-6 for the basic implementation. In addition, the maximum annual exposures to individual crew members will not change. The analysis has assumed a maximum number of voyages that a single crew would be involved in during a single year. Although the total number of shipments per year must increase in this alternative (an average of 73 casks must be shipped per year for eight years), no single ship's crew will be involved in more shipments than had been assumed in the analysis of the basic implementation. The annual doses presented in Tables C-5 and C-6 are applicable to this alternative as well as to the basic implementation.

The total population (ship's crew) exposure resulting from this implementation subalternative would be approximately 81 percent of exposure calculated for the basic implementation. The total population exposure for the implementation subalternative, assuming that regularly scheduled commercial vessels are used, would be approximately 69 person-rem, and would be approximately 61 person-rem if chartered vessels were to be used. These population exposures translate into a risk to the ships' crew of 0.028 LCF and 0.025 LCF, respectively. As discussed in Section 4.1, the relationship between a dose and LCFs for workers (ship's crew) is that a 1 rem dose equates to 0.0004 LCF.

Management Alternative 2, Subalternative 1b – Overseas Processing with Shipment of Waste to a U.S. Storage Facility: In this subalternative, the foreign research reactor spent nuclear fuel would be reprocessed overseas (most probably in Great Britain or France) and the waste products would be contained within a small number of vitrified waste logs. This high-level waste might be brought to the United States for storage at one of the management site facilities evaluated under the basic implementation of Management Alternative 1. Under these conditions, up to eight transportation casks containing 16 European-size canisters of vitrified waste would be shipped from Europe to the United States (see Section 4.4.2.2 for more information on the vitrification of the waste material). This analysis addresses the incident-free marine risks associated with transporting these eight casks of vitrified waste from Europe to the United States.

As with the shipment of unprocessed spent nuclear fuel, the primary impact of incident-free marine shipping of the vitrified waste is upon the crews of the ships used to carry the casks. Most of the assumptions used in the analysis of the crew exposure to the spent nuclear fuel (see Section C.4.1 of this appendix) have been used to analyze the impact of the shipment of vitrified waste. The crew exposure due to loading and offloading activities have been considered, but the primary contribution to the crew dose comes from the daily cargo inspection activities. The inspection activities on the ship carrying the vitrified waste have been modeled in the same manner as the inspections aboard the vessels carrying the spent nuclear fuel. Three crew members have been modeled as performing the inspections, and the same three crew members are assumed to perform this task for the entire voyage. For the purposes of this analysis, it has been assumed that the vitrified waste will be transported on a chartered vessel, there will be no intermediate port calls, and the shipment will originate in Europe. Because there are no intermediate port calls and the shipments originate in Europe, the voyage duration is estimated to be 15 days. This estimate is based on the average of the voyage durations for one trip from the United Kingdom to the East Coast of the United States, one to the West Coast of the United States, and the average of a trip from France to both U.S. coasts. The assumption that there are no intermediate port calls reduces the average duration of each of these trips by three days from the estimates presented in Table C-1.

Little information is available on the casks that might be used to transport the vitrified waste. Therefore, the assumption has been made that the exposure to the crew will be limited to the exclusive-use regulatory limit (10 CFR 71) of 10 mrem per hour at 2 m (6.6 ft) from the surface of the container. No attempt was made to extrapolate limited historical data to determine crew incident-free impacts from any other exposure rate other than the limit set forth in NRC and DOE regulations.

It has been assumed that two casks are being transported as part of a single shipment. This assumption results in additional exposure to the crew members due to exposure to two radiation fields during all activities which bring crew members into the vicinity of the transportation casks. Should all of the casks be shipped at once, this assumption is equivalent to assuming that this single shipment is made with two casks per hold on the vessel. The crew risk would be the same for this single (eight cask) shipment as for the four shipments with two casks per vessel.

Based on the assumptions outlined above, the incident-free impact of the shipment of vitrified waste on the ship's crew would be slightly less per shipment than that calculated for the shipment of foreign research reactor spent nuclear fuel. The trip duration of only 15 days, versus the average duration of 18 days, for a chartered vessel in the basic implementation of Management Alternative 1 results in a reduction of the dose to each inspector, the Chief Mate, the Bosun, and the Engineer, of approximately 6.9 mrem per journey (three fewer inspections, each of which would have resulted in a dose of 2.3 mrem). The population dose to the ship's crew, per voyage, can be derived from the data contained in Table C-6. Incorporating the reduction in the inspection dose into the data from this table, the individual doses would be: 210 mrem to the Chief Mate and the Bosun, 43 mrem to the Mate on Watch, 70 mrem to each of two Seamen, and 140 mrem to the ships Engineer. Per voyage, the total population dose to the ship's crew would be 0.74 person-rem.

With only eight casks to be shipped, the subalternative action could be achieved with a single shipment (the crew dose would be the same as that calculated if four shipments of two casks each were made). The population exposure results in a risk to the crew of 0.00030 LCF. Due to the reduced number of shipments, compared to the 721 shipments of spent nuclear fuel in the basic implementation of Management Alternative 1, the marine incident-free risk to the crew is approximately two orders of magnitude lower than that calculated for the basic implementation.

Management Alternative 3 – Combination of Components of Management Alternative 1 and 2 (Hybrid Alternative): Under the Hybrid Alternative, the United States would accept foreign research reactor spent nuclear fuel from countries without high-level waste storage capability. This Hybrid Alternative could result in the shipment of 452 casks of foreign research reactor spent nuclear fuel. The assumptions used in the analysis of the incident-free marine impact for the basic implementation of Management Alternative 1 have been used in the analysis of this Hybrid Alternative. This alternative has been analyzed using the selected "exclusive-use" regulatory dose limit for the shipment of spent nuclear fuel casks.

Included in the assumptions that have not changed between the analysis for the basic implementation and this alternative are the following:

- The same types of vessels should be available for use under this Hybrid Alternative, the option for using chartered or regularly scheduled commercial vessels was examined, and
- The activities associated with the loading of the foreign research reactor spent nuclear fuel, the daily inspection of the cargo during the voyage, and the offloading of the foreign research reactor spent nuclear fuel do not change simply because there is a reduction in the number of shipments to be made.

The average duration of the voyages from the countries without high-level waste storage capability to the United States is slightly longer than the average for the voyages associated with the basic implementation. Using the data in Table C-12, and eliminating the aluminum-based spent fuel shipments from Belgium, France, Germany, Italy, Spain, Switzerland, and the United Kingdom, the average voyage duration is almost 23 days (for a regularly scheduled commercial vessel) versus the 21 days for the basic implementation. For a chartered vessel, the voyage duration is three days less (i.e., almost 20 days). The longer average voyage duration results in an increase in the total of the daily inspection-related crew doses of approximately 4.6 mrem per crew member involved in the inspection. The inspection dose for a 23-day voyage would be 52.9 mrem (2.3 mrem times 23 days) per inspector.

The population dose to the ship's crew, per voyage, can be derived from the data contained in Tables C-5 and C-6. Incorporating the increase in the inspection dose into the data from Table C-5, the individual doses on a regularly scheduled commercial vessel would be 71 mrem to the Chief Mate and the Bosun, 11 mrem to the Mate on Watch, 18 mrem to each of two Seamen, and 54 mrem to the ship's Engineer. The population (ship's crew) dose per shipment would be 243 mrem. If a chartered vessel is used (carrying eight transportation casks instead of two for the regularly scheduled commercial vessel), the corresponding doses are 257 mrem to the Chief Mate and the Bosun, 43 mrem to the Mate on Watch, 70 mrem to each of two Seamen, and 187 mrem to the ship's Engineer. The population (ship's crew) dose per shipment would be 884 mrem.

The 452 cask shipments, requiring 236 ocean voyages using commercial regularly scheduled commercial cargo vessels, represent approximately 63 percent of the total number of shipments for the basic implementation. The total population (ships' crew) exposure resulting from this Hybrid Alternative would be approximately 69 percent of the exposure calculated for the basic implementation. The differences in these two percentages is a direct result of the longer average duration of ocean crossings. The total population exposure for the Hybrid Alternative, assuming that regularly scheduled commercial vessels are used, would be approximately 57.2 rem and would be approximately 52.2 rem if chartered vessels were used. These population exposures translate into a risk to the ships' crew, in terms of LCFs, of 0.024 LCF and 0.021 LCF, respectively. As discussed in Section 4.1, the relationship between a dose and LCFs is that a 1 rem dose equates to 0.0004 LCFs.

C.5 Accident Impacts: Methods and Results

C.5.1 Introduction

If the cask sinks anywhere in U.S. coastal waters, it will be recovered, regardless of depth. U.S. coastal waters in this case refers to waters within the 12-mile territorial limit. Recovery would be accomplished, even in the deepest parts of U.S. coastal waters, such as in Puget Sound, which reaches 305 meters or 1,000 feet (Encyclopedia Americana, 1991). Elsewhere in the world, if the cask sinks in coastal water (i.e., in water up to 200 m or 660 ft), every effort would be made to recover it. In deeper waters, the recovery is more problematic. As recovery, even in coastal waters, cannot be guaranteed, two scenarios need to be evaluated:

> ***Scenario A***: As the result of a maritime casualty (e.g., collision, foundering, fire), the vessel sinks in coastal waters, resulting in the submersion of the cask on the ocean floor. The cask is not retrieved. Analyses are done for two cases, (1) damaged cask, and (2) undamaged cask.
>
> ***Scenario B***: As the result of a maritime casualty (e.g., collision, foundering, fire), the vessel sinks in deep ocean waters, resulting in the submersion of the cask on the ocean floor. The cask is not retrieved. Analyses are done for one case only, a damaged cask, as it has been assumed that submersion in the deep ocean will damage the cask.

In 1988, the Nuclear Energy Agency of the Organization for Economic Cooperation and Development published a radiological assessment as part of a feasibility study for disposal of high-level radioactive waste into the seabed (NEA, 1988). As part of the radiological assessment, several accident scenarios were examined. In particular, a scenario involving a transportation accident at sea was examined. The results of calculations performed for the Nuclear Energy Agency radiological assessment are used here, with modification. The Nuclear Energy Agency results are based on vitrified high-level waste, which behaves differently in salt water than the metal foreign research reactor spent nuclear fuel. Also, the

inventory of radioactive material in the foreign research reactor spent nuclear fuel is considerably different than the vitrified high-level waste inventory. With modifications to compensate for these differences, the Nuclear Energy Agency results were used to predict the peak individual dose and biota dose for Scenario A and Scenario B.

C.5.2 Assumptions

1. The spent nuclear fuel and cask modeled are the BR-2 fuel and the Pegase cask. Based on the information provided in Appendix B, the loaded Pegase cask contains 0.0155 metric tons of heavy metal (MTHM) (15.5 kg) of fuel (assuming the cask is loaded with BR-2 type fuel). This fuel type was selected because BR-2 fuel has the highest isotope content per unit mass of heavy metal of the three fuel types considered in this analysis. Use of the highest inventory of radionuclides establishes a conservative upper bound on the estimated dose rates from the leaching of radionuclides into the sea. This is because the dose rates are a function of the corrosion rate of spent nuclear fuel, expressed in terms of mass per unit of time, and the specific activity of the spent nuclear fuel, expressed in terms of radioactivity per unit of mass.

2. The fuel rods contain aluminum-clad metallic spent nuclear fuel elements.

3. The deep ocean model is for the South Nares Abyssal Plain.

4. Corrosion of spent nuclear fuel inside a damaged cask begins immediately; corrosion of spent nuclear fuel inside an undamaged cask begins at the time the cask fails and allows seawater to come in contact with the spent nuclear fuel.

5. Once free of the fuel matrix through corrosion, the fission products exit the failed cask without delay.

6. The corrosion rate for spent nuclear fuel elements is constant. Radionuclides are leached from the spent nuclear fuel elements at a rate proportional to the corrosion rate depending on their relative concentrations.

Data from the Nuclear Energy Agency vitrified high-level waste model and on spent nuclear fuel corrosion rates are summarized in Table C-13.

Table C-13 Data For Estimating Spent Nuclear Fuel Dose Rates From the Nuclear Energy Agency Assessments for Vitrified High-Level Waste

Parameter Description	*Value*[a]	*Source*
Corrosion Rate for Glass (α_0)	0.000036 kg/m^2 day	NEA 1988
Corrosion Rate for Aluminum-Clad Fuel (α_1)	0.0086 kg/m^2 day	Rechard 1994
Sensitivity Coefficient for Corrosion Rate (a)	0.99	NEA 1988
Undamaged Cask Peak Individual Dose	9 rem/yr	NEA 1988
Damaged Cask Peak Individual Dose	650 rem/yr	NEA 1988
Undamaged Cask Peak Biota Dose (Fish)	3.6 rad/yr	NEA 1988
Undamaged Cask Peak Biota Dose (Crustaceans)	3.8 rad/yr	NEA 1988
Undamaged Cask Peak Biota Dose (Mollusks)	10.0 rad/yr	NEA 1988
Damaged Cask Peak Biota Dose (Fish)	29.0 rad/yr	NEA 1988
Damaged Cask Peak Biota Dose (Crustaceans)	31 rad/yr	NEA 1988
Damaged Cask Peak Biota Dose (Mollusks)	660 rad/yr	NEA 1988

[a] *Dose rates are based on a total Nuclear Energy Agency program mass of 100,000 MTHM*

C.5.3 Calculational Method For Dose Rate Estimates

The calculations presented here are designed to account for two differences between the Nuclear Energy Agency radiological assessment and the radiological assessment required for this EIS. First, in the radiological assessment performed for the Nuclear Energy Agency, a vitrified glass waste form was assumed. For this EIS, aluminum-clad metal matrix fuel elements are assumed. Thus, the corrosion rate of the matrix containing the radionuclides will be different in the two cases. Second, the radiological assessment for the Nuclear Energy Agency was performed assuming reprocessed fuel equivalent to 100,000 MTHM containing a total of 10 billion curies, for a specific activity of 100,000 Ci per MTHM. For this EIS, it is assumed that one Pegase cask contains 0.0155 MTHM (15.5 kg) of spent nuclear fuel and 930,000 Ci, for a specific activity of 60 million Ci per MTHM. Table C-14 contains a detailed list of the inventory of radionuclides for both the Nuclear Energy Agency vitrified high-level waste and the foreign research reactor spent nuclear fuel. The specific activity for the vitrified high-level waste is significantly lower than that of the foreign research reactor spent nuclear fuel because the Nuclear Energy Agency study uses data assuming a 100-year decay time for the waste, while the foreign research reactor spent nuclear fuel is assumed to only have been out of the reactor less than a year. The Nuclear Energy Agency study used 100-year decay time because in their study the spent nuclear fuel was not vitrified until it was 50 years out of the reactor, and it was assumed to take 50 years for their cask to fail once it was in the ocean.

The dose estimates from the Nuclear Energy Agency analysis are scaled for this EIS to reflect (1) the fact that spent nuclear fuel corrodes faster than vitrified glass, (2) there is significantly less mass of heavy metal in a spent nuclear fuel cask than was used in the Nuclear Energy Agency dose risk models, and (3) the specific activity of the foreign research reactor spent nuclear fuel is higher than the specific activity of the Nuclear Energy Agency vitrified high-level waste.

To account for differences in the waste matrix corrosion rate, the sensitivity of the calculated dose to the corrosion rate was used. In its radiological assessment, the Nuclear Energy Agency published sensitivity studies. For the accident analyses, an adjoin method was used to determine the sensitivity of the peak individual dose and the collective dose to key parameters in their performance assessment model, including the waste matrix corrosion rate.

The adjoin method employs a mathematical algorithm for calculating directly in one run the sensitivity of a performance assessment model to the model parameters. It gives as output the first derivative of the response of the performance assessment model (here, peak individual dose and collective dose) with respect to each of the model parameters (in particular, corrosion rate). Explicitly, the sensitivity coefficient is defined as:

$$a = \frac{\partial D/D}{\partial \alpha/\alpha} \qquad (1)$$

where a is the sensitivity coefficient, D is the dose (peak or cumulative), and α is a given parameter (leach rate). This expression can be used to determine the change in the dose for a change in the parameter value by integrating as follows in equation 2.

Total

$$\int_{D_0}^{D_1} \frac{\partial D}{D} = a \int_{\alpha_0}^{\alpha_1} \frac{\partial \alpha}{\alpha} \qquad (2)$$

or

Table C-14 Comparison of Radionuclide Inventories for Nuclear Energy Agency High-Level Waste Sub-Seabed Disposal Studies and BR-2 Foreign Research Reactor Spent Nuclear Fuel

Radionuclide	*Nuclear Energy Agency Vitrified High-Level Waste Inventory[a] (Ci)*	*Foreign Research Reactor Spent Nuclear Fuel Inventory[b] (Ci)*	*Radionuclide*	*Nuclear Energy Agency Vitrified High-Level Waste Inventory[a] (Ci)*	*Foreign Research Reactor Spent Nuclear Fuel Inventory[b] (Ci)*
Hydrogen-3	0.0	86.4	Cerium-141	0.0	5,700
Selenium-79	33,000	0.0	Cerium-144	0.0	310,000
Krypton-85	0.0	2,500	Promethium-147	11,000	48,000
Strontium-89	0.0	41,000	Promethium-148m	0.0	75.6
Strontium-90	2,000,000,000	21,000	Samarium-151	27,000,000	0.0
Yttrium-90	2,000,000,000	0.0	Europium-154	8,600,000	620
Yttrium-91	0.0	73,000	Europium-155	480,000	130
Niobium-95	0.0	220,000	Uranium-233	178	0.0
Zirconium-93	180,000	0.0	Uranium-234	300	0.0091
Zirconium-95	0.0	110,000	Uranium-235	0.0	0.014
Technicium-99	1,400,000	0.0	Uranium-236	47	0.0
Ruthenium-103	0.0	8,900	Uranium-238	0.0	0.00034
Ruthenium-106	0.0	22,000	Neptunium-237	32,000	0.0
Palladium-107	10,000	0.0	Plutonium-238	0.0	64.2
Tin-123	0.0	430	Plutonium-239	120,000	1.8
Tin-126	58,000	0.0	Plutonium-240	620,000	1.2
Antimony-125	990	890	Plutonium-241	3,500,000	280
Antimony-126m	58,000	0.0	Plutonium-242	600	0.0
Tellurium-125m	0.0	210	Americium-241	6,900,000	0.4
Tellurium-127m	0.0	890	Americium-242m	0.0	0.0011
Tellurium-129m	0.0	200	Americium-243	2,000,000	0.0043
Iodine-129	3.0	0.0	Curium-242	0.0	1.8
Cesium-134	108	16,000	Curium-244	0.0	1.3
Cesium-135	150,000	0.0	Curium-245	21,000	0.0
Cesium-137	3,000,000,000	21,000	Curium-246	5,500	0.0
Barium-137m	2,900,000,000	0.0			
			Total	**10,000,000,000**	**930,000**

[a] *Nuclear Energy Agency vitrified high-level waste radionuclide inventories are based on 100,000 MTHM that represent spent nuclear fuel radionuclide inventories for 100 years out of reactor. The Nuclear Energy Agency analysis based its dose rate estimate calculations on vitrified high-level waste that was produced from commercial light water reactor spent nuclear fuel at 50 years out of reactor, then the Nuclear Energy Agency analysis models the release of the vitrified high-level waste inventory into the ocean only after an additional 50 years of submersion.*

[b] *Foreign research reactor spent nuclear fuel radionuclide inventories are based on a Pegase cask filled with 36 elements of BR-2 spent nuclear fuel, 300 days out of reactor.*

$$\ln (D_1/D_0) = a \ln (\alpha_1/\alpha_0) \quad (3)$$

Using the data provided in Table C-13,

$$\ln (D_1/D_0) = 0.99 \ln (8.6 \times 10^{-3}/3.6 \times 10^{-5}) \quad (4)$$

or

$$D_1 = 227 D_0 \quad (5)$$

Where D_1 is the dose by foreign research reactor spent nuclear fuel, adjusted only for the difference in leach rate, and D_0 is the Nuclear Energy Agency dose.

Since the derivative in Equation (1) is evaluated at a particular value of each model parameter, it is by definition the sensitivity coefficient of the dose to small variations in each parameter around their assigned value. As a result, the calculation of dose using the sensitivity coefficient is valid only when changes in the leach rate remain "sufficiently small" compared to the leach rate. However, the Nuclear Energy Agency assessment states that many of the models in their assessment are linear, and it is possible to estimate changes in the dose even for large variations in the leach rate.

To account for differences in the waste inventory, the dose was scaled linearly according to the ratio of the specific activity of the BR-2 spent nuclear fuel to the specific activity of the vitrified high-level waste as shown in Equation (6).

$$D = D_1 \frac{\beta_{EIS}}{\beta_{NEA}} = D_1 \frac{0.0155}{1.0E+05} \frac{6.0E+07}{1.0E+05} = 9.3E-05 \; D_1 \quad (6)$$

Finally,

$$D = 0.021 \; D_0 \quad (7)$$

C.5.4 Results

Dose rates were calculated in the Nuclear Energy Agency study for two types of ocean environments, coastal waters and deep ocean floors. The results of scaling the Nuclear Energy Agency dose rate estimates for the scenario of losing a cask of foreign research reactor spent nuclear fuel in coastal waters are shown in Table C-15, with the comparable Nuclear Energy Agency results. In Table C-16, the results of losing a cask containing foreign research reactor spent nuclear fuel in deep ocean waters are shown. Table C-15 presents results for both an undamaged and a damaged cask, however Table C-16 provides the estimated dose for a damaged cask only because it is assumed that the pressure from the deep ocean will damage the cask seals.

The doses associated with the foreign research reactor spent nuclear fuel in Table C-16 are, in the case of the mollusks, very high. However, to properly interpret this result, several factors must be considered. First, the calculation that produced these results is very conservative for two reasons. The radioactive material, once corroded, was assumed to immediately be released into the open ocean water. In fact, the cask is expected to provide a significant "hold-up" time. This is because only the seal is expected to fail, which means that, due to the small area of the seal, only a very limited amount of water movement through the cask will be experienced. Over time, this small flow would carry out all of the soluble fission products, but insoluble precipitates would remain in the cask. Also, no account was taken for the possibility that the cask would likely become buried in silt, greatly slowing the fission product's entry into

Table C-15 Coastal Waters Dose Rate Estimates for 100,000 MTHM Vitrified High-Level Waste and a Pegase Cask Loaded With BR-2 Foreign Research Reactor Spent Nuclear Fuel

Dose Category	*D_0 (NEA)*	*D (BR-2)*
Undamaged Cask Peak Individual Dose	9.0 rem/yr	0.19 rem/yr
Damaged Cask Peak Individual Dose	650 rem/yr	14 rem/yr
Undamaged Cask Peak Biota Dose (Fish)	3.6 rad/yr	0.077 rad/yr
Undamaged Cask Peak Biota Dose (Crustaceans)	3.8 rad/yr	0.081 rad/yr
Undamaged Cask Peak Biota Dose (Mollusks)	10 rad/yr	0.21 rad/yr
Damaged Cask Peak Biota Dose (Fish)	29 rad/yr	0.62 rad/yr
Damaged Cask Peak Biota Dose (Crustaceans)	31 rad/yr	0.66 rad/yr
Damaged Cask Peak Biota Dose (Mollusks)	660 rad/yr	14 rad/yr

Table C-16 Deep Ocean Dose Rate Estimates for 100,000 MTHM Vitrified High-Level Waste and a Pegase Cask Loaded with BR-2 Foreign Research Reactor Spent Nuclear Fuel

Dose Category	*D_0 (NEA)*	*D (BR-2)*
Damaged Cask Peak Individual Dose	0.00053 rem/yr	0.114 rem/yr
Damaged Cask Peak Biota Dose (Fish)	30,000 rad/yr	640 rad/yr
Damaged Cask Peak Biota Dose (Crustaceans)	41,000 rad/yr	880 rad/yr
Damaged Cask Peak Biota Dose (Mollusks)	1,400,000 rad/yr	30,000 rad/yr

the open water. Also, no account was taken of the reduction in corrosion rate in the deep ocean due to lower oxygen levels or the reduced temperatures. These factors indicate that if a rigorous calculation were possible, the resultant dose would be lower, and likely significantly lower.

Once out of the cask, the fission products are unlikely to be transported very far in the very slow current typical in the deep ocean. While this would concentrate the dose to those organisms in the area of the cask, especially the mollusks, it also means that the population affected would be relatively small, since only a small area would be contaminated.

Additionally, as explained in Chapter 3, the density of organisms in the deep ocean is around one percent that in coastal waters. This further reduces the affected population of organisms.

The risks associated with the dose estimated for the mollusk are very low, due to the low frequency of the event, as explained in the following section.

C.5.5 Risks Associated With Submersion of a Foreign Research Reactor Spent Nuclear Fuel Cask

Risks associated with submersion of foreign research reactor spent nuclear fuel casks were calculated for a single cask, even though more than one cask may be carried on some voyages. The risk (consequences multiplied by probability) is essentially independent of the number of casks carried per voyages. That is, the risk associated with eight voyages of one cask each are essentially the same as one voyage carrying eight casks.

The consequence estimates in Tables C-15 and C-16 are indicative of what could happen in the event that a foreign research reactor spent nuclear fuel cask were to become submerged in coastal waters or in the deep ocean and is not recovered. By combining an estimate of the frequency at which such a situation is

expected to occur with the consequence estimates, an estimate of the risk associated with ocean transportation can be developed. The frequency of a cask becoming submerged is: the mathematical product of the annual frequency of foreign research reactor spent nuclear fuel shipments, the probability that a shipment is involved in an accident, the probability that a ship sinks (given that an accident occurs), and the probability that a submerged cask is not recovered. Additionally, the frequency of a damaged cask becoming submerged in coastal waters includes the probability that a cask is damaged given that an accident occurs. The data for these events were taken from two sources, the Nuclear Energy Agency study (NEA, 1988) and the Environmental Assessment of Urgent-Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel (DOE, 1994). These data are summarized in Table C-17.

Table C-17 At Sea Risk Assessment Data

Parameter	*Coastal Data*	*Deep Ocean Data*
Shipment Accident Rate	0.00032/Shipment (DOE, 1994)	0.000046/Shipment (NEA, 1988)
Probability that Cask is Damaged, Given an Accident	0.002 (DOE, 1994)[a]	1.0[c]
Probability that a Ship Sinks Given an Accident	0.001 (Wheeler, 1994)	0.001 (Wheeler, 1994)
Probability that a Submerged Cask is not Recovered	0.0001 (NEA, 1988)[b]	0.05 (NEA, 1988)
Number of Shipments	721	721
Probability - Submerged Cask, Damaged, Unrecovered	4.6×10^{-11}	0.0000017
Probability - Submerged Cask, Undamaged, Unrecovered	2.3×10^{-8}	0.0c

[a] *This value represents the conditional probability that the severity of an accident is greater than Category II, as shown in Appendix E, Environmental Assessment of Urgent Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel (DOE, 1994).*

[b] *Derivation of this probability is based in a fault tree analysis using data from the Nuclear Energy Agency analysis.*

[c] *The cask is assumed to fail at deep ocean depths.*

The risk estimate results for the basic implementation of Management Alternative 1 are shown in Table C-18. The risk for a peak dose to an individual is 6.4×10^{-7} mrem per year for a damaged cask in coastal water and 0.0000043 mrem per year for an undamaged cask. Risk associated with a submerged, unrecovered cask in the deep ocean is 0.00019 mrem per year for a damaged cask.

Table C-18 Radiological Risk Estimates for At Sea Accidents

Dose Category	*Damaged Cask*	*Undamaged Cask*
Coastal Dose Rate Risk Estimates		
Peak Individual Dose	6.4×10^{-7} mrem/yr	0.0000043 mrem/yr
Peak Biota Dose (Fish)	2.8×10^{-8} mrad/yr	0.0000018 mrad/yr
Peak Biota Dose (Crustaceans)	3.0×10^{-8} mrad/yr	0.0000019 mrad/yr
Peak Biota Dose (Mollusks)	6.4×10^{-7} mrad/yr	0.0000048 mrad/yr
Deep Ocean Risk Estimates		
Peak Individual Dose	0.00019 mrem/yr	Cask is assumed to fail at deep ocean depths
Peak Biota Dose (Fish)	1.1 mrad/yr	Cask is assumed to fail at deep ocean depths
Peak Biota Dose (Crustaceans)	1.4 mrad/yr	Cask is assumed to fail at deep ocean depths
Peak Biota Dose (Mollusks)	49 mrad/yr	Cask is assumed to fail at deep ocean depths

C.5.6 Marine Accident Impacts of Policy Alternatives

In Section C.4.2, two implementation subalternatives to Management Alternative 1 and one implementation subalternative to Management Alternative 2 of the proposed action that could impact the risk calculations were identified: accepting spent nuclear fuel from developing countries only, a 5-year

acceptance program, and overseas reprocessing of the foreign research reactor spent nuclear fuel. Implementation of any of these has the potential to impact the marine accident risks calculated for the basic implementation of Management Alternative 1 calculated above.

For the implementation subalternatives involving the shipment of different quantities of foreign research reactor spent nuclear fuel, the consequences of an accident are the same for the implementation subalternatives as they are for the basic implementation. In these subalternatives, the same type of spent nuclear fuel is being shipped in the same types of transportation casks and is subject to the same accidents as for the basic implementation. These are the variables between subalternatives that could have affected the consequences of a marine accident. Since none changed, the consequences do not change. Two of the implementation subalternatives fall into this category: the developing countries implementation subalternative and the five-year policy duration implementation subalternative. For these two alternatives, the marine accident risks are directly proportional to the number of foreign research reactor spent nuclear fuel shipments required to implement each implementation subalternative. It is therefore possible to scale the results presented in the previous section by the ratio of the number of cask shipments in implementation subalternative to the number of cask shipments in the basic implementation.

Subalternative 1b to Management Alternative 2 requires the shipment of the foreign research reactor spent nuclear fuel wastes in a different form than the basic implementation. With overseas reprocessing of the foreign research reactor spent nuclear fuel, any material that would be returned to the United States would be in the form of vitrified high-level waste. As discussed earlier in Section C.5, the high-level waste behaves differently when exposed to seawater than does spent nuclear fuel. The vitrified waste dissolves at a much slower rate than the foreign research reactor spent nuclear fuel. A second major difference is the amount of radioactivity present in each of the shipping casks carrying vitrified waste and spent nuclear fuel. As shown in Table C-14, the total curie content of a transportation cask carrying foreign research reactor spent nuclear fuel is approximately a million curies. Each vitrified waste transportation cask could contain approximately a hundred times this amount. The contents of 837 spent nuclear fuel transportation casks (all foreign research reactor spent nuclear fuel could be processed, including that from Canada, which was not included in the marine risk analyses for the basic implementation) are expected to be reduced to fit into eight transportation casks.

In addition, a Hybrid Alternative has been analyzed to assess the impact of encouraging overseas reprocessing of the foreign research reactor spent nuclear fuel for those countries capable of storing the resultant high-level waste. The United States would accept for management the research reactor spent fuel from countries that are unable to accept and store the high-level waste resulting from fuel processing. Under the Hybrid Alternative analyzed, Belgium, France, Germany, Italy, Spain, Switzerland, and the United Kingdom are assumed to process their aluminum-based spent nuclear fuel and accept the high-level waste. All other countries identified in Table C-1 would be allowed to ship spent nuclear fuel to the United States. The resulting 452 shipments of spent nuclear fuel (excluding the overland transport of fuel of Canadian origin) are the basis for the marine impact analysis for this Hybrid Alternative.

The marine accident risks associated with each of these management alternatives is presented in the following paragraphs.

Management Alternative 1, Implementation Subalternative 1a — Acceptance of Foreign Research Reactor Spent Nuclear Fuel Only from Developing Countries: This implementation subalternative would result in the shipment of 168 transportation casks of foreign research reactor spent nuclear fuel. This is 23 percent of the shipments required for the basic implementation. Using this relationship, the risks presented in Table C-18 can be scaled to produce the following results. The maximally exposed individual (MEI) would be exposed to a risk (in terms of a peak individual dose rate) of 0.000044 mrem per year as a result

of an accident causing the loss of a cask in the deep ocean. The consequences of this accident do not change; the peak individual dose remains at 0.114 rem per year. The loss of a damaged cask in coastal waters results in the lowest risk to man, 1.5×10^{-7} mrem per year. The risks to marine biota are reduced by the same ratio and will range from a high of 11 mrad per year to a mollusk from the loss of a cask in the deep ocean, to a low of 6×10^{-9} mrad per year to fish from the loss of a damaged cask in coastal waters.

Management Alternative 1, Implementation Subalternative 2a — Acceptance of Foreign Research Reactor Spent Nuclear Fuel for 5-Year Policy Duration: This implementation subalternative results in the shipment of 586 transportation casks of foreign research reactor spent nuclear fuel. This is 81 percent of the shipments required for the basic implementation. Using this relationship, the risks presented in Table C-18 can be scaled to produce the following results. The MEI will be exposed to a risk (in terms of a peak individual dose rate) of 0.00015 mrem per year as a result of the accident causing the loss of a cask in the deep ocean. The loss of a damaged cask in coastal waters results in the lowest risk to man, 5×10^{-7} mrem per year. The risks to marine biota are reduced by the same ratio and will range from a high of 40 mrad per year to a mollusk (deep sea accident) to a low of 2×10^{-8} mrad per year to fish (coastal water, damaged cask accident).

Management Alternative 2, Subalternative 1b — Overseas Processing with Shipment of Waste to a U.S. Storage Facility: In this subalternative, all of the foreign research reactor spent nuclear fuel (including that generated in Canada) is sent to either Great Britain or France for processing and the vitrified high-level waste generated in the process would be shipped to the United States. Based on the processing of approximately 23 metric tons (25.3 tons) of spent nuclear fuel, enough vitrified high-level waste would be generated to require up to eight transportation casks of vitrified high-level waste being shipped to the United States. Only the impact of the marine shipments from the processing facility to the United States was calculated.

The consequences of an accident at sea that results in the loss of a transportation cask filled with vitrified high-level waste can be derived from the information used to develop the marine accident consequences for a foreign research reactor spent nuclear fuel cask. The consequences listed in Tables C-15 and C-16 for D_0 represent the consequences associated with the loss of 100,000 MTHM equivalent of vitrified high-level waste. Based on eight shipments for the approximately 23 metric tons (25.3 tons) of spent nuclear fuel, each shipment in this subalternative will contain approximately 2.9 metric tons (3.2 tons) equivalent of vitrified high-level waste. Table C-19 presents the consequences from Tables C-15 and C-16 scaled to represent the consequences for an accident resulting in the loss of a transportation cask containing 2.9 metric tons (3.2 tons) equivalent.

Table C-19 Consequences Resulting from the Loss of a Transportation Cask Containing Vitrified High-Level Waste[a]

	Coastal Waters		*Deep Ocean*
	Undamaged Cask	*Damaged Cask*	*Damaged Cask*
Peak Individual Dose (Man) rem/yr	0.0003	0.019	1.5×10^{-8}
Peak Biota Dose (Fish) rad/yr	0.0001	0.0008	0.9
Peak Biota Dose (Crustaceans) rad/yr	0.0001	0.0009	1.2
Peak Biota Dose (Mollusks) rad/yr	0.0003	0.019	41

[a] *These estimates are based on the best estimate values presented in the Nuclear Energy Agency report (NEA, 1988)*

From the accident frequency data in Table C-17, a per-shipment accident frequency can be developed for all three accidents of interest: 1) the loss of an undamaged cask in coastal waters, 2) the loss of a damaged cask in coastal waters, and 3) the loss of a damaged cask in the deep ocean. These frequencies are the product of the shipment accident rate, the probability of the vessel sinking after an accident, the probability that a submerged cask is not recovered, and where applicable (for the damaged cask in coastal waters only), the probability that the cask is damaged in the accident. The resulting per shipment accident probabilities are 3.2×10^{-11} for the loss of an unrecovered, undamaged cask in coastal waters, 6.4×10^{-14} for the loss of an unrecovered damaged cask in coastal waters, and 2.3×10^{-9} for the unrecovered loss of a damaged cask in the deep ocean.

With the assumption that there are only up to eight shipments of vitrified high-level waste, the risks associated with the marine transport of this material are almost non-existent. The risks in terms of rem per year peak public dose and rad per year peak dose to marine biota, of an unrecovered cask in coastal waters are essentially zero, less than 1.0×10^{-10}. The risks calculated for the deep ocean accidents are: much less than 1×10^{-10} rem per year peak dose to man, 2×10^{-8} rad per year peak dose to fish and crustaceans, and 7×10^{-7} rad per year peak dose to mollusks.

Management Alternative 3 — Combination of Components of Management Alternatives 1 and 3 (Hybrid Alternative): Under the Hybrid Alternative, the United States would accept foreign research reactor spent nuclear fuel from countries unable to store high-level waste. This Hybrid Alternative could result in the shipment of 452 transportation casks of foreign research reactor spent nuclear fuel to the United States. This is approximately 63 percent of the shipments required in the basic alternative. Using this relationship, the risks presented in Table C-18 can be scaled to produce the following results. The MEI will be exposed to a risk (in terms of a peak individual dose rate) of 0.00012 mrem per year as a result of an accident causing the loss of a cask in the deep ocean. The consequences of this accident do not change from the basic implementation; the peak individual dose remains at 0.114 mrem per year. The loss of a damaged cask in coastal waters results in the lowest risks to man, 4×10^{-7} mrem per year. The risks to marine biota are reduced by the same ratio and will range from a high of 31 mrad per year to a mollusk (deep sea accident) to a low of 1.8×10^{-8} mrad per year to fish (coastal water, damaged cask accident).

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Volume 2

FINAL ENVIRONMENTAL IMPACT STATEMENT

on a

Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Appendix D
Selection and Evaluation of Potential Ports of Entry

United States Department of Energy
Assistant Secretary for Environmental Management
Washington, DC 20585

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Appendix D
Selection and Evaluation of Potential Ports of Entry

This appendix describes the process used by the Department of Energy (DOE) in selecting the potential ports of entry analyzed in this Environmental Impact Statement (EIS). In addition, the appendix provides the basic information required to evaluate ports and port activities, and the potential environmental impacts (incident-free and accidents) associated with the receipt and handling of foreign research reactor spent nuclear fuel from vessels to intermodal transport in ports.

D.1 Ports of Entry Selection Process

The adopted port selection process was based on a set of criteria developed by DOE to identify those ports that would be most capable of providing for the safe receipt, handling, and transhipment of foreign research reactor spent nuclear fuel. This appendix first describes the process through which DOE developed the port selection criteria, and then describes the application of the criteria, resulting in the identification of the specific ports available for consideration.

Because the basic implementation of Management Alternative 1 of the proposed action would involve shipments from many foreign countries to several potential foreign research reactor spent nuclear fuel management sites in addition to those identified in the Environmental Assessment of Urgent-Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel (DOE, 1994d), it was necessary to expand on the port analysis approach used in the Urgent Relief Environmental Assessment. The Urgent Relief Environmental Assessment was concerned with fewer shipments within a short timeframe, with the shipments going only to the Savannah River Site. Also, as stated in the Urgent Relief Environmental Assessment, this EIS considers future population trends and future port developments.

Independent maritime safety experts consulted during the preparation of this EIS informed DOE that any modern breakbulk or container terminal can accommodate the safe receipt, handling, and transhipment of foreign research reactor spent nuclear fuel in approved shipping casks (USMMA, 1994). This view is supported by the well-documented excellent safety record for shipping foreign research reactor spent nuclear fuel in the United States (NRC, 1993). In addition, the port selection criteria discussed in this appendix, taken collectively, provide a reasonable additional basis for identifying those candidate ports suitable for the safe receipt and handling of foreign research reactor spent nuclear fuel.

D.1.1 Background

Since 1979, when the U.S. Nuclear Regulatory Commission (NRC) first began approving spent nuclear fuel shipments in the United States, 317 spent nuclear fuel shipments in Type B casks have been transported safely into several U.S. ports of entry. These include Newport News, Norfolk, and Portsmouth, VA; Portland, OR; Savannah, GA; and Oakland, CA (NRC, 1993). However, prior to the fall of 1993, DOE did not have any generally applicable criteria for identifying ports of entry. For this EIS, as well as for the Urgent Relief Environmental Assessment, DOE developed criteria to identify candidate ports of entry. The criteria used in this evaluation to identify potential ports for the receipt of foreign research reactor spent nuclear fuel are based on consideration of several independent factors, each described in more detail in the following sections.

D.1.2 Information on Past Spent Nuclear Fuel Shipments

The NRC has the authority under the Atomic Energy Act of 1954, as amended, to regulate certain aspects of spent nuclear fuel transportation. Of the thousands of shipments completed over the last 30 years in the United States and abroad, none has resulted in an injury due to the radioactive nature of the cargo (NRC, 1993). For the same period, about 1,200 (924 domestic and 293 foreign) overland shipments of spent nuclear fuel took place without any injury attributable to accidents or incident-free radiation doses during transport. Table D-1 provides the number of NRC and Department of Transportation regulated international and domestic overland shipments since 1979 (excluding DOE shipments). The casks that would be used in this program are robust Type B containers. The safety, safeguards, and precautions used for such shipments have historically been very successful (NRC, 1993).

Table D-1 Number of NRC/Department of Transportation Regulated Overland and International Spent Nuclear Fuel Shipments

Year	Overland		International[a]		
	Highway	Railway	Export	Import	Transient
1979	2	11	0	14	0
1980	73	5	2	55	0
1981	30	2	3	48	0
1982	80	0	1	43	0
1983	92	0	2	23	0
1984	209	3	2	34	0
1985	114	18	0	21	0
1986	88	15	0	17	0
1987	85	15	3	19	0
1988	10	7	0	15	0
1989	11	6	1	4	0
1990	0	8	2	0	3
1991	7	10	4	0	1
1992	17	6	0	0	0
Total	**818**	**106**	**20**	**293**	**4**

[a] *Ports included Newport News, Norfolk, and Portsmouth, VA; Savannah, GA; Portland, OR; and Oakland, CA.*

D.1.3 Federal Court Ruling

In the December 1991 decision of the U.S. District Court, District of Columbia Circuit, on the return of spent nuclear fuel from Taiwan, the court ruled that DOE must consider a reasonable range of alternative ports, including (at least) two low population density ports near DOE's Savannah River Site (U.S. District Court, 1991). In this appendix, DOE has identified a reasonable range of alternative ports on the East, Gulf, and West Coasts (including several low population ports) for the receipt, handling, and transhipment of foreign research reactor spent nuclear fuel to five potential DOE management sites (including the Savannah River Site) being considered in this EIS.

D.1.4 Notice of Intent Port Criteria

The Notice of Intent for this EIS (DOE, 1993) listed a series of preliminary criteria which might be applied to a potential list of candidate seaports to identify ports which would be acceptable for receipt, handling, and transhipment of foreign research reactor spent nuclear fuel. These proposed criteria included: "(a) adequacy of harbor and dock characteristics to satisfy the cask carrying ship requirements;

(b) availability of safe and secure lag storage; (c) adequacy of overland transportation systems from ports to the storage site(s); (d) experience in safe and secure handling of hazardous cargo; (e) emergency preparedness status at the port and nearby communities; and (f) proximity to the proposed storage sites." Either implicitly or explicitly, these criteria were considered in the port screening, as discussed in the following sections.

D.1.5 The U.S. Merchant Marine Academy Workshop Recommendations

A DOE-sponsored workshop on port selection criteria for spent nuclear fuel was held at the U.S. Merchant Marine Academy at Kings Point, New York, on November 15-16, 1993 (USMMA, 1994). Participants at the workshop included experts from the maritime industry in the areas of marine transportation, intermodal systems, marine insurance, admiralty law, U.S. Coast Guard Operations, U.S. Navy Operations, Military Sealift Command Operations, and national cargo, pilotage, and ships operations.

A series of panel discussions focused on issues such as economics and transportation safety, advantages of shipping spent nuclear fuel on various types of vessels, and shipping spent nuclear fuel through large versus small ports. The purpose of such discussions, in part, was to enable DOE to identify port criteria that would minimize both the actual and perceived risk involved in spent nuclear fuel shipments. The workshop participants agreed that any port capable of handling an ocean-going vessel is capable of receiving spent nuclear fuel. While some of these ports might have features that would make them more desirable than others (e.g., easy access from the open sea, modern facilities, etc.), no port would have such limitations as to preclude safe receipt of the spent nuclear fuel. While individual ports might not satisfy all the criteria recommended at the workshop, the workshop participants concluded that the criteria would provide a means of evaluating the relative merits of ports.

The three criteria recommended as necessary for safe shipment were: short distance from the open ocean to the port, adequate port cargo facilities, and intermodal access (i.e., for truck or rail shipments from the port to the management site).

A second set of recommendations that were listed as "important but not necessary" included: an experienced risk management staff, emergency preparedness and response capabilities, a skilled labor force aboard ship and in port, good port security, no local restrictions or regulations on movement of hazardous cargo, and no significant environmental considerations for the port.

Finally, the workshop also provided a list of "desirable" attributes for ports, including: distance of the port from a population center, proximity of the port to a spent nuclear fuel management location, "local economic issues" (e.g., areas that receive a significant fraction of their revenues from maritime and shipping activities), and personnel with training and experience in radioactive shipments and incident response.

D.1.6 Provisions of the National Defense Authorization Act for Fiscal Year 1994

On November 30, 1993, the National Defense Authorization Act for Fiscal Year 1994 was signed into law (NDAA, 1993). Section 3151 stipulates specific criteria that must be used "if economically feasible" and "to the maximum extent practicable" in selecting U.S. ports for both emergency and nonemergency receipt of foreign research reactor spent nuclear fuel at the Savannah River Site. Although the National Defense Authorization Act does not specifically address other potential DOE management sites, DOE assumed that the guidance provided for foreign research reactor spent nuclear fuel shipments to Savannah

River Site should be considered for the other four potential sites being considered in this EIS (Idaho National Engineering Laboratory, Hanford Site, Oak Ridge Reservation, and the Nevada Test Site), to the extent feasibility and practicability permitted.

Specifically, the National Defense Authorization Act requires that DOE may not receive foreign research reactor spent nuclear fuel if it "cannot be transferred in an expeditious manner from its port of entry in the United States to a storage facility that is located at a Department of Energy facility and is capable of receiving and storing the spent nuclear fuel." Further, it requires that the "Secretary of Energy shall, if economically feasible and to the maximum extent practicable, provide for the receipt of spent nuclear fuel....at a port of entry in the United States which...compared to each other port of entry....that is capable of receiving the spent nuclear fuel - (1) has the lowest human population in the area surrounding the port of entry; (2) is closest in proximity to the facility which will store the spent nuclear fuel; and (3) has the most appropriate facilities for, and experience in, receiving nuclear fuel (NDAA, 1993)."

D.1.7 Comments Received During the EIS Scoping Meetings and on the Urgent Relief Environmental Assessment

Nine public scoping meetings were held in November and December, 1993, at six cities being considered as potential ports for the receipt of spent nuclear fuel from foreign research reactors, and four cities near the potential spent nuclear fuel management sites discussed in this EIS. As a result of these meetings, DOE received several groups of similar comments, which have been incorporated into the development of the criteria (DOE, 1994a).

The largest number of comments (44) received on any general port-related issue dealt with avoiding ports in high population areas. Reasons ranged from concerns about accident consequences and possible terrorist attacks, to concerns about the ability to adequately respond to emergencies and possible evacuation of populations.

The second largest number of comments (32) suggested that alternative ports in low-population areas or ports operated by the military be seriously considered, and that ports that are closest to the storage sites and/or have the most direct transportation routes between the ports and management sites be considered.

Other comments that fall within the jurisdiction of DOE and within the scope of this EIS include: suggestions that selected ports should have experience handling spent nuclear fuel (9 comments); the safest marine terminals should be used at the port selected (3 comments); and that DOE should allow case-by-case designation of ports based on the most sensible options at the time each individual shipment occurs, considering the vessel, country of origin, time, cost, and overall experience of the ports (2 comments).

In addition to comments presented at the EIS Scoping Meetings, DOE has also considered individual comments and a list of suggestions from the Sierra Club on the draft Urgent Relief Environmental Assessment (DOE, 1994d).

D.1.8 Key Assumptions and Methodology for Port Identification

A number of possible maritime shipment modes are potentially available for shipping the foreign research reactor spent nuclear fuel over the next 10 or more years. The various transport modes generally determine which port facilities are adequate at each specific port [e.g., container cranes are required for container vessels, a pier for roll-on/roll-off vessels, and breakbulk cranes for breakbulk vessels]. While regularly scheduled cargo ships servicing commercial ports could be an important mode selected by

owners of the foreign research reactor spent nuclear fuel for their shipments, smaller unscheduled vessels would also be a common mode of transport for multiple cask shipments (e.g., the first shipment of foreign research reactor spent nuclear fuel under the Urgent Relief Environmental Assessment in September 1994). This means that there will be a somewhat greater number of potential ports of entry to consider than if only larger, regularly scheduled commercial container vessels were to be used (details on potential vessel types that might be used are provided in Appendix C).

In addition to the types of vessels that could be used, the way foreign research reactor spent nuclear fuel casks are "packaged" for shipment is also a determinant in the selection of potential ports. For the Urgent Relief Environmental Assessment shipments to Savannah River Site, the Terms and Conditions for Financial Settlement for Receipt and Disposition of Foreign Research Reactor Spent Fuels (DOE, 1994c) required that spent nuclear fuel casks be containerized in 20 ft International Standards Organization containers (nominally, 2.4 m x 2.4 m x 6.1 m, or 8 ft x 8 ft x 20 ft), also called 20-ft equivalent units. Therefore, it was assumed that spent nuclear fuel casks would only be shipped containerized. This eliminates consideration of receipt and handling of foreign research reactor spent nuclear fuel casks in a "palletized" mode. Thus, the EIS focuses primarily on reasonable options for ports qualified for the receipt, handling, and transhipment of containerized spent nuclear fuel on any viable vessel type.

Among the ports that routinely handle containerized freight, two groups of ports - those along the in-land Mississippi River (above New Orleans) and those around the Great Lakes - are not considered in this evaluation. Access to these ports requires a long inland transit from open ocean. The U.S. Merchant Marine Academy recommendations discouraged such transits.

Finally, since the National Defense Authorization Act did not establish numerical distance or transport time limits for spent nuclear fuel transport, DOE concluded that, consistent with current and past Federal practice for transport of spent nuclear fuel in the contiguous United States, all overland shipments should be managed such that the spent nuclear fuel is kept moving as expeditiously as possible from the time it is placed on the transportation vehicle at the port of entry until it reaches the DOE management site, to the maximum extent practicable. For example, truck shipments (which typically involve two drivers in a tractor with a sleeping area) are assumed to be basically nonstop in order to deliver the spent nuclear fuel promptly, stopping only for fuel and food. This has been, and is expected to remain, DOE practice for such shipments.

NRC recently reported that for the period 1979-1992, rail transport only accounted for 8.6 percent of the total spent nuclear fuel shipments in the United States, but these shipments accounted for about 66 percent of the total quantity of spent nuclear fuel shipped (NRC, 1993). Rail travel (freight) typically takes much longer than truck transport when moving spent nuclear fuel on a dedicated railcar, where even short trips may require movement through additional intermodal terminals (e.g., transfer from rail to truck for site delivery), or intermediate points of dedicated railcar transfers to other train systems (e.g., from a local freight handler to one or more long distance freight lines). However, in the case of dedicated trains where entire multiple cask shipments (such as those used for the Urgent Relief shipment from the Military Ocean Terminal at Sunny Point (MOTSU) to the Savannah River Site) go directly from the port to the management site, rail travel times are expected to be somewhat longer than those for truck transport. Generally, rail distances are also typically somewhat longer than those for trucks using interstates, and rail transport generally costs more, and potentially exposes larger numbers of people since transits typically pass through major railyards in inner cities (see Appendix E for comparative travel distances for truck and rail).

In both cases, DOE concludes that by proper planning and compliance with current Department of Transportation and NRC shipment requirements (including use of pre-approved routes), each shipment of foreign research reactor spent nuclear fuel could be moved expeditiously from each port to each management site, and specific distance and time considerations do not serve to usefully discriminate against ports in the contiguous 48 States.

D.1.9 Methodology for Port Selection

The methodology for identifying acceptable ports of entry began with a list of 153 commercial ports throughout the contiguous United States. These ports included the 151 ports that were originally considered in the Urgent Relief Environmental Assessment (DOE, 1994d). The two additional commercial ports are Eddystone, PA, and Fernandina Beach, FL. Also, eight additional military ports in the contiguous United States suggested by the Military Traffic Management Command (MTMC, 1994a) were evaluated. The eight candidate military ports were those believed to routinely handle dry containerized cargoes (largely munitions), on breakbulk, container, and/or roll-on/roll-off vessels. Military ports are subject to extreme fluctuations in port activities as a function of national need. By using the criteria described below, ports that did not meet each DOE mandatory criterion in the sequence were eliminated. Those ports not eliminated at each step of the screening process were then evaluated in the same fashion against the remaining required criteria.

The required screening criteria DOE used to identify potential ports of entry are:

- The ports must have appropriate (routine) experience handling containerized cargo (Criterion 1);
- The ports must offer favorable transits from the open ocean to the selected terminals (Criterion 2);
- The ports must have appropriate facilities for safe receipt, handling, and transhipment of foreign research reactor spent nuclear fuel (Criterion 3);
- The ports must have ready access for intermodal transport (i.e., truck and rail facilities at or close to the selected terminal) (Criterion 4); and
- The human population of the ports and along transportation routes must be low to the extent economically feasible and maximum extent practicable (Criterion 5).

In selecting the final list of seaports from those found acceptable under Criterion 5, DOE applied several desirable port attributes. The potentially most useful of these ports for receipt, handling, and transhipment of foreign research reactor spent nuclear fuel to any of the five DOE management sites, and which also had the highest number of other desirable attributes, were selected for consideration and detailed analysis in the EIS.

D.1.9.1 Criterion 1: Appropriate Port Experience

The first criterion selected is one of the National Defense Authorization Act requirements for using ports with appropriate experience. The criterion is used first because if a port does not currently have appropriate container handling experience, or is unlikely to have this experience during the time period analyzed in this EIS, there is no reason to consider it further. For this screening, commercial ports that handle on the order of at least 20,000 20-ft equivalent units of containerized cargo per year [i.e., any mix

of breakbulk, combination breakbulk/container ships, or self-contained ships that are equivalent to unloading (or loading) a small container vessel every week or two] were selected for further detailed analysis under the remaining criteria.

Because containerized spent nuclear fuel requires no special port experience or facilities specific to the handling of radioactive material, ports were not eliminated from consideration because of lack of such experience or facilities.

This criterion excludes experience in handling bulk liquid cargoes (e.g., oil or petrochemicals) or other bulk cargoes (e.g., grain, coal, etc.) unloaded using special cargo equipment not of the type used for receipt and handling of containerized foreign research reactor spent nuclear fuel shipments. It also excludes ports used primarily by fishing fleets or cruise ship liners.

Ports meeting the appropriate experience requirement would be those where port terminal(s) and operators routinely load and/or unload all types of containerized dry cargoes requiring the same type of handling as containerized spent nuclear fuel (e.g., everything from television sets and machine parts to toxic materials, flammable or explosive cargoes, etc.), or are likely to acquire such experience during the time period analyzed in this EIS (i.e., large cargo or container port expansions or improvements are planned within the next several years). DOE found that the status of commercial port facilities is very dynamic and subject to rapid and unpredictable changes. For example, the Port of San Francisco, CA lost four of its five major container lines to the Port of Oakland, CA early in 1994, and the Port of Morehead City, NC, has gone from on the order of 10,000 containers per year a few years ago to essentially no container service at the present time (DOE, 1994d). Similarly, the Port of Richmond, CA (while it still has two container cranes available and acceptable facilities) no longer receives significant numbers of containers (AAPA, 1994), although that could change in the near future.

This criterion also effectively eliminated ports that have infrequent container/breakbulk ship calls, marginal equipment or facilities, and were less likely to have well-trained and experienced personnel than busier ports during the period analyzed in this EIS (adequacy of ports and facilities for receiving, handling, and transhipping such cargoes will be addressed in Section D.1.9.3).

Out of the original list of 153 commercial candidate ports in the contiguous United States that were discussed earlier (excluding the 29 Great Lakes and upper Mississippi River ports), this screening resulted in the identification of 31 candidate seaports (see Table D-2 and Figure D-1). Many of the rejected ports were associated with oil or other bulk shipments, and were not viable for either breakbulk or container operations. These 31 commercial ports are considered to be reasonably representative of the total population of viable commercial seaports in the contiguous United States. Three of the eight military ports evaluated were found to generally satisfy this criterion, allowing for the cyclical nature of military activities at these ports (see Figures D-1 and D-2 and Table D-3). The acceptable military ports included the Military Ocean Terminal Bay Area in Oakland, CA, and the Naval Weapons Station (NWS) in Concord, CA, as potential West Coast ports of entry, and MOTSU for a potential East Coast port of entry. This criterion screened out all naval bases and shipyards in the contiguous United States because they do not regularly handle containerized cargo from ocean-going vessels in any significant quantity.

There is great uncertainty associated with attempts to project the future of port activities and possible availability for receipt, handling, and transhipment of foreign research reactor spent nuclear fuel. Many of the features and facilities of ports addressed in Criterion 3 are inextricably related to the likelihood that any given port will meet the minimum requirements for "appropriate" experience in the future. Thus, for example, if a specific port lacks adequate facilities and equipment at present, and there is no identifiable intention of improving the port in the future, it is unlikely that the port will develop the appropriate

Table D-2 Commercial Ports with Appropriate Experience Receiving, Handling, and Transhipping Containerized Dry Cargoes[a]

U.S. Seaport	Appropriate Experience	U.S. Seaport	Appropriate Experience	U.S. Seaport	Appropriate Experience
Alameda, CA	No	Gloucester City, NJ	No	Port Angeles, WA	No
Albany, NY	No	Gramercy, LA	No	Port Arthur, TX	No
Alexandria, VA	No	Grays Harbor, WA[c]	No	Port Canaveral, FL	No
Anacortes, WA	No	Green Bay, WI	NA	Port Costa, CA	No
Antioch, CA	No	Gulfport, MS	Yes	Port Everglades, FL	Yes
Ashtabula, OH	NA	Hopewell, VA	No	Port Hueneme, CA	No
Astoria, OR	No	Houston, TX	Yes	Port Manatee, FL[c]	No
Baltimore, MD	Yes	Huntington Beach, CA	No	Port Neches, TX	No
Baton Rouge, LA	NA	Huron, OH	NA	Port Royal, SC	No
Bay City, MI	NA	Jacksonville, FL	Yes	Port San Luis, CA	No
Beaumont, TX[c]	No	Kalama, OR	No	Port Sulfur, LA	No
Bellingham, WA	No	Kenosha, WI	NA	Port St. Joe, FL	No
Benicia, CA	No	La Place, LA	No	Port Townsend, WA	No
Boston, MA	Yes	Lake Charles, LA	Yes	Portland, OR	Yes
Bridgeport, CT	No	Long Beach, CA	Yes	Portland, ME[c]	No
Brownsville, TX	No	Longview, WA[c]	No	Portsmouth, NH[c]	No
Brunswick, GA	No	Lorain, OH	NA	Portsmouth, VA	Yes
Buffalo, NY	NA	Los Angeles, CA	Yes	Providence, RI	No
Burns Harbor, IN	NA	Mandalay Beach, CA	No	Raymond, WA	No
Cambridge, MD	No	Manitowoc, WI	NA	Redwood City, CA	No
Camden, NJ[c]	No	Marcus Hook, PA	No	Reedsport, OR	No
Carlsbad, CA	No	Marine City, MI	NA	Reserve, LA	No
Carpinteria, CA	No	Miami, FL	Yes	Richmond, VA	Yes
Charleston, SC	Yes	Milwaukee, WI	NA	Richmond, CA[c]	No
Chicago, IL	NA	Mobile, AL[c]	No	Rochester, NY	NA
Cleveland, OH	NA	Morehead City, NC	No	Sacramento, CA	No
Conneaut, OH	NA	Moss Beach, CA	No	Saginaw, MI	NA
Coos Bay, OR	No	Muskegon, MI	NA	San Diego, CA[c]	No
Corpus Christi, TX[c]	No	New Bedford, MA	No	San Francisco, CA	Yes
Crescent City, CA	No	New Haven, CT	No	Sandusky, OH	NA
Crockett, CA	No	New London, CT	No	Savannah, GA	Yes
Delaware City, DE	No	New Orleans, LA	Yes	Searsport, ME	No
Detroit, MI	NA	New York, NY[b]	Yes	Seattle, WA	Yes
Duluth, MN	NA	Newport News, VA	Yes	Sheboygan, WI	NA
Eddystone, PA	Yes	Newport, OR	No	Stockton, CA	No
Edmonds, WA	No	Norfolk, VA	Yes	Superior, WI	NA
El Segundo, CA	No	Oakland,CA	Yes	Tacoma, WA	Yes
Erie, PA	NA	Ogdensburg, NY	NA	Taft, LA	No
Essexville, MI	NA	Olympia, WA	No	Tampa, FL[c]	No
Estero Point, CA	No	Orange, TX	No	Texas City, TX	No
Eureka, CA	No	Ostrica, LA	No	Toledo, OH	NA
Everett, WA	No	Oswego, NY	NA	Uncle Sam, LA	No
Fairport Harbor, OH	NA	Palm Beach, FL	Yes	Vallejo, CA	No
Fall River, MA	No	Panama City, FL	No	Vancouver, WA[c]	No
Ferndale, WA	No	Pascagoula, MS	No	Venice, LA	No
Fernandina Beach, FL	Yes	Paulsboro, NJ	No	Ventura, CA	No
Freeport, TX	Yes	Pensacola, FL	No	Willapa Bay, WA	No
Friday Harbor, WA	No	Philadelphia, PA	Yes	Wilmington, DE	Yes
Galveston, TX	Yes	Pilottown, LA	No	Wilmington, NC	Yes
Gaviota, CA	No	Pittsburgh, CA	No	Winslow, WA	No
Georgetown, SC	No	Point Wells, WA	No (Closing)		

[a] *For possible use by breakbulk, container, Roll-on/Roll-off or combination vessels. No Great Lakes ports or ports far up the Mississippi River were evaluated in detail because of the unacceptably long transits on crowded inland waterways or need for additional intermodal transfers (listed as "not applicable" or NA).*

[b] *Includes the preferred terminal at Elizabeth, NJ.*

[c] *Does have limited dry cargo facility; could acquire appropriate experience during 10 to 15-years.*

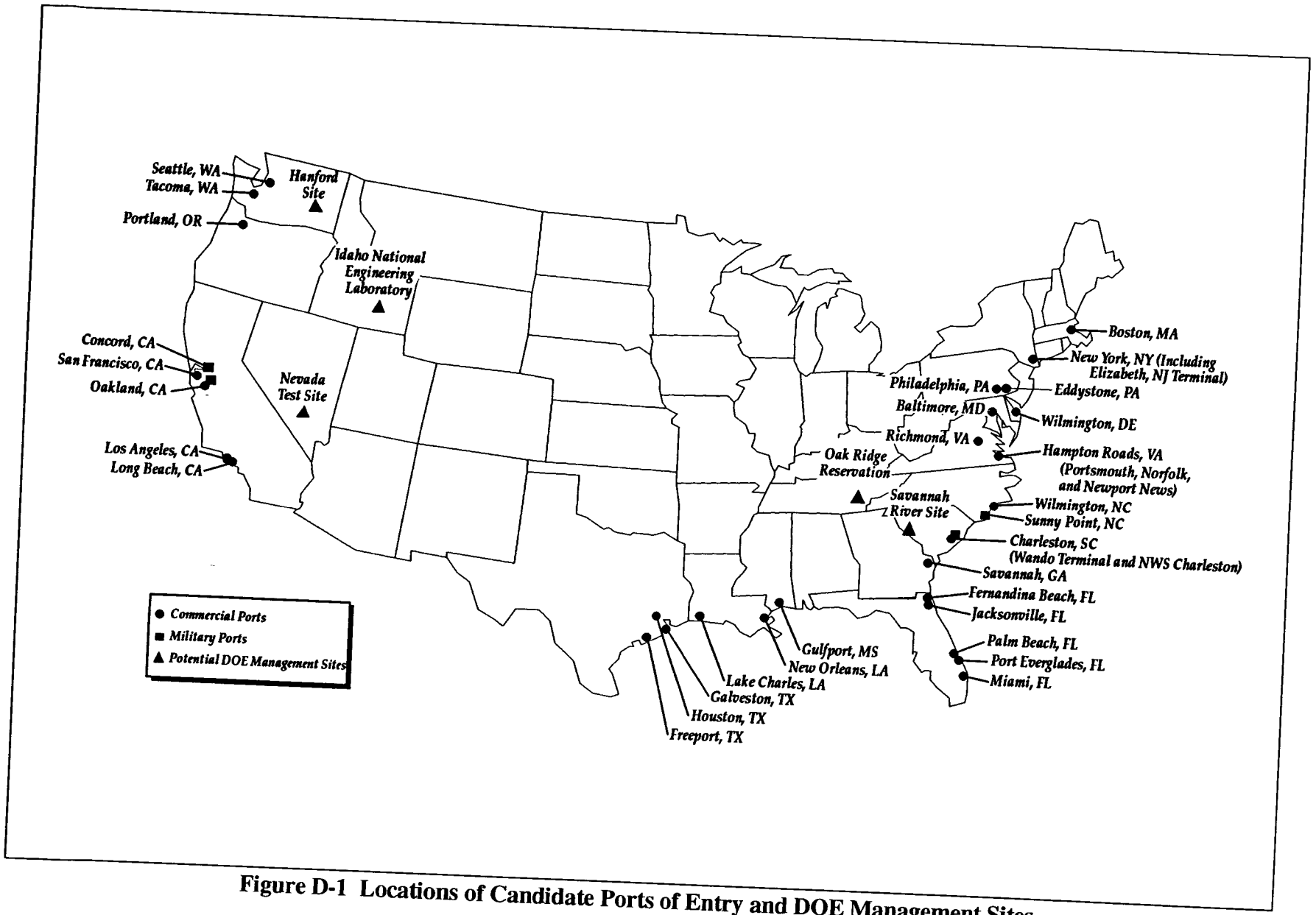


Figure D-1 Locations of Candidate Ports of Entry and DOE Management Sites

1 Appropriate Port Experience:

- Ports routinely handle containerized cargo (at least 20,000 TEUs/yr)

a. Accepted 31 Commercial Ports:

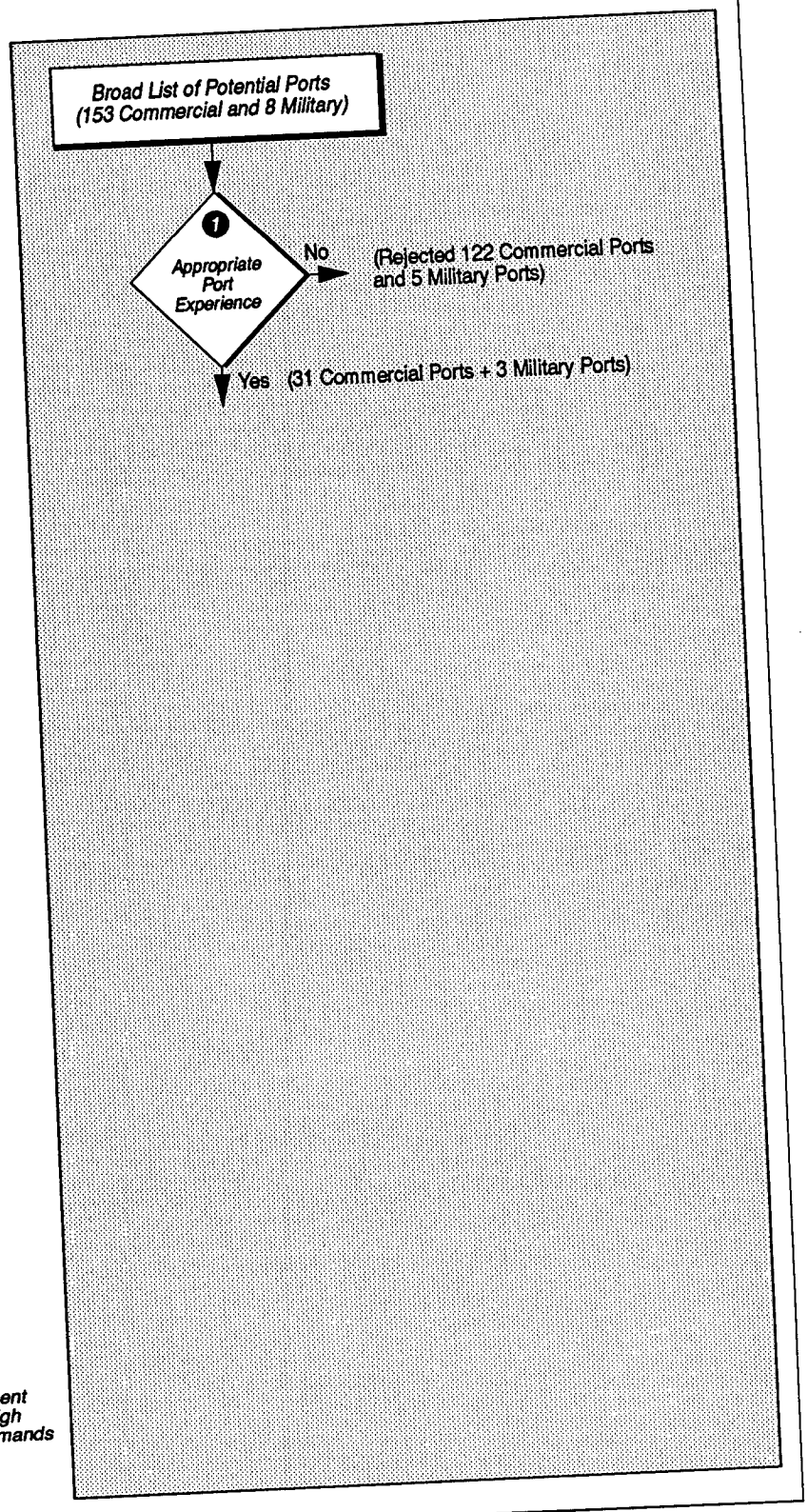
Baltimore, MD*
Boston, MA
Charleston, SC
Eddystone, PA*
Elizabeth, NJ
Fernandina Beach, FL
Freeport, TX
Galveston, TX
Gulfport, MS
Houston, TX
Jacksonville, FL
Lake Charles, LA
Long Beach, CA
Los Angeles, CA
Miami, FL
Newport News, VA*
New Orleans, LA
Norfolk, VA*
Oakland, CA*
Palm Beach, FL
Philadelphia, PA
Port Everglades, FL
Portland, OR*
Portsmouth, VA*
Richmond, VA
San Francisco, CA
Savannah, GA*
Seattle, WA
Tacoma, WA
Wilmington, DE
Wilmington, NC

*b. Accepted 3 Military Ports**:*

Military Ocean Terminal
Sunny Point, NC*

Military Ocean Terminal
Oakland, CA

Naval Weapons Station
Concord, CA



** Database indicates Port has handled SNF or other Type B cask shipments*

*** Military ports meet 20,000 TEU requirement on a periodic basis, but cycle between high and low work loads based on military demands*

Figure D-2 Screening Ports with Appropriate Experience Criterion

Table D-3 Military Ports with Appropriate Experience Receiving, Handling, and Transhipping Containerized Dry Cargoes

U.S. Military Port	*Appropriate Experience*[a]
Bayonne, NJ (Military Ocean Terminal)	No
Cheatham Annex, VA (Navy)	No
Concord, CA (Naval Weapons Station)	Yes
Kings Bay, GA (Submarine Base)	No
Oakland, CA (Military Ocean Terminal)	Yes
Port Hueneme, CA (Naval Construction Battalion Center)	No
Sunny Point, NC (Military Ocean Terminal, MOTSU)	Yes
Yorktown, VA (Naval Weapons Station)	No

[a]*Military ports meet 20,000 twenty-foot equivalent units/yr requirement on a periodic basis and retain a corp of experienced port workers.*

Sources of information include: MTMCTEA, 1992 (Bayonne, NJ); MTMC, 1994a (Cheatham Annex, VA); Yocum, 1994a and 1994b (Concord, CA); FHI, 1993b (Kings Bay, GA); MTMC, 1994b; MTMCTEA, 1990 (Port Hueneme, CA); DOE, 1994d (Sunny Point, NC); and FHI, 1994a (Yorktown, VA).

experience required during the period analyzed in this EIS. As a result, DOE searched the available literature and scanned port-specific information from a number of sources (including direct discussions with numerous port officials) to identify planned future port improvements to see if that information could be used to tentatively increase the number of potential ports in subsequent port screenings for other necessary criteria. The results of this review are addressed further in Attachment D1 to this appendix. The basic finding was that all identifiable future port improvements were generally being made in ports that already meet the appropriate experience criterion (also see Attachment D1 to this appendix for projected port improvements that have been identified). As a result, that test for potential future port utilization did not yield any additional ports for subsequent screening.

On the other hand, DOE also found that some ports already have adequate facilities, but for one reason or another have been unable to attract enough container shipments to ensure a reasonable core of experienced workers (e.g., Port of Richmond, CA). In such cases, future projections are extremely uncertain, since there is no way of knowing whether ports will be successful in marketing new business opportunities in the future. As a result, DOE concluded that there was no useful purpose served in keeping these ports in the list for subsequent screening.

D.1.9.2 Criterion 2: Favorable Transit From Open Ocean

This criterion was based on recommendations from the U.S. Merchant Marine Academy Workshop participants who found that a short transit from the open ocean to port was necessary to maximize the safety of shipments of spent nuclear fuel (USMMA, 1994). However, it is clear that since this criterion focuses on ship safety, it is essentially synonymous with the requirement for a favorable ship transit from the open ocean to the port. Thus, while a port might be within a few miles of the open sea, if there were numerous hard shoals, ship wrecks, or reefs along the ship channel, this port might be less desirable than other ports with longer but less risky transits. On the other hand, ports that can only be reached by transporting spent nuclear fuel through long, narrow, winding, or crowded ship channels present additional risks that can be avoided by using ports that are easier to reach.

As a result, DOE concluded that ports meeting the intent of this criterion would have relatively short trips to port from large, deep bodies of water that were either oceans, seas, or notable extensions thereof, such as large bays or sounds (e.g., Chesapeake Bay, San Francisco Bay, or Puget Sound), and which present no

special navigational hazards to ships (including adequate width and depth of water in ship channels). A minimum channel depth (mean low water) of 7.6 m (25 ft) was selected to permit use by at least small to intermediate size vessels.

Less desirable were potential ports that could only be reached by traversing long, narrow and/or winding, or crowded ship channels [e.g., the St. Lawrence seaway to a Great Lakes port or the long passage up the Galveston/Houston ship channel to Houston (which is crowded by oil tankers in the channel and numerous petroleum and petrochemical plants along the channel that could impact on ship safety in the event of a plant or pipeline accident)].

Reliable data on risks associated with transits are difficult to find. In 1991, the U.S. Coast Guard established a national database on ship accidents. The 46 Code of Federal Regulations (CFR) §4.05-1 defines reportable accidents as those events that (1) leave a vessel damaged and presenting a navigational hazard (e.g., loss of propulsion or steering) or affect seaworthiness, (2) cause damage in excess of $25,000, or (3) result in serious injury or loss of life. Included in the database are allisions (single ship collisions with fixed structures such as buoys, docks, or bridges), collisions (between two vessels while under power), hard groundings (where a vessel cannot free itself), and fires onboard cargo vessels due to other accidents (USCG, 1994a and 1994b). However, since these accident statistics are not comprehensive and include barge accidents in addition to those involving ocean-going vessels, it is difficult to provide sound and reliable estimates of accident frequencies and types per transit to port.

Using all of the information currently available that pertains to analysis of this criterion, DOE found that the Ports of Richmond VA, New Orleans and Lake Charles, LA, and Houston, TX do not meet the criteria for receipt of foreign research reactor spent nuclear fuel at this time.

As shown in Table D-4 and Figure D-3, application of this criterion resulted in the retention of 27 commercial seaports and three military ports for further analysis.

D.1.9.3 Criterion 3: Appropriate Port Facilities

The National Defense Authorization Act requires the use of ports with "appropriate port facilities" that allow safe handling of foreign research reactor spent nuclear fuel. The U.S. Merchant Marine Academy Workshop recommended as "necessary for safe shipment" that an acceptable port have "adequate port cargo facilities," which included (1) berthing options (e.g., so that conflicting activities at an adjacent berth or onshore could be avoided if necessary), and (2) onsite cranes with trained operators (while it was recognized that ports without cranes could use other means to offload a vessel, the panel preferred ports with cranes).

Thus, port facilities must possess the following minimum physical attributes: (1) adequate water depths alongside piers [at least 7.6 m (25 ft) was selected for this screening] for docking at least small to intermediate-sized vessels, (2) adequate wharfs and quays, with berthing options (in case a potential for conflicting operations exists near the berth of choice), for securing vessels and safely offloading, and carrying the necessary spent nuclear fuel loads, and (3) at least one adequate crane for offloading containerized spent nuclear fuel onto ground transport [at least a 30 metric ton (33 ton) capacity crane was selected for this screening].

While many small ports have cranes with large lift capacities [100 metric tons (110 tons) or more], they are not purpose-built container cranes and must use special container spreaders for use with containers. Although the U.S. Merchant Marine Academy Workshop found it "desirable" for a port to have an adequate purpose-built container crane available, participants determined it was unnecessary to have one.

Table D-4 Required Maritime Transit Criterion for Selection of Seaports for Foreign Research Reactor Spent Nuclear Fuel Shipments

Seaports	Distance from Open Sea (km)[a]	Favorable Transit
Commercial		
Baltimore, MD	240	Yes
Boston, MA	12	Yes
Charleston, SC	11	Yes
Eddystone, PA	120	Yes
Elizabeth, NJ	18	Yes
Fernandina Beach, FL	15	Yes
Freeport, TX	6	Yes
Galveston, TX	16	Yes
Gulfport, MS	30	Yes
Houston, TX	71	No
Jacksonville, FL	11	Yes
Lake Charles, LA	52	No
Long Beach, CA	4	Yes
Los Angeles, CA	5	Yes
Miami, FL	5	Yes
Newport News, VA	40	Yes
New Orleans, LA	160	No
Norfolk, VA	35	Yes
Oakland, CA	15	Yes
Palm Beach, FL	6	Yes
Philadelphia, PA	130	Yes
Port Everglades, FL	2	Yes
Portland, OR	140	Yes
Portsmouth, VA	40	Yes
Richmond, VA	190	No
San Francisco, CA	19	Yes
Savannah, GA	24	Yes
Seattle, WA	5	Yes
Tacoma, WA	5	Yes
Wilmington, DE	100	Yes
Wilmington, NC	38	Yes
Military		
NWS Concord, CA	60	Yes
MOTBA, CA	15	Yes
MOTSU, NC	16	Yes

[a]*To convert distance to miles, divide by 1.6.*

Thus, while it is preferable to avoid any additional risks associated with the use of general purpose cranes (even though small) by using terminals with equipment designed to handle containerized cargo (an alternative to port container cranes might be the use of combination breakbulk/container vessels with shipboard container cranes that are generally operated by trained and experienced port stevedores), a purpose-built container crane was not determined to be necessary to satisfy this criterion. Military ports also represent a special case, since most do not have such purpose-built container cranes, and use a container spreader attachment when necessary.

❷ *Favorable Transit to Port:*

- Port within reasonable distance from the open sea, with favorable transit

a. Accepted 27 Commercial Ports:

Baltimore, MD
Boston, MA
Charleston, SC
Eddystone, PA
Elizabeth, NJ
Fernandina Beach, FL
Freeport, TX
Galveston, TX
Gulfport, MS
Jacksonville, FL
Long Beach, CA
Los Angeles, CA
Miami, FL
Newport News, VA
Norfolk, VA
Oakland, CA
Palm Beach, FL
Philadelphia, PA
Port Everglades, FL
Portland, OR
Portsmouth, VA
San Francisco, CA
Savannah, GA
Seattle, WA
Tacoma, WA
Wilmington, DE
Wilmington, NC

b. Accepted 3 Military Ports:

Military Ocean Terminal
Sunny Point, NC

Military Ocean Terminal
Oakland, CA

Naval Weapons Station
Concord, CA

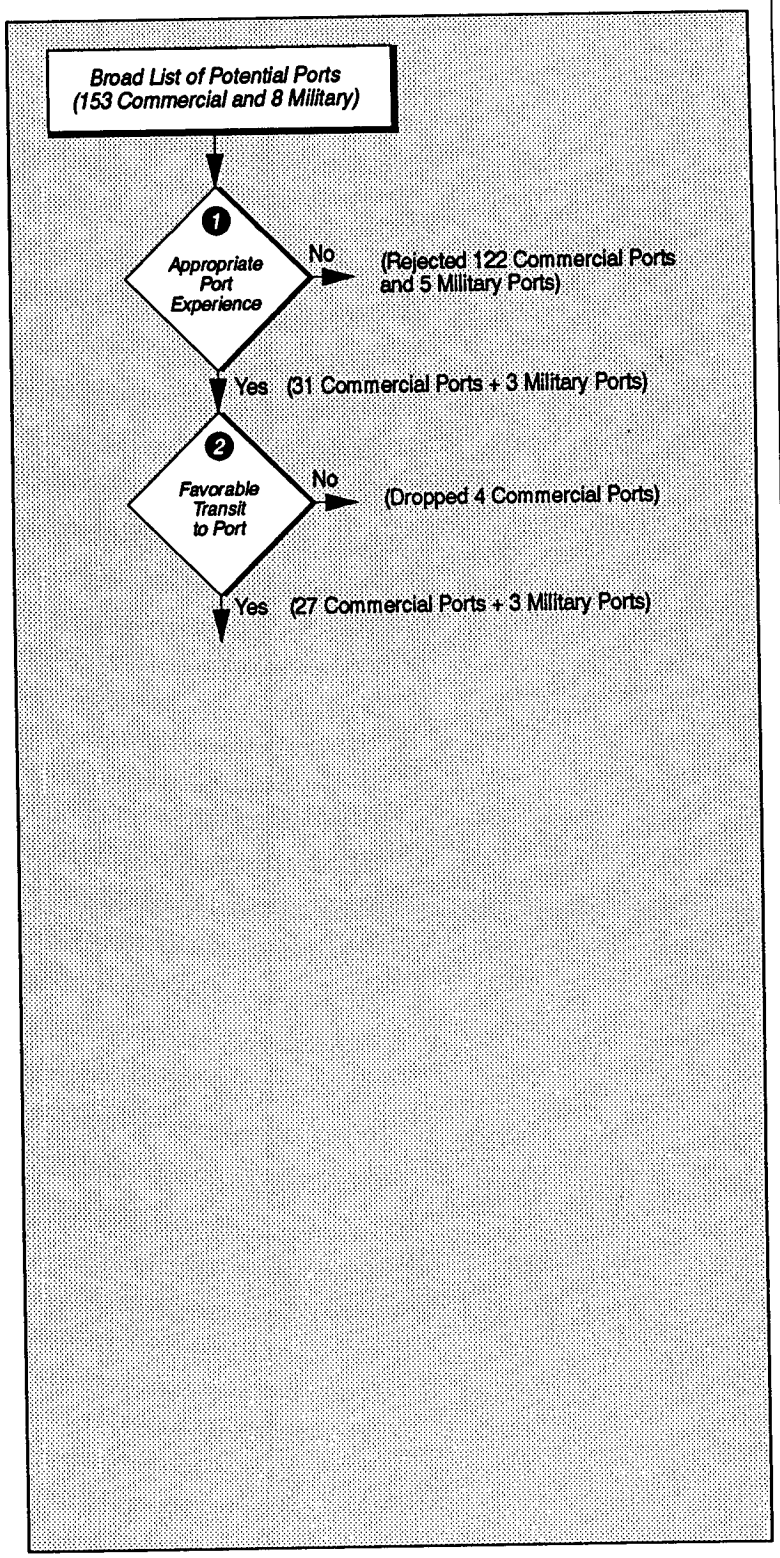


Figure D-3 Screening Ports for Favorable Transit Criterion from Sea to Port

Because containerized spent nuclear fuel requires no special port experience or facilities specific to the handling of radioactive material, ports were not eliminated from consideration because of lack of such experience or facilities.

As noted earlier, there is no reasonable way of determining the future likelihood that currently marginal ports that already have adequate facilities (but simply lack "appropriate experience") will acquire such experience. It depends totally on whether the ports will be able to induce shipping lines to use their facilities. In the area of appropriate facilities, however, there is much less uncertainty in making such determinations, since the planning process for port improvements must be made years in advance in order to allow time for land acquisition, funding, and other approvals before such improvements can be made. Therefore, those ports that have current plans for improvements that might permit their consideration for purposes of this EIS are much easier to identify. As a result, available information relating to future port improvements was studied carefully. Ports with substantial identified improvements or developments during the period analyzed in this EIS include: Baltimore, MD; Boston, MA; Charleston, SC; Fernandina Beach, FL; Gulfport, MS; Jacksonville, FL; San Francisco, CA; Oakland, CA; Long Beach, CA; Naval Weapons Station Concord, CA; Los Angeles, CA; Miami, FL; Mobile, AL; New Orleans, LA; Norfolk, VA; Philadelphia, PA; Port Everglades, FL; New York, NY; Portland, OR; Savannah, GA; Seattle and Tacoma, WA; and Wilmington, DE. Details on these improvements are shown in Attachment D1 to this appendix. All of these ports (except Mobile, AL) currently have both adequate experience and facilities without further improvements. Therefore, no additional ports were identified for foreign research reactor spent nuclear fuel receipt in the future. (Mobile, AL will meet the requirement for experience if it approximately doubles its current container business in the future, but that is too speculative to be useful at this time).

In addition to physical attributes of port facilities, public safety also depends on the reliability of the personnel operating the facilities. In addition to port accidents related to a failure of the container-handling equipment, human error can also increase risks of accidents. The U.S. Merchant Marine Academy Workshop identified the skill of the labor force at a port as an important (but not mandatory) criterion.

While the U.S. Merchant Marine Academy Workshop preferred ports with cranes, it also considered the use of roll-on/roll-off vessels, but preferred the use of other vessels for a number of reasons. Although roll-on/roll-off is not as likely to be used for spent nuclear fuel shipments as conventional cargo vessels due to costs, availability, and other factors, such vessels require only adequate water depths and appropriate piers to receive foreign research reactor spent nuclear fuel. As a result, the presence of roll-on/roll-off facilities is noted in Section D.2 in the detailed discussions of potential ports, but was not considered an adequate sole basis for port selection.

Several related "desirable" attributes for port facilities were recommended by the U.S. Merchant Marine Academy Workshop or identified during the port analyses. These attributes which would contribute to a port having "appropriate facilities," but were not required for safe receipt, handling, and transhipment of spent nuclear fuel include: (1) secure short-term storage areas (in the event of unexpected events such as snow or icing of roads), (2) the existence of emergency planning and training, (3) the absence of environmentally sensitive areas in port or local restrictions on movement of spent nuclear fuel, (4) the absence of conflicting uses (e.g., explosives, petroleum, tourism), and (5) minimal likelihood of severe natural phenomena impacting port activities (such as high winds from hurricanes, floods, earthquakes, volcanoes). These desirable port attributes are used in final port selection in Section D.1.8.5, and are discussed for each port in Section D.2.

In applying the DOE criteria, it became evident that the majority of the ports that met the first required screening criterion (Appropriate Port Experience) also met these requirements. Application of the Appropriate Facility Criterion retained 25 commercial ports and three military seaports for further analysis. Two commercial ports, Freeport, TX and Palm Beach, FL were dropped due to the application of this criterion. The results of this screening are summarized in Figure D-4.

D.1.9.4 Criterion 4: Ready Access to Intermodal Transportation

A U.S. Merchant Marine Academy Workshop criterion determined to be necessary for safe shipment of spent nuclear fuel was "intermodal access", which means "ready access from a port" to truck and rail routes. It is becoming common practice for ports with intermodal transfer facilities to carry off-loaded containers on special port-owned container handling equipment to a marshalling yard adjacent the terminal, where the containers are loaded onto trucks or rail for shipment to the consignee. Such transfers tend to minimize traffic congestion at shipside by using experienced port personnel and specialized port equipment. These intermodal transfers are increasingly accomplished with purpose-built container handling equipment (straddle carriers, sidelifts, front-end loaders, stackers, and container forklifts) that require no additional workmen for container handling. Given that the handling is done very rapidly and securely by a single operator, the opportunities for additional worker exposures or serious accidents are minimized. Moving a container from a pier to a marshalling area a few kilometers more distant than one at a terminal has little significance with regard to either worker exposure or public risk (see, for example, container handling equipment in Jane's, 1992).

DOE found that most of the potential ports accepted under the three preceding required criteria also had good access to interstate highways and rail transport. However, smaller ports and most military ports with more limited facilities could also accept containerized spent nuclear fuel from combination breakbulk/container vessels or roll-on/roll-off vessels. These ports often have limited intermodal capabilities for rail in the immediate vicinity of a pier, but the spent nuclear fuel could be trucked to a rail area (often a few miles or less) for loading on a railcar. While these arrangements could involve an additional intermodal transfer, such transfers are typically also done rapidly using special container handling equipment. Therefore, they do not involve significant additional opportunities for worker exposure or accidents than would be the case for movement of foreign research reactor spent nuclear fuel from a pier to an intermodal yard at a large port.

DOE concluded that the lack of an intermodal rail facility immediately at a terminal should not eliminate an otherwise desirable port from further evaluation, if rail access was reasonably close to the port (e.g., container cargo from the Wando Terminal in Charleston, SC, must be trucked a few miles to an intermodal facility in North Charleston for transfer to rail). All ports evaluated have acceptable intermodal access for trucks, although smaller ports typically do not have dedicated truck routes for access to interstates, and may require short transports through sometimes congested local traffic to reach the interstate highway system. This apparent conflict between requirements for ready intermodal access at ports and the National Defense Authorization Act requirement for using ports with the "lowest human populations" has been balanced to permit some small ports with more limited intermodal capabilities to be considered for further screening, since the additional public impacts associated with a few miles' transport through urban populations would be small compared to public impacts associated with transport over hundreds or thousands of miles of the country's Interstate highway system.

Application of the intermodal access criterion resulted in acceptance of 25 commercial seaports and three military ports (i.e., no additional ports were rejected) for further analysis using the remaining DOE criteria. The results of applying this criterion to commercial and military ports are shown in Figure D-5. Details regarding intermodal access are addressed in each port description in Section D.2.

❸ *Appropriate Facilities:*

- Adequate crane(s), piers, depth of water alongside, etc.

a. Accepted 25 Commercial Ports:

Baltimore, MD
Boston, MA
Charleston, SC
Eddystone, PA
Elizabeth, NJ
Fernandina Beach, FL
Galveston, TX
Gulfport, MS
Jacksonville, FL
Long Beach, CA
Los Angeles, CA
Miami, FL
Newport News, VA
Norfolk, VA
Oakland, CA
Philadelphia, PA
Port Everglades, FL
Portland, OR
Portsmouth, VA
San Francisco, CA
Savannah, GA
Seattle, WA
Tacoma, WA
Wilmington, DE
Wilmington, NC

b. Accepted 3 Military Ports:

Military Ocean Terminal
Sunny Point, NC

Military Ocean Terminal
Oakland, CA

Naval Weapons Station
Concord, CA

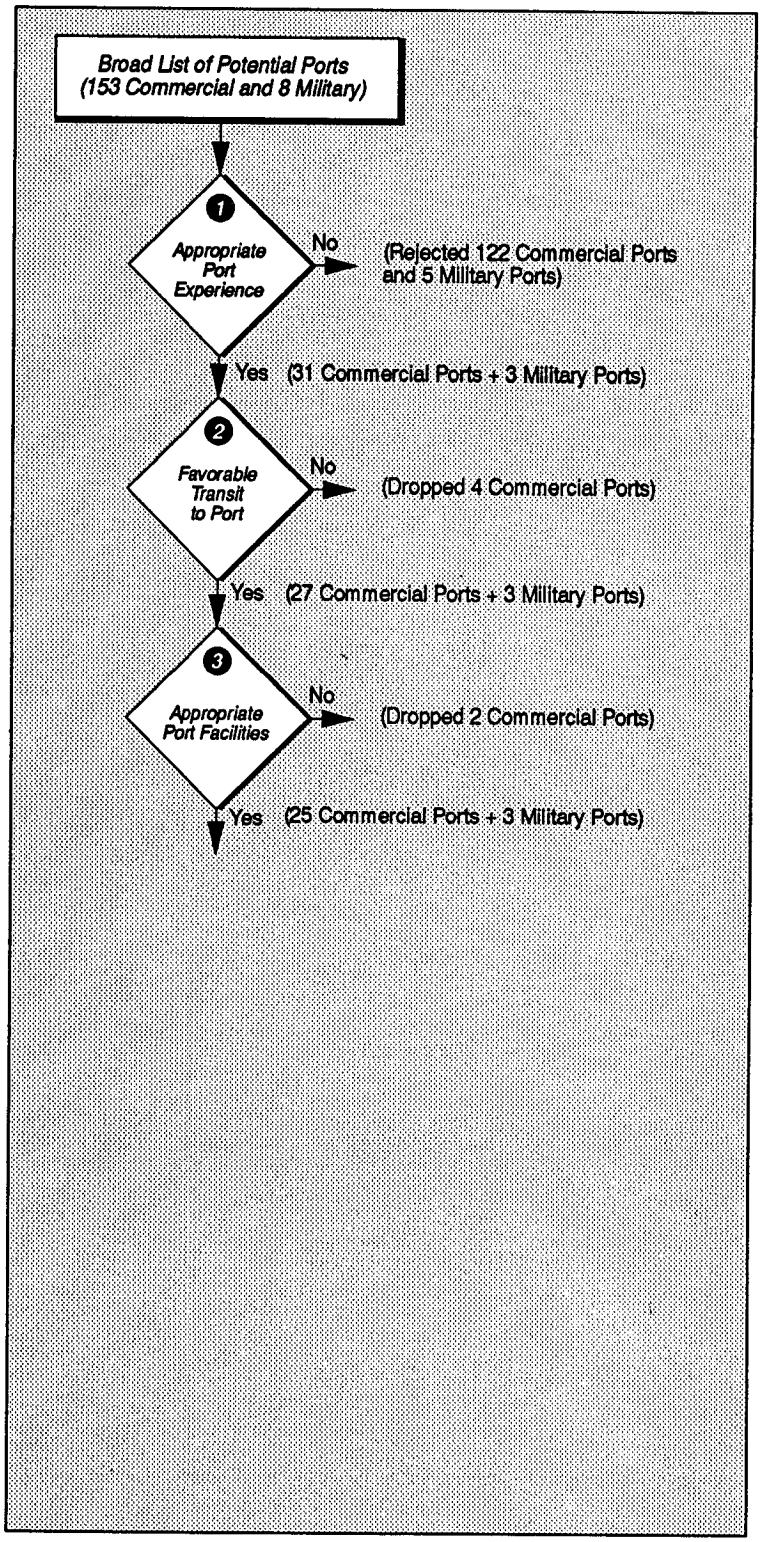


Figure D-4 Screening Ports with Appropriate Facilities Criterion

4 *Intermodal Access:*

a. Accepted 25 Commercial Ports (SRS and ORNL unless otherwise specified):

Baltimore, MD
Boston, MA
Charleston, SC
Eddystone, PA
Elizabeth, NJ
Fernandina Beach, FL
Galveston, TX
Gulfport, MS
Jacksonville, FL
Long Beach, CA
Los Angeles, CA
Miami, FL
Newport News, VA
Norfolk, VA
Oakland, CA
Philadelphia, PA
Port Everglades, FL
Portland, OR
Portsmouth, VA
San Francisco, CA
Savannah, GA
Seattle, WA
Tacoma, WA
Wilmington, DE
Wilmington, NC

b. Accepted 3 Military Ports:

Military Ocean Terminal
Sunny Point, NC

Military Ocean Terminal
Oakland, CA

Naval Weapons Station
Concord, CA

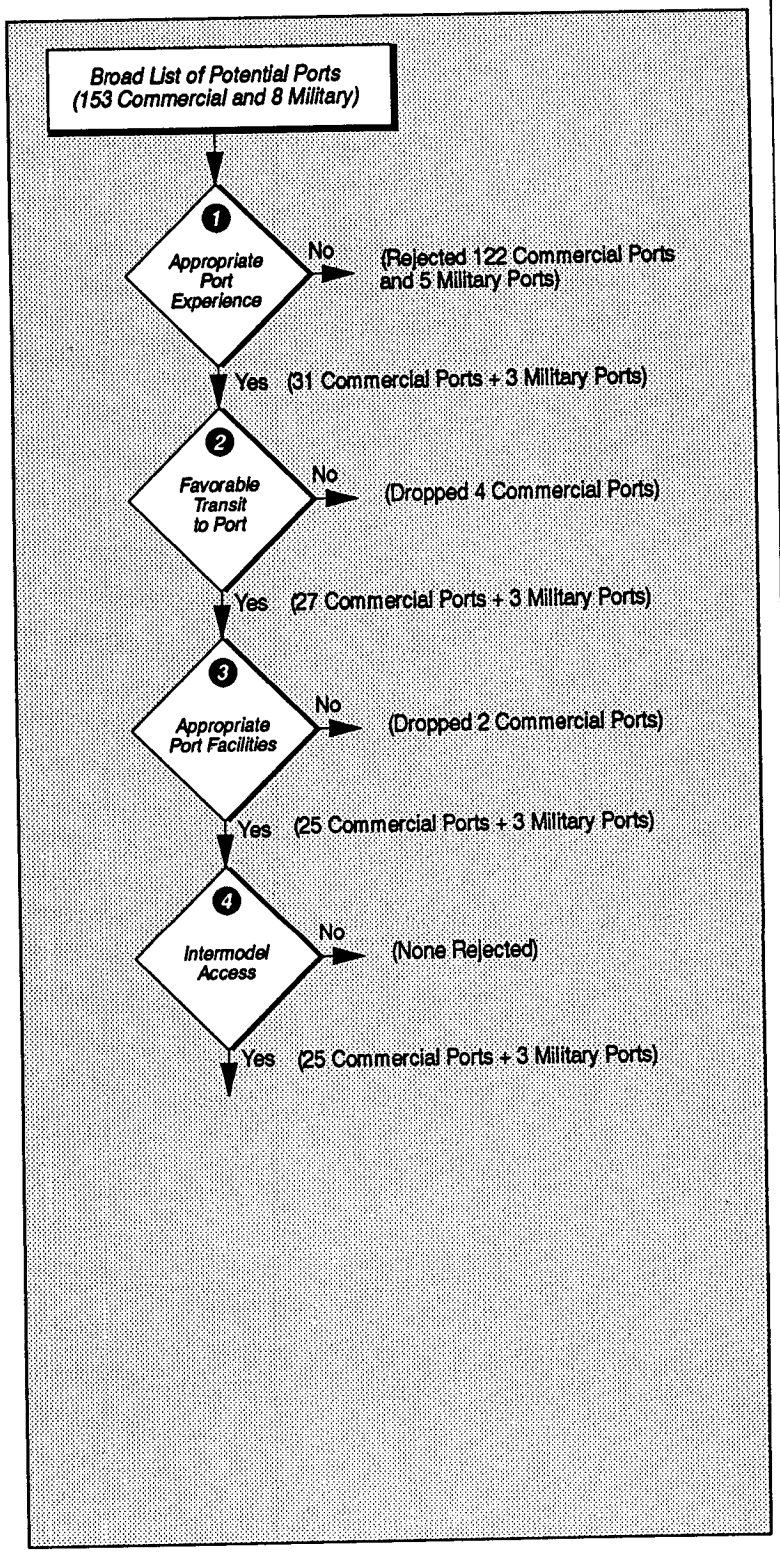


Figure D-5 Screening Ports for Ready Access to Intermodal Transportation

D.1.9.5 Criterion 5: Human Populations

While only dealing with foreign research reactor spent nuclear fuel shipments bound for the Savannah River Site, the Federal court ruling discussed in Section D.1.3 indicates that the courts consider port populations to be an important ingredient in the National Environmental Policy Act (NEPA) process for assessing the range of reasonable port alternatives.

NEPA requires that DOE consider a range of reasonable alternatives for potential ports of entry. On the other hand, the National Defense Authorization Act port selection factors required that, if economically feasible and to the maximum extent practicable, ports of entry for foreign research reactor spent nuclear fuel bound for the Savannah River Site have the lowest human populations in the area surrounding the port. While the National Defense Authorization Act was written specifically to regulate the receipt and storage of foreign research reactor spent nuclear fuel at the DOE's Savannah River Site, DOE elected to apply this criterion in identifying ports of entry for all five potential sites, to the maximum extent practicable.

DOE has considered a number of potential definitions of "lowest human populations" and resulting models that might be used to satisfy the National Defense Authorization Act lowest population factor (NDAA, 1993). These include using the same approach used in the Urgent Relief Environmental Assessment (DOE, 1994d), and variations that might be useful for identifying ports for inclusion in this EIS. A description of the various approaches that were considered are provided in Attachment D3 to this appendix.

As shown in the Urgent Relief Environmental Assessment (DOE, 1994d) and this EIS (Chapter 4), public risk is driven not only by port populations, but by the populations within the immediate proximity of truck and rail shipments from each port to each management site. For each selected port and each selected mode of overland transport (truck or rail), the total "affected" population represents a unique population surrounding the port plus those along the transport route to each of the five potential DOE management sites. DOE considered the affected populations outside the immediate port vicinity along the routes to the management sites to be as important for protection of public health and safety as those within the vicinity of the port terminals, for both incident-free transport and a range of potential accidents.

DOE evaluated port populations within the radii of three distances: 1.6 kilometers (km) [1 mile (mi)], 8.0 km (5 mi), and 16 km (10 mi). These populations are shown in Table D-5. DOE expects that the 1.6 km (1 mi) radius population would include resident members of the public immediately outside the port who would be the most likely to be affected by severe accidents and incident-free impacts. In addition, the radioactivity, which is hypothesized to be released from a very severe accident (long-term fire leading to severe cask damage), would be lofted high into the air and would not normally produce peak ground-level air concentrations until well outside the 1.6 km (1 mi) radius. Therefore, the 1.6 km (1 mi) population was not considered adequate to reflect the population criterion.

The population within a 16 km (10 mi) radius was selected to be consistent with the results of analyses of severe hypothetical accidents described in Section D.5 of this appendix. For severe accidents in ports, the maximum radiation dose to an individual located 16 km (10 mi) from the port is typically much lower than the dose to the maximally exposed individual. However, analyses of the potential impacts of severe accidents in a range of port populations show that the average dose to members of the public within a 16 km (10 mi) radius of the port is higher than the average per capita dose for any of the larger radii around the port for typical (i.e., 50th percentile) meteorology and typical dry deposition and fallout patterns. Further, as discussed in section D.5.4, most of the population dose for even severe accidents occurs within the 16 km (10 mi) radius. Less energetic accident scenarios would cause less dispersion and

Table D-5 Total Populations within Three Distances of Selected U.S. Ports

Name of the Port	*Within 1.6 km (1 mi)*	*Within 8 km (5 mi)*	*Within 16 km (10 mi)*
NWS Concord, CA	14	71,152	381,070
MOTSU, NC	21	960	7,995
Tacoma, WA	94	172,124	511,575
Portland, OR	280	69,039	356,064
Elizabeth, NJ	378	596,076	3,223,038
MOTBA, CA	419	312,133	1,288,699
Jacksonville, FL	523	72,313	334,212
Seattle, WA	557	270,145	753,296
Wilmington, DE	753	166,165	381,502
Gulfport, MS	761	50,218	113,153
Baltimore, MD	818	352,730	1,182,024
Savannah, GA	860	30,845	155,166
Long Beach, CA	1,025	270,336	1,014,418
Charleston, SC	1,550	81,874	233,424
Oakland, CA	1,901	296,661	1,387,611
Miami, FL	2,043	251,551	833,057
Fernandina Beach, FL	2,086	11,787	32,952
Portsmouth, VA	2,554	269,314	665,700
Newport News, VA	2,637	86,993	430,757
Wilmington, NC	2,690	60,308	115,057
Los Angeles, CA	2,918	362,397	1,124,493
Norfolk, VA	2,982	227,290	681,864
Boston, MA	3,084	495,679	1,466,233
Port Everglades, FL	3,927	175,320	714,176
Philadelphia, PA	5,878	50,687	1,915,775
Eddystone, PA	6,179	204,969	827,564
Galveston, TX	8,115	49,175	73,322
San Francisco, CA	9,671	592,869	1,265,529

even smaller doses beyond 16 km (10 mi). Therefore, DOE selected the 16 km (10 mi) radius population to represent the port populations most likely to be impacted by both incident-free transport and the entire range of potential port accidents.

It should be noted that while the populations within the 16 km (10 mi) radius include the populations within 0.8 km (0.5 mi) of the transportation route out to 16 km (10 mi) from the port and result in some double-counting of populations, the results provide only somewhat conservative estimates of the total affected population for each port/management site combination considered.

The populations along truck and rail routes are those computed in Appendix E for the transportation analysis impacts for incident-free transportation.

In summary, this evaluation considered the following population factors:

- Total 1990 Census population within a 16 km (10 mi) radius of the port facilities, and
- Total 1990 Census population within 0.8 km (0.5 mi) of the transport route that would be exposed during transport (from each port to each of the potential DOE management sites).

The statistical distribution of these combined populations for truck transport is shown in Figure D-6. The distribution exhibits some skewing due to a few very large port/site populations, such as around Boston, MA and Elizabeth, NJ. The statistical distribution of combined populations for rail transport is shown in Figure D-7, and again exhibits some skewing due to a few very high population ports. These port/site populations are not clearly normal and are better fit by a Poisson (so-called rare event) distribution, which is often the case for small sample sizes. However, for purposes of developing a systematic and fair method (i.e., one with minimal subjectivity) for evaluating port/site populations, DOE assumed, given the large uncertainty and variances for the small sample sizes for each port/site combined population, that the combined populations for truck transit and the combined populations for rail transit are approximately normal. The port/site population distributions for each of the five management sites (truck and rail routes) are shown in Figures D-8 through D-17, with the bounds associated with the mean plus and minus one standard deviation marked for reference.

For purposes of identifying an acceptable range of ports of entry for the receipt of foreign research reactor spent nuclear fuel, DOE assumed that port/site population combinations greater than approximately one standard deviation above the mean would not be desirable (i.e., about 84 percent of the port/site populations would exhibit statistically lower populations). Thus, the range of ports would include most of the 28 ports being considered, but avoid the extremely large populations around Boston, MA, Elizabeth, NJ, and Philadelphia, PA.

From the remaining 25 ports, DOE assumed that population combinations below the mean combined population would meet the low population criterion while combined populations above the mean would not. As seen in Figures D-8 through D-17, some unique port/site populations would be acceptable for several potential management sites, while other populations would have very limited utility. The potential usefulness of low population ports in relation to this EIS is addressed in Section D.1.9.6. This screening would result in the elimination of an additional five commercial ports and one military port from the list. These commercial ports are Baltimore, MD, and Long Beach, Los Angeles, Oakland, and San Francisco, CA. The military port is Military Ocean Terminal Bay Area in Oakland, CA. The results of the population screening are summarized in Figure D-18.

As previously discussed, the position of maritime experts (USMMA, 1994) is that all of the ports evaluated under the DOE-developed criteria for populations could safely receive and transhipp foreign research reactor spent nuclear fuel to all five of the potential DOE management sites. Further, the EIS analyses show that the conservatively calculated impacts would be extremely low. The identification of a smaller number of preferred ports of entry is driven by the requirements of the National Defense Authorization Act, not by any significant safety issues.

As promised in the Urgent Relief Environment Assessment, DOE has also considered future population growth near potential port facilities over the time period considered in this EIS. Year 2010 estimates of projected growth from the 1990 census populations were provided by the states hosting the selected ports and other sources where necessary. Population growth patterns in port cities are continuously changing in ways that cannot be accurately forecast 10 or more years into the future. Nevertheless, the projected port populations based on these growth factors were scrutinized to be sure that no unacceptably large growth would occur around the list of ports selected under the DOE "lowest human population" criterion. The port growth factors used for projecting potential future impacts of port accidents are summarized in Attachment D2 to this appendix, and were used to make final port selections, where appropriate, as discussed in the next section.

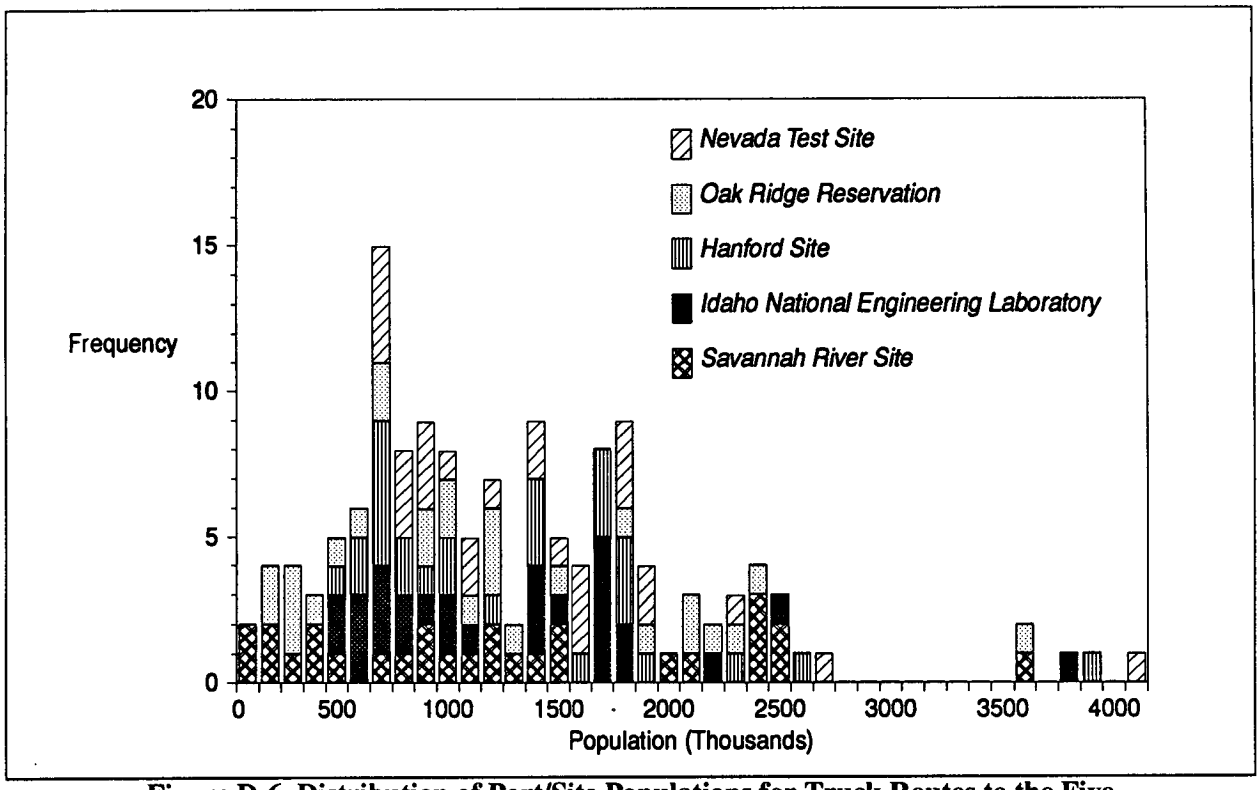


Figure D-6 Distribution of Port/Site Populations for Truck Routes to the Five Management Sites

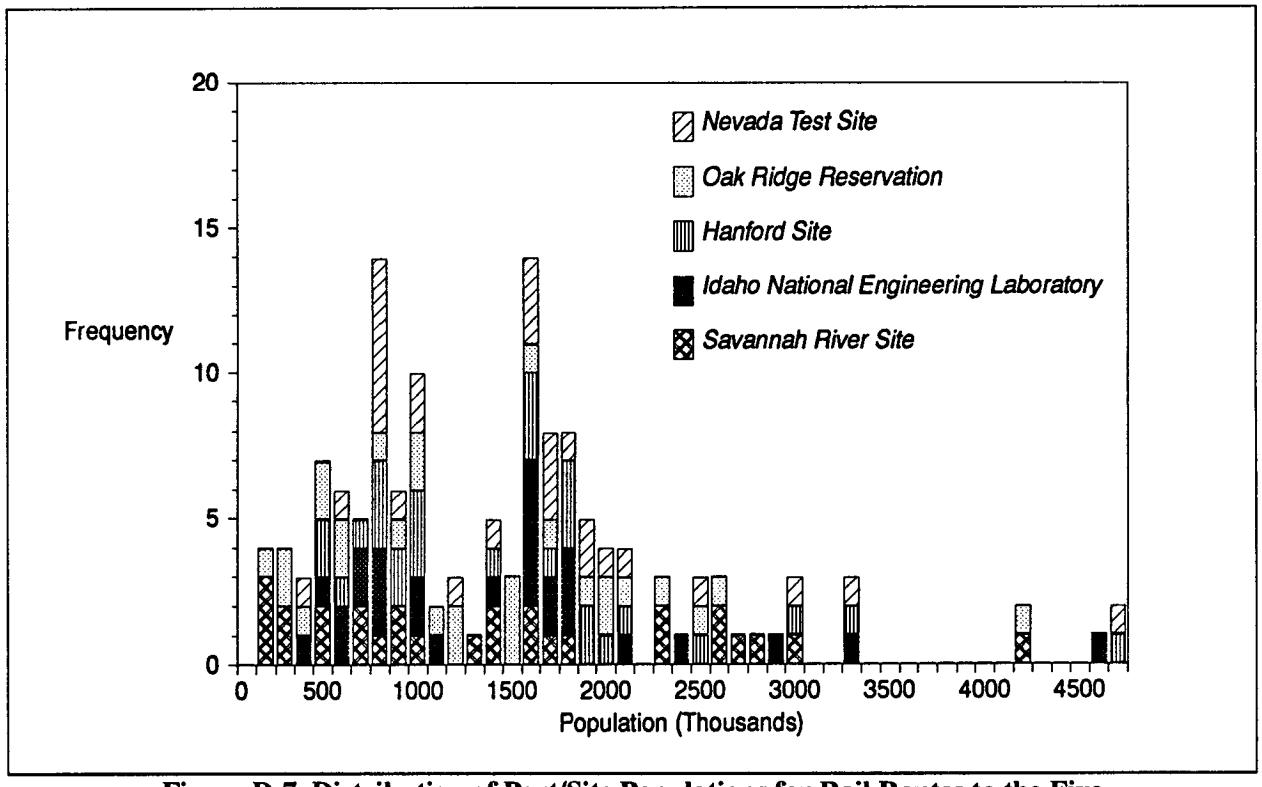


Figure D-7 Distribution of Port/Site Populations for Rail Routes to the Five Management Sites

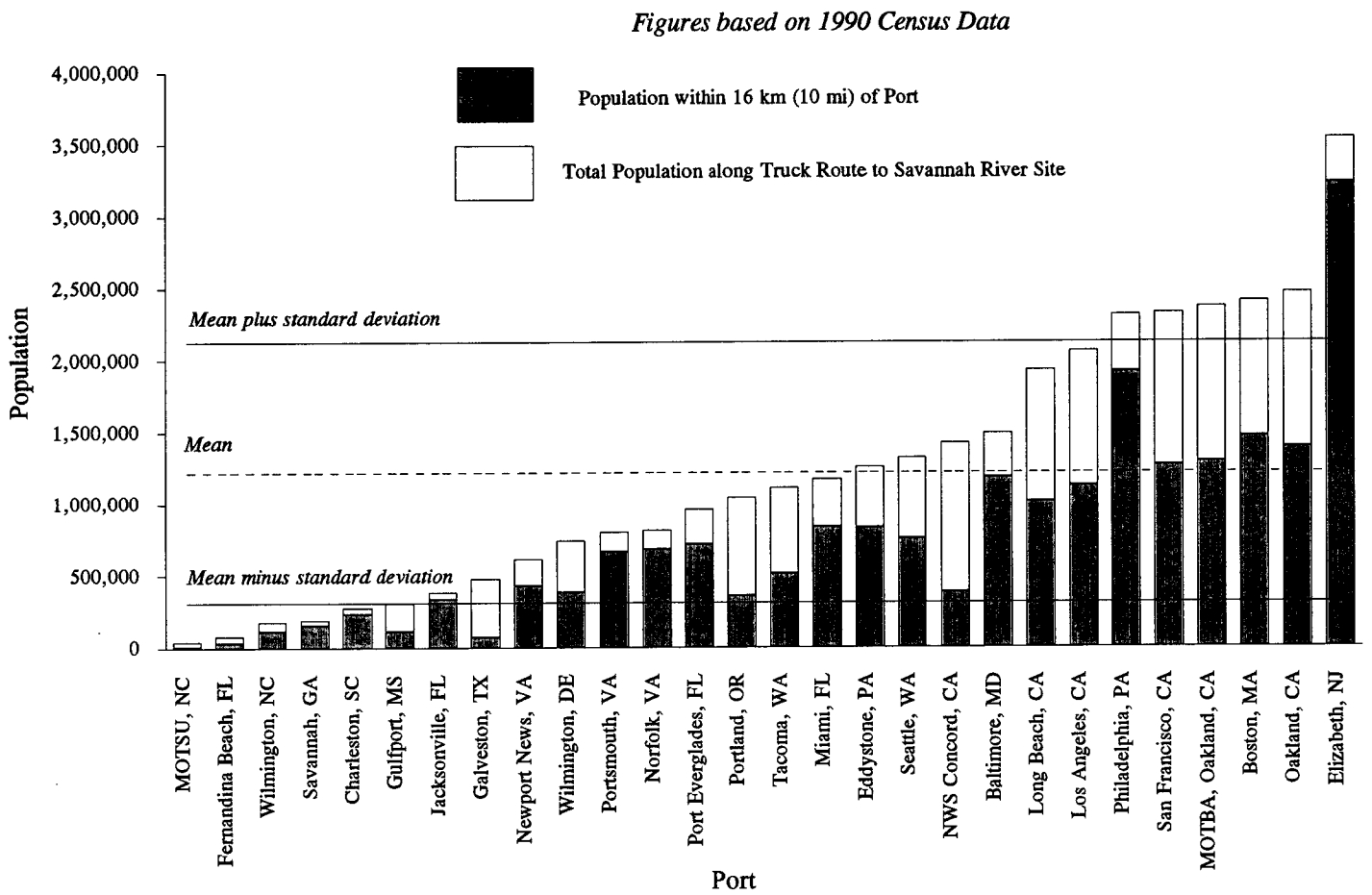


Figure D-8 Population Distribution for Savannah River Site by Truck

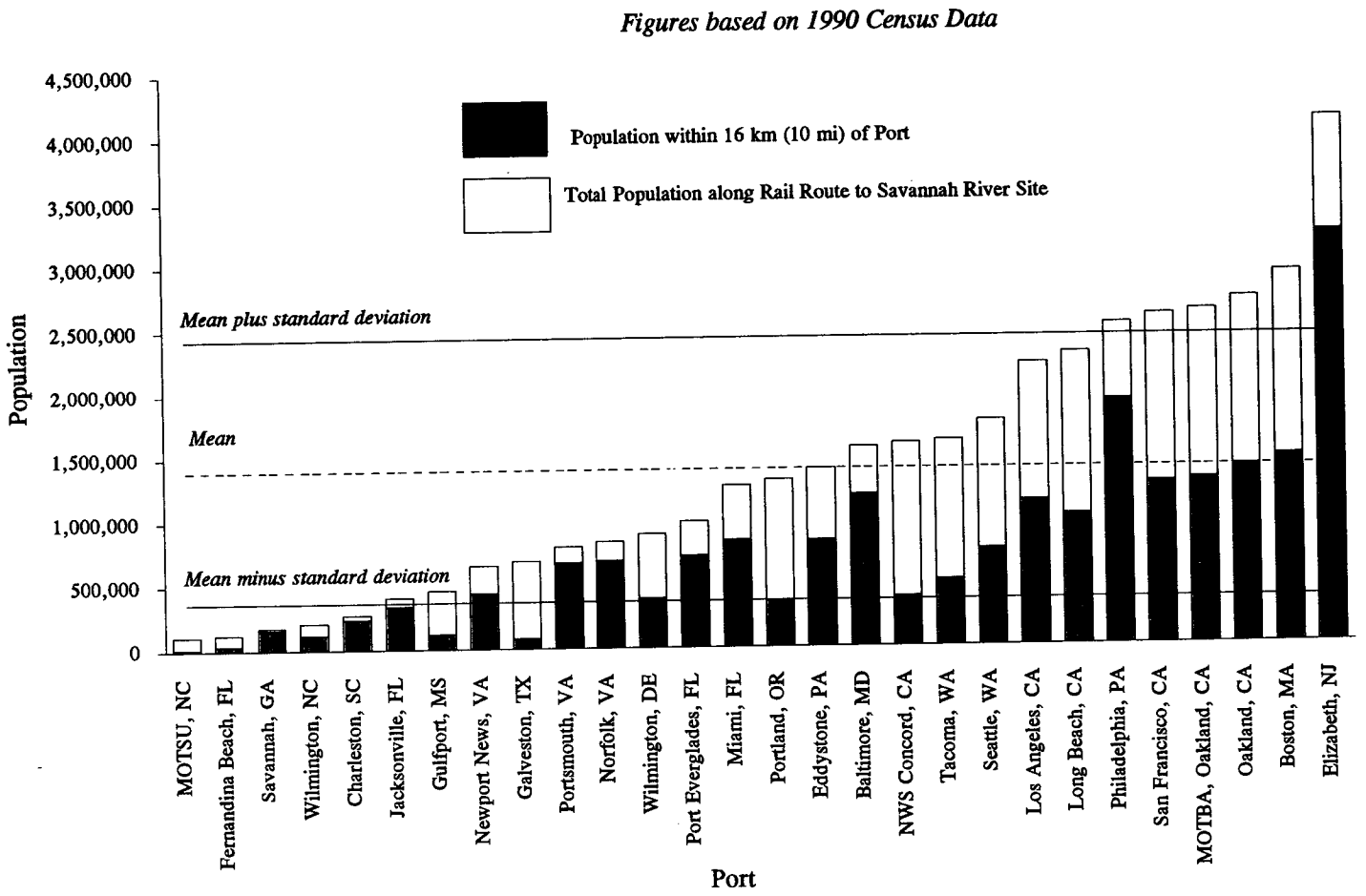


Figure D-9 Population Distribution for Savannah River Site by Rail

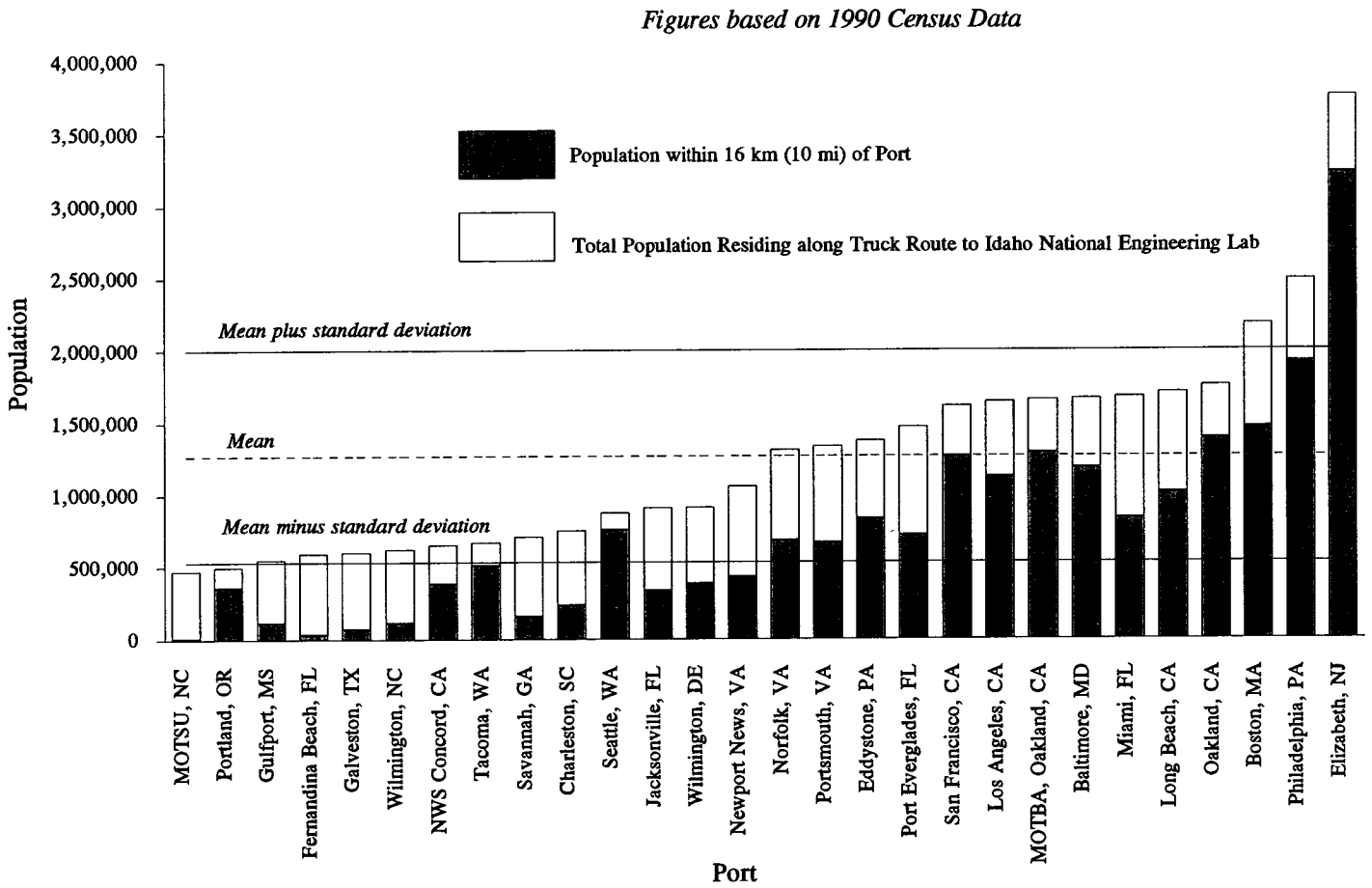


Figure D-10 Population Distribution for Idaho National Engineering Laboratory by Truck

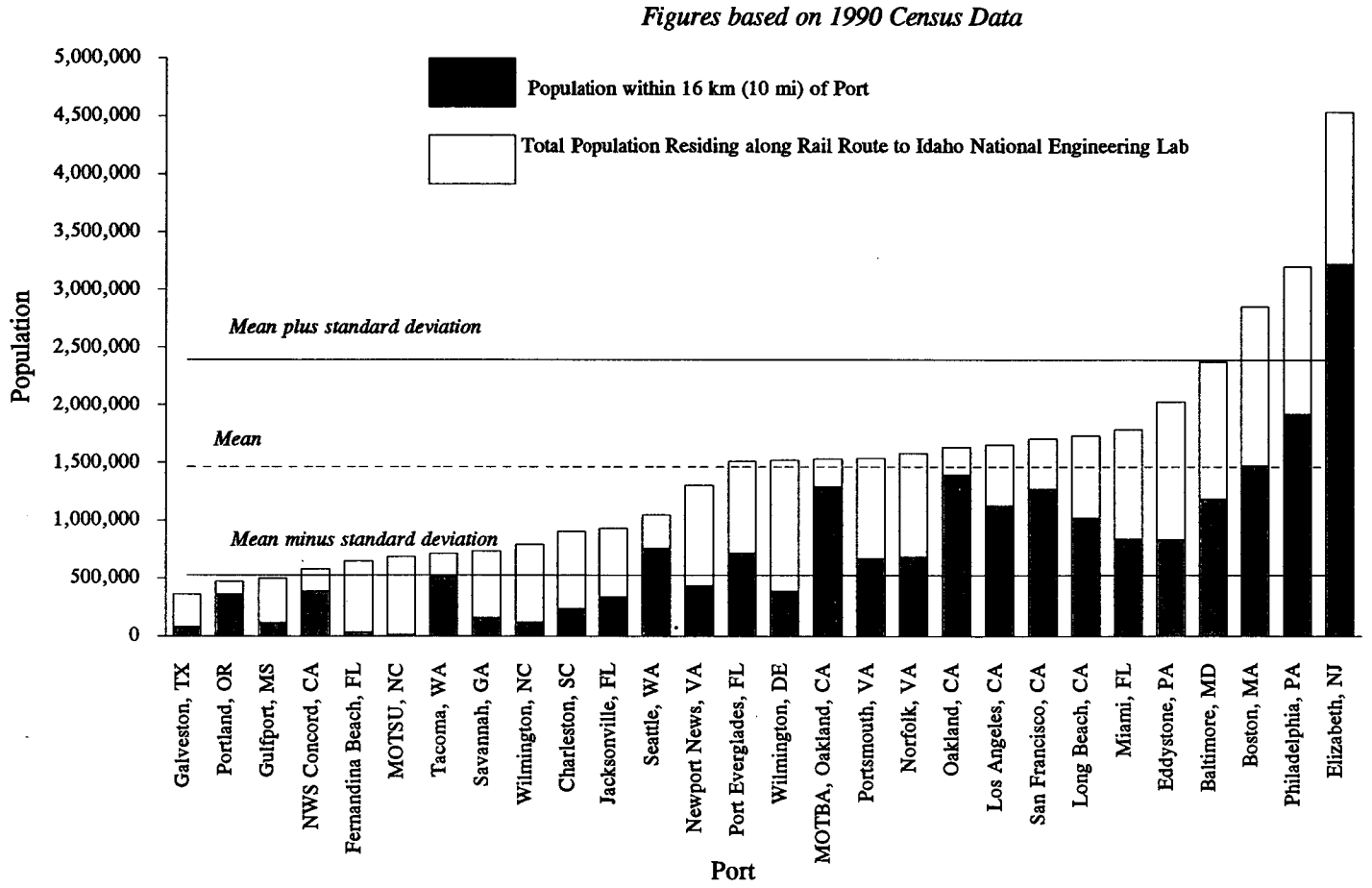


Figure D-11 Population Distribution for Idaho National Engineering Laboratory by Rail

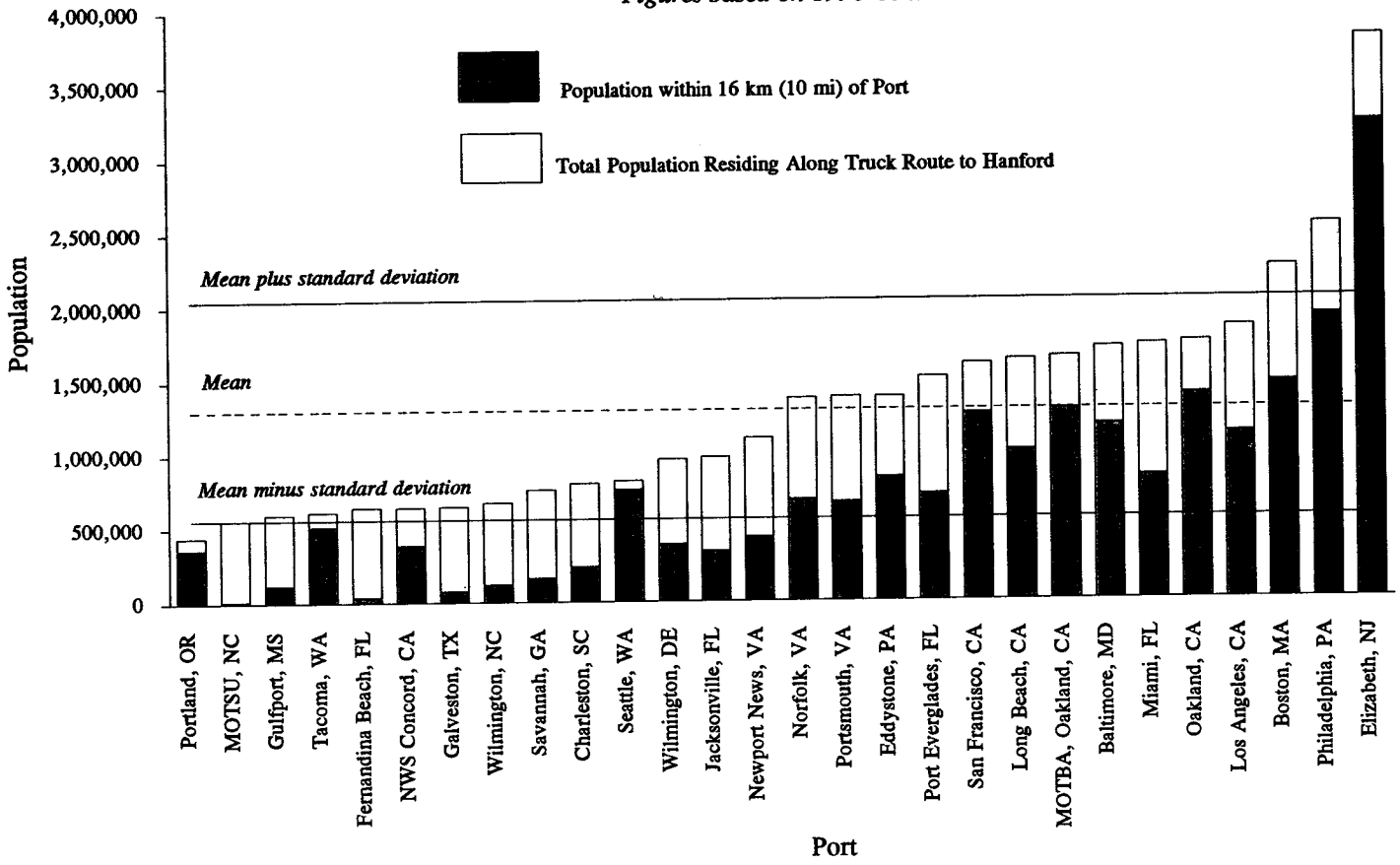


Figure D-12 Population Distribution for Hanford Site by Truck

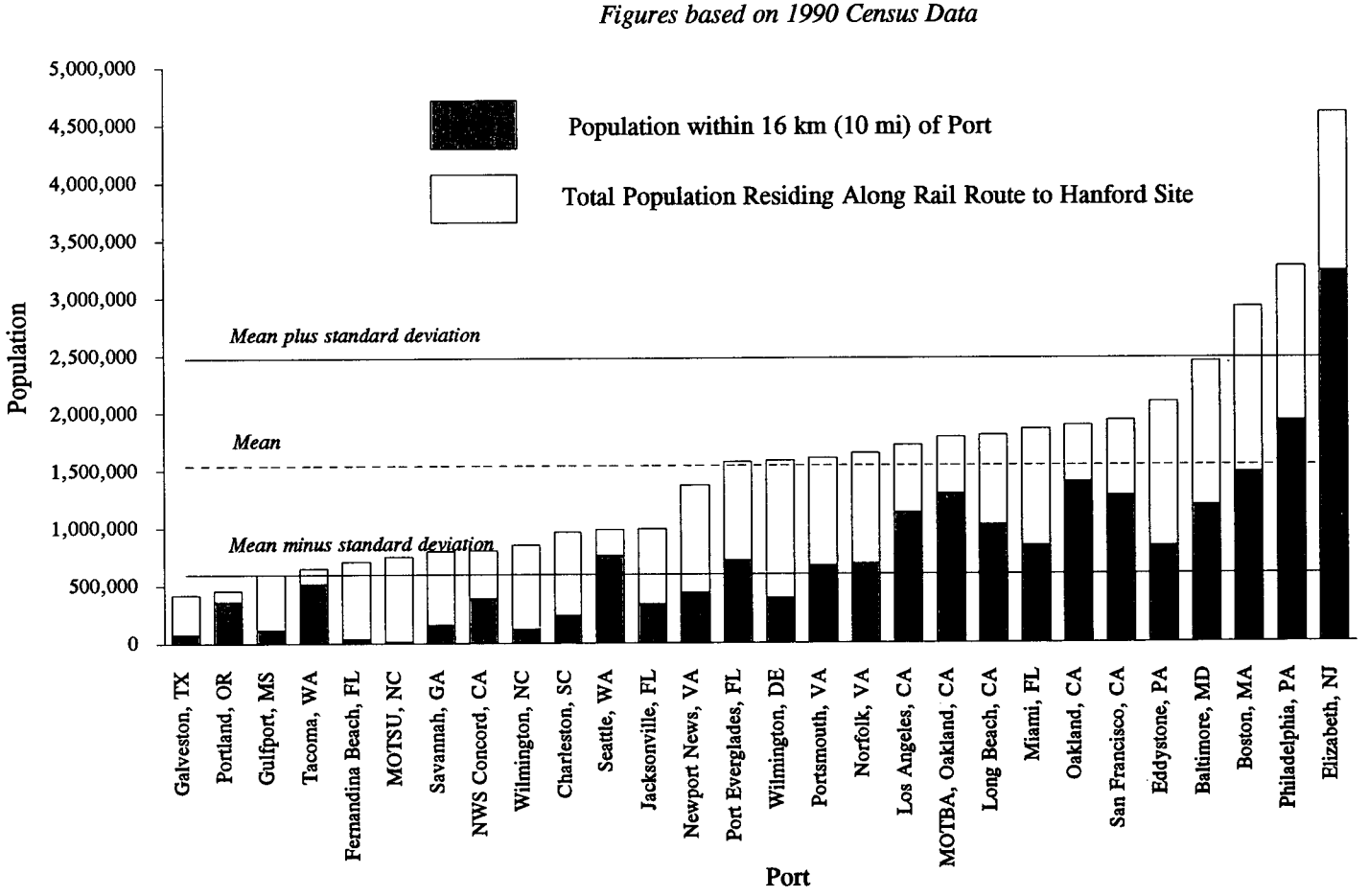


Figure D-13 Population Distribution for Hanford Site by Rail

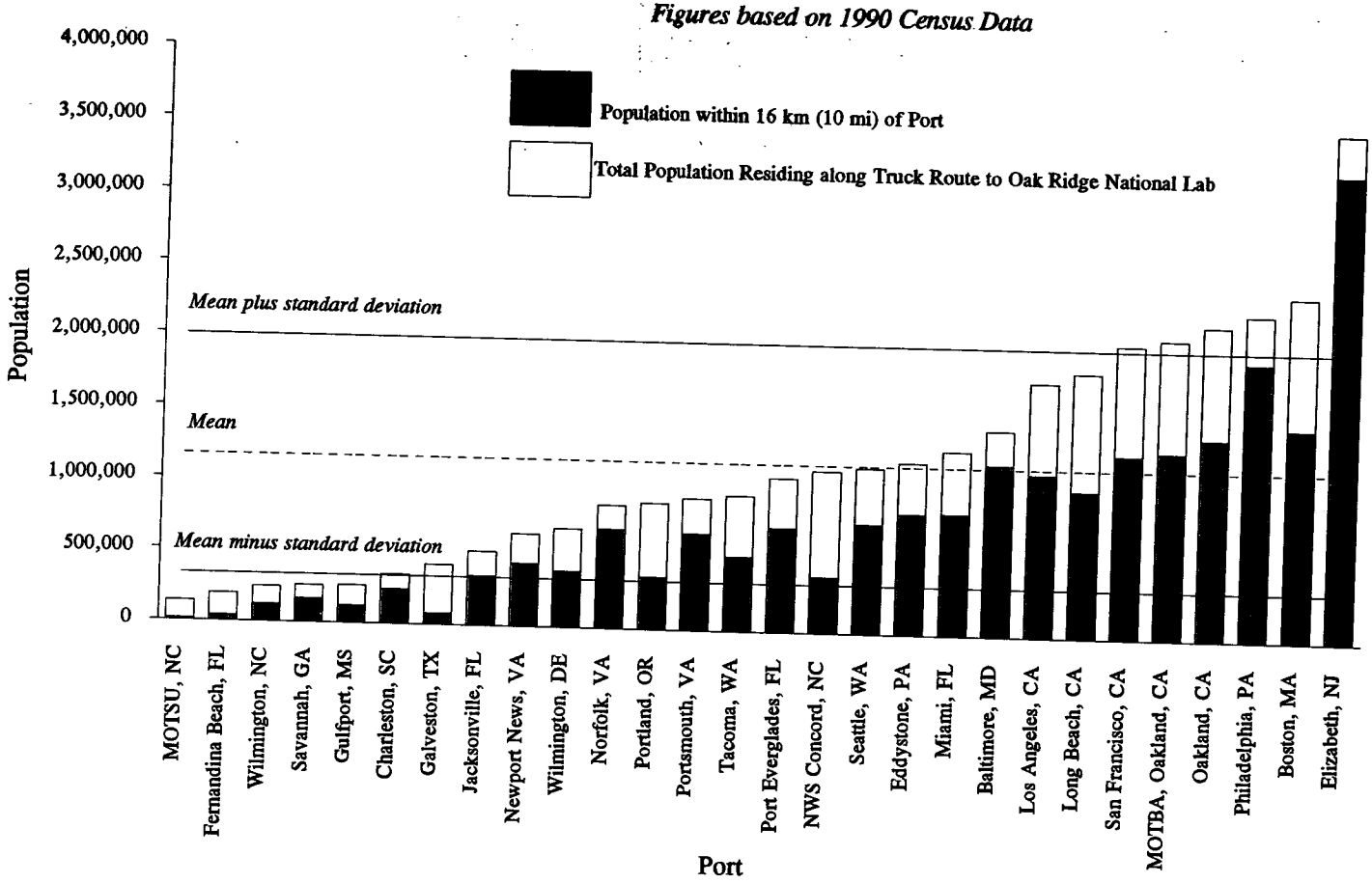


Figure D-14 Population Distribution for Oak Ridge Reservation by Truck

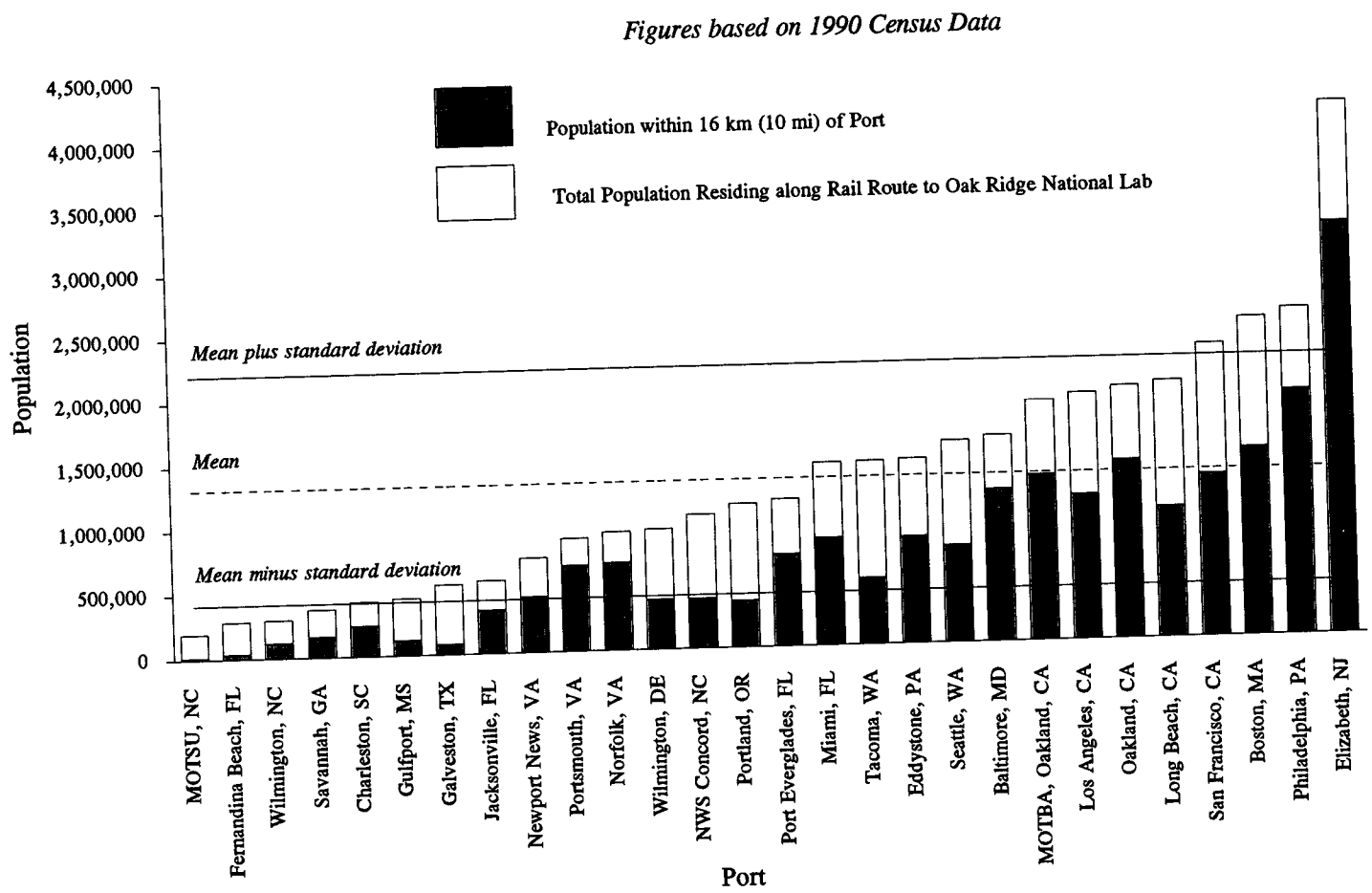


Figure D-15 Population Distribution for Oak Ridge Reservation by Rail

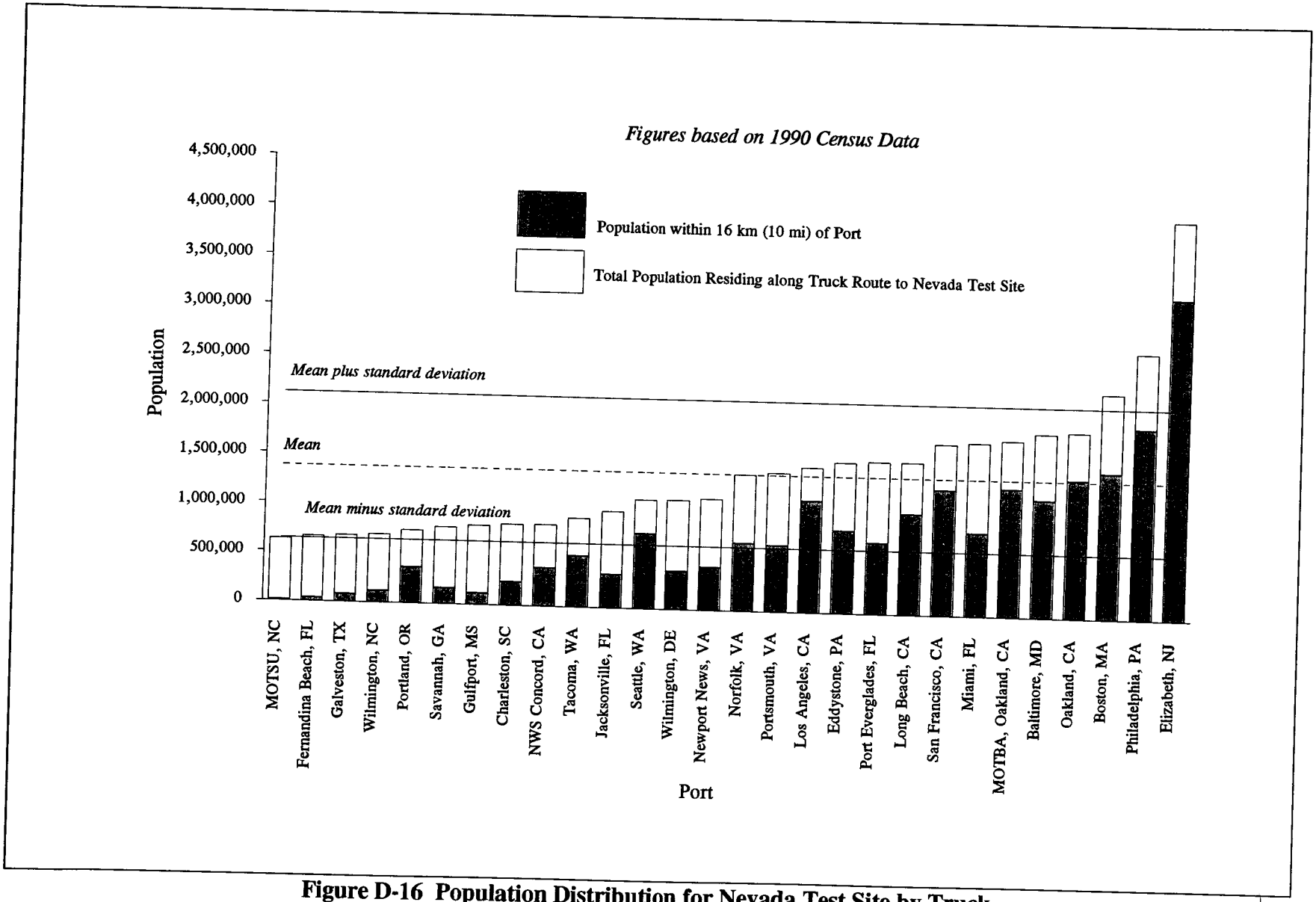


Figure D-16 Population Distribution for Nevada Test Site by Truck

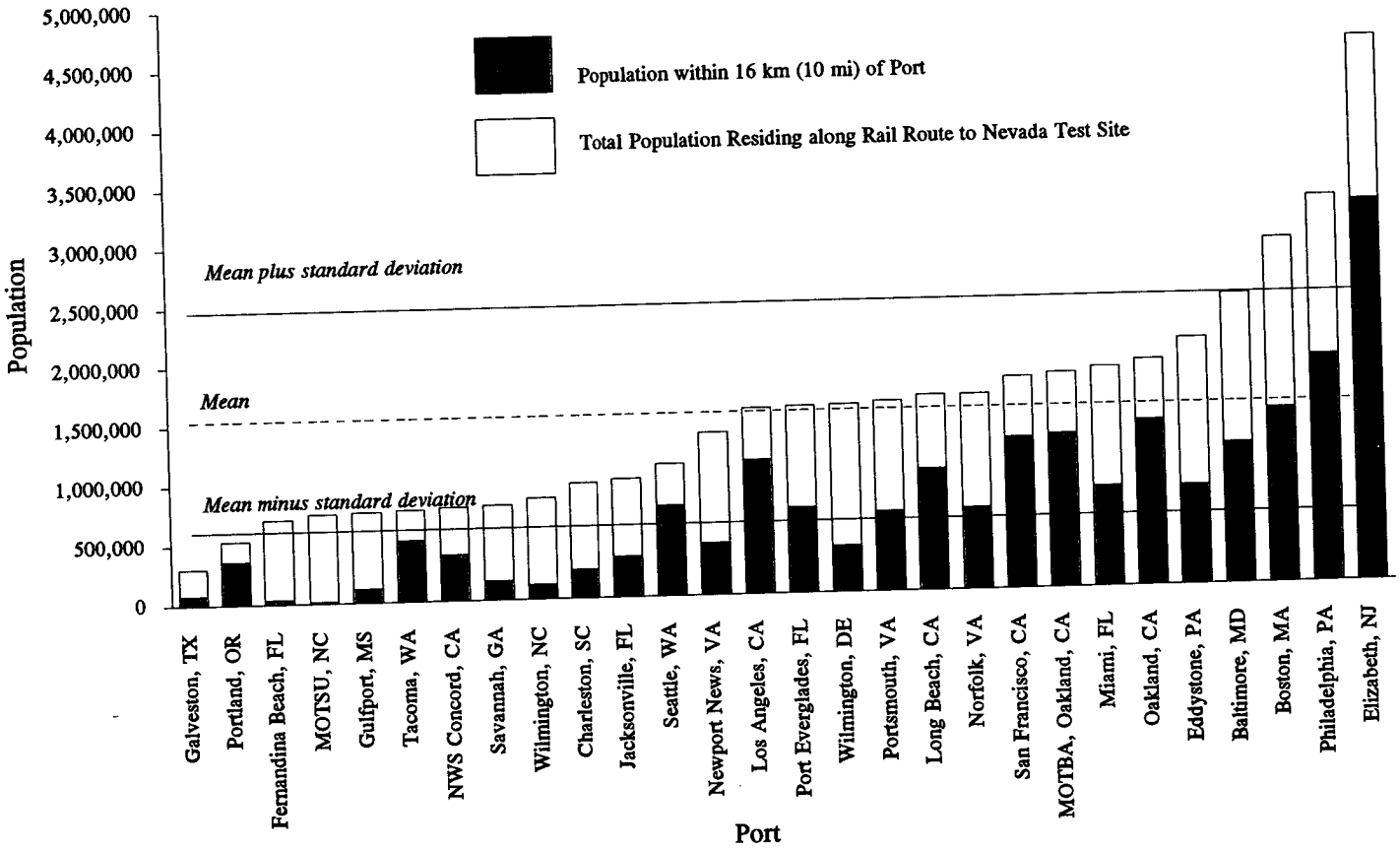


Figure D-17 Population Distribution for Nevada Test Site by Rail

5 *Low Population Criteria:*

a. Accepted 17 Commercial Ports:

Charleston, SC
Eddystone, PA
Fernandina Beach, FL
Galveston, TX
Gulfport, MS
Jacksonville, FL
Miami, FL
Newport News, VA
Norfolk, VA
Port Everglades, FL
Portland, OR
Portsmouth, VA
Savannah, GA
Seattle, WA
Tacoma, WA
Wilmington, DE
Wilmington, NC

b. Accepted 2 Military Ports:

Military Ocean Terminal
Sunny Point, NC
Naval Weapons Station
Concord, CA

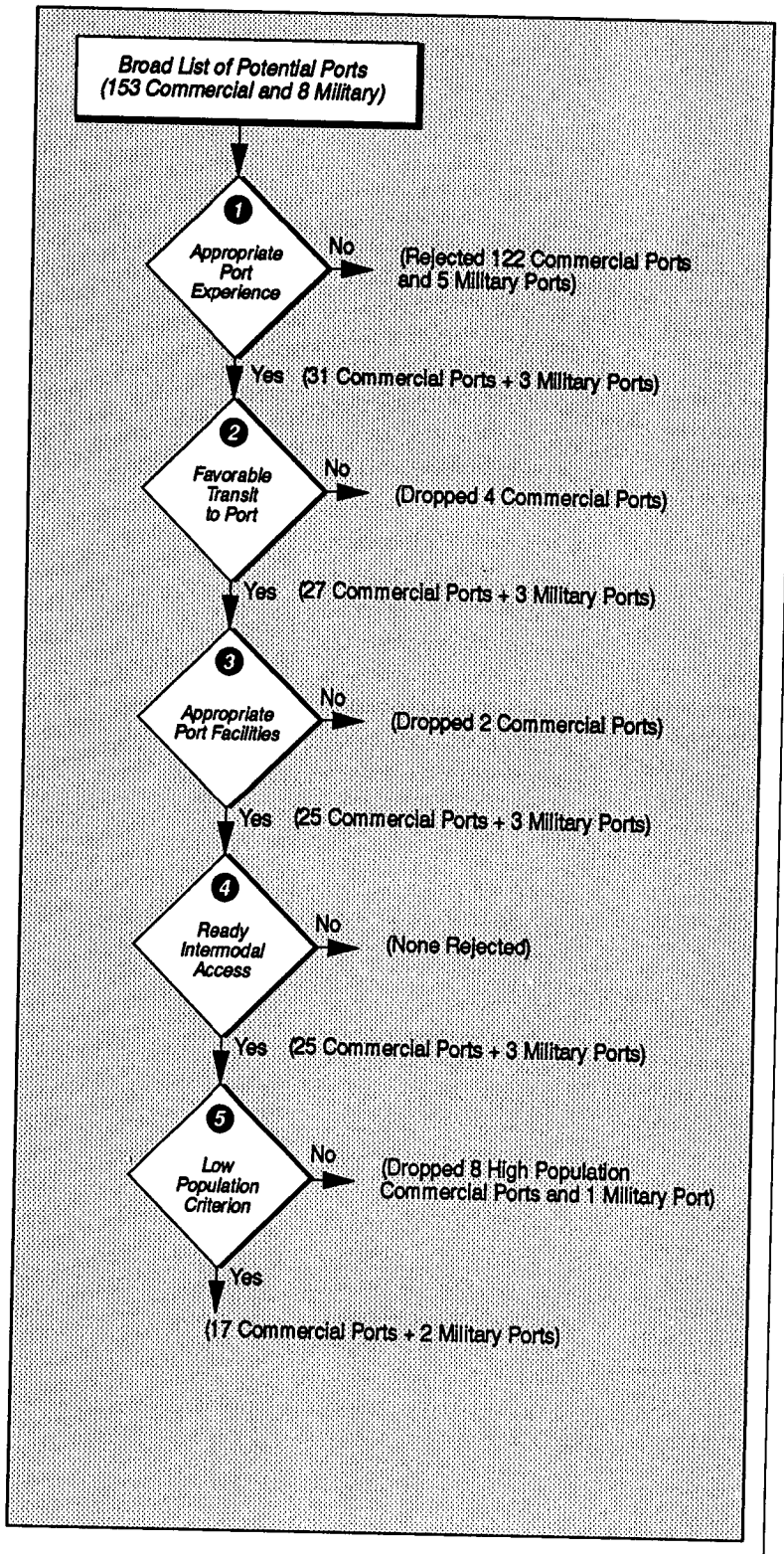


Figure D-18 Screening Ports for DOE "Lowest Human Population" Criteria

D.1.9.6 Desirable Port Attributes

As discussed in Section D.1.9, there are a number of desirable attributes that were not important enough individually to reject an otherwise acceptable port, but have been collectively used to select proposed ports from the list of ports found acceptable under the other DOE criteria. As an element of desirable attributes, DOE examined the likely usefulness of ports for foreign research reactor spent nuclear fuel shipments to any of the five DOE management sites.

The term "usefulness," as used here, is a relative term wherein the relative numbers of scheduled shipping lines and the types of ships that service each port and the countries served by those lines, are compared for two or more otherwise acceptable ports for purposes of selecting the best of that group. This helped to select the ports most likely to be useful in relation to this EIS. This information is shown in Table D-6.

In using these factors, the Ports of Newport News, Norfolk, and Portsmouth, VA, are examined as a single port: Hampton Roads, VA. Table D-6 shows the results of the evaluation of the low population ports for usefulness. The limited usefulness of a port for truck or rail access and service to the potential foreign research reactor spent nuclear fuel management sites eliminated the Ports of Eddystone, PA, Miami and Port Everglades, FL, Wilmington, DE, and Seattle, WA from further consideration.

DOE also identified the most desirable attributes of the remaining ports, such as terminals that do not have conflicting activities nearby (e.g., cruise ship lines, large tourist populations, large petroleum or petrochemical facilities, etc.), and are well-separated from high density populations, have secure short-term storage for contingencies, and have adequate emergency preparedness.

Absence of Conflicting Activities in Port Facilities

While it is the long-held position of DOE, Department of Transportation, and the NRC (NRC, 1977) that spent nuclear fuel shipped in certified Type B casks is well-protected from possible damage due to accidental cask drops, transportation fires, or immersion in water, DOE also concluded that the small public risks associated with such activities could be reduced further if the port in question also had no potentially dangerous, unavoidable conflicting activities, such as regularly scheduled transport of explosive or flammable cargoes, no petroleum carriers or storage facilities in the immediate vicinity of foreign research reactor spent nuclear fuel carrying vessels, and no large numbers of tourists in the immediate area of the terminal who could be unacceptably impacted by a severe accident (good planning and scheduling for arrival of foreign research reactor spent nuclear fuel carrying vessels could mitigate many potential conflicts). The absence of conflicting activities at potential commercial ports was considered in the final port selection to the maximum extent practicable.

A similar important factor for military ports is whether there is adequate separation of the potential port facilities to be used for receipt of the spent nuclear fuel from other hazardous activities (e.g., loading munitions). An exception would be military facilities that were designed and constructed to mitigate the potential impacts of explosions or fires at other piers. Two examples of such facilities which were accepted under the other DOE criteria are MOTSU, NC and the NWS Concord, CA, where such activities are routinely carried out with a high degree of safety. In addition, such conflicts can be avoided by scheduling foreign research reactor spent nuclear fuel shipments at times when no explosives are present at piers.

Table D-6 Relative Usefulness of Low Population Ports for Foreign Research Reactor Spent Nuclear Fuel Shipments

Ports-of-Entry	Relative Usefulness by Storage Site					Relative Usefulness by Foreign Research Reactor Spent Nuclear Fuel Shippers	
	SRS	ORR	INEL	HS	NTS	Conventional Carriers	Charters
Commercial							
East Coast							
Charleston, SC (Wando Terminal)	T&R	T&R	T&R	T&R	T&R	Europe, Far East, Japan, Australia	Yes
Eddystone, PA	R	No	No	No	No	Central/South America	Yes
Fernandina Beach, FL	T&R	T&R	T&R	T&R	T&R	South/Central America, Mediterranean (monthly)	Yes
Hampton Roads, VA	T&R	T&R	T&R	T&R	T&R	Most of the world	Yes
Jacksonville, FL	T&R	T&R	T&R	T&R	T&R	Most of the world	Yes
Miami, FL	T&R	No	No	No	No	Central/South America, Mediterranean, Mexico, Far East	Yes
Port Everglades, FL	T&R	T&R	No	No	No	South American, Northern Europe, Mediterranean, Mideast, Scandinavia	Yes
Savannah, GA	T&R	T&R	T&R	T&R	T&R	Most of the world	Yes
Wilmington, DE	T&R	T&R	T	T	T	Central/South America	Yes
Wilmington, NC	T&R	T&R	T&R	T&R	T&R	Northern Europe, Mediterranean, Mideast, East and South Africa, South America, Far East, Australia	Yes
Gulf Coast							
Galveston, TX	T&R	T&R	T&R	T&R	T&R	Northern Europe, Mediterranean, Mexico, South America, Central America	Yes
Gulfport, MS	T&R	T&R	T&R	T&R	T&R	Northern Europe, Central/South America	Yes
West Coast							
Portland, OR	T&R	T&R	T&R	T&R	T&R	Most of the Pacific Rim, Mediterranean	Yes
Seattle, WA	No	T	T&R	T&R	T&R	Most of the Pacific Rim, Mediterranean	Yes
Tacoma, WA	T	T	T&R	T&R	T&R	Most of the Pacific Rim, Mediterranean	Yes
Military							
MOTSU (NC)	T&R	T&R	T&R	T&R	T&R	None	Yes
NWS Concord (CA)	No	T&R	T&R	T&R	T&R	None	Yes

SRS = Savannah River Site, ORR = Oak Ridge Reservation, INEL = Idaho National Engineering Laboratory, HS = Hanford Site, NTS = Nevada Test Site; T = truck, R = rail

Emergency Response Capabilities

The U.S. Merchant Marine Academy Workshop identified the importance of a risk management staff and emergency response capabilities (including response plans and training of operating personnel) in determining the acceptability of ports for receipt and handling of foreign research reactor spent nuclear fuel. DOE focused on identification of ports that have current emergency response plans and personnel appropriately trained to respond to a port emergency to protect workers and the public from avoidable risks (however small). Since few ports have detailed response plans for radiological emergencies involving spent nuclear fuel, DOE determined that such shortcomings do not prevent consideration of such ports provided the ports have in place appropriate response plans and training for hazardous cargo

accidents, since many of the features are the same (e.g., identification of decisionmakers, first responders, and support personnel to mitigate impacts of fires, etc.). In addition, for ports that have no specific response plans for spent nuclear fuel accidents in port, DOE could provide assistance in the development of radiological emergency response plans (in addition to existing hazardous cargo emergency response capability) and training at such ports in the event they were ultimately selected for foreign research reactor spent nuclear fuel shipments. Thus, appropriate plans and training would likely be in place prior to actual receipt of any such shipments. Ports having current emergency response capabilities were considered more desirable than those that do not.

Spent Nuclear Fuel Handling Experience

The National Defense Authorization Act would also require, "to the maximum extent practicable," that the ports selected for receipt of foreign research reactor spent nuclear fuel have spent nuclear fuel handling experience. At the present time, there are only a few ports in the United States with relatively recent experience handling either spent nuclear fuel or high-level radioactivity in Type B casks. As a result, this criterion, while desirable, unnecessarily restricts considerations to an unacceptably small group of potential ports, and strictly applied, could preclude shipments of spent nuclear fuel from some of the countries being considered under this EIS except by chartered ship. However, because all containerized cargoes are handled in the same manner as the containerized spent nuclear fuel would be handled, DOE concluded that current experience (especially any involving routine handling of potentially hazardous cargoes, or other radioactive cargoes in Type B casks) is much more important for public safety than foreign research reactor spent nuclear fuel handling experience in years past. This is especially true since the trained longshoremen are likely to have changed jobs, ports, or retired during the several years between the last shipments of spent nuclear fuel and the potential onset of future shipments under this EIS.

In addition, ports that have satisfied the "appropriate experience" and "port facilities" criteria are expected to be fully capable of currently handling spent nuclear fuel containers, and would gain experience as the program progressed.

Environmental Concerns Near Ports

Marine areas, immediately surrounding most of the ports considered in this selection process, tend to be severely impacted as a result of necessary periodic dredging or construction of new port facilities, including turning basins, high volumes of marine traffic, and routine port activities. As a result, ports generally are no longer environmentally sensitive areas within the context of NEPA. However, consistent with U.S. Merchant Marine Academy Workshop recommendations and in response to public comments, DOE decided that when special protected or sensitive areas were identified nearby the terminal(s) being considered, these areas would be identified in the EIS and used for final port identification as appropriate. No serious issues have been identified in the immediate vicinity of any ports selected under the DOE low population criterion review, with the possible exception of the NWS Concord, CA and Fernandina Beach, FL.

Environmental Concerns from Severe Natural Phenomena

Other factors that were considered desirable attributes for ports include average or lower risks from severe weather (e.g., extremely high winds, hurricanes, etc.) or other natural phenomena (e.g., seiches, earthquakes, volcanism, etc.). These attributes are not expected to be of great significance in practice, since the time involved with potential receipt and transhipment of containerized spent nuclear fuel represents such an extremely short period of risk (typically less than 24 hours), that the probability of

severe natural phenomena impacting foreign research reactor spent nuclear fuel shipments is vanishingly small. Further, some natural events, such as hurricanes, can often be avoided. However, these characteristics were examined in conducting the port evaluation.

Separation of Port Facilities from Urban Populations

The following desirable characteristics are examined:

- Terminals used for spent nuclear fuel shipments should be physically separated from densely populated city centers (by several kilometers if possible) to help ensure that the general public would be unlikely to be exposed to significant radiation doses from either incident-free transport or accidents within the port (e.g., cask drops, fires, or truck or rail accidents, etc.).

- Transport of spent nuclear fuel through large, densely-populated, congested areas around the port should be avoided where practical.

These geographic/demographic characteristics, while not explicitly addressed in the evaluation of "lowest human populations" for ports, are implicitly included in the 16 km (10 mi) radius populations used for screening ports. While absence of these characteristics would not necessarily eliminate the use of such ports under this EIS, DOE reviewed these ports to determine if there were terminals or piers within the port that provided these characteristics. In many cases, development of new port facilities in recent years has resulted in specific terminals and/or piers that meet all of the required criteria (USMMA, 1994, and NDAA, 1993), and that also have most or all of the additional desirable characteristics (e.g., the Wando Terminal in Charleston, SC, the Blount Island Terminal in Jacksonville, FL, or Terminal T6 in Portland, OR).

Absence of Local Restrictions on Receipt and Handling of Spent Nuclear Fuel

Another desirable port factor recommended by the U.S. Merchant Marine Academy Workshop is the absence of local regulatory restrictions on receipt and handling of spent nuclear fuel. It is well established that local restrictions on international or interstate commerce are void under the U.S. Constitution, and similar challenges have been rejected by the Federal courts. For example, the Port of Oakland, CA indicated that a citizen's legislative initiative in 1987 led to a ban on the handling and transport of foreign research reactor spent nuclear fuel through the port. Although Oakland's ban was invalidated by the Federal District Court, the Port Authority has maintained some control over radioactive shipments through the port through its permitting system (Adams, 1993). Nevertheless, although claiming to be a "nuclear free zone," the port continues to allow permitted shipments of certain radioactive materials, handling approximately 500 metric tons (551 tons) of radioactive shipments between January and June 1994 (Adams, 1994).

Further, if DOE were to avoid selection of ports with restrictions by local ordinances, every port wishing to close its doors to receipt of spent nuclear fuel (or any other type of cargo) would simply promulgate an ordinance. Therefore, the EIS will only identify existing local restrictions (formal or informal) in section D.2 for consideration by decisionmakers, and this criterion will have no immediate impact on determination of the acceptability of ports within this EIS.

Secure Short-Term Storage

Although the National Defense Authorization Act requires, to the extent practicable, expeditious movement of casks from a port, the presence of regular guards, fences, and lighted areas that provide security at all times is a desirable attribute. Such additional features provide assurance of safe segregation and short-term storage of foreign research reactor spent nuclear fuel shipments away from workers and the public in the event of unexpected local occurrences, such as snow or ice storms, traffic congestion, and other events beyond the control of spent nuclear fuel shippers.

To best comply with this attribute, the storage area should be one designated for the storage of hazardous materials (referred to as a facility of particular hazard). Such designations are normally simple processes which result in U.S. Coast Guard approval following a request by the terminal operator. While all the military ports are designated as "facilities of particular hazard," some commercial facilities may only request periodic designations for specific incoming or outgoing cargoes (e.g., the Port of Tacoma, WA periodically designates Terminal 7B for occasional shipments of potentially explosive ammonium nitrate). Table D-7 shows which commercial ports have traditionally had secure storage areas for hazardous cargoes, and DOE has assumed such storage would be available in the future for receipt and short term storage of foreign research reactor spent nuclear fuel. (More detailed information on "facilities of particular hazard" may be found in section D.4.3).

D.1.10 Application of the Desirable Port Attributes in Port Selection

As a result of the evaluation of desirable attributes, two additional ports, Fernandina Beach, FL, and Gulfport, MS, were removed from the potential ports of entry list (Table D-7). The port of Fernandina Beach, FL, is not well-separated from the urban population surrounding the port, and the population is expected to substantially grow by about 82 percent by the year 2010 (see Attachment D2). Also, entry to the port requires ship passage through a State sea manatee (an endangered species) preserve. The Port of Gulfport, MS, does not currently have a well-secured area designated for the storage of foreign research reactor spent nuclear fuel, and it is unlikely it ever will due to casino operations. There is a former cruise ship terminal at the East Pier, which is slated for new casino development, a floating casino located in the port and two new casinos on the West Pier. In addition, the port is not well-separated from surrounding urban population.

Conclusion

As a result of the evaluation, ten ports remained as the final list of ports acceptable for the potential receipt, handling, and transhipment of foreign research reactor spent nuclear fuel. These ten ports [Charleston, SC; Galveston, TX; Hampton Roads (includes terminals in Newport News, Norfolk, and Portsmouth), VA; Jacksonville, FL; MOTSU, NC; NWS Concord, CA; Portland, OR; Savannah, GA; Tacoma, WA, and Wilmington, NC] represent the final list of ports considered for the receipt of foreign research reactor spent nuclear fuel.

D.2 Detailed Information on Potential Ports of Entry

This section of Appendix D provides detailed information that served as the bases for identifying the candidate ports addressed in Section D.1. For convenience, the port details are divided into two categories: (1) the DOE candidate ports of entry that met the criteria developed for port identification in Section D.1, and (2) the remainder of the ports that fully or marginally satisfied the first criterion for appropriate port experience. Within each of the categories, the ports are arranged in alphabetical order. The location of the ports is shown in Figure D-1.

Table D-7 Use of Desirable Attributes for Selecting Final "Low Population" Ports for Foreign Research Reactor Spent Nuclear Fuel Shipments

Ports-of-Entry	*Free of Conflicting Uses at Port Facilities*	*Emergency Preparedness*	*Short-Term Secure Storage*	*Free of Environmental Concerns*	*Free of Severe Natural Phenomena*	*Terminal Well-Separated from High Density Populations*
			Commercial			
East Coast						
Charleston, SC	Yes (Wando)	Yes	Yes	Yes	E, H	Yes (Wando)
Fernandina Beach, FL	T	Yes	No	Some (Manatee)	H	No
Hampton Roads, VA	Yes	Yes	Yes[b]	Yes	Yes	Yes (Newport News, VA)
Jacksonville, FL	Yes (Blount Island)	Yes	Yes	Yes	H	Yes (Blount Island)
Savannah, GA	P	Yes	Yes[b]	Yes	E, H	Yes (Container Port)
Wilmington, NC	P, Some Ex[a]	Yes	Yes[b]	Yes	H	Yes
Gulf Coast						
Galveston, TX	Some P, T, Ex[a]	Yes	Yes[b]	Yes	H	No
Gulfport, MS	T[c]	Yes	No	Yes	H	No
West Coast						
Portland, OR	Yes	Yes	Yes[b]	Yes	E, V	Yes (T6)
Tacoma, WA	Yes, some Ex[a]	Yes	Yes	Yes	E, V	Yes
			Military			
MOTSU (NC)	Ex[a]	Yes	Yes	Yes	H	Yes
NWS Concord (CA)	Ex[a]	Yes	Yes	Some (wetlands and Tule elk)	E	Yes

Ex= explosives, T = tourism, P = petroleum handling/storage facilities, H = hurricanes/tropical storms, V = volcanoes, E = earthquakes

[a] *Separation of piers and scheduling of spent nuclear fuel and explosive shipments on different days makes consideration of these ports appropriate*

[b] *No currently designated facilities of particular hazard at preferred terminal(s)*

[c] *Extensive casino development within 1,000 feet*

D.2.1 Detailed Information on Candidate Ports of Entry

D.2.1.1 Charleston, SC (Includes the Naval Weapons Station Terminal and the Wando Terminal)

Charleston is the largest port city in South Carolina, and the greater Charleston area is one of the major seaports on the East Coast of the United States. The city of Charleston itself is located at the confluence of the Cooper and Ashley Rivers, approximately 11 km (7 mi) from the entrance from the sea. The principal wharves are along the west bank of the Cooper River except for the Wando Terminal which is along the east bank of the Wando River near Mount Pleasant, about 20 km (11 mi) from the Atlantic Ocean. The city is the center of a rich agricultural district for which it is the distribution point. The entrance to the harbor is maintained by a Federal project providing a channel depth of 10.7 m (35 ft) over the bar, through the entrance and into the major reaches of the Cooper River. The harbor is easy to access in day or night in clear weather, and is one of the best harbors of refuge on the South Atlantic coast (DOC, 1993d). The maps of the port are shown in Figures D-19 (Naval Weapons Station, Charleston) and D-20 (Wando Terminal).

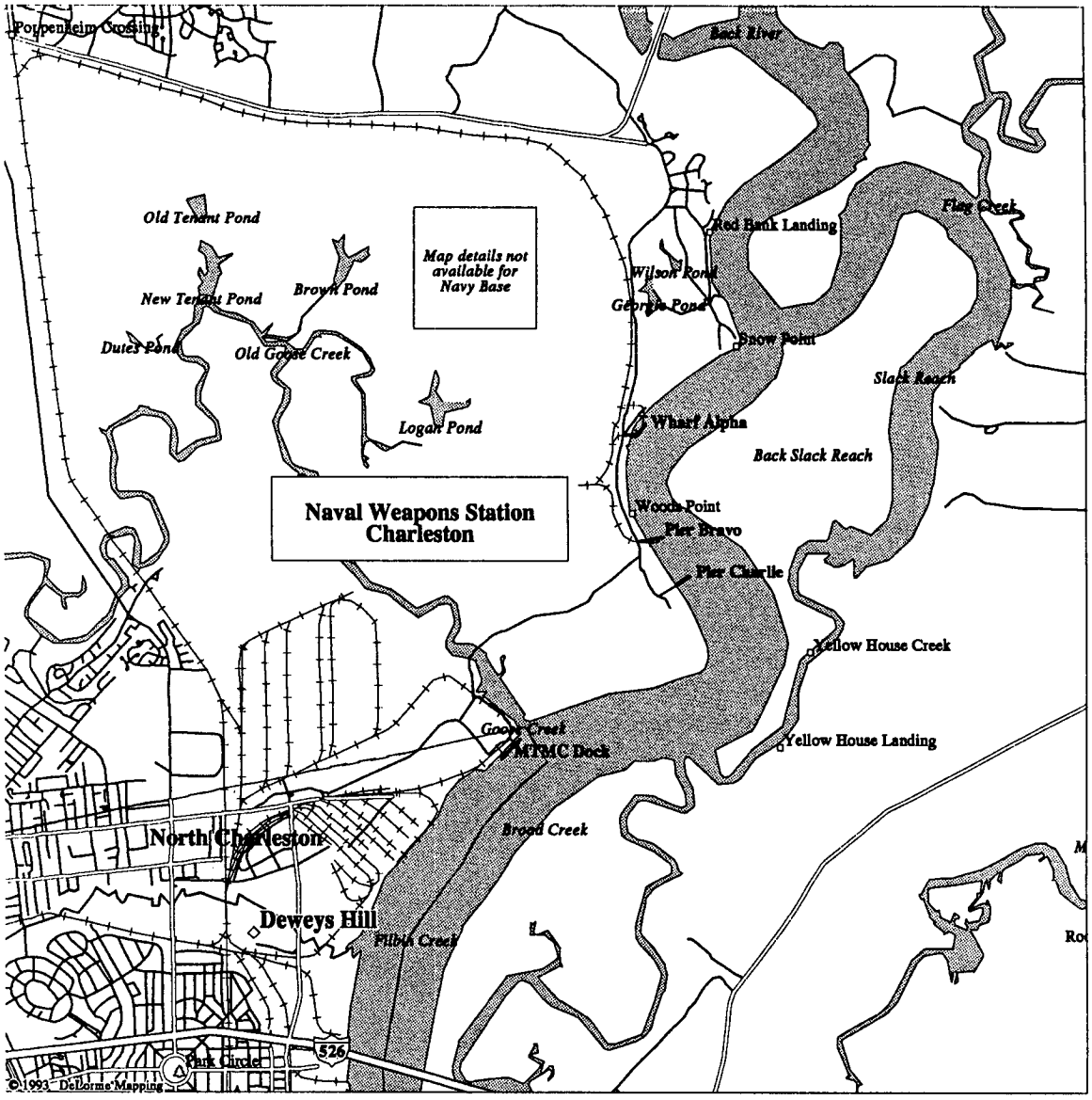
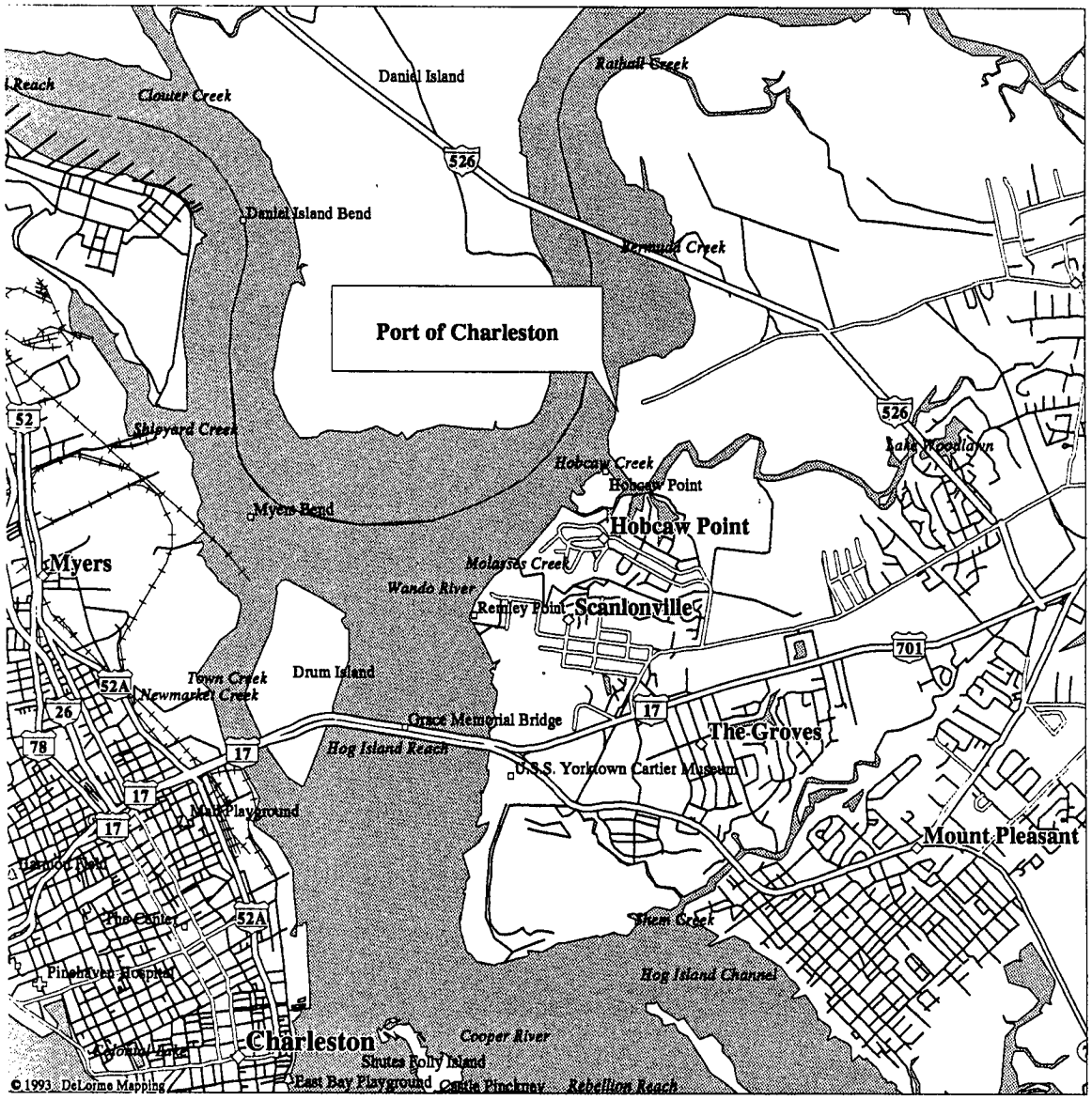


Figure D-19 Map of the Naval Weapons Station, Charleston, SC



LEGEND

- Population Center
- Geo Feature
- Town, Small City
- Park
- Interstate, Turnpike
- US Highway
- County Boundary
- Hwy Ramps
- Street, Road
- Major Street/Road
- State Route
- Interstate Highway
- US Highway
- Railroad
- River
- Land Mass
- Open Water

Scale 1:50,000 (at center)

5000 Feet

1000 Meters

Mag 13.00
Mon Mar 27 17:25:11 1995

"Map(s) from MapExpert, DeLorme Mapping, Freeport, ME."

Figure D-20 Map of the Wando Terminal, Charleston, SC

However, the areas to the east and southeast of the port entrance are used extensively by the U.S. Navy and other military services for training exercises which may result in occasional restrictions. Under unfavorable weather conditions current velocities in some areas have been reported as high as 2.1 meters-per-sec (4 knots) (DOC, 1993d). All of the port terminals have 12.2 m (40 ft) of water alongside at mean low water. The port is serviced by many of the world's largest container shipping lines (a total of 56), that handled 807,106 standard 20-ft container equivalents in 1991 (AAPA, 1993; FHI, 1993a). These lines provide service between Europe, the Far East, Japan, Australia and other countries (Jane's, 1992).

The South Carolina State Ports Authority owns and operates four large general cargo and container terminals within the greater Charleston area. The City of Charleston hosts two facilities (Union Pier Terminal and Columbus Street Intermodal Terminal) that were eliminated from consideration because they are not well separated from dense urban populations, and are within the city limits and subject to potential restrictions on receipt and handling of spent nuclear fuel (Jane's, 1992; AAPA, 1993).

The North Charleston Terminal is a container terminal located about 16 km (10 mi) upstream from the city of Charleston. This facility was considered to be inferior to the Wando Terminal because it requires additional transport up a heavily trafficked and more confining channel (only about 120 m (or 400 ft) wide in many reaches) on the upper Cooper River, with ships required to pass below an additional bridge (I-526) over the river (in comparison to Wando Terminal). Further, superior facilities and better separation from populated areas are found at the Wando Terminal discussed below.

In the Draft version of this EIS, only the Wando Terminal was addressed in detail. Public commentors from the Charleston area and other candidate port areas suggested that DOE further consider military ports. Since the Draft EIS was published, the Record of Decision for the SNF&INEL Final EIS (DOE, 1995) directs all aluminum-based spent nuclear fuel to the Savannah River Site. Because of the public requests and the relative proximity of the Savannah River Site to the greater Charleston area, the NWS Charleston has been added as a candidate port of entry, and detailed information is provided in the following section.

Other Pertinent Information: The City of Charleston has a city ordinance restricting the transport of spent nuclear fuel through the city. According to information gathered, the ordinance does not preclude shipment, but requires a permit and approval from the city. The Sandia National Laboratories Radioactive Materials Postnotification Database indicates that the port has not received any spent nuclear fuel since the database was initiated in October 1984 (SNL, 1994), and the NRC has no record of foreign research reactor spent nuclear fuel shipments since 1979, when NRC began approving spent nuclear fuel shipments (NRC, 1993). From discussions with senior port officials, it was determined that Wando Terminal would handle spent nuclear fuel shipments provided they had the approval of the U.S. Coast Guard Captain of the port and the Charleston Fire Department (Moise et al., 1993). Use of City terminals, rather than the Wando Terminal, has the potential for delays in the receipt and transhipment of foreign research reactor spent nuclear fuel, which could result in failing to move the foreign research reactor spent nuclear fuel from the port of entry to the management site "expeditiously." The NWS Charleston is capable of handling spent nuclear fuel shipments provided that the NWS Charleston receives appropriate program "Waivers". A program waiver would have to be issued by the Chief of Naval Operations to allow NWS Charleston facilities to be used to handle spent nuclear fuel shipments. Event waivers would have to be issued by the NWS Charleston Commanding Officer to allow each shipment to be handled. Event waivers are routine procedures used by the NWS Charleston Commanding Officer to place restrictions on conflicting activities, such as ammunition handling (Stark, 1995).

The South Carolina State Ports Authority Port Police are part of an emergency response team comprised of the local fire departments, Coast Guard, and private hazardous materials response organizations. The Ports Authority provides operating personnel basic hazardous materials training. Dock workers are trained in hazardous materials placard recognition and other basic information by the port's stevedores. Security is provided by perimeter fencing with controlled access and the South Carolina State Ports Authority Police Force, which maintains 24-hour manned access booths, patrols, and surveillance. All container terminals have secure, open and/or covered storage space for temporary storage of spent nuclear fuel if necessary (Moise et al., 1993).

The Wando Terminal is located several kilometers northeast of downtown Charleston in a relatively low population area with good access to interstate highways. Aside from general environmental concern for the wetlands around the port, there are no known special sanctuaries or habitats of concern although the port is subject to severe hurricanes (with high water) and tropical storms. It was the site of the largest earthquake (Modified Mercalli Intensity X) in the Eastern United States in recorded history, on August 31, 1886 (Bolt, 1978). The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Charleston, the Uniform Building Code requires buildings to withstand wind speeds up to 160 km/hr (100 mph). The port is located in a moderate seismic zone with an acceleration of 0.15 g.

There are several tanker terminals and petroleum storage depots along the west bank of the Cooper River downstream of the North Charleston Container Terminal (which is also immediately adjacent the Naval Weapons Station off Goose Creek). However, there do not appear to be any conflicting cargoes or activities at the Wando, Columbus, or Union Pier Terminals. The port officials contacted indicated that they believe that radioactive shipments have been made through the port in the past, but they were not sure if spent nuclear fuel had been handled (Moise et al., 1993).

Environmental Conditions

The State of South Carolina has given the lower portion of the Wando River two different water quality classifications. The water is classified as SFH or SA. SFH waters are shellfish harvesting waters and SA waters are suitable for primary and secondary recreation and for other water uses requiring lower quality. According to the U.S. Fish and Wildlife Service's Ecological Inventory Map for James Island, SC, the Wando Terminal and the NWS Charleston are located in a mid-salinity estuarine habitat (generally 5 to 16.5 parts per thousand). The Charleston Harbor, which is traversed on the way to either terminal, is located in a high-salinity estuarine habitat (generally 16.5 to 30 parts per thousand) (FWS, 1980b).

The State of South Carolina has also classified the water quality of the portion of the Cooper River above the confluence with the Ashley River as SB (SB waters are tidal saltwaters suitable for secondary contact recreation, crabbing, and fishing, except the harvesting of clams, mussels, or oysters for market purposes and human consumption). The waters of Goose Creek, upstream of the confluence with the Cooper River to the dam at the Charleston Waterworks, are also Class SB (Department of the Navy, 1994).

The lower Wando River, the Charleston Harbor, and the NWS area support a large number of aquatic and terrestrial species. According to the South Carolina Heritage Trust, no rare, threatened, or endangered species or communities have been recorded in the area near the Wando Terminal (McBee, 1994). State or Federally protected endangered or threatened aquatic species in the vicinity of the Charleston Harbor include the Shortnose sturgeon, Atlantic sturgeon, and the American shad. Bachman's warbler is a Federally protected bird species also found in the vicinity (FWS, 1980b).

In addition, the U.S. Fish and Wildlife Service reports that several protected marine species are known to occur in Charleston County (Banks, 1994). These are the west indian manatee (endangered), Kemp's ridley sea turtle (endangered), leatherback sea turtle (endangered), loggerhead sea turtle (threatened), and the green sea turtle (threatened). Protected bird species include the arctic peregrine falcon (threatened), bald eagle (endangered), wood stork (endangered), red-cockaded woodpecker (endangered), and the piping plover (threatened).

In recent years, two pairs of bald eagles (*Haliaeetus leucocephalus*) nested on the NWS Charleston. One nest was located north of Foster Creek near the POMFLANT storage and activity area, over four miles north of Wharf Alpha. The other was located on the golf course west of Pier X. Their nest tree was destroyed by Hurricane Hugo and the pair have relocated to Big Island, located north of Foster Creek (Department of the Navy, 1994).

Prior to Hurricane Hugo, 12 colonies of red-cockaded woodpeckers, *Picoides borealis*, were known at the NWS Charleston. The red-cockaded woodpecker requires mature pines old enough to be susceptible to red heart disease, which makes the wood soft enough for these small woodpeckers to create a cavity. Such trees are generally at least 70 to 75 years old. Nearly all trees this age were destroyed by Hurricane Hugo, so it is unlikely that the colony could reestablish at this site in the near future (Department of the Navy, 1994).

Wetlands are plentiful on and adjacent to the NWS Charleston. Three basic habitat types found within the area's wetland ecosystem are forested wetlands, nonforested wetlands, and open water. The station's wetland habitats had previously been identified according to the National Wetland Inventory classification system. Within this classification system, the station's wetlands had been placed in four major categories: estuarine, palustrine, lacustrine, and riverine. Based upon that classification, the station contained 1,356 acres of estuarine, 1,730 acres of palustrine and 131 acres of lacustrine wetlands (Department of the Navy, 1994). Field investigations have been performed at the NWS, and no rare or endangered plants or animals were observed (Department of the Navy, 1990 and 1994).

Wetlands at the station contain potential habitat for the flatwoods salamander (*Ambystoma cingulatum*), which is pending placement on the threatened or endangered species list. However, two spot checks of the area by the NWS Charleston environmental personnel have failed to locate either adults or larvae. It has been indicated that a detailed study may be performed of the area in the future (Department of the Navy, 1994).

Climatic Conditions

In general, the elevation of the area ranges from sea level to approximately 6 m (20 ft) on the peninsula. The climate of this region is temperate, primarily due to its close proximity to the Atlantic Ocean. The prevailing winds are generally northerly in the fall and winter months, becoming more southerly during the summer months. This type circulation serves to "warm" the region during winter and "cool" it during the summer. Summer is the rainy season in Charleston, with the city receiving 41 percent of the annual total rainfall during these months. Except for the occasional tropical storm or hurricane, the majority of this rain occurs during afternoon and evening thunderstorms. The late summer and early fall brings the highest probability of tropical storm activity to the Charleston, SC area. The fall season is a transitional period, where temperature extremes are rare and sunshine is abundant. The winters in this area are mild with periods of rain. However, in contrast to the summer, the winter rains tend to be steady and uniform, and last for several days. The most unstable period in this region is spring when the confluence of warm moist

tropical air and cool dry continental air increase the occurrence of severe weather in this region. The average earliest freeze in this area is in early December and the average last frost is in late February (NOAA, 1992c).

D.2.1.1.1 Naval Weapons Station - Charleston

The NWS Charleston is located on the west bank of the Cooper River, north of the city of North Charleston in southeastern Berkeley County, South Carolina. The station occupies about 7080 hectares (17,500 acres) along a 14-km (9-mi) stretch of the Cooper River, starting about 30 km (19 mi) from the Atlantic Ocean. The primary missions of the NWS Charleston are to provide material support for assigned weapons and weapon systems, to provide housing and community support facilities for personnel assigned to the Charleston area, and to do additional tasks such as home porting and logistics support for ammunition ships, and other fleet and shore activities dealing with weapons. Major tenant activities on the station include the new Army Strategic Mobility Logistics Base, a Propulsion Training Facility and the Military Traffic Management Command, an Army organization (Department of the Navy, 1990 and 1994). The Army Strategic Mobility Logistics Base is being constructed on the formerly Polaris Missile Facility Atlantic site (Lewis, 1995).

In selecting a port this far from the open ocean, DOE considered the navigation safety through the Charleston Harbor and up the Cooper River. As previously described, the harbor experiences a significant amount of deep draft traffic, and is accustomed to managing ship traffic in several 10.7 m (35 ft) deep channels. The Navy maintains a 10.7-m (35-ft) deep channel up the Cooper River to all relevant piers and wharfs of the NWS. The channel is as narrow as 120 m (400 ft) in some areas and extends to the edge of piers that may be in use for handling ammunition, petroleum products or other hazardous cargo (DOC, 1993d). However, with proper management of the harbor by the U.S. Coast Guard and pilots, and the proper planning by the U.S. Navy, additional assurance of a safe transit can be provided.

The Charleston Harbor Navigational Guidelines (DOC, 1993d) identifies areas of particular concern in the Cooper River area and provides guidelines for navigation, overtaking and passing in these areas. The Charleston Branch Pilots Association procedures (Commissioners of the Pilotage, 1995) require strict adherence to these guidelines for deep draft vessels and vessels carrying hazardous materials. The Coast Guard Captain of the port has broad regulatory authority over all port activities, and procedurally delegates control of vessel movements to the Charleston Branch Pilots Association (Bennett, 1995). This authority includes activities ranging from minor additional traffic restrictions on passing to establishing and enforcing a moving safety zone around a ship traversing the harbor area. A moving safety zone requires advance notification in the *Federal Register*, but is routinely done in areas in which hazardous materials are carried (USCG, 1994c). The Coast Guard and the South Carolina State Police have conducted exercises on moving a ship up the Cooper River under the threat of terrorist activities (Millar, 1995).

The U.S. Navy is the only significant user of the Cooper River north of the North Charleston facilities, and is a major user of the Cooper River. Cooper River transits can be planned by the Navy so that they would not conflict with other Naval activities and ship movements. The Commanding Officer of the NWS Charleston would determine which facility is most appropriate for each shipment based on the characteristics of the vessel carrying the fuel, the planned mode of overland transportation and any conflicting activities at the NWS Charleston. The NWS Charleston has four facilities that can handle spent nuclear fuel. The northern facility is Wharf Alpha, which is more than 12 m (40 ft) wide and has about 300 m (1000 ft) of useful berthing area dredged to 12.3 m (40 ft) deep. Wharf Alpha was previously used to service Polaris missile-carrying nuclear submarines, including removal and replacement of nuclear missiles. This function is no longer necessary, and submarines do not regularly visit the NWS Charleston.

Wharf Alpha is currently being used to service and load U.S. Navy ammunition ships. With the construction of the Army Strategic Mobility Logistics Base, the Army plans to upgrade in 1998 the rail lines serving Wharf Alpha as well as expanding the wharf itself. The wharf has a mobile crane, and is served by truck and rail loops, meaning that either trucks or trains can drive directly onto the wharf, load, and exit without turning around or reversing direction. Pier Bravo, located about 1 km (3281 ft) south of Wharf Alpha, is also used for ammunition handling. Pier Bravo protrudes 300 m (983 ft) into the Cooper River, with 214 m (703 ft) on the south side and 166 m (545 ft) on the north side of useful berthing in 11.9 m (39 ft) deep waters. The pier has a mobile crane that can off-load spent fuel casks directly onto trucks or trains parked on the pier.

Pier Charlie, located about 1000 m (3281 ft) south of Pier Bravo, has been used for berthing nuclear submarines and a tender. It is not in regular use, but is maintained as a backup for Wharf Alpha and Pier Bravo. A portable crane, which is capable under ideal conditions of lifting 36,280 kg (40 tons), can be moved to Pier Charlie and used to off-load casks onto trucks. The Military Traffic Management Command dock is located about 3 km (9840 ft) down the river from Pier Charlie. This facility is in regular use for roll on/roll off military cargo. The Military Traffic Management Command dock is a safe distance from any weapons handling operations at Wharf Alpha or Pier Bravo. However, the same portable crane that could be used at Pier Charlie would be used at the Military Traffic Management Command dock.

The portable cranes available on the NWS Charleston may not be able to off load some larger casks, especially if they have to extend horizontally over the ship. The DOE and the NWS Charleston would plan to use shipboard cranes or rented cranes, or schedule these certain shipments to dock at Wharf Alpha or Pier Bravo. Commercial 82 metric ton (90 ton) and 118 metric ton (130 ton) cranes are available in the greater Charleston, SC area (Silver, 1995). Additionally, Pier Charlie and the Military Traffic Management Command dock are not directly served by rail. However, several rail heads on the NWS are in secure and isolated locations that can be used to load the fuel from trucks to trains.

The NWS Charleston is a fenced facility with several guarded gates and a 24 hour security force. Additional guard facilities and temporary barricades are used to keep unnecessary personnel away from ammunition handling, and could be used for this program. The on-base emergency facilities are appropriate for fire and rescue response to ammunition handling and other potential accidents. Additionally, the Propulsion Training Facility includes two operating nuclear reactors. The staff is adequately trained and equipped to make initial response and assessment of any accident with the potential for radioactive release or radiation exposure.

The NWS Charleston facility is capable of supporting the implementation of a policy to accept foreign research reactor spent nuclear fuel. The facility is experienced in handling nuclear and hazardous cargo, can be safely reached from open ocean, has adequate facilities, ready access to truck and rail transportation, and low human populations. Desirable attributes include excellent emergency response capabilities, acceptable environmental concerns, moderate concerns from severe natural phenomena, separation from urban population, no local restrictions and secure short term storage. The risk associated with the conflicting uses can be mitigated by rigorous compliance with Naval operation procedures.

The 1990 population within 16 km (10 mi) of the Wharf Alpha was 209,188. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 46,200; Oak Ridge Reservation, 108,000; Idaho National Engineering Laboratory, 498,000; Hanford Site, 550,000; and Nevada Test Site, 540,000. Populations along rail routes to these sites are slightly larger. The distances to the five potential sites on interstate routes are: Savannah River Site,

301 km (188 mi); Oak Ridge Reservation, 644 km (402 mi); Idaho National Engineering Laboratory, 3,910 km (2,441 mi); Hanford Site, 4,580 km (2,858 mi); and Nevada Test Site, 3,930 km (2,543 mi). Distances along rail routes are slightly longer.

D.2.1.1.2 Wando Terminal

The South Carolina State Port Authority Wando Terminal is an ultra modern marine facility that is the designated hazardous materials terminal for the port ("Facility of Particular Hazard"), and is a superior terminal for receipt of spent nuclear fuel. In addition to being outside the city limits of Charleston and not subject to any potential restrictions on receipt and handling of spent nuclear fuel, it is closest to the Atlantic Ocean, and has outstanding facilities. The terminal has 3 container berths and 67.7 ha (167 acres) of paved container storage yard. It has a 428 m (1,400 ft) by 427 m (1,400 ft) turning basin. It currently has 740 m (2,430 ft) of lineal berthing space, but a fourth berth and 35.2 ha (87 acres) of additional paved storage area is currently under construction. The terminal is 8.1 km (5 mi) from the Mark Clark Expressway (I-526), which by-passes most of the city of Charleston and joins Interstate 26 at North Charleston. Of the four terminals in the Port of Charleston, Wando is the only one without direct rail service, requiring trucking of containers about 15 km (9 mi) to intermodal rail yards serviced by the CSX and Norfolk Southern Railroads. This was not considered a serious problem, since most shipments are anticipated to be carried overland by trucks.

The 1990 population within 16 km (10 mi) of the Wando Terminal was 233,434. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 65,700; Oak Ridge Reservation, 127,000; Idaho National Engineering Laboratory, 518,000; Hanford Site, 569,000; and Nevada Test Site, 559,000. Populations along rail routes to these sites are slightly larger. The distances to the five potential sites on interstate routes are: Savannah River Site, 325 km (203 mi); Oak Ridge Reservation, 668 km (417 mi); Idaho National Engineering Laboratory, 3,935 km (2,456 mi); Hanford Site, 4,600 km (2,873 mi); and Nevada Test Site, 4,098 km (2,558 mi). Distances along rail routes are slightly longer.

D.2.1.2 Galveston, TX

The Port of Galveston is about 16 km (10 mi) from the Gulf of Mexico via the Galveston channel. The City of Galveston, TX, occupies the entire width of the east end of Galveston Island. The shipping wharves are on the north side of the island and the Gulf of Mexico is on the south. The Port of Galveston is located in the heart of the City (DOC, 1992a). A map of the port is shown in Figure D-21.

As stated in the Coast Pilot, the Port of Galveston offers a short route to the sea and, together with the deep and easily navigated channel and excellent port facilities, enables Galveston to handle cargo most expeditiously and economically (DOC, 1992a). A Federal project provides for an entrance channel and an outer bar channel both dredged to 12.8 m (42 ft), thence 12.2 m (40 ft) to Galveston. The Port of Galveston is a multi-terminal port complex located on the northeastern end of Galveston Island, only 15 km (9.3 mi) from the entrance buoy to the open sea. Overall tonnage reported for 1991 was 4,159,233 metric tons (4,584,723 tons), of which approximately 17 percent (703,511 metric tons or 773,862 tons) was containerized freight (over 70,000 20-ft equivalent units). Roughly 77 percent of the tonnage was dry and liquid bulk, much of it grain (AAPA, 1993).

The Port of Galveston is a separate utility of the City of Galveston with its powers established by the City Charter. The Charter provides that all city-owned wharf and terminal properties be set aside and controlled, maintained, and operated by a "Board of Trustees of the Galveston Wharves."

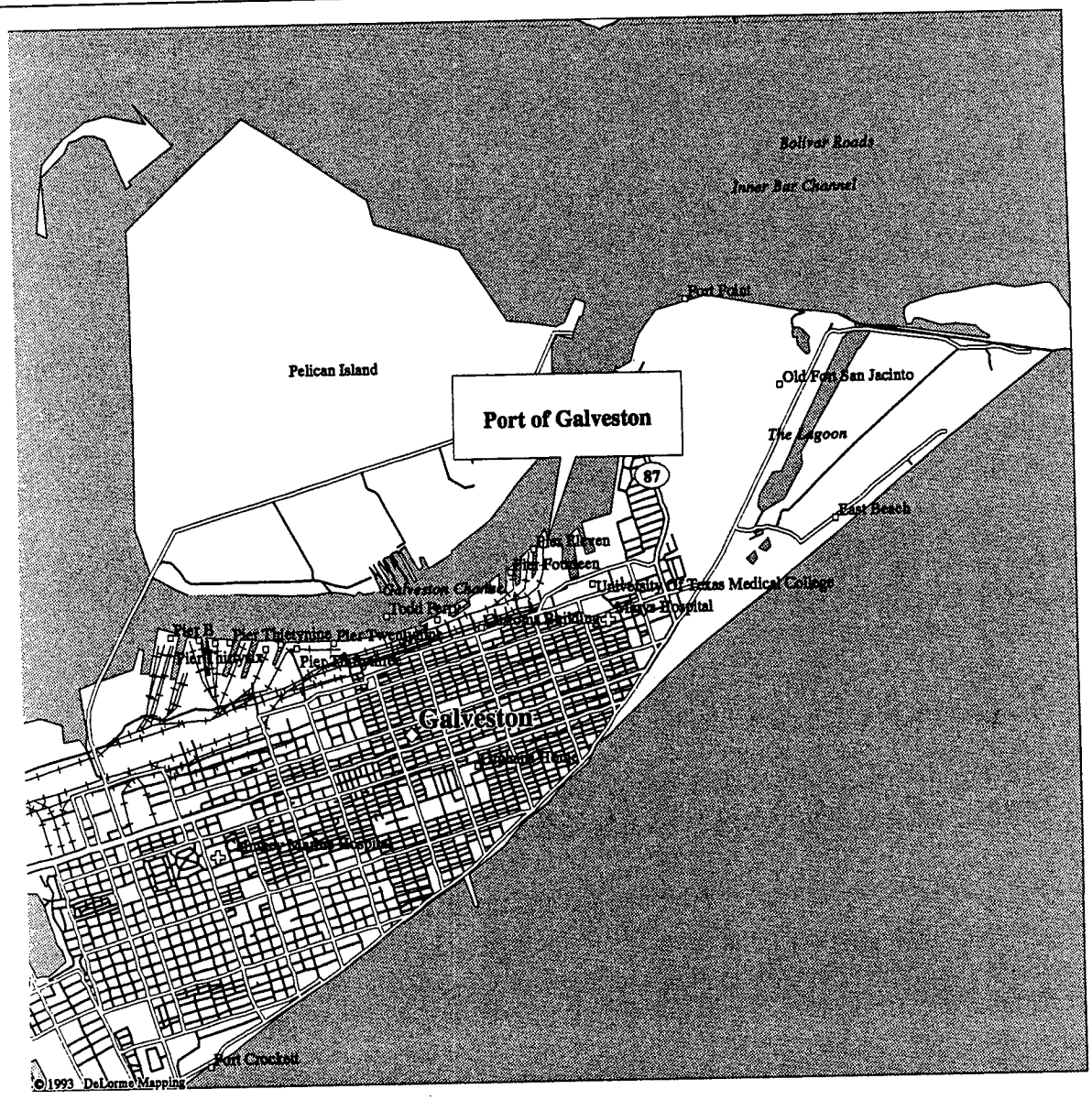


Figure D-21 Map of the Port of Galveston, TX

Principal container lines and the areas they serve include: Lykes Brothers — North Europe, Mediterranean, Mexico and West Coast of South America; Deppe Line — North Europe; Companhia Maritima Nacional — Brazil/Mexico; Compania Chilean Navegacion Interoceanica — South America/Mexico, and Del Monte/Network Shipping — Guatemala/Mexico (Jane's, 1992; AAPA, 1993).

Pier 10 Container Terminal: This is Galveston's principal container handling facility. It is leased to a private operator, Container Terminal of Galveston, Inc., who operates the facility as a public terminal. This facility has two berths, four container cranes, and 19.83 ha (49 acres) of paved storage area. The Port of Galveston owns an additional ten (10) open-dock ship berths and 20 berths with shipside warehouses used for breakbulk and other cargoes. The Container Terminal of Galveston, Inc. has two berths with a total length of 410 m (1,346 ft). Depth alongside the Container Terminal of Galveston, Inc. at mean low water is 12.2 m (40 ft). Crane capacities on Container Terminal of Galveston, Inc's. Pier 10 are three 50.8 metric tons (56 ton) container cranes and one 61.0 metric tons (67 ton) container crane. All cranes are equipped with 40.6 metric tons (45 ton) capacity spreaders.

The Container Terminal of Galveston, Inc. has a controlled all-weather truck entrance and interchange area. The terminal is connected to Interstate Highway 45 on the mainland by the 9.3 km (5.8 mi), four-lane State Highway 87 and two 2.8 km (1.75 mi) causeways that cross the southwest end of Galveston Bay. The island portion of the limited access route is through densely populated built-up areas. The Container Terminal of Galveston, Inc. is served by four major railroads: the Burlington Northern, Santa Fe, Southern Pacific, and Union Pacific Lines. Galveston Railway, Inc., provides terminal connections and performs switching of all rail traffic. An intermodal container transfer terminal is located within the container terminal and trackage extends to within 30.5 m (100 ft) of ship berths (Jane's, 1992; AAPA, 1993; Schultz, 1993).

Other Pertinent Information: The Port of Galveston has its own security force that provides 24-hour surveillance of its terminals. Container Terminal of Galveston, Inc. is fenced and has controlled access. An area is provided for segregation and temporary storage of hazardous cargoes.

The Port of Galveston's Director of Operations was unaware of any regulations prohibiting the importation of spent nuclear fuel (Schultz, 1993). The port occasionally handles hazardous materials, including Class A explosives (Schultz, 1993). NRC records indicate the port has not handled foreign research reactor spent nuclear fuel since at least 1979 (NRC, 1993).

The container terminal operator is responsible for handling hazardous materials emergencies at the Container Terminal of Galveston, Inc. facility. The Port of Galveston relies on the Galveston Fire Department's hazardous materials team and/or highly trained hazardous materials personnel at refineries located some 16-24 km (10-15 mi) away. The West Gulf Employers Association holds training courses for longshoremen which Port of Galveston terminal personnel also attend (Schultz, 1993).

Galveston is a major resort and tourist center for the Southwest United States. There is a 2.95 ha (7.3 acres) waterfront tourist attraction at "Pier 21" close to the historic district. A hospital is located across the street from the general cargo berths (Schultz, 1993). A public park on Pelican Island, reached by causeway, is located across the Intracoastal Waterway from the port. A cruise ship terminal is located at Pier 25 in the heart of the port complex and there is a tanker terminal on Pelican Island across from the port at its southern end. The greatest source of potential conflict is the heavy tanker traffic utilizing the Galveston entrance channel en route to Texas City and the Port of Houston petroleum/petrochemical terminals. Houston is the third most active port in the United States in terms of tonnage handled |

(IPA, 1993). The U.S. Coast Guard accident data for the period 1991-1993 indicate 52 reported accidents in the Galveston Bay area (USCG, 1994b). This includes ship traffic bound for the Houston area and also includes barge accident data.

Other than general heightened environmental awareness, there are no known sensitive environmental areas in the Port of Galveston area (Schultz, 1993). The port is subject to hurricane and tropical storms. The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Galveston, the Uniform Building Code requires buildings to withstand wind speeds up to 160 km/hr (100 mph). The port is located in a very low seismic zone with an acceleration of less than 0.075 g.

The 1990 census population within 16 km (10 mi) of the port terminals was 73,322. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 403,000; Oak Ridge Reservation, 337,000; Idaho National Engineering Laboratory, 526,000; Hanford Site, 575,000; and Nevada Test Site, 595,000. Populations along rail routes to these sites are slightly larger for Savannah River Site and Oak Ridge Reservation, but are slightly less for Idaho National Engineering Laboratory, Hanford Site, and Nevada Test Site. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 1,600 km (1,000 mi); Oak Ridge Reservation, 1,550 km (963 mi); Idaho National Engineering Laboratory, 3,070 km (1,911 mi); Hanford Site, 3,740 km (2,327 mi); and Nevada Test Site, 3,000 km (1,862 mi). Distances along rail routes are slightly longer.

Environmental Conditions

A large number of aquatic and terrestrial species frequent the Galveston Bay area. A variety of birds migrate, winter, and breed along the Texas Coast including shorebirds, songbirds, waterfowl, and raptors (Breslin, 1993; FWS, 1992). These endangered/threatened bird species include the brown pelican, peregrine falcon, bald eagle, Attwater's greater prairie-chicken, piping plover, and the eskimo curlew (State-threatened only). Endangered/threatened marine mammals and sea turtles also are found in the coastal bay systems and the Gulf of Mexico. Galveston Bay is within the range of the green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles. While no protected species are known to be located within the Port of Galveston, significant populations of the endangered brown pelican and the piping plover exist nearby (Werner, 1994). The U.S. Fish and Wildlife Service reported that as many as 600 brown pelicans have been sighted loafing on the north end of Little Pelican Island, which is approximately 5.6 km (3.5 mi) northwest of the port. In addition, approximately 125 pairs nested and produced 90 young for the year at this site in 1994, the first time that brown pelicans had successfully nested in Galveston Bay in over 40 years. Wintering populations of the threatened piping plover use the northeastern end of Galveston Island and the southeastern end of Bolivar Peninsula. Of the 3,187 birds observed during the first Gulf Coast count of wintering piping plovers, 1,904 were observed on the Texas coastline (Werner, 1994).

A great amount of commercial and recreational fishing occurs in Galveston Bay and the Gulf of Mexico. Shellfish are the most important commercial species, particularly shrimp, followed by eastern oysters and blue crabs (TPWD, 1989a). The most valuable finfish landed from the Galveston Bay system are black drum, and mullet. In 1988, a total of 5,077,170 kg (11,169,773 lbs) of shellfish valued at $13,489,146 was landed from the Galveston Bay System; a total of 224,536 kg (493,980 lbs) of finfish valued at $226,140 was also landed. The major recreational species of fish that were caught in the Galveston Bay system in 1987-1988 were: Atlantic croaker, sand seatrout, spotted seatrout, southern flounder, black drum, and red drum (TPWD, 1989b).

While the port area is highly developed, a wide variety of marine, estuarine, and lacustrine wetlands exist along Galveston Bay, including a large portion of Pelican Island, directly west of the port. Wetlands also occupy the majority of the far northern end of Galveston Island (FWS, n.d.a.).

Climatic Conditions

The City of Galveston is bounded on the southeast by the Gulf of Mexico and on the northwest by Galveston Bay. Thus, the climate of the Galveston area is predominantly marine, with periods of modified continental influence during the colder winter months when cold fronts from the northwest sometimes reach the Texas coast. Because of its coastal location, sub-freezing temperatures are rare, and higher than normal humidities prevail throughout the year. Summer rainfall is highly variable across the island due to thunderstorms and the local sea breeze circulation. Winter precipitation comes mainly from frontal activity and onshore flow, which produces slow, steady rains under a low stratus cloud deck. The island has been subject at infrequent intervals to major tropical storm systems with hurricane-force winds (NOAA, 1993c).

D.2.1.3 Hampton Roads, VA (Includes the Combined Terminals at Newport News, VA; Norfolk, VA; and Portsmouth, VA)

Hampton Roads is one of the world's foremost bulk cargo harbors. It is a multi-terminal port with privately and publicly owned marine cargo handling facilities located at the southwest corner of the Chesapeake Bay at the confluence of the James and the Elizabeth Rivers. The port is about 26 km (16 mi) from the Virginia Capes and the entrance from the Atlantic Ocean. The major terminals located on the Elizabeth and James Rivers are approximately another 10 to 13 km (6 to 8 mi) from the Bay (DOC, 1993c). The port includes the ports and cities of Norfolk, Portsmouth, and Newport News. Adjacent communities include the cities of Chesapeake and Virginia Beach. The maps of the port are shown in Figures D-22 (Newport News), D-23 (Norfolk), and D-24 (Portsmouth).

In 1992, Hampton Roads handled approximately 5.9 million metric tons (6.5 million tons) and 875,000 20-ft equivalent units of containerized cargo, including large amounts of radioactive materials (primarily uranium dioxide). The port ranks closely with the port of Charleston as the second or third most active container port for the East and Gulf Coasts (DOE, 1994d). The port is serviced by more than 75 ship lines that serve the port on a regular basis and provide approximately 4,000 sailings a year to many countries of the world, including Scandinavia, Europe, the Mediterranean, Near East, Mideast, Far East, Africa, Japan, and South America. A partial listing of lines include Alianca, American-Africa-Europe, American Transport, Argentine Line-ELMA, ACL, Atlantic Express, Bank, Ceylon Shipping, CGM, Chilean Line, Cho Yang Shipping, COSCO, DB Turkish Cargo Lines, Deppe, DSR Senator, Eimskip, Evergreen, Farrell, Hapag-Lloyd, Hoegh, Italian Line, Ivarian Lines, Jugolinja, K Line, Lloyd Basilero, Lykes Lines, Maersk, Mediterranean Shipping, Mitsui OSK, NSCSA, Nedlloyd, Neptune Orient, Netumar Lines, NYK, OOCL, Ocean Star Container Line, P & O, PT Djakarta Lloyd, Safbank Lines, Sea-Land Service, Shipping Corp. of India, Spanish Line, Tokai Shipping, Toko Kaiu Kaisha Ltd., Torm West Africa, United Arab Shipping, Venezuelan Line Walleniuis, Waterman, Wilhelmsen, Yang Ming Line, and Zim (Jane's, 1992; AAPA, 1993).

Because Hampton Roads and its approaches from the Virginia Capes handle a large amount of shipping, traffic separation schemes have been established for the control of maritime traffic. The controlling depth in the Deep Water Route from the Virginia Capes is 15.2 m (50 ft), except for one 14.3 m (47 ft) location. Projected depth for the Hampton Roads channel varies from 15.2 m to 16.7 m (50 to 55 ft). Depth alongside terminals at Newport News and Portsmouth is about 11.6 m (38 ft), while at the Norfolk terminal it is 12.5 m (41 ft) (DOC, 1993c; Jane's, 1992).

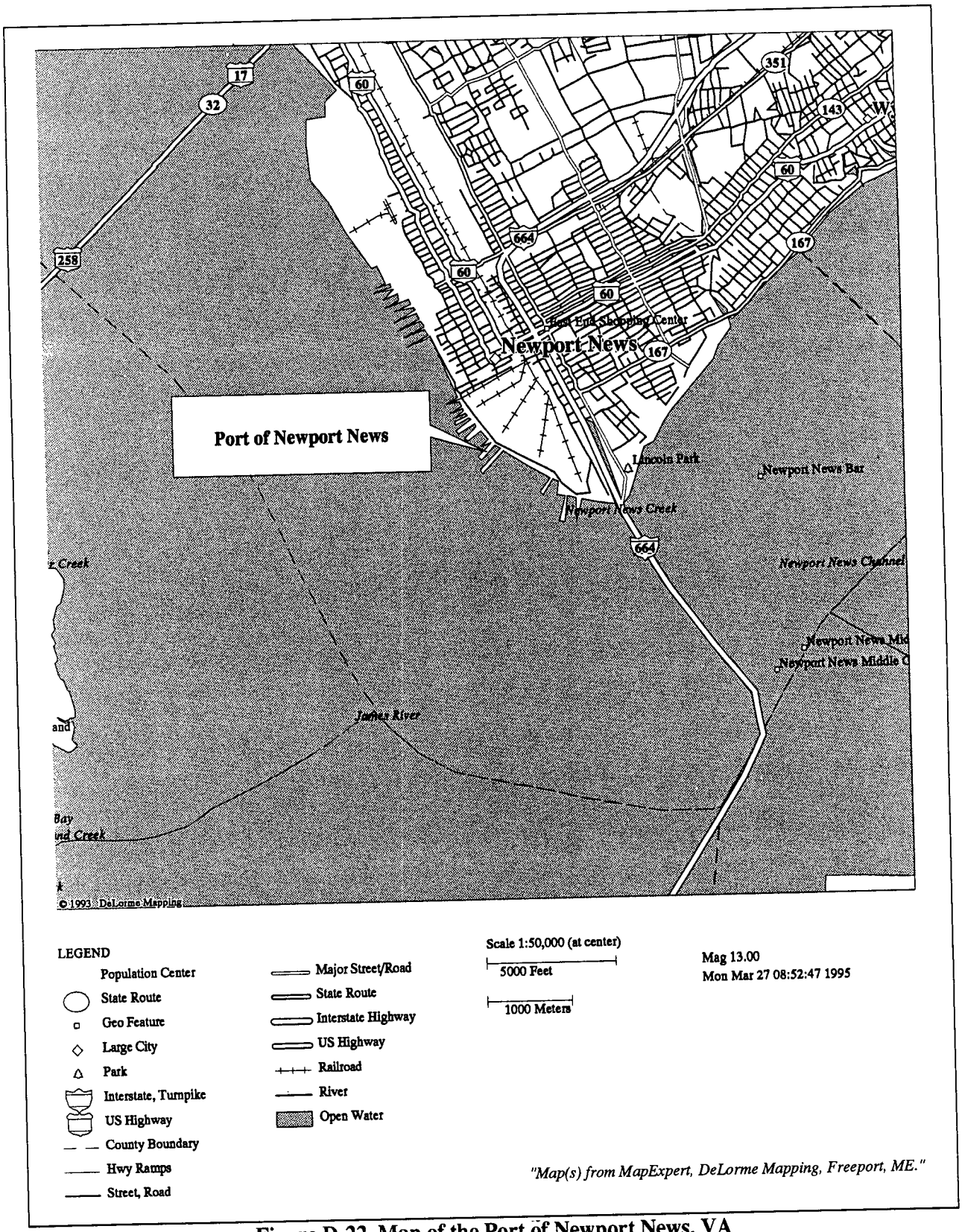


Figure D-22 Map of the Port of Newport News, VA

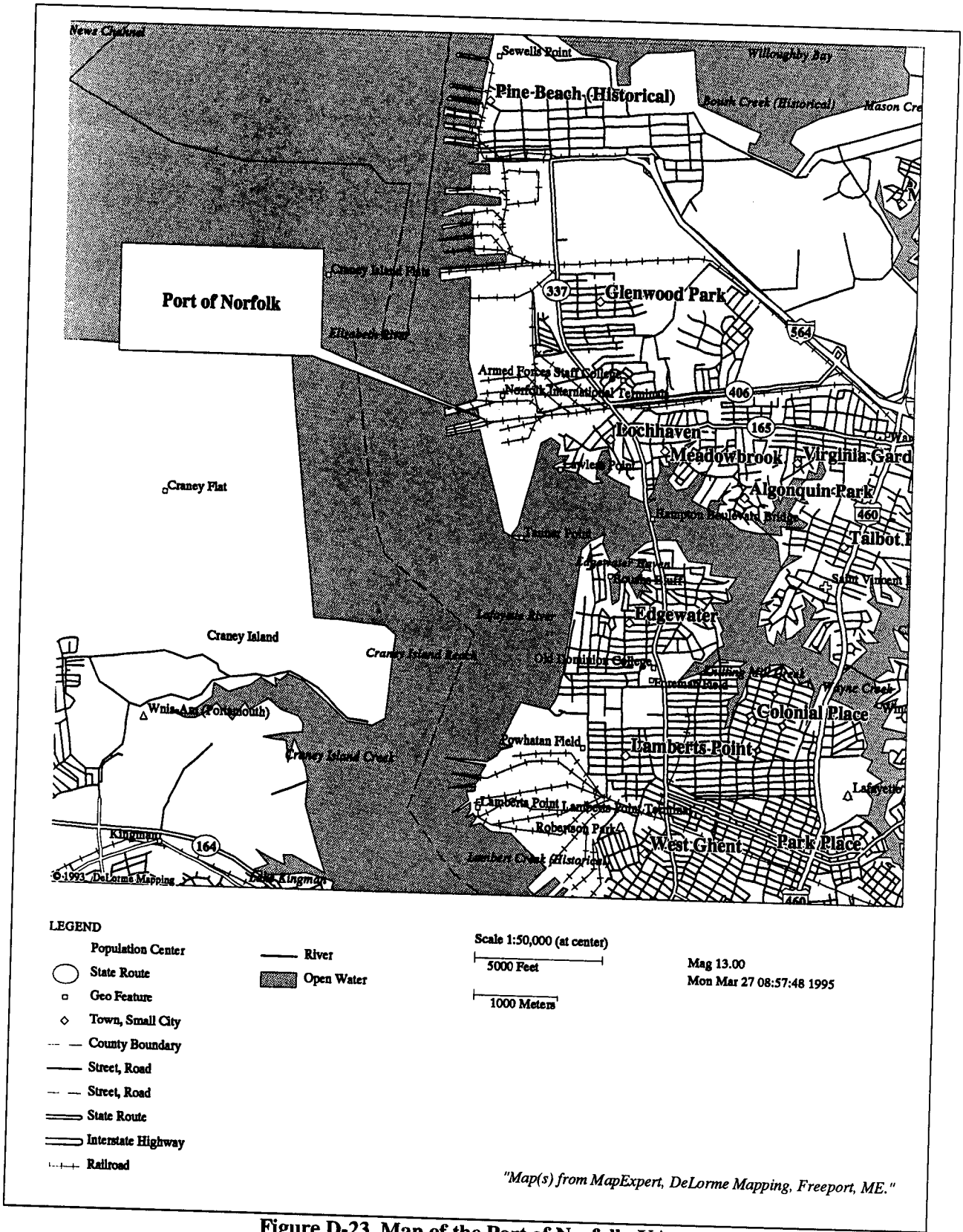


Figure D-23 Map of the Port of Norfolk, VA

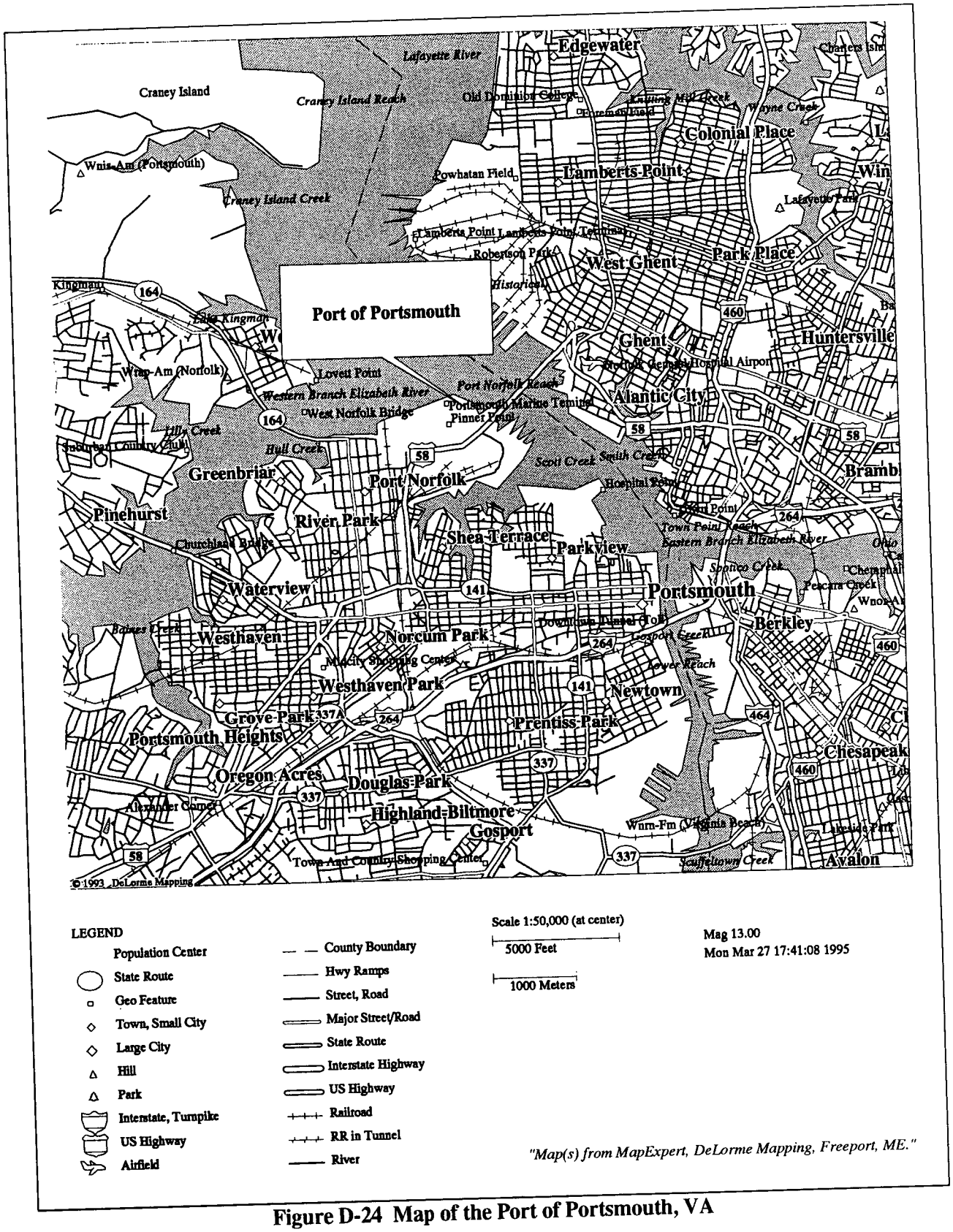


Figure D-24 Map of the Port of Portsmouth, VA

Changing weather can also be a concern as noted in the U.S. Coast Pilot: "Weather deterioration in the lower bay is often sudden and violent and constitutes an extreme hazard to vessels operating or anchoring in this area. The proximity of the bridge-tunnel complex to main shipping channels adds to the danger. Currents in excess of 1.5 meters-per-sec (3 knots) can be expected in this area" (DOC, 1993c).

The presence of three major vehicle tunnels (Chesapeake Bay tunnels, and Hampton Roads Tunnel with associated bridges) under the shipping channels are also sources of risk from ship collisions, especially in fog or during bad weather. Overall, however, the transit is direct and well-managed (DOC, 1993c).

The terminals of primary interest are owned by the Virginia Port Authority, that is a state agency reporting to the Secretary of Economic Development. The Virginia Port Authority's three large, general cargo terminals within the Greater Hampton Roads harbor area include Norfolk International Terminals which is a large container port that includes Sewell's Point Docks (a breakbulk facility), Portsmouth Marine Terminal, and Newport News Marine Terminals. These Terminals are operated by the Virginia International Terminals (the operating arm of the Virginia Port Authority). Lambert's Point Docks, a large breakbulk terminal owned by Norfolk Southern Railroad is also located on the Norfolk waterfront, but lacks container cranes. All three terminals are located in commercial port districts of their respective cities, somewhat separated from other community activities, in areas dedicated primarily to port industrial usage. The three Virginia Port Authority terminals are discussed below in subsections by terminal (Jane's, 1992; AAPA, 1993; FHI, 1994b; DOE, 1994d; VPA, 1994).

Other Pertinent Information: There are no regulatory restrictions prohibiting the receipt and handling of spent nuclear fuel in the port. Compliance with hazardous materials regulations (49 CFR) is the primary requirement. The Portsmouth Marine Terminal has had extensive experience in the receipt and handling of spent nuclear fuel shipments in the recent past, and Norfolk International Terminal and Newport News Marine Terminal also have had some experience (SNL, 1994; NRC, 1993). There appears to be little or no conflict with other hazardous cargoes, including petroleum products, naval weapons depots, etc., in the immediate vicinity of the three Virginia Port Authority terminals. The Virginia Port Authority depends on the Hampton Roads Emergency Team for response to hazardous materials accidents within its terminals. Hampton Roads Emergency Team consists of the fire departments of Norfolk, Portsmouth, and Virginia Beach, in liaison with the U.S. Coast Guard. Chief White of the Portsmouth Fire Department is in charge of the team, which also has ties to the State Emergency Team. All of the Virginia Port Authority terminal operating personnel and longshoremen are currently trained in hazardous materials awareness. Security for the port is provided by perimeter fences and the Virginia Port Authority's Port Police, which maintain 24-hour patrol and surveillance at all three terminals. The state of Virginia's Safety Manual sets forth the rules and policies for operations, including, among other things, hazardous cargoes, container control, emergency procedures and general safety, and provides the policy for receipt and handling of radioactive materials, including emergency response, personnel protection, facility protection, environmental protection and cargo protection (Edwards and Drews, 1993).

All three terminals are located in a large urban area in which congestion is to be expected. Of the three terminals, Portsmouth Marine Terminal is located closest to residential and downtown areas; however, Portsmouth is a relatively small city in both area and population, and it is only a short distance from the terminal to more sparsely populated rural areas. Conversely, truck shipments from Norfolk International Terminals, the terminals closest to the sea, must travel about 38 km (24 mi) of heavily trafficked Interstate through built-up sections of Norfolk, Virginia Beach, and Chesapeake before reaching Bowers Hill (a rural area). The comparable distance from Portsmouth is about 6 km (4 mi).

The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Hampton Roads, the Uniform Building Code requires buildings to withstand wind speeds up to 140 km/hr (90 mph). The port is located in a low seismic zone with an acceleration of 0.075 g.

Environmental Conditions

The lower Chesapeake Bay - Hampton Roads area is located on the coastal plain of southeastern Virginia. This area is rather flat and is dissected by numerous bays, rivers, creeks, and wetlands including saltwater marshes, bogs, and swamps (DOE, 1995). However, the areas in the vicinity of the Ports of Newport News, Norfolk, and Portsmouth are highly developed and the waterfronts consist largely of piers and bulkheads associated with the various shipyards, shipping terminals, warehouses and railroad yards that comprise this heavily utilized harbor area. The U.S. Fish and Wildlife Service reports that there are no Federally-listed or proposed listing for endangered or threatened species within a one-mile radius of the Portsmouth or Newport News Terminals (Mayne, 1994). However, rare, threatened, and endangered plant and animal species may be found around the cities of Newport News, Norfolk, and Portsmouth (O'Connell, 1994).

The waters of the Chesapeake Bay and Hampton Roads can be classified as a high-salinity estuarine habitat (generally 16.5-30 parts per thousand), while the Elizabeth and James Rivers, in the vicinity of the ports addressed in this section, are classified as mid-salinity estuarine habitat (generally 5-16.5 ppt) (FWS, 1980d). A number of aquatic species can generally be found in mid-salinity estuarine habitat in this area. Of particular note is the Atlantic sturgeon, a state-endangered species that migrates through these areas. In addition, the eastern oyster is common in the Elizabeth River, in the vicinity of the Norfolk International Terminal and the Portsmouth Marine Terminal. Blue crabs, eastern oysters, and hard clams are also found in the vicinity of the Newport News Marine Terminal (FWS, 1980d). However, Hampton Roads, the Elizabeth River, and portions of the James River (including that portion along the port of Newport News) have been designated as the "Condemned Shellfish Area No. 7" by the Virginia State Department of Health (West, 1994). Shellfishing is either restricted (special permits) or prohibited in this area. The State of Virginia also reports that a fishing health advisory is in effect for the James River and its tributaries due to Kepone contamination. In addition, the Southern Branch of the Elizabeth River, which is upstream of the Norfolk International and Portsmouth Marine Terminals, only partially supports water column standards for dissolved oxygen and sediment standards for lead. The waters in the Hampton Roads area are considered to be "swimmable" by the State of Virginia (West, 1994). The Tidewater area is part of the Mid-Atlantic flyway, and the numerous waterways and wetlands in this area are utilized by many migratory birds that pass through or winter in this region. There is generally a lack of suitable habitat or forage areas in the immediate vicinity of these ports. However, the Ragged Island Wildlife Management Area, located across the James River from the Port of Newport News, is used as a migratory area for waterfowl. Nesting areas for the great blue heron and the yellow-crowned night heron, both State-protected species, are reportedly located on the Lafayette River, approximately 3.2 km (2 mi) upstream of the Norfolk International Terminal (FWS, 1980d). More recently, the U.S. Fish and Wildlife Service indicated that a yellow-crowned night heron rookery consisting of eight nests was documented in the vicinity of the Norfolk Terminal (Mayne, 1994).

There are no known areas of special environmental concern other than the growing interest in preservation of the Chesapeake Bay and its tributary rivers. While the Dismal Swamp National Wildlife Refuge is located about 16 km (10 mi) from the two terminals on the Elizabeth River, the water drainage from the swamps is toward the port, and would not normally carry waterborne radioactivity into the swamp. Further, the swamp is far enough from the terminals so that any radiological impacts from airborne

releases (e.g., fires) would be expected to be negligible. In port, any potential negative impacts of low-probability, severe accidents on wildlife populations would be limited to the immediate area around the terminals.

Climatic Conditions

The Port of Hampton Roads, VA is located at the confluence of the James River and the Chesapeake Bay, approximately 29 km (18 mi) west of the Atlantic Ocean. The average elevation of this region is approximately 4 m (13 ft) above sea level.

The geographic location of this region is especially favorable, tending to be located south of the predominant winter extratropical cyclone tracks which originate at higher latitudes and north of the usual tropical cyclone (e.g., tropical storms and hurricanes) paths. In general, the winters are mild with slightly warmer temperatures during the spring and fall seasons. The summer season is warm and long, but is characterized by frequent cool periods, generated by cool northeasterly winds off of the North Atlantic. Extreme cold waves are infrequent, and temperatures below 18°C (0°F) are almost nonexistent. In general, winters pass without measurable snowfall, and most snowfall melts within 24 hrs. The average first sub-freezing day in the fall is November 17 and the last occurrence in the spring is March 23. The predominant wind directions since 1984 are from the south-southwest (about 30 percent) and north-northeast (about 25 percent) and vary seasonally (NOAA, 1992a).

D.2.1.3.1 Newport News Marine Terminal

This terminal is located on the north shore of the Port of Hampton Roads on the James River. It is a combination container, roll-on/roll-off, and breakbulk terminal. The facility has two piers (B and C), a total area of 56.9 ha (141 acres), five berths [two container berths, (each 284 m (930 ft) long), three breakbulk berths (totaling 667 m or 2,190 ft)], and four container cranes [(two 40.6 metric ton (45 ton) and two 30.5 metric ton (33.6 ton)]. Pier B is 189 m (620 ft) long and 168 m (550 ft) wide with three ship berths. Pier C is 285 m (985 ft) long and 165 m (540 ft) wide with equal dimensions of both the north and south sides. There is covered storage on both piers (36,620 m^2, or 394,200 ft^2) and the container handling terminal has storage for 790 stacked containers and 1,210 containers on chassis. The Virginia Port Authority is improving this terminal with a new 9,300 m^2 (100,000 ft^2) warehouse (Jane's, 1992; AAPA, 1993; FHI, 1994b).

Newport News Marine Terminal has immediate access to Interstate-664 outside the terminal. I-664 connects with I-64 Northbound, bypassing the Hampton Roads Tunnel, en route to the Richmond bypass, I-295 South, which connects with I-95 and I-85 Southbound. The terminal is served shipside via CSX Railroad, with direct rail service (Jane's, 1992, FHI, 1994b; AAPA, 1993).

The 1990 population within 16 km (10 mi) of the port terminals was 430,757. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 181,000; Oak Ridge Reservation, 209,000; Idaho National Engineering Laboratory, 628,000; Hanford Site, 677,000; and Nevada Test Site, 691,000. Populations along rail routes to these sites are slightly larger. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 840 km (519 mi); Oak Ridge Reservation, 890 km (553 mi); Idaho National Engineering Laboratory, 4,010 km (2,492 mi); Hanford Site, 4,680 km (2,908 mi); and Nevada Test Site, 4,172 km (2,595 mi). Distances along rail routes are slightly longer.

D.2.1.3.2 Norfolk International Terminals

This is the Virginia Port Authority's largest container handling facility, located on the south side of the Port in Norfolk, adjacent to the Navy Base on the Elizabeth River Channel. The Norfolk International Terminals have a wharf area of 328 ha (811 acres), 4 container berths, 7 container cranes, room for stacking 23,930 20-ft equivalent units four high, chassis stackers for 702 chassis, a roll-on/roll-off berth and covered pier storage of 83,640 m^2 (900,000 ft^2) plus associated container terminal handling equipment. Sewell's Point Terminal, located at the north end (seaward) of the Norfolk International Terminals' container berths consists of 12.14 ha (30 acres) of land area, two piers, and covered storage for breakbulk cargoes. The Norfolk International Terminals have four container berths, 1,289 m (4,230 ft) in length, six 40.6 metric ton (45 ton) container cranes, and one 30.5 metric ton (33.6 ton) container crane.

The terminal is located approximately 2.9 km (1.8 mi) from Interstate 64 via International Terminal Boulevard (a multi-lane industrial roadway bordering the Norfolk Naval Base). It is assumed that travel on I-64 would be southbound only because of the Hampton Roads Tunnel on I-64 North. Southbound routing requires crossing several bridges over the Eastern and Southern Branches of the Elizabeth River and dealing with frequent traffic congestion on the heavily traveled Interstate. The Norfolk International Terminals is served directly (shipside) by the Norfolk Southern Railroad, and indirectly via the Norfolk and Portsmouth Belt Line Railroad, with CSX and Eastern Shore Railroads (AAPA, 1993; FHI, 1994b).

The 1990 population within 16 km (10 mi) of the port terminals was 681,864. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 131,000; Oak Ridge Reservation, 174,000; Idaho National Engineering Laboratory, 631,000; Hanford Site, 694,000; and Nevada Test Site, 694,000. Populations along rail routes to these sites are slightly larger. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 800 km (498 mi); Oak Ridge Reservation, 880 km (550 mi); Idaho National Engineering Laboratory, 4,070 km (2,530 mi); Hanford Site, 4,740 km (2,949 mi); and Nevada Test Site, 4,240 km (2,633 mi). Distances along rail routes are slightly longer.

D.2.1.3.3 Portsmouth Marine Terminals

This is the Virginia Port Authority's second largest marine container handling facility, located further upstream at the confluence of the Elizabeth River and its Western Branch in the City of Portsmouth. The terminal has 3 berths that handle container, breakbulk and roll-on/roll-off cargoes, and a total land area of 88.7 ha (219 acres). It has four marginal berths with a total length of 1,080 m (3,540 ft), with 759 m (2,490 ft) of container berths. The terminal has a storage capacity of 1,770 stacked containers and 2,000 containers on chassis. The terminal also has 14,900 m^2 (160,400 ft^2) of warehouse space. The terminal has three 30.5 metric ton (33.6 ton) container cranes, one 40.6 metric ton (45 ton) container crane, and one 48.8 metric ton (54 ton) container crane.

The Portsmouth Marine Terminals are located approximately 4 km (2.5 mi) from the entrance ramp to I-264, a beltway that links up with U.S. Route 58 westbound in the rural Bowers Hill area of Chesapeake en route to I-95 or I-85 south. The assumed route from the Portsmouth Marine Terminals to the Beltway would be via Harbor Drive and Turnpike Road (State Highway 337), which runs through an area of mixed, small businesses and low-density housing for about 1.6 km (1.0 mi). The Portsmouth Marine Terminals are served directly (shipside) by the CSX Railroad with connections to the other rail lines via the Norfolk and Portsmouth Belt Line Railroad (AAPA, 1993; FHI, 1994b).

The 1990 population within 16 km (10 mi) of the port terminals was 665,700. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 135,000; Oak Ridge Reservation, 257,000; Idaho National Engineering Laboratory, 670,000; Hanford Site, 718,000; and Nevada Test Site, 732,000. Populations along rail routes to these sites are about the same for Eastern sites and slightly larger for Western sites. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 810 km (501 mi); Oak Ridge Reservation, 780 km (487 mi); Idaho National Engineering Laboratory, 4,040 km (2,514 mi); Hanford Site, 4,710 km (2,930 mi); and Nevada Test Site, 4,210 km (2,617 mi). Distances along rail routes are slightly longer.

D.2.1.4 Jacksonville, FL

The Port of Jacksonville is located on the Atlantic Coast of Northern Florida, along the St. Johns River. It is a geographically large city (1,967 km^2 or 760 mi^2), ranging from the town of Orange on the east side of the river to Julington Creek on the west side. Most of the marine terminals are on the west side of the river, about 34 km (21 mi) from the ocean entrance. However, the Blount Island container terminal is well-separated from the city, and is only about 11 km (7 mi) from the harbor entrance. A Federal Project maintains a channel depth of 12.2 m (40 ft) to 12.8 m (42 ft) at the entrance to the river. The depth gradually decreases to about 9.1 m (30 ft) at the railroad bridge in Jacksonville. The Blount Island Terminal is located downstream from the railroad bridge in a deeper part of the channel (DOC, 1993d; Jane's, 1992; AAPA, 1993; Southern Shipper, 1993). A map of the port is shown in Figure D-25.

The St. Johns River has a deep, steep-sided channel cut through the rock in some areas. This channel configuration, combined with the increased size and draft of vessels entering the port makes the river difficult to navigate. Tidal currents in the river are strong as far as Jacksonville, approaching 1.5 meters-per-sec (3 knots) in several places (DOC, 1993d).

The Jacksonville Port Authority (Jaxport) operates two deep water container/general cargo terminals: Blount Island, located approximately 11 km (7 mi) from the harbor entrance and Talleyrand Docks and Terminals, located about 34 km (21 mi) from the entrance. Both terminals are equipped with modern entrance cranes, handle breakbulk and other types of cargo, and have transit sheds, warehouses, and open storage areas. Of the two, Blount Island is preferred because of its separation from the high density downtown area and closer proximity to the sea. A new terminal is under consideration adjacent Blount Island at Dames Point (Southern Shipper, 1993).

Both terminals serve a number of major general cargo and container ship lines from around the world including Sea-Land, NYK, Hyundai, and Mitsui OSK, that offer worldwide cargo services, and Columbus and Blue Star Line (Australia service). These lines provide service to many regions of the world, including Europe, the Mideast, South America, and Australia (Southern Shipper, 1993; Jane's, 1992).

Blount Island Terminal: Blount Island is a 356 ha (880 acre) facility with 1,920 m (6,299 ft) of berthing space, of which Berth 12 is the longest [351 m (1,150 ft)]. Blount Island Berths 7-13 have 11.6 m (38 ft) of water alongside at mean low water, and five 40.6 metric ton (45 ton) container cranes. It has 34,000 m^2 (360,000 ft^2) of transit sheds/warehousing and 149 ha (367 acres) of open storage. This terminal is connected to the mainland via a fixed highway bridge that joins State Highway 105 (Necksher Drive) and connects with I-95 and Route 17 about 8 km (5 mi) north of the City of Jacksonville. A new eight lane truck security plaza was dedicated in 1992. Blount Island has pierside service by the CSX Railroad that connects with the Norfolk Southern Railroad (Southern Shipper, 1993).

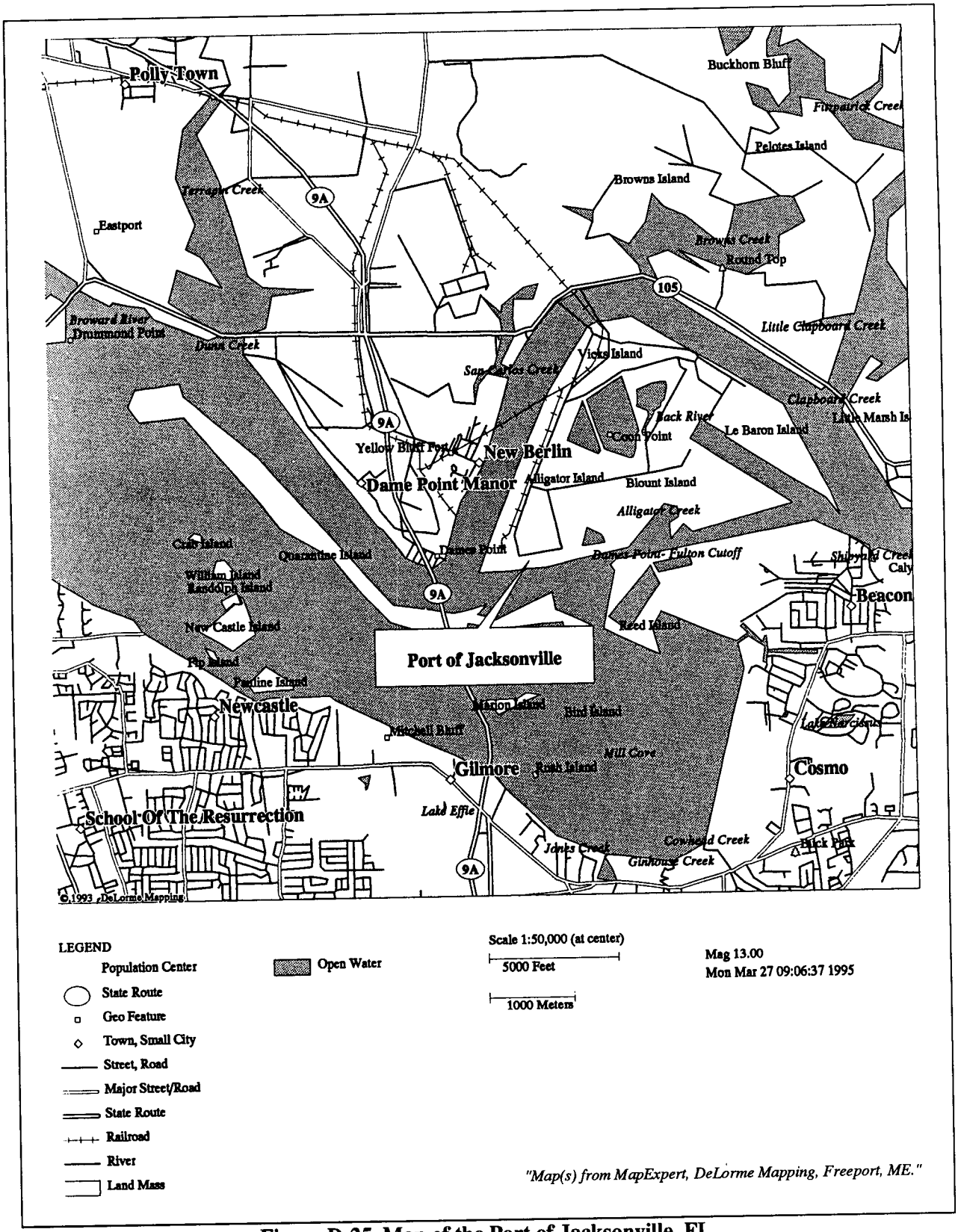


Figure D-25 Map of the Port of Jacksonville, FL

Talleyrand Terminal: Talleyrand Docks is a 70 ha (172 acre) facility with 1,250 m (4,100 ft) of marginal wharf on deep water [11.6 m (38 ft)] at mean low water. It has two 40.6 metric ton (45 ton) container cranes, and two large gantry whirley cranes [50.8 metric ton (56 ton) and 102 metric ton (112 ton)], and 14,900 m^2 (160,000 ft^2) of transit sheds/warehousing with 49 ha (120 acres) of paved open storage (fenced and lighted). Talleyrand Terminal is located in downtown Jacksonville's shopping and commercial zone, about 2.9 km (1.8 mi) downstream of the John R. Matthews Bridge (alternate U.S. Route 90), and less than 1 km (0.6 mi) via city streets to the Expressway (alternate U.S. Route 1) (Southern Shipper, 1993).

Other Pertinent Information: The Port Authority is not aware of any local regulatory restrictions on receipt and handling of spent nuclear fuel (Castiel, 1993). The terminals have no prior experience handling spent nuclear fuel (SNL, 1994; NRC, 1993) or hazardous wastes, but do handle hazardous cargoes such as poisons, corrosives, and Class B explosives. Jaxport is a member of Jacksonville Spillage Control and the City of Jacksonville's Hazardous Materials Team. Terminal operating personnel and longshoremen receive basic instruction in the handling of hazardous cargoes. Around the clock security is provided to both terminals by the Jacksonville Port Authority, with secure, short-term storage available if needed.

There are several tanker terminals and petroleum storage depots downstream and immediately adjacent Talleyrand Docks and Terminals. Blount Island Terminal appears to have no petroleum terminals or other conflicting cargo activities (Castiel, 1993).

While the entire State is environmentally aware, there are no known sensitive wildlife sanctuaries in the immediate area of Jaxport. Blount Island is surrounded by extensive marsh and wetlands. The port is subject to severe hurricanes and tropical storms. The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Jacksonville, the Uniform Building Code requires buildings to withstand wind speeds up to 160 km/hr (100 mph). The port is located in a very low seismic zone with an acceleration of less than 0.075 g.

The 1990 population within 16 km (10 mi) of the port terminals was 334,212. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 46,900; Oak Ridge Reservation, 175,000; Idaho National Engineering Laboratory, 576,000; Hanford Site, 643,000; and Nevada Test Site, 639,000. Populations along rail routes to these sites are slightly larger. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 607 km (377 mi); Oak Ridge Reservation, 912 km (567 mi); Idaho National Engineering Laboratory, 4,030 km (2,504 mi); Hanford Site, 4,700 km (2,924 mi); and Nevada Test Site, 4,190 km (2,607 mi). Distances along rail routes are about the same.

Environmental Conditions

The area between the mouth of the St. Johns River and Blount Island is characteristic of typical coastal lowlands found along the southeastern United States. Numerous creeks meander through large expanses of marshes and swamps. With the exception of the U.S. Naval Station Mayport and the village of Mayport, which occupy the first several kilometers along the southern bank of the river, the land bordering the lower portion of the river is largely undeveloped, with the exception of riverfront residences, mainly along the northern bank. In fact, most of the land to the north of the river between Blount Island and the coast is part of the Nassau River - St. Johns River Marshes Aquatic Preserve. The Fort Caroline National Memorial is located southeast of Blount Island on the southern bank of the river. The Little Talbot Island State Park is located approximately 1.6 km (1 mi) north of the channel entrance.

The lower 24.2 km (15 mi) of the St. Johns River has been designated as critical habitat for the manatee, a listed endangered species. The river is also used as a migratory area for the shortnose sturgeon, a listed endangered species (FWS, 1980e). According to the Florida Natural Areas Inventory, the following rare species have been reported within 3.2 km (2 mi) of the Blount Island Terminal: West Indian Manatee (State and Federal Listed Endangered Species), shortnose sturgeon (State and Federal Listed Endangered Species), Atlantic sturgeon (State Listed Species of Special Concern and Federal Listed Threatened Species), sea lamprey, and the opossum pipefish (Murray, 1994). In addition, the U.S. Fish and Wildlife Service reports that the following protected marine species may occur in Duval County: west indian manatee (endangered), shortnose sturgeon (endangered), Kemp's ridley sea turtle (endangered), leatherback sea turtle (endangered), loggerhead sea turtle (threatened), hawksbill sea turtle (endangered), and the green sea turtle (threatened). Protected bird species include the bald eagle (endangered), wood stork (endangered), piping plover (threatened), and red-cockaded woodpecker (endangered) (Bentzien, 1994).

A variety of wading birds are also found in the vicinity of the Fort Caroline National Memorial. Several species of birds, including shorebirds, waterfowl, and gannets frequent the area around the jetties at the channel entrance. In particular, the brown pelican (a State Species of Special Concern) is found in this area. A variety of birds inhabit the Little Talbot Island State Park, including the American oystercatcher (a State Species of Special Concern). Loggerhead sea turtles (a listed endangered species) use the beaches along this portion of Florida as a nesting area (FWS, 1980e).

Climatic Conditions

The Port of Jacksonville, FL, is located along the lower 39.4 km (24.5 mi) of the St. Johns River. The terrain in this area is relatively level, providing very little change in relief proceeding inland from the coastal region.

As with the other more northern ports, the climate of this area is also modified by the influence of the Atlantic Ocean. Easterly winds occur roughly 40 percent of the time, producing a true maritime climate for the Jacksonville area. The greatest rainfall occurs during summer, usually associated with afternoon and evening thunderstorms. During summer, measurable precipitation can be recorded nearly every two days. The prevailing winds are northeasterly in the fall and winter months, becoming more southwesterly during spring and summer. Although Jacksonville is along the eastern United States coast, it has been very fortunate in escaping hurricane-force winds. The majority of systems in recent years that have reached this latitude have moved parallel to the coastline, keeping well offshore. Others have weakened significantly moving over land prior to reaching the Jacksonville area. The combination of these two factors has spared the area from any major devastation due to tropical systems in recent years (NOAA, 1992e).

D.2.1.5 Military Ocean Terminal, Sunny Point, NC

The Military Ocean Terminal at Sunny Point (MOTSU) is a defense transportation facility used to move military cargo (principally munitions) into and out of the United States. The terminal is located approximately 16 km (10 mi) upstream from the mouth of the Cape Fear River on the Atlantic Coast near Southport, NC. A map of the port is shown in Figure D-26. The port is easily accessed from the ocean, and all commercial vessels bound for Wilmington, NC must pass by MOTSU. It is served by a 12.1 m (40 ft) deep by 152 m (500 ft) wide channel from the ocean (DOE, 1994d).

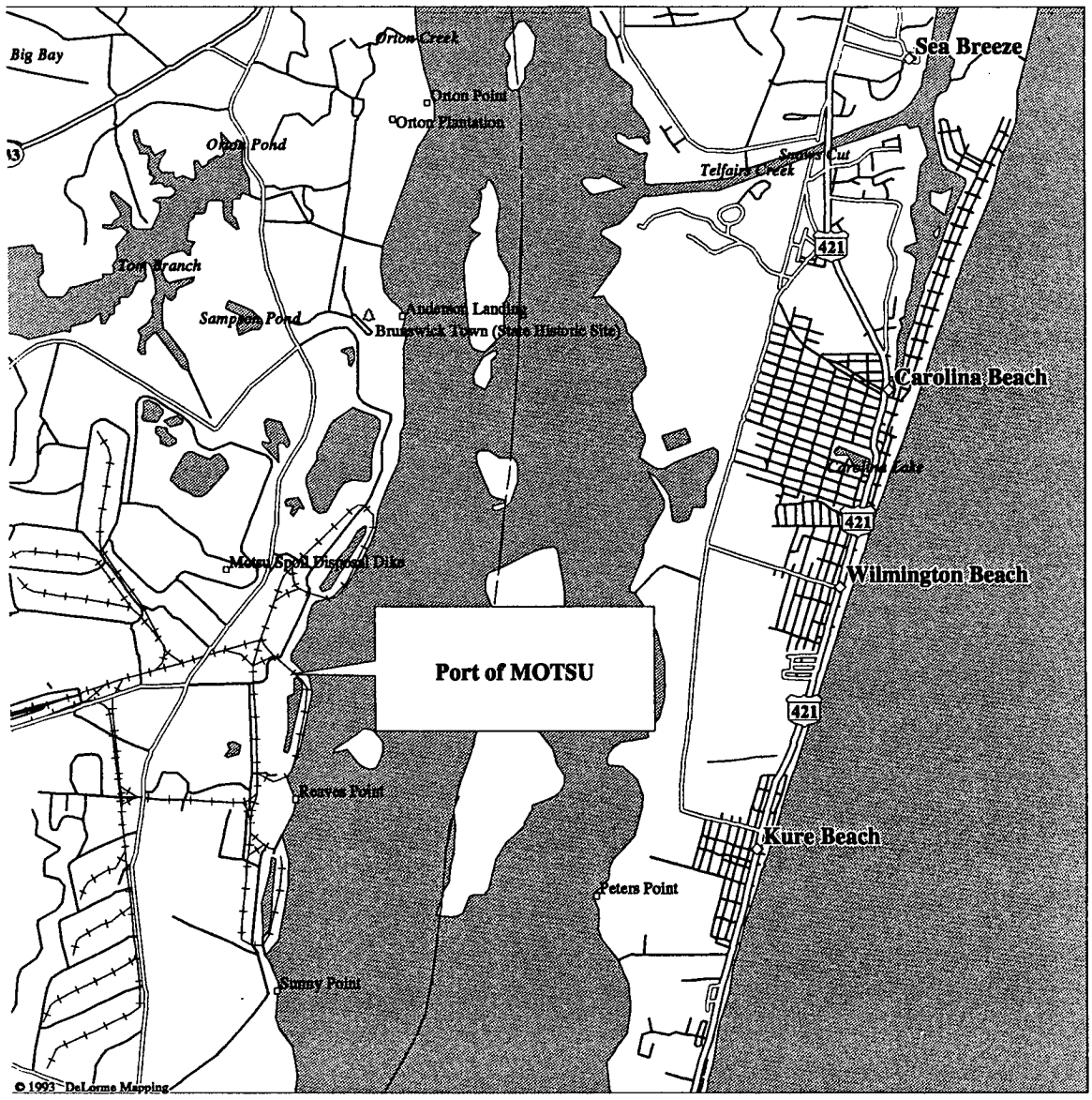


Figure D-26 Map of the Military Ocean Terminal, Sunny Point, NC

Since the majority of cargoes handled at MOTSU are explosive, the terminal is laid out such that an explosion at one wharf will not seriously impact activities at an adjacent wharf. This would permit containerized spent nuclear fuel carried in a commercial vessel (without explosive or hazardous cargoes on-board) to be safely received and transported from the terminal, even though there are conflicting activities within the terminal. Further, after many years of service, MOTSU has never had an explosion accident, so the risks are believed to be small. However, unloading of spent nuclear fuel would be scheduled during periods when explosives were not being unloaded. On average, MOTSU receives about 70 vessels per year, and moves approximately 433,000 metric tons (476,000 tons) of cargo through the port.

While regularly scheduled commercial container or breakbulk vessels do not call at MOTSU, commercial container vessels chartered by defense agencies routinely call at the port. The water depth (channel and alongside the wharves) of 10.3 m (34 ft) mean low water is adequate for most commercial breakbulk, roll-on/roll-off, and container ships. The terminal has three 606 m (2,000 ft) wharves, each with three berths. All wharves have three parallel sets of rail tracks. Berth 1, on the south wharf, has two 45.3 metric ton (50 ton) container cranes capable of off-loading container or container/breakbulk vessels. Berth 3 has been modified with a 30 m (100 ft) wide, reinforced concrete apron that permits breakbulk and roll-on/roll-off operations in addition to containerized cargoes (DOE, 1994d).

MOTSU is serviced by well-maintained roads which are primarily two-lane roads providing connections to multi-lane controlled access highways. In the event that MOTSU was utilized for receipt of foreign research reactor spent nuclear fuel, all transport of spent nuclear fuel over these roadways would be in conformance with State regulations for normal truck traffic between MOTSU and other locations to avoid overloading roadways and bridges. Truck access is provided by State Route 87 from the northwest and State Route 133 from the north. Route 87 provides access to U.S. 17, which runs southwest or northeast. The distance from the terminal gate to Route 133 is about 3.7 km (2.2 mi). Route 133 runs directly to U.S. 17 just outside Wilmington, NC. From Wilmington, U.S. 74 runs west 120 km (75 mi) to Interstate 95, the nearest major north-south highway (DOE, 1994d). A dedicated 157 km (97.4 mi) U.S. Army rail line connects the CSX network directly to the terminal.

Other Pertinent Information: At the present time, there are no regulatory restrictions on receipt, handling, and transhipment of foreign research reactor spent nuclear fuel at MOTSU. MOTSU is the only port in the contiguous United States which has current experience with foreign research reactor spent nuclear fuel receipt and handling, with two shipments received in October 1994 under the Urgent Relief Environmental Assessment.

Cargo handling at the terminal, including explosives, is performed by members of the International Longshoremen Association. Port security is maintained on land by security guards, and on water by dedicated patrol boats.

The likelihood of severe natural phenomena, such as high winds and earthquakes, is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For MOTSU, the Uniform Building Code requires buildings to withstand wind speeds up to 160 km/hr (100 mph). The port is located in a low seismic zone with an acceleration of 0.075 g.

The 1990 population within 16 km (10 mi) of the port terminals was 7,995. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 34,200; Oak Ridge Reservation, 128,000; Idaho National Engineering Laboratory, 463,000; Hanford Site, 548,000; and Nevada Test Site, 619,000. Populations along rail routes to these sites are

slightly larger. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 402 km (250 mi); Oak Ridge Reservation, 798 km (496 mi); Idaho National Engineering Laboratory, 3,873 km (2,407 mi); Hanford Site, 4,615 km (2,868 mi); and Nevada Test Site, 3,953 km (2,457 mi). Distances along rail routes are slightly longer.

Climatic and environmental information for MOTSU is similar to that for the Port of Wilmington, NC, as listed in Section D.2.1.10.

D.2.1.6 Naval Weapons Station (NWS) Concord, Concord, CA

Concord NWS is located on the western edge of Suison Bay, an esturine area carrying the flows of the Sacramento and San Joaquin Rivers to San Pablo Bay through the Straits of Carquinez. By sea, the transit is approximately 55 km (35 mi) northeast of the Golden Gate Bridge. Concord NWS is about 5 km (3 mi) north of the city of Concord, CA. The wharf at Concord NWS is about 8 km (5 mi) north of the city. The site tidal areas surrounding the pier areas (including small off shore islands) comprise about 3,1000 ha (7,648 acres) to provide a large separation from nearby communities, and security for the site. A map of the area is shown in Figure D-27. Concord NWS is aligned under the Pacific Division Division of the Naval Ordnance Center. Concord NWS is aligned under the Pacific Division of the Naval Ordnance Center. The Pacific Division is located at Seal Beach, CA and the Naval Ordnance Center is located at Indian Head, MD (Yocum, 1994b).

The Station currently is a breakbulk facility (primarily munitions, naval ordnance, and other high explosives), with limited container handling capabilities. Most vessels servicing the facility are self-supporting, with on-board cranes for handling cargo. Concord NWS currently has a 100-metric ton (112-ton) floating crane and a truck mounted mobile 82 metric ton (90 ton) crane used to service the Station as needed (several cranes are mounted on a crane ship that ties up alongside cargo vessels and loads or offloads cargoes). The facility also has a roll-on/roll-off berth for stern ramps, and a substantial barging pier. A $57 million modernization program has been approved for completion by 1999, which will add to Pier 3 two new 36 metric ton (40 ton) container cranes and gantry crane rails outside of the existing pier structures. The improvements will permit more efficient handling of containerized cargo. The Station is very similar to the MOTSU facility, with three well-separated wharves with two berths on each [about 360 m to 370 m long (1,180 ft to 1,220 ft) at Pier 3]. Separation is designed to protect adjacent vessels from severe damage (or additional explosions) in the unlikely event of an explosion on one ship. Like MOTSU, each pier has three parallel rail lines. Depth alongside the breakbulk/container wharves is 10.6 m (35 ft) at mean low water, which is adequate for most breakbulk/container vessels. Vessel size is limited by the height limit of 33 m (135 ft) under the bridges over the Strait, and the width of the channel [about 90 m (300 ft) minimum] (Yocum, 1994a and 1994b).

Truck access to Interstate 680 is about 10 km (6 mi) via State Route 4. The site has about 127 km (79 mi) of paved roads and 165 km (103 mi) of rail tracks. Concord NWS is served by the Union Pacific, Southern Pacific, and Santa Fe Railroads (all of which have mainline tracks through the tidal area) and has the equivalent of a small intermodal railyard in the immediate vicinity of the pier where railcars can be brought after loading on the piers. Rail routes include direct movement to the Hawthorne Army Ammunition Depot in Hawthorne, NV, where spent nuclear fuel could be off-loaded to trucks for direct shipment to the Nevada Test Site (Yocum, 1994b).

Other Pertinent Information: Since it is a military facility and an explosives operating area, the entire pier operations waterfront is surrounded by barbed wire fencing with access through military posted gates. The facility has areas for staging (and short-term secure storage) shipments by truck or rail near the pier areas.

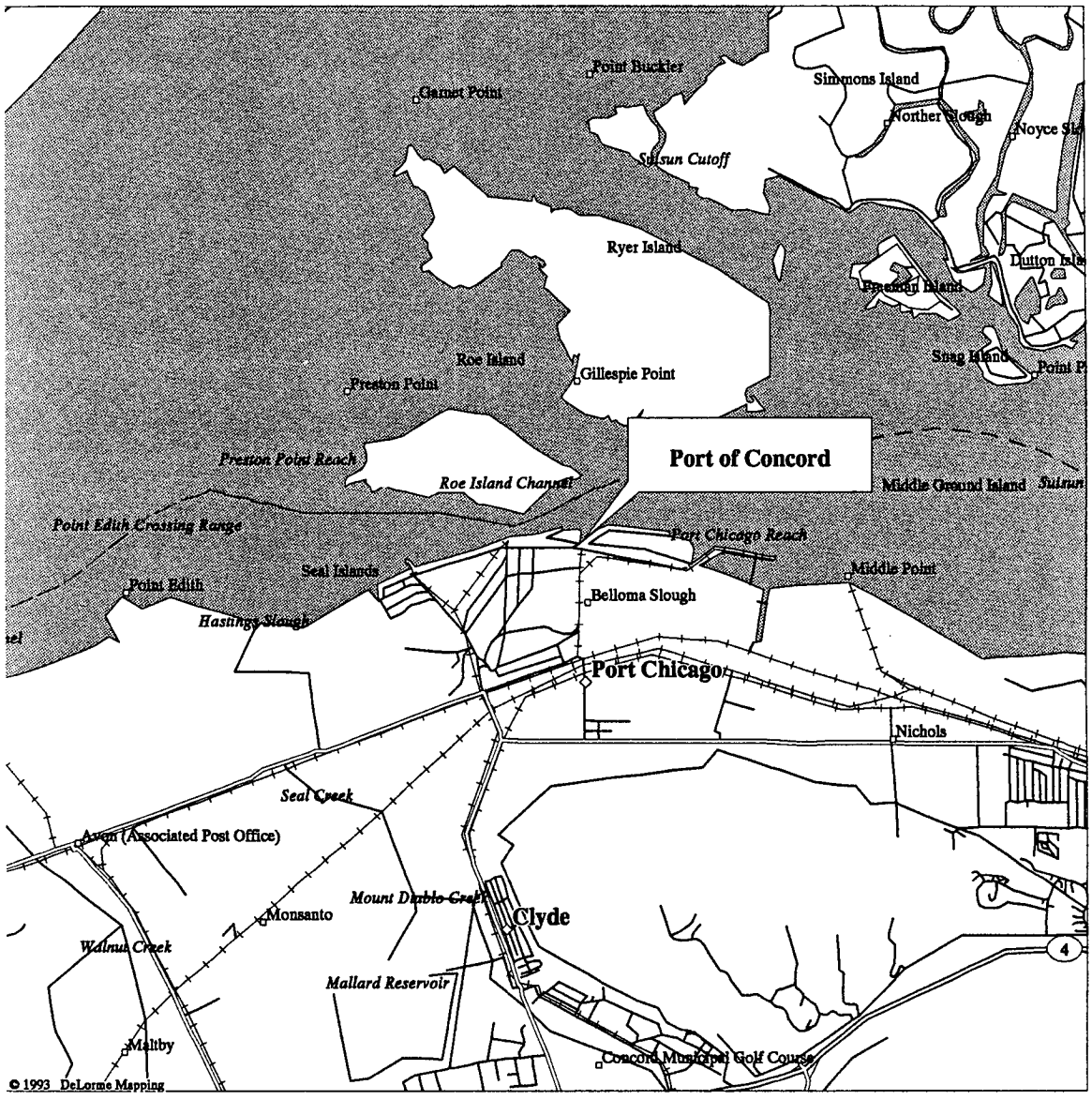


Figure D-27 Map of the Concord Naval Weapons Station, Concord, CA

When explosives are being handled, the explosive safety arc is approximately 3,400 m (11,200 ft) around the pier area. The existing State highway through the site is closed off about 3 km (2 mi) from the piers at the small town of Clyde (population about 485) adjacent to the Station's Administrative areas (Yocum, 1994b). Concord NWS area has its own full-time security force, with a U.S. Coast Guard facility onsite to provide some explosive oversight services during loading and unloading activity. There is a fire station in the immediate vicinity of the pier areas, with an estimated 3-minute response time for first responders.

The primary mission of the port is to support all branches of the military in shipping munitions. No concurrent non-explosives cargo handling, such as foreign research reactor spent nuclear fuel, would be allowed when explosives are being handled. Scheduling of foreign research reactor spent nuclear fuel shipments would have to be done for times when no explosives handling is anticipated. Unscheduled activities or activities with little advance notice involving the military mission would require re-scheduling or re-routing of the foreign research reactor spent nuclear fuel. The foreign research reactor spent nuclear fuel handling would not be the first priority of the port.

Conflicting activities are expected to be avoided by proper scheduling (normally only one ship at a time is in port).

Parts of the tidal area are leased to local cattle growers to keep the grass down for fire protection purposes. The station is a wildlife sanctuary for migratory birds (about 1,200 ha or 3,000 acres) of the tidal area) and hosts native Tule elk, which were formerly on the endangered species list (Yocum, 1994b).

The likelihood of severe natural phenomena, such as high winds and earthquakes, is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Concord NWS, the Uniform Building Code requires buildings to withstand wind speeds up to 110 km/hr (70 mph). The port is located on the edge of a very high seismic zone with an acceleration of 0.45 g.

The 1990 population within 16 km (10 mi) of the port terminals was 381,070. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 1,040,000; Oak Ridge Reservation, 742,000; Idaho National Engineering Laboratory, 271,000; Hanford Site, 263,000; and Nevada Test Site, 437,000. Populations along rail routes to these sites are slightly smaller for Oak Ridge Reservation, Idaho National Engineering Laboratory and Nevada Test Site, and slightly larger for Savannah River Site, and Hanford Site. These populations are shown in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 4,476 km (2,784 mi); Oak Ridge Reservation, 4,111 km (2,557 mi); Idaho National Engineering Laboratory, 1,516 km (943 mi); Hanford Site, 1,376 km (856 mi); and Nevada Test Site, 1,145 km (712 mi). Distances along rail routes are about the same for Idaho National Engineering Laboratory, and slightly longer for Savannah River Site, Oak Ridge Reservation, Hanford Site, and Nevada Test Site.

Environmental Conditions

Concord NWS occupies 5,233 ha (12,931 acres) of land adjoining south Suison Bay. Of this total acreage, 2,135 ha (5,276 acres) are inland, while 3,097 ha (7,653 acres) are more tidal in nature. Wetlands comprise approximately 1,215 ha (3,002 acres) of the tidal area (Yocum, 1994b). Wetlands occupy large areas of land bordering all sides of Suison Bay and Grizzly Bay, which is located directly north of Suison Bay. The waters of Suison Bay are characterized as a mid-salinity estuarine habitat (generally 5 to 16.5 ppt). Chinook salmon (endangered), steelhead trout, striped bass, sturgeon, and American shad are typically found in this area (FWS, 1981e; FWS, 1981f).

Portions of the inland area at Concord NWS serve as a sanctuary for Tule elk, a formerly endangered species (Yocum, 1994b). Other terrestrial species found in the area include the river otter, the salt-marsh harvest mouse (a Federally protected species), and the white-tailed kite (FWS, 1981e; FWS, 1981f). Adult concentrations and nesting areas of the California clapper rail (a Federally protected bird species) and the California black rail (a State protected species) are also found in this area. The U.S. Fish and Wildlife Service reports that the following Federally-listed, protected species may occur in Contra Costa County: winter-run chinook salmon (endangered), delta smelt (threatened), bald eagle (endangered), American peregrine falcon (endangered), Aleutian Canada goose (threatened), California brown pelican (endangered), California clapper rail (endangered), California least tern (endangered), and the salt marsh harvest mouse (Medlin, 1994). The Federally and State protected figwort plant family is also found in the vicinity of Concord NWS. In general, the greater San Francisco Bay area annually supports large numbers of shorebirds, wintering waterfowl, raptors, seabirds, and passerlings. In addition, shorebirds, wading birds, waterfowl, seabirds, and songbirds migrate through this coastal area.

Climatic Conditions

Currently, there is no operational National Weather Service station located in Concord, CA. However, the National Weather Service does operate stations at the San Francisco International Airport (37° 37' N; 122° 23' W) and at Stockton, CA (37° 54' N; 121° 15' W). Because of the influence of the California Coast Ranges, which exist between San Francisco and Concord (trending northwest-southeast), the National Weather Service data at Stockton, CA, is considered a better surrogate for the climatological conditions at the Concord Naval Weapons Station.

Concord is located on the westernmost edge of the Great Valley of California, in the eastern foothills of the Coast Ranges. The region is comprised of rich agricultural land, located on the broad delta formed by the confluence of the Sacramento and San Joaquin Rivers. Well to the east of this region are the foothills of the Sierra Nevada Mountains and to the west are the California Coast Ranges. The coast ranges are important in providing an effective barrier from the maritime air masses that greatly influence the San Francisco-Oakland area. However, several gaps in the Coast Ranges do permit the inland migration of the sea breeze circulation, which tends to moderate daytime high temperatures in the summer months. In general, the area is characterized in summer by warm, dry days and relatively cool nights with clear skies and little rainfall. Winter brings relatively milder temperatures, with light precipitation and frequent heavy fog events, which often have long durations in December and January. Ninety percent of the precipitation falls between November and April, with thunderstorms extremely infrequent (4 days per year) and snowfall almost nonexistent (NOAA, 1992j).

D.2.1.7 Portland, OR

The Port of Portland is located about 160 km (97 mi) above the mouth of the Columbia River on the Willamette River tributary. Portland is the principal city of the Columbia River system and one of the major ports on the Pacific Coast. The preferred container terminal (T6) is located approximately 170 km (90 mi) from the entrance of the Columbia River. Federal project depths in the Columbia River are 14.6 m (48 ft) over the bar, and 12 m (40 ft) to Portland (DOC, 1992b). However, a port official indicated the actual channel depth is 13.11 m (43 ft), and the channel width is 183 m (600 ft) from the coast to the port (Magness, 1993).

There are a number of cautions concerning entering and navigating the Columbia and Willamette Rivers. The U.S. Coast Pilot warns that entry into the Columbia River can be dangerous because of sudden and unpredictable changes in the currents often accompanied by breakers. It is reported that "ebb [tide] currents on the [North] side of the bar attain velocities of [3.1 to 4.2 meters-per-sec] 6 to 8 knots . . . In the

entrance the currents are variable, and at times reach a velocity of [2.6 meters-per-sec] 5 knots on the ebb; on the flood [tide] they seldom exceed [2.1 meters-per-sec] 4 knots. Since logging is one of the main industries of the region, free floating logs and submerged deadheads or sinkers are also a source of danger. The danger is increased during spring freshets" (DOC, 1992b).

U.S. Coast Guard statistics for 1990 through 1993 indicate that the transit from the Pacific Ocean to the Port of Portland is hazardous, with a reported total of 112 ship collisions and 145 (hard) groundings (USCG, 1994b). It is noted that a large number of oceangoing vessels make the transit on a routine basis without incident. Since some of these accidents were most likely associated with barges, it is believed that the actual rate for oceangoing vessels is probably lower.

The Port of Portland owns and operates Terminal T6, a deep-water dedicated container facility located on Pearcy Island, at the confluence of the Columbia and Willamette Rivers, about 140 km (90 mi) from the ocean entrance to the Columbia River. The port also owns other terminals (including T2, a container/breakbulk facility), all of which lie further upstream of Terminal T6. Terminals are situated in an industrial port district northwest and seaward of downtown Portland (POP, 1994). A map of the port is shown in Figure D-28.

The port is served by several container lines including Australia New Zealand Direct Line, Evergreen Line, Hanjin Shipping Co., LTD., Hawaiian Marine Lines, Hyundai, International Marine Transport Lines, Italian Line, d'Amico Line, Jebson's International, "K" Line, Mitsui OSK, Neptune Orient, NYK Line, Pacific Commerce Line, Safbank Line, and United Yugoslav Line (Jane's, 1992; AAPA, 1993; POP, 1994).

Terminal T6: This terminal has three berths, five container cranes [two 36.3 metric ton (40 ton) and one 50 metric ton (55 ton)], a container freight station, distribution warehouse, and rail/barge service. It has about 869 m (2,851 ft) of marginal wharf, with 12.2 m (40 ft) of water alongside at mean low water. Truck access to Interstate 5 is via North Marine Drive and N. Lombard Street, both of which connect with I-5 about 5.5 km (3.4 mi) from the terminal entrance. North Marine Drive is an industrial use roadway that connects with I-84, the assumed route to Idaho National Engineering Laboratory, north and across the Willamette River from downtown Portland. T6 is served by the Burlington Northern and Union Pacific Railroads, whose tracks reach to within about 0.5 km (1,500 ft) of the container berths; an intermodal, container-on-flat-car rail yard is an integral part of the terminal. T6 has reciprocal switching arrangements with the Southern Pacific Railroad (AAPA, 1993; POP, 1994).

T6 is located north (downstream) of the port's other marine terminals and has no apparent conflict with other hazardous cargoes. It is currently operated by the port, but the port is considering an operations contractor for the future (Hachey et al., 1994).

Terminal T2: This terminal has about 833 m (2,730 ft) of marginal wharf, with 12.2 m (40 ft) of water alongside at mean low water, and four container cranes with capacities ranging from 33 metric tons (36 tons) to over 77 metric tons (85 tons). Truck access to Interstate 84 is via Interstate 5 South to U.S. Route 30 West, connecting with I-84 at Maywood Park, a total distance of about 19 km (12 mi). The terminal is served by the Portland Terminal Railroad and the Burlington Northern, and has direct ship-to-rail transfer capability. T2 also has reciprocal switching arrangements with the Southern Pacific (AAPA, 1993; POP, 1994). T2 is located near several large bulk petroleum terminals that are undoubtedly supplied by tankers. Such traffic was not considered to be a major risk factor for the transportation of spent nuclear fuel to Portland. However, because of the potential conflicting uses, Terminal T6 is the preferred facility.

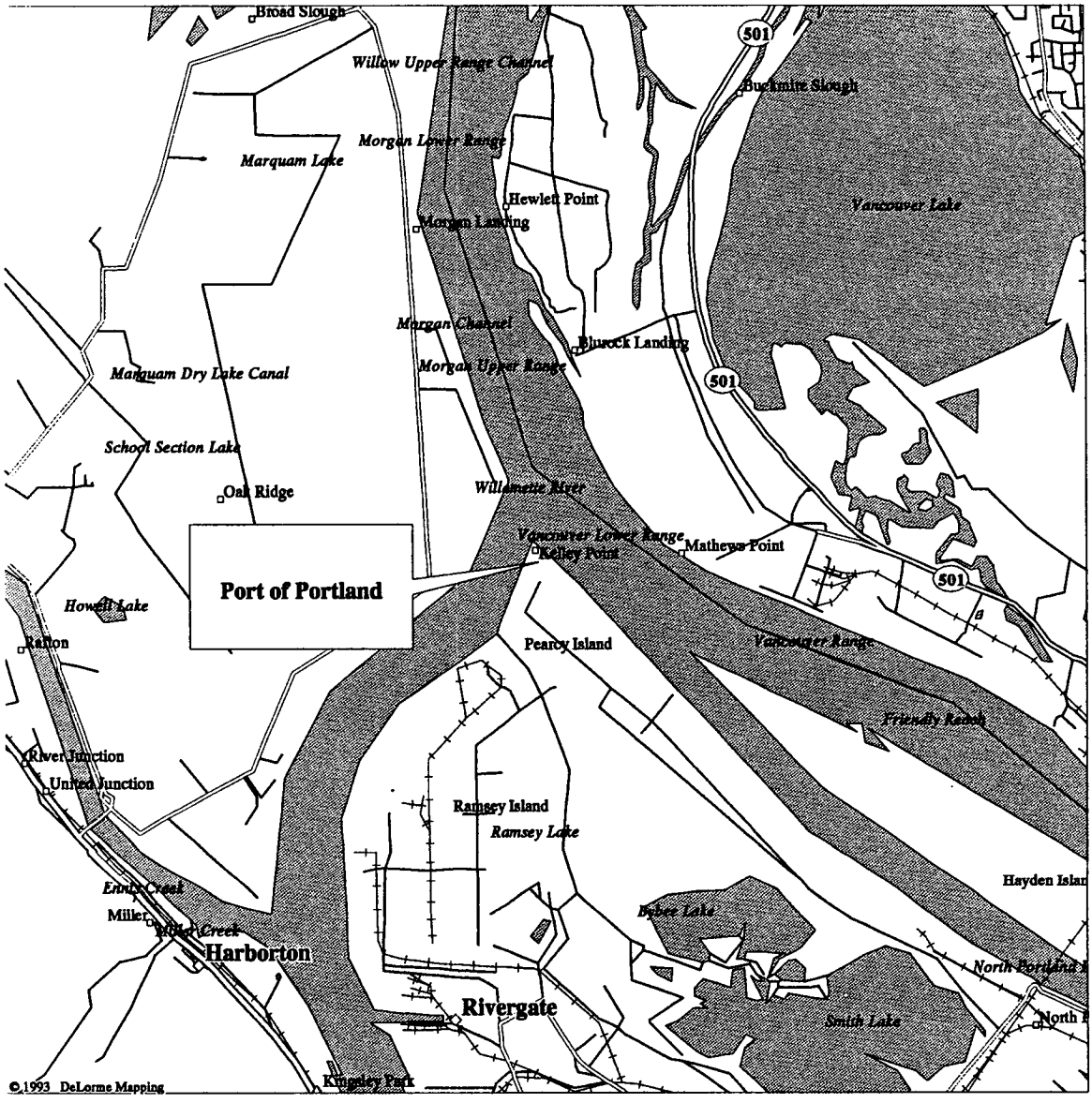


Figure D-28 Map of the Port of Portland, OR

Other Pertinent Information: Security is provided by perimeter fencing and the port's police force, which maintains a 24-hour patrol and surveillance function at both terminals.

There are no restrictive regulations currently affecting the potential receipt and transport of foreign research reactor spent nuclear fuel through the port. The Manager of Marine Market Development indicated that the port has not handled spent nuclear fuel since 1985, and there is opposition to handling nuclear materials by the port's labor unions (Magness, 1993). It is noted that while most of the spent nuclear fuel shipped through Portland had been shipped by the end of 1985, other data sources indicate the port also handled additional spent nuclear fuel in 1989 (NRC, 1993; SNL, 1994). There are no restrictions on Class A or B explosives, and the Coast Guard does not make radiation surveys of radioactive cargoes. Recently, the port could not get shippers to handle naturally radioactive columbium concentrate from British Columbia even if it is not unloaded (Hachey et al., 1994). While this does not preclude foreign research reactor spent nuclear fuel shipments, this indicates there is the potential for delays which could result in failing to "expeditiously transfer" foreign research reactor spent nuclear fuel from the port to a selected storage site.

Portland has a Port Evacuation Plan and a hazardous materials advisory staff (Hachey et al., 1994). The State Health Division with whom the port confers, has a resident nuclear physicist for technical assistance. The port is also a member of the Maritime Fire and Safety Association (an industrial association representing 27 terminal operators) and nine fire departments on the Columbia and Willamette Rivers. The nearest fire station can respond within about six minutes (Hachey et al., 1994). The Association has developed emergency response plans and is implementing a radio communications system covering the entire river system from Astoria to Portland. The City fire department and Coast Guard respond to accidents involving hazardous materials cargoes. Port operating personnel and longshoremen receive general instruction concerning handling of hazardous materials cargoes (Magness, 1993). In addition, the port has contractors ready to respond to hazardous materials accidents when necessary (Hachey et al., 1994). There has not been a severe container accident in at least 10 years, so no port accident statistics were available (Hachey et al., 1994). The port is located several miles downstream from Portland's business and residential districts in an area that appears dedicated to port industrial usage, but as already noted, has excellent connections with highways and rail service.

There are no known areas of special environmental concern in the immediate vicinity of the port, although concern for the environment runs high throughout the Pacific Northwest. A "critical habitat" adjacent to Terminal 6 will have to be mitigated with the planned expansion at T6, but there are no plans to fill wetlands between T6 and populated areas about 1 or 2 km (0.6 or 1.2 mi) away (Hachey et al., 1994).

The port is subject to earthquakes and volcanism. The likelihood of severe natural phenomena, such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Portland, the Uniform Building Code requires buildings to withstand wind speeds up to 140 km/hr (90 mph). The port is located in a moderate seismic zone with an acceleration of 0.20 g. There have been two major earthquakes in the Puget Sound area this century; a Modified Mercalli Intensity (MMI) VIII on April 13, 1949, and an MMI VII-VIII on April 29, 1965 (Bolt, 1978). On May 18, 1980, nearby Mount St. Helens suffered a major volcanic eruption (IPA, 1993). All the mountains along the Cascade Range are volcanic in origin and prone to eruption (Foster, 1971; Hamilton, 1976; IPA, 1993).

The 1990 census population within 16 km (10 mi) of the Terminal was 356,064. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 686,000; Oak Ridge Reservation, 519,000; Idaho National Engineering Laboratory, 143,000; Hanford Site, 85,700; and Nevada Test Site, 375,000. Populations along rail routes to these sites are

slightly smaller for Nevada Test Site and Idaho National Engineering Laboratory, but slightly larger for Savannah River Site, Oak Ridge Reservation, and Hanford Site. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 4,630 km (2,879 mi); Oak Ridge Reservation, 4,200 km (2,609 mi); Idaho National Engineering Laboratory, 1,190 km (738 mi); Hanford Site, 407 km (253 mi); and Nevada Test Site, 2,040 km (1,270 mi). Distances along rail routes are slightly longer, with the exception of Hanford Site, which is slightly less.

Environmental Conditions

The areas surrounding the Terminal are in river-oriented industrial land use. Wildlife habitat along the Oregon Slough is limited because of the industrial development, although some waterfowl use the area. While the primary uses in the Terminal area are commercial navigation and industry, some recreational fishing and boating occurs in Oregon Slough and the Columbia River (Kurkoski,1994).

The U.S. Fish and Wildlife Service's Ecological Inventory for the Vancouver, Washington-Oregon area indicates that the Columbia River generally includes the following fish species: salmonids, chinook salmon, coho salmon, chum salmon, pink salmon, sockeye salmon, steelhead trout, Dolly Varden, smelts, river lamprey, white sturgeon, American shad, eulachon, and cutthroat trout (FWS, 1981d). South of Portland, the various islands and wetlands along the Columbia River provide habitat for a wide variety of terrestrial organisms. Areas of special interest include the Sauvie Island Game Management Area, which is located approximately 8 km (5 mi) downriver of Terminal 6, and the Ridgefield National Wildlife Refuge, which is approximately 16 km (10 mi) downriver.

The U.S. Army Corps of Engineers reports that raptors such as the red-tail hawk, bald eagle, and peregrine falcon are occasional visitors to this area and that the U.S. Fish and Wildlife Service has indicated that the endangered American peregrine falcon and threatened bald eagle may winter in this area. In addition, the National Marine Fisheries Service has listed the Snake River sockeye salmon as endangered, and two Snake River chinooks stocks as threatened (Kurkoski, 1994). The State of Oregon's Natural Heritage Program reports that there are at least two rare species that occur in the vicinity of Terminal 6 (Gaines, 1994). These species are the painted turtle (a State-Sensitive-Critical species) and the Columbia water-meal.

Climatic Conditions

The city of Portland is situated midway between the northerly oriented low coast range on the west and the higher Cascade range on the east. The Cascade range provides a steep slope for orographic uplift of moisture laden air arriving on westerly winds from over the Pacific Ocean, resulting in moderate rainfall events in the area. The prevailing winds are generally northwesterly during spring and summer, becoming more southeasterly in fall and winter. The Portland area is characterized by a winter rainfall regime, where approximately 88 percent of the annual total falls during October through May. Thus, the winter season is dominated by relatively mild temperatures, cloudy skies and rain accompanied by southeasterly surface winds. Summer produces pleasantly mild temperatures, northwesterly winds and very little precipitation. Fall and spring are traditional seasons with variable characteristics. Fog generally occurs most frequently during fall and early winter. Destructive storms are infrequent in this region of the United States, and surface winds rarely exceed gale force. Thunderstorms occur monthly through the spring and summer, with gentle rains occurring almost daily during the winter months. Based on the 1951-1980 climatology, the first frost occurs on average around November 7, with the last spring frost occurring near April 3 (NOAA, 1992f).

D.2.1.8 Savannah, GA

The Port of Savannah is located on the South Bank of the Savannah River, about 35 km (22 mi) above the entrance from the Atlantic Ocean. Savannah is the third largest city in Georgia, and is the chief port of the State of Georgia. A Federal Project maintains 12.2 m (40 ft) of water through Tybee Roads, then 11.6 m (38 ft) for about 16 mi in the main channel to the turning basin at Kings Island (DOC, 1993d). A map of the port is shown in Figure D-29.

Under normal conditions, currents at the entrance to Savannah are 1.1 to 1.5 metric-sec (2.2 to 3.1 knots) during the ebb tide, and 0.8 to 1.2 metric-sec (1.6 to 2.4 knots) during the flood tide. It has been reported that currents in the river can reach 3.6 to 4.1 metric-sec (7 to 8 knots) in the vicinity of Garden City Terminal just below the Route 17A bridge and at the Colonial Oil Berths, about 4 km (2.5 mi) above the bridge. Access to the port can be complicated due to some relatively narrow sections of the channel combined with high currents (DOC, 1993d).

The Georgia Ports Authority (GPA) operates three large cargo terminals on the South Bank of the Savannah River. Ocean Terminal, located approximately 41 km (25 mi) from the river entrance in the City of Savannah, is a combination breakbulk and container handling facility; Garden City Terminal is about 4.6 km (2.9 mi) further upstream from Ocean Terminal. Containerport, part of the Garden City terminal complex, is a dedicated container handling facility. The depth alongside both container terminals is 11.6 m (38 ft), and dredging to 12.7 m (42 ft) is in progress.

The port is served by more than 50 container and breakbulk ship lines, including several major container carriers, with itineraries to some 100 countries in the world, including many in Europe and the Far East, as well as Japan, and Australia (Jane's, 1992; AAPA, 1993; Southern Shipper, 1993)

Ocean Terminal: This facility has 10 berths, a 61 m (200 ft) apron, extensive Transit sheds and warehouse space, with 34 ha (83 acres) of open storage. It has one 41 metric ton (45 ton) single hoist container crane and four gantry cranes of greater capacity, and 1,825 m (5,990 ft) of marginal wharf; Berth 13, the longest, is 297 m (975 ft) long. The terminal has almost immediate access to U.S. Route 17 (north/south), and connects with I-16 a few city blocks from the terminal. The terminal is served by the Norfolk Southern and CSX railroads (AAPA, 1993; Southern Shipper, 1993; Jane's, 1992). Due to its close proximity to the City, it is not a preferred container terminal.

Containerport: This is the preferred container terminal, due to its better separation from the City and modern facilities. It is located about 40 km (25 mi) from the Atlantic. It has 6 container ship berths, a 61 m (200 ft) apron, and a 457 m (1,500 ft) by 488 m (1,600 ft) turning basin. The terminal has a large Container Freight Station comprising 51,280 m^2 (552,000 ft^2) for stuffing and stripping containers, with areas for segregating hazardous cargoes. The facility has 1,676 m (5,500 ft) of marginal wharf, and nine 40.8 metric ton (45 ton) single hoist container cranes. Truck access to the terminal is via limited access roads and lightly populated areas to the following expressways: about 13 km (8 mi) to I-16 (east/west); about 9.6 km (6 mi) to I-95 north and about 18 km (11 mi) to I-95 south. Containerport has excellent shipside rail service, consisting of a series of rail spurs at right angles to the container berths, providing direct ship-to-rail transfers. Onsite switching is provided by GPA's Savannah State Docks Railroad, connecting with the CSX and Norfolk Southern rail systems (AAPA, 1993; Southern Shipper, 1993; Jane's, 1992; GPA, 1994).

Other Pertinent Information: The port's Director of Public Relations was unaware of any ordinances or regulations prohibiting the receipt and handling of spent nuclear fuel, and the port does handle radioactive materials (Moore, 1993). The official did not know if the port had handled spent nuclear fuel, but data

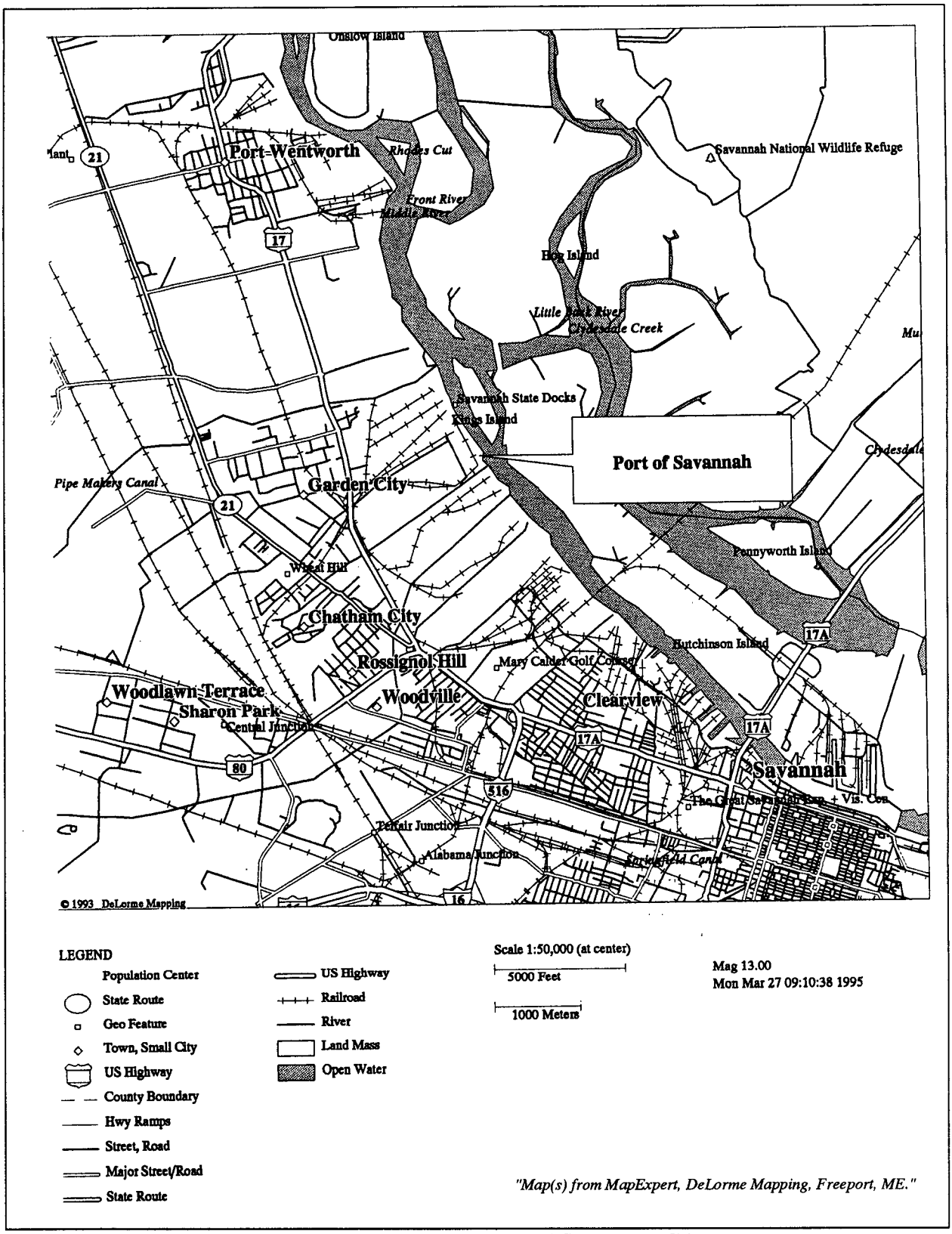


Figure D-29 Map of the Port of Savannah, GA

show it has (SNL, 1994; NRC, 1993). The port has a hazardous materials training staff but no Emergency Response Team. Reportedly, the GPA contracts with outside firms to respond to oil and other hazardous materials accidents.

There are tanker berths and petroleum storage facilities adjacent to Containerport's facilities, and there are several private bulk liquid storage facilities downstream of Containerport (towards the City), including a liquid natural gas terminal a few miles above the Pilot station. The presence of these terminals along a river channel only 152 m (245 ft) wide with swift currents, and the increasing number of container ships with lengths in excess of 250 m (820 ft) heighten the possibility of potentially serious conflicts within the port.

The port is subject to severe hurricanes and tropical storms, and given its proximity to Charleston, SC may have a slightly higher risk of earthquakes than the rest of the State of Georgia. The likelihood of severe natural phenomena, such as high winds and earthquakes, is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Savannah, the Uniform Building Code requires buildings to withstand wind speeds up to 130 km/hr (80 mph). The port is located in a low seismic zone with an acceleration of 0.075 g.

The 1990 population within 16 km (10 mi) of the port terminals was 155,166. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 37,300 ; Oak Ridge Reservation, 101,000; Idaho National Engineering Laboratory, 553,000; Hanford Site, 602,000; and Nevada Test Site, 616,000. Populations along rail routes to these sites are slightly larger. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 400 km (250 mi); Oak Ridge Reservation, 720 km (449 mi); Idaho National Engineering Laboratory, 3,860 km (2,398 mi); Hanford Site, 4,530 km (2,813 mi); and Nevada Test Site, 4,020 km (2,501 mi). Distances along rail routes are slightly longer.

Environmental Conditions

The lower Savannah River has multiple branches that meander through a variety of coastal lowlands including salt marshes, tidal creeks, freshwater marshes and freshwater impoundments. South Carolina has classified the portion of Savannah Harbor within its boundaries upstream from Fort Pulaski as Class B and the portion oceanward as Class SA. Class B waters are fresh waters suitable for secondary contact recreation, as a drinking water source following conventional treatment, fishing, industrial, and agricultural use. Class SA waters are defined as tidal saltwaters suitable for primary contact recreation, and for all the uses listed in Class B. The State of Georgia has classified the Savannah River from Mi 0 at Fort Pulaski north to Mi 5 at Field's Cut as recreation waters. North of Field's Cut, the waters are classified as Coastal Fishing (U.S. Army, 1991). According to the U.S. Fish and Wildlife Service's Ecological Inventory Map for Savannah, the Containerport is located in a transitional estuarine habitat where the salinity ranges from low (generally 0.5 to 5 parts per thousand) to mid-salinity (generally 5 to 16.5 parts per thousand) (FWS, 1980c).

A large number of aquatic and terrestrial species are found in and around the Savannah River near Garden City. The U.S. Fish and Wildlife Service indicated that the protected species most likely to be found on or near this general area include: the bald eagle, wood stork, shortnose sturgeon, west indian manatee, and eastern indigo snake. The bald eagle and wood stork occur on the Savannah National Wildlife Refuge. West indian manatees are known to use the lower Savannah River and are seen fairly often in the river and harbor area. The shortnose sturgeon uses the Savannah River as a migratory area. The lower Savannah

River also is reported to be an important spawning area for striped bass (Laumeyer, 1994). In addition, the loggerhead turtle, bald eagle, and the American alligator are found along the lower reaches of the Savannah River (FWS, 1980c).

Both invertebrate and fish species of commercial and recreational value found in the Savannah River. Commercial fishing is primarily for American shad, sturgeon, shrimp, and blue crab. Public shellfishing is allowed in some areas near the mouth of the Savannah River in the vicinity of Fort Pulaski. The Savannah River is host for the migration of several important commercial and game fishes including the American shad, the hickory shad, and the blueback herring. Game species include the spotted seatrout, red drum, croaker, spot, striped bass, flounder, silver perch, white catfish, channel catfish, large mouth bass, sunfish, and crappies. The State of Georgia has closed the striped bass fishery for population recovery purposes. Results of a seasonal creel survey of the Savannah River estuarine fishery, conducted by the Georgia Department of Natural Resources from October 20, 1992 to February 16, 1993 found that the estimated angler harvest for that time period was 10,893 fish. White catfish (28.4 percent), spotted seatrout (27.9 percent), red drum (17.9 percent), and silver perch (10.4 percent) represented approximately 85 percent of the fish harvested from the Savannah River during this time period (Schmitt, 1993).

There are several wildlife refuges and/or game management areas located along the lower portion of the Savannah River. Tybee National Wildlife Refuge is located at the mouth of the Savannah River at the confluence with the Atlantic Ocean. Just north of Tybee National Wildlife refuge is the Turtle Island Game Management Area. The Containerport itself is located across the river from the southern end of the 10,371 ha (25,608 acre) Savannah National Wildlife Refuge. The Savannah National Wildlife Refuge and the Tybee National Wildlife Refuge are managed by the U.S. Fish and Wildlife Service.

Climatic Conditions

The Port of Savannah, GA, is located in Chatham County on the Savannah River. The city of Savannah is surrounded by low, flat terrain that is marshy to the north and east and rises to a few meters (several ft) above sea level to the west and south.

The area has a temperate climate which, again, is greatly influenced by winds coming into the area off of the surrounding ocean. Nominally, 50 percent of the rainfall occurs during thunderstorms with the remainder being equally distributed over the year and generally related to frontal passages. Severe tropical systems affect the Savannah, GA, area roughly once every 10 years and cause heavy, sustained precipitation, high winds, and extreme localized coastal flooding. Rainfall measurements in excess of 51 cm (20 in) have been observed as a result of tropical systems impacting the area. Based on the 1951-1980 climatology, the first freeze occurs on average around November 15th and the last freeze occurs near March 10th (NOAA 1992d).

D.2.1.9 Tacoma, WA

The Port of Tacoma is located in the southeastern corner of Puget Sound on the deep waters of Commencement Bay, about 5 km (3 mi) from the Sound. It is a rapidly expanding major port, second only to Seattle in maritime importance on Puget Sound. Like Seattle, access is gained via the Straits of Juan de Fuca and Puget Sound. The distance from the entrance into Puget Sound is approximately 130 km (80 mi). While the transit is open with deep wide channels, it is a relatively long distance on an inland waterway (DOC, 1992b). The port currently handles about 1,054,000 20-ft equivalent container units, amounting to 6.7 million metric tons (7.4 million tons) of cargo (AAPA, 1994). A map of the port is shown in Figure D-30.

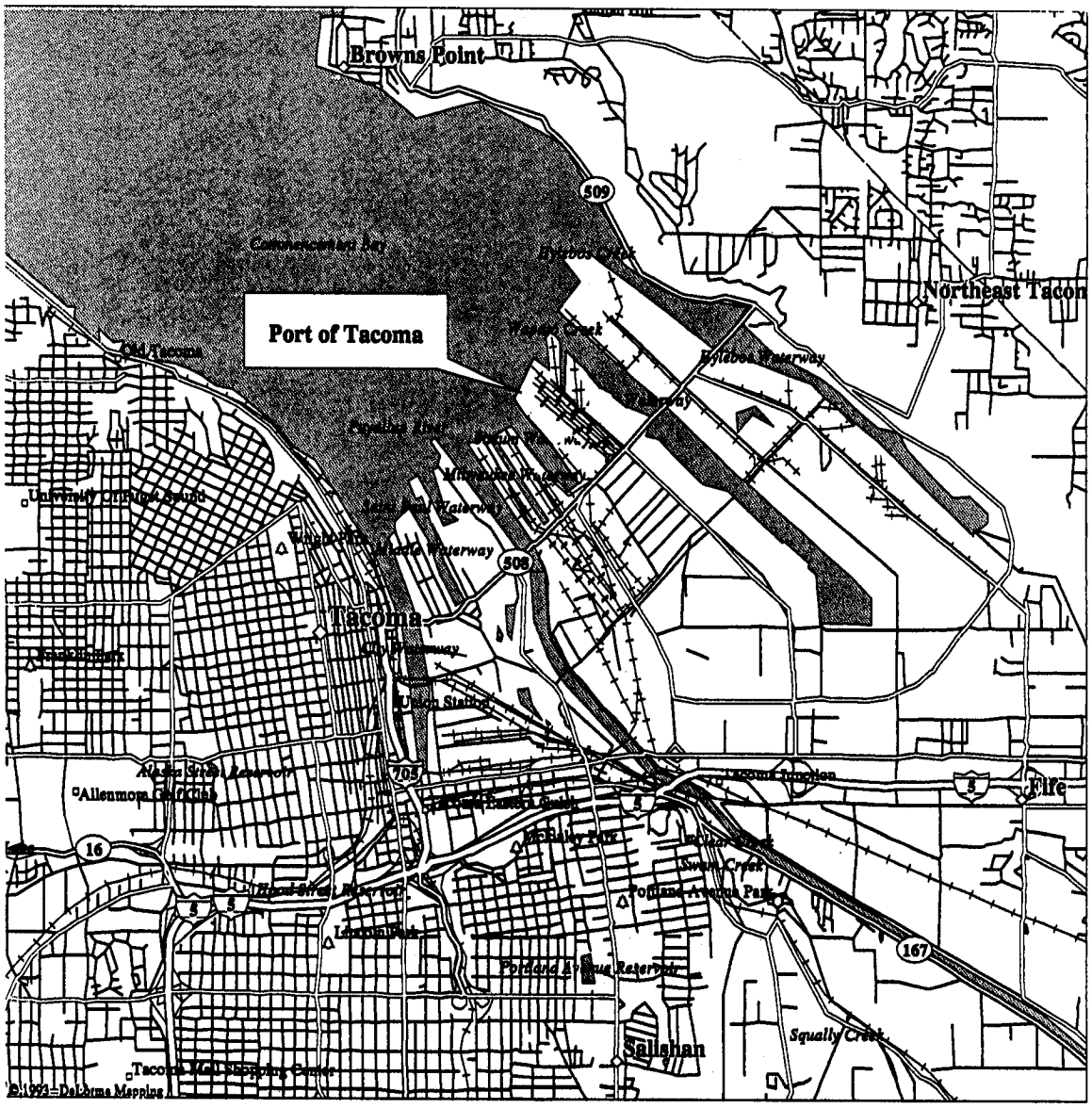


Figure D-30 Map of the Port of Tacoma, WA

The port functions as a special purpose district operation under State enabling legislation and is governed by a Board of Commissioners. The Commission owns and operates several terminals, including container and roll-on/roll-off facilities. Stevedoring is performed by private contractors and/or by ship lines leasing facilities from the port.

Commencement Bay has been designated a "Superfund Site" by the Environmental Protection Agency. However, since the acceptance of spent nuclear fuel through the Port of Tacoma would neither affect the activities being conducted in response to the "Superfund Site" designation, nor would it add any additional burden to this designation, the "Superfund Site" designation has no bearing on the proposed action.

Berths A, B, and C of Terminal 7 are primarily public general cargo facilities handling breakbulk and dry bulk cargoes. Depths alongside range from about 12.2 m to 15.2 m (40 to 50 ft), and it has two 36 metric ton (40 ton) gantry cranes and one 36 metric ton (40 ton) multi-purpose bulk unloading crane. Terminal 7, Berth D (Husky Terminal) is the primary container terminal, and has one 274 m (900 ft) long container berth, 3 container cranes [two 45 metric ton (50 ton) and one 50 metric ton (55 ton)), and 15.2 m (50 ft) of depth alongside at mean low water. It has 14 ha (33 acres) of terminal area with access to the 9,512 m^2 (102,400 ft^2) container freight station and a 8,920 m^2 (96,000 ft^2) transit warehouse located near Berths A and B.

The Husky Terminal is about 4.8 km (3 mi) from the Port of Tacoma road access (Exit 136) to Interstate 5 immediately outside the port complex. While a somewhat longer route, Interstate 5 South connects with I-84 East near Portland, OR, avoiding the added risks of trucking spent nuclear fuel over Snoqualmie Pass to Eastern Washington during the winter. Ship berths are served by the Port Belt Line Railroad, and the port is served by the Burlington Northern and Union Pacific Railroads, which interline with eastern and southern railroads. All Terminal 7 berths are adjacent to the North Intermodal Railroad Yard, which consists of 10.4 ha (26 acres) of yard area and 5,340 m (17,500 ft) of trackage. A second intermodal rail terminal, the South Intermodal Rail Yard, is also located within the port for use by all port shippers (Jane's, 1992; AAPA, 1993; POT, 1994).

Tacoma is served by over a dozen containership and breakbulk ship lines including ELMA, Evergreen, Hyundai, IMT, "K" Line, Maersk, MOL, Navianca, Naviera Pacifico, NOSAC, PCL, Sea-Land, South Pacific Interline, Totem Ocean Trailer Express, Wallenius, and Wallno (Jane's, 1992; AAPA, 1993). These lines provide service with most of the Pacific Rim, including Australia and Japan, and also have service with the Mediterranean (Jane's, 1992; AAPA, 1993).

Other Pertinent Information: According to the port's Director of Risk Management, shipments of spent nuclear fuel could be prohibited by the City of Tacoma Harbormaster's Office, but no formal regulatory restriction was identified. The port has had no identifiable experience with shipment of spent nuclear fuel (SNL, 1994; Paulsen, 1993; NRC, 1993). Security is maintained at Terminal 7 by the port Police around the clock, with locations for segregation and temporary storage of hazardous cargoes (special guards would have to be provided by the shipper for spent nuclear fuel) (Paulsen, 1994). The Tacoma Fire Department provides response for accidents, and the port security personnel are trained in emergency response in cooperation with the Fire Chief (McLendon, 1994). There is also the possibility that the Husky Terminal may begin handling ammonium nitrate in bulk, which (because of the explosion potential) would have to considered in the event the port were to receive spent nuclear fuel shipments (Paulsen, 1994). The U.S. Coast Guard accident statistics for the period 1991-1993 for the Puget Sound indicate a total of 54 reportable accidents (USCG, 1994b). Given the high volume of ship traffic, the accident frequency is considered to be low.

As is the case with Seattle, there is substantial environmental concern about environment damage, and the entire Puget Sound area is subject to severe earthquakes and volcanism. The likelihood of severe natural phenomena, such as high winds and earthquakes, is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Tacoma, the Uniform Building Code requires buildings to withstand wind speeds up to 130 km/hr (80 mph). The port is located in a high seismic zone with an acceleration of 0.30 g. There have been two major earthquakes in the Puget Sound area this century; a modified Mercalli intensity VII on April 13, 1949 and a modified Mercalli intensity of VIII on April 29, 1965 (Bolt, 1978). On May 18, 1982, Mount Saint Helens suffered a major volcanic eruption (IPA, 1993). All the mountains along the Cascades Range, from Canada to Northern California, are volcanic in origin, and potentially active (Foster, 1971; Hamilton, 1976; IPA, 1993)

The 1990 population within 16 km (10 mi) of the port terminals was 511,575. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 601,000; Oak Ridge Reservation, 431,000; Idaho National Engineering Laboratory, 157,000; Hanford Site, 98,600; and Nevada Test Site, 379,000. Populations along rail routes to four of these sites are slightly larger, but the population along the rail route to Nevada Test Site is slightly smaller (this is largely due to primary use of interstate highways through Salt Lake City and Las Vegas, use of U.S. 95 south from Oregon would reduce the population along truck routes. These populations are shown in Tables D-6 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 4,720 km (2,931 mi); Oak Ridge Reservation, 4,280 km (2,658 mi); Idaho National Engineering Laboratory, 1,310 km (815 mi); Hanford Site, 399 km (248 mi); and Nevada Test Site, 2,160 km (1,344 mi). Distances along rail routes are longer.

Environmental Conditions

A variety of aquatic species are found in Puget Sound. Several animal species, with special status, may also be found in this area. A variety of marine mammals can be found in the central Puget Sound including the Pacific harbor seal, California sea lion, killer whale, Dall porpoise, and harbor porpoise. In 1991, the U.S. National Marine Fisheries Services reported that the following endangered and/or threatened species may occur in the Puget Sound: the endangered gray whale, the endangered humpback whale, the threatened Stellar sea lion, and the endangered leatherback sea turtle (DOE, 1995). These species are not reported at the port. The U.S. Fish and Wildlife Service reported that the bald eagle and marbled murrelet, both listed protected species, may occur in the vicinity of the port (Frederick, 1994). Bald Eagles can be found throughout this coastal zone, and American peregrine falcons are uncommon winter visitors (FWS, 1981a). The U.S. Fish and Wildlife Service's Ecological Inventory for the Puget Sound area indicates that the habitat of Commencement Bay is used by a variety of birds including: shorebirds, gulls, sandpipers, turnstones, yellowlegs, herons, rails, great blue herons, waterfowls, loons, grebes, swans, geese, dabbling ducks, diving ducks, mergansers, American widgeons, pintails, mallards, seabirds, cormorants, alcids, common murre, and the pigeon guillemot. Adult concentrations of all of these species may be found in the Bay. Some of these species may also use this area as an overwintering area, a migratory area, and/or a nesting area (FWS, 1981a). It is also indicated that adult concentrations of Chinook salmon, coho salmon, chum salmon, and pink salmon are found in the Puyallup Waterway/River and use this water body and upstream segments as migratory and nursery areas.

According to the State of Washington's Department of Wildlife, a number of seabird colonies exist along the shoreline of Commencement Bay. Areas of the Puget Sound, north of Commencement Bay, are also used as haulouts by the California sea lion. Areas of estuarine wetlands are located along the northern shore of Commencement Bay (WDW, 1994b).

Commencement Bay has been designated a "Superfund Site" by the Environmental Protection Agency. However, since the acceptance of spent nuclear fuel through the Port of Tacoma would neither affect the activities being conducted in response to the "Superfund Site" designation, nor would it add any additional burden to this designation, the "Superfund Site" designation has no bearing on the proposed action.

Climatic Conditions

See Section D.2.2.21 (Seattle) for climatic information, since conditions in Tacoma, WA are essentially the same.

D.2.1.10 Wilmington, NC

The Port of Wilmington, NC is located on the east bank of the Cape Fear River, about 42 km (26 mi) above its mouth on the Atlantic Ocean. It is the leading port of North Carolina, and its major export is wood pulp. It handles about 110,000 20-ft equivalent units per year, representing about 30 percent of total tonnage. The major terminals are down river from the city. A Federal project maintains a 12.2 m (40 ft) channel over the ocean bar into the Cape Fear River, and then 11.6 m (38 ft) to the port. A new dredging program will deepen the approach channel to 12.2 m (40 ft). The approach to Wilmington, up the Cape Fear River, is more open than many river approaches but has restricted segments. The minimum channel width is about 120 m (400 ft). Currents in the river conform to the channel (DOC, 1993d; FHI, 1993c; NCSPA, 1994). A map of the port is shown in Figure D-31.

The port is owned and operated by the North Carolina State Ports Authority (NCSPA), a State agency. It is a modern container and general cargo facility with over 92,900 m^2 (more than a million ft^2) of covered, sprinklered storage and a total of 11 berths, two of which are open. The port has over 40 ha (100 acres) of paved, open area and 10 ha (25 acres) of semi-improved storage area. The Wilmington wharves are of concrete pile construction, rubber fendered, with a total frontage of about 2,000 m (6,568 ft). Berths 6 to 9 are dedicated containership berths with the remaining berths used for various kinds of general cargo. All of the main cargo berths have a depth alongside at mean low water of 11.6 m (38 ft). The terminal has three, 40.6 metric ton (45 ton) container cranes and two, 50.8 metric ton (56 ton) container cranes, plus three gantry cranes ranging from 40.8 metric ton (45 ton) to 204 metric ton (225 ton) (Jane's, 1992; AAPA, 1994; FHI, 1993c; NCSPA, 1994).

Terminal access via truck is through the controlled South Gate Container Entrance. Truck shipments of spent nuclear fuel from Wilmington to southern destinations are from U.S. Routes 17, 74, 76 and 421 to Interstates 95 and 40. The local routes are accessed about 3 km (2 mi) north of the terminal where they cross the Cape Fear River using the lift bridge. Northern and western long distance routes are via Interstate 40 which connects with State Highway 132 about 16 km (10 mi) north of the city. Wilmington container berths are served shipside by the port rail system and the CSX Railroad. There is also an intermodal trailer-on-flat-car and container-on-flat-car rail yard within the container port. While not currently operational, the port is negotiating with CSX for resumption of intermodal rail service at that facility. At the present time, most rail cargo which requires intermodal connections is trucked to the Charlotte Intermodal Terminal (Wilson, 1995).

The port is serviced by over 30 container lines, including Yang Ming, Polish Ocean, Allied Scandinavian, Central Gulf, Zim, Hanjin and Turkish Cargo Line, plus several regularly scheduled breakbulk shipping companies. These lines provide service from Northern Europe, the Mediterranean, Mideast, East and South Africa, South America, the Far East, Australia, and other shipping centers of the world (Southern Shipper, 1993; Jane's, 1992).

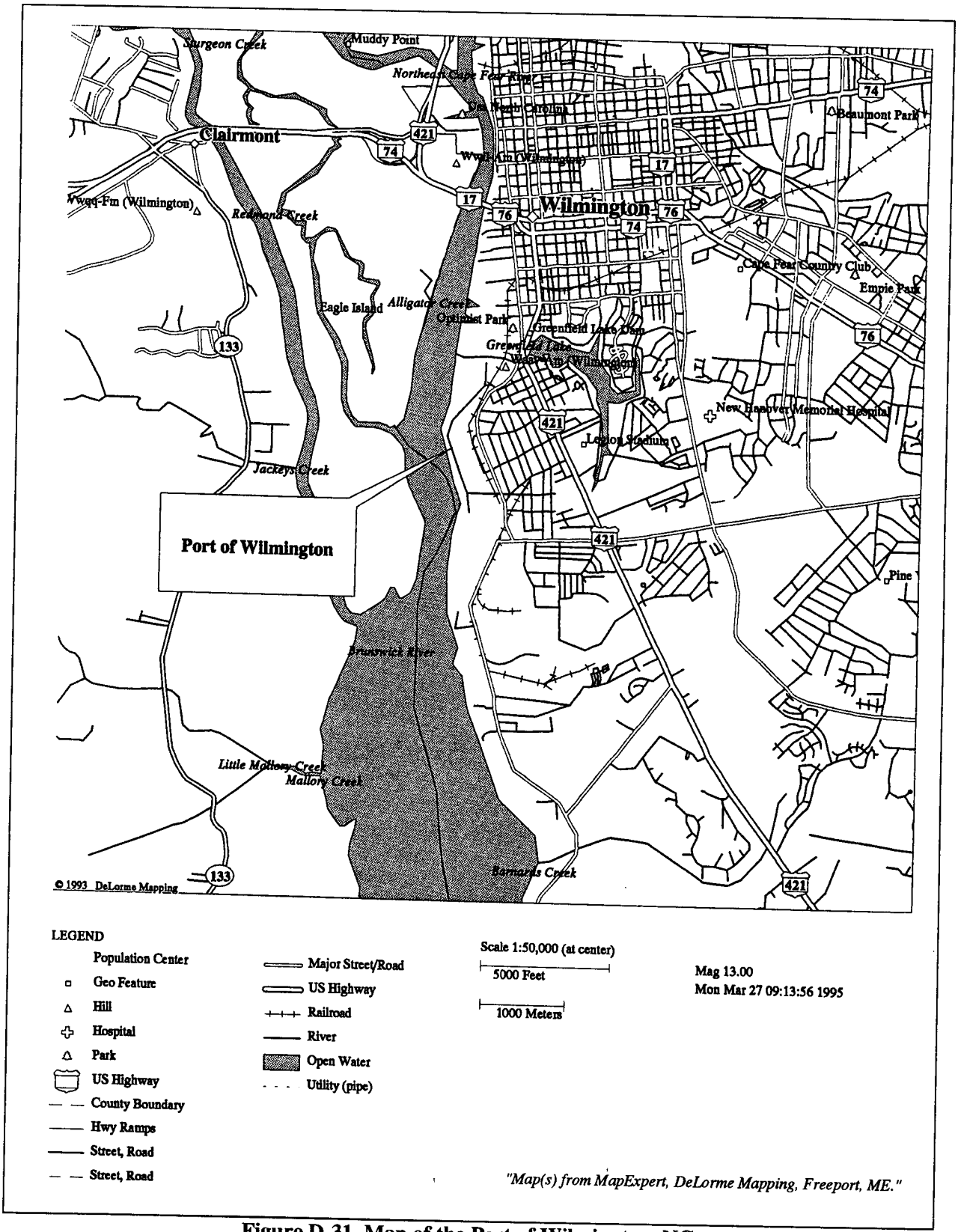


Figure D-31 Map of the Port of Wilmington, NC

Other Pertinent Information: There are no known restrictions on the receipt and handling of spent nuclear fuel through the port, although the Mayor has provided notice that the city is not convinced that the port is desirable for spent nuclear fuel shipments (Betz, 1994). This position was echoed by the Port's Executive Director, who noted that permission to visit the port must come from the State Port Commission, and that the Governor was opposed to handling spent nuclear fuel at State ports (Scott, 1994). Wilmington has handled the import shipments of enriched uranium for nuclear fuel fabrication consigned to a General Electric commercial nuclear fuel fabrication plant north of Wilmington, the exports of the finished nuclear fuel assemblies, and has also handled containerized Class A explosives (Wilson, 1993). The Sandia National Laboratories Radioactive Materials Postnotification Database was queried in April 1994, and the data showed that Wilmington received two shipments of spent nuclear fuel from Japan on February 3, 1986 and transhipped the casks to Savannah River Site the same day (SNL, 1994).

The port is located several miles downstream of the business district in an area of increasing industrial development, although there is some residential housing bordering the complex. The Military Ocean Terminal at Sunny Point is also located on the Cape Fear River, north of Southport, NC, and south of Wilmington, NC.

Port officials are part of an emergency response team headed by the Coast Guard and the Wilmington Fire Department. There are two fire stations within 3 km (2 mi) of the port, with a 5-minute response time (Scott, 1994). All operational personnel working within the terminal, including longshoremen, are given basic hazardous materials training, but training does not deal specifically with spent nuclear fuel.

Security at the port is provided by a 2 m- (6 ft-) high perimeter fencing topped with barbed wire, and a North Carolina State Ports Authority Police Force, which maintains a 24-hour patrol and surveillance. Armed officers are commissioned by the City Police Department, and unarmed guards at the gates are employed by the port (Scott, 1994). A North Carolina State Ports Authority Safety Manager reports to the Director of Operations and is responsible for all safety aspects of the terminal. A tanker terminal and petroleum storage depot are located immediately adjacent downstream of the port. Immediately north of the terminal, on the same side of the river, is an asphalt and chemical storage marine terminal. There is little ship traffic on the River, north or south of the State docks, and therefore there is little conflicting traffic or cargoes.

There are no known environmentally sensitive areas in the immediate vicinity of the terminal, but due to area resorts and recreational activity, there is heightened environmental awareness. The port is subject to hurricanes and tropical storms, as discussed below.

The likelihood of severe natural phenomena, such as high winds and earthquakes, is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Wilmington, the Uniform Building Code requires buildings to withstand wind speeds up to 160 km/hr (100 mph). The port is located in a low seismic zone with an acceleration of 0.075 g.

The 1990 population within 16 km (10 mi) of the port terminals was 115,057. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 64,700; Oak Ridge Reservation, 128,000; Idaho National Engineering Laboratory, 507,000; Hanford Site, 556,000; and Nevada Test Site, 570,000. Populations along rail routes to these sites are slightly longer. These populations are shown in Tables D-7 through D-16 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 500 km (310 mi); Oak Ridge

Reservation, 820 km (509 mi); Idaho National Engineering Laboratory, 4,100 km (2,546 mi); Hanford Site, 4,770 km (2,963 mi); and Nevada Test Site, 4,260 km (2,650 mi). Distances along rail routes are slightly longer for Western sites, but about the same for Eastern sites.

Environmental Conditions

North Carolina has given the lower portion of the Cape Fear River three different stream classifications. From the Northeast Cape Fear River to the confluence with the Cape Fear River the waters are classified as SC-swamp. From the mouth of the Northeast Cape Fear to a point between Snow and Federal Points, the waters are classified as SC. From Snow and Federal Points oceanward the waters are classified as SA. SC waters are tidal waters suitable for fishing, fish and wildlife propagation, secondary recreation and other water uses requiring lower quality. The term "swamp" denotes waters with slow velocity. Class SA waters are suitable for shellfishing, primary recreation, as well as all of the activities approved for Class SC waters (NCDEHNR, 1992). According to the U.S. Fish and Wildlife Service's Ecological Inventory Map for Beaufort, NC, the Port of Wilmington is located in a low salinity estuarine habitat (generally 0.5 to 5 parts per thousand) and tidal freshwater habitat. Below Wilmington at Campbell Island, the river changes to a mid-salinity estuarine habitat (generally 5 to 16.5 ppt). The Cape Fear River near MOTSU changes once again to a high salinity estuarine habitat (generally 16.5 to 30 ppt) (FWS, 1980a).

The lower Cape Fear River supports a large number of aquatic and terrestrial species. There are both invertebrate and fish species of commercial and recreational value found in the Cape Fear River near the Port of Wilmington. Species sought by commercial and recreational fisherman include flounder, trout, spot, croaker, bluefish, Spanish mackerel, and king mackerel. Shellfish sought include penaeid shrimp and blue crabs.

The Natural Heritage Program of the North Carolina Department of Environment, Health, and Natural Resources reports that the area around the state port has not been systematically inventoried for rare species (Smith, 1994). However, DEHNR reports that the lower Cape Fear River, from Wilmington to the mouth of the river at Smith Island, is brackish and contains numerous rare animals. The shortnose sturgeon (State and Federal Endangered Species) rarely occurs in the river, whereas manatees (State and Federal Endangered Species) occasionally occur, especially in the summer. American alligators (State and Federal Threatened Species) can be found in tributary streams. The freckled blenny, spinycheek sleeper, opossum pipefish, and marked goby are other rare marine fishes that inhabit the river.

A large number of aquatic species may be found in the lower Cape Fear River and along the southern coast of North Carolina (Horning, 1994; U.S. Army, 1993; FWS, 1980a). There are many animals with special status in this area, including various types of whales, sea turtles, and birds. State or Federally protected endangered or threatened aquatic species in this area include the shortnose sturgeon (fish), finback whale, Florida manatee, humpback whale, right whale, sei whale, and sperm whale (mammals), Arctic peregrine falcon, bald eagle, piping plover, red-cockaded woodpecker, wood stork (birds), and the American alligator, green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle and the loggerhead sea turtle (reptiles and amphibians).

Climatic Conditions

The elevation of this region is approximately 12 m (40 ft) above sea level and is more variable than the coastal plain surrounding the Norfolk, VA, area.

The maritime location of the Wilmington, NC, area makes the climate unusually mild for its northern latitude. All wind directions from the east-northeast through the southwest have some moderating effect on the local climate, due to the relatively warm and cool ocean in the winter and summer seasons, respectively. The area rarely experiences cold episodes where the temperature falls below -18°C (0°F). However, cold air outbreaks do occur, causing sharp fluctuations in winter temperatures. Rainfall in the area is generally considered ample and evenly distributed throughout the year, with the bulk of the precipitation occurring during the summer months. The bulk of this rainfall is generally associated with afternoon and evening thunderstorms. In contrast, the winter rains tend to be of the slow, steady type lasting, generally, one to two days. As is common at Atlantic coastal localities at this latitude, the late summer and early fall months bring the possibility of hurricanes and tropical storms to the Wilmington, NC area. These storms are capable of generating high winds, above normal tides, and torrential rains. The latter two are also capable of creating widespread local flooding of low-lying coastal areas (NOAA, 1992b).

D.2.2 Other U.S. Ports Meeting the Appropriate Experience Criteria

The ports described in this section are those that were initially identified as acceptable based on experience with containerized cargo, but that were subsequently dropped from further consideration based on evaluation against other criteria. Those criteria and the evaluation process are described in Section D.1.

D.2.2.1 Baltimore, MD

The Port of Baltimore, one of the major ports of the United States, is established on the upper Chesapeake Bay at the head of tidewater navigation on the Patapsco River. It is situated 13 km (8 mi) from the entrance to the Patapsco, 240 km (150 mi) from the Virginia Capes, and 1670 km (104 mi) from the Delaware Capes.

Depths within the harbor range from 15.2 m (50 ft) to 12.2 m (40 ft). Federal project depths are 15.2 m (50 ft) in the main channel between the Virginia Capes and Fort McHenry in the Baltimore Harbor. Access to the port can be gained via the Delaware Bay and River, and the Chesapeake and Delaware Canal, although this route is not recommended due to the restrictive nature of the transit. The preferred route is via the Virginia Capes and Chesapeake Bay. The Chesapeake Bay is considered part of the transit to Baltimore; this includes 240 km (150 mi) up the Bay under the Chesapeake Bay Bridge to the Patapsco River (DOC, 1993c). A map of the Port of Baltimore is shown in Figure D-32.

In the Port of Baltimore, the Maryland Port Administration (MPA) owns and operates the two principal general cargo terminals — Seagirt and Dundalk Marine Terminals. Together these terminals provide a total of 338 ha (835 acres) of cargo handling space on deepwater channels. Both terminals are ports of call for many of the world's largest container and roll-on/roll-off shipping lines. Seagirt is capable of handling (length and draft) the largest post-Panamax vessels currently in service (Jane's, 1992; AAPA, 1993; D&B, 1993).

Seagirt Terminal: Seagirt is MPA's newest and most modern container facility with three container ship berths, eight cranes, and 107 ha (265 acres) of developed terminal area. Seagirt also has a deeper water depth alongside berths; the three container berths have a depth alongside at mean low water of 12.8 m (42 ft). The terminal has two 313 m each (1,020 ft each) marginal wharves and one 326 m (1,070 ft) marginal wharf. Crane capacity at the terminal consists of four 50.8 metric ton (56 ton) single hoist container cranes, three 50.8 metric ton (56 ton) double hoist container cranes, and one 27.9 metric ton (30.7 ton) single hoist container crane (AAPA, 1993 and 1994; Jane's, 1992; D&B, 1993).

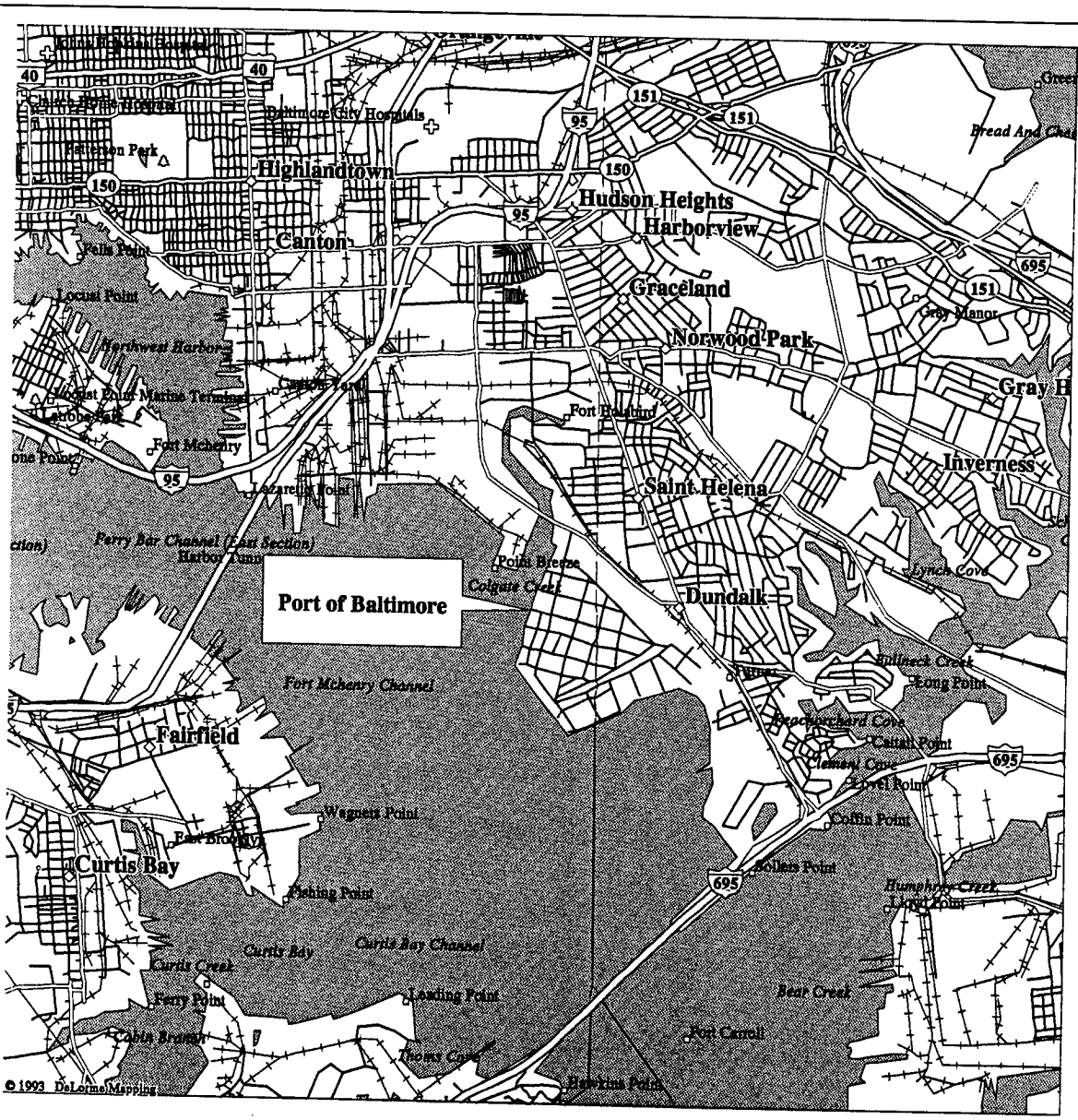


Figure D-32 Map of the Port of Baltimore, MD

Dundalk Marine Terminal: Dundalk Marine Terminal, located adjacent and eastward of Seagirt, has approximately 231 ha (570 acres) of terminal area and is a combination container, roll-on/roll-off, and breakbulk handling facility. The terminal has 13 barge and ship berths, 11 cranes, and covered storage shed space of more than 37,000 m^2 (400,000 ft^2). Marginal wharves consist of three 808 m total (2,650 ft), two 553 m total (1,820 ft) container berths, and one 305 m (1,000 ft) container berth. Containership berths have a depth alongside of 11.5 m (38 ft). Crane capacity at the terminal includes nine 40.6 metric ton (45 ton) single hoist container cranes and two 61 metric ton (67 ton) gantry whirley cranes (Jane's, 1992; D&B, 1993; AAPA, 1993 and 1994).

The Seagirt and Dundalk Terminals are located in the Dundalk section of the City of Baltimore, east and south of the central business district. The access road to both terminals is bordered primarily by heavy industrial types of businesses with relatively good interstate highway connections. Southbound, the distance from Seagirt to I-695 is roughly 4 km (2.5 mi). The entrance to the Seagirt Marine Terminal is approximately 1.6 km (1 mi) from I-95 connected by Bruening Highway, an industrial roadway that also serves as the main truck access to both terminals. Access to other major interstate highways is via the I-695 Beltway, which would be used to bypass harbor tunnels for Savannah River Site or other southern destinations. Routing and connect time for Dundalk traffic would be virtually the same due to proximity of location to the Seagirt terminal. Seagirt is served by the CSX Railroad, which operates a 16.2 ha (70 acre) intermodal container transfer facility inside the terminal and within 0.3 km (1000 ft) of the ship berths. Conrail serves the Dundalk Terminal for breakbulk cargoes (D&B, 1993; AAPA, 1993 and 1994).

Other Pertinent Information: Security of both terminals is maintained by the MPA Port Police and is deemed to be excellent. There are secure areas for temporary segregation and storage of containers if necessary.

There are no port restrictions against handling spent nuclear fuel. A port safety officer stated that spent nuclear fuel shipments go out of the port with an armed escort (normally at night), and that the port also handles casks (cylinders) of uranium hexafluoride (UF_6) shipments quite frequently. Although there are no known conflicts with other hazardous materials in the immediate terminal area, there is a diversity of marine terminals and ship traffic activity on the Patapsco River which are not deemed to represent a major hazard factor.

There are no known special environmental issues with regards to handling spent nuclear fuel at Baltimore. The likelihood of severe natural phenomena, such as high winds and earthquakes, is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Baltimore, the Uniform Building Code requires buildings to withstand wind speeds up to 110 km/hr (70 mph). The port is located in a low seismic zone with an acceleration of 0.075 g.

The MPA relies on the hazardous materials teams of the Baltimore City and County fire departments as well as the Coast Guard for response to hazardous materials accidents. The Maryland Department of the Environment also has input on hazardous materials problems. The MPA has an ongoing hazardous materials training program for all port operating personnel, including the longshoremen. Instruction includes dealing with hazardous wastes (but not spent nuclear fuel in particular) in the soil and groundwater due to the former use of the port site.

The 1990 population within 16 km (10 mi) of the port terminals was 1,182,024. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 308,000; Oak Ridge Reservation, 246,000; Idaho National Engineering Laboratory, 482,000; Hanford Site, 531,000; and Nevada Test Site, 665,000. Populations along rail routes to these sites are

much larger. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 1,020 km (636 mi); Oak Ridge Reservation, 925 km (575 mi); Idaho National Engineering Laboratory, 3,790 km (2,354 mi); Hanford Site, 4,460 km (2,770 mi); and Nevada Test Site, 4,060 km (2,526 mi). Distances along rail routes are slightly longer.

Environmental Conditions

The Gunpowder Falls State Park is located approximately 22 km (13 mi) northeast of the port. The Remington Farms Wildlife Reserve, on the Eastern Shore of Maryland, is approximately 35 km (23 mi) east of the port. The Eastern Neck National Wildlife Refuge is located in the Chesapeake Bay, about 38 km (25 mi) southeast of the port area. The Fort McHenry National Monument and Historic Shrine is located on a point of land approximately 4 km (2 mi) west of the Baltimore port. Numerous State Parks and other wildlife refuges are located along the passageway in the Chesapeake Bay south of the port.

The endangered peregrine falcon occurs in the vicinity of the Port of Baltimore (Wolflin, 1994). These birds feed, in part, on shorebirds and other waterbirds using the waters of the Port of Baltimore. The endangered Delmarva fox squirrel and the great blue heron (State-protected) nest on the Eastern Neck Island (FWS, 1980g). The bald eagle (endangered) also nests in the Eastern Neck Island area.

The Bay contains many beds of commercially valuable oysters and soft-shelled clams. Blue crabs are harvested extensively throughout the Bay area. Commercial harvesting of channel catfish and menhaden also is important in the Bay area. Numerous types of fish use the Bay area, including the waters around the port, for nursery areas. Common fish species include the American eel, blueback herring, hickory shad, alewife, gizzard shad, perch, striped bass, drum, flounder, and others. Sport fishing for these fish is also common. State-protected species include the Atlantic sturgeon and American shad (FWS, 1980g). The western bank of the Eastern Shore is a migratory area for the dabbling duck (nonendangered) and a heavily used migration pathway for geese.

Climatic Conditions

Baltimore is in a region about midway between the rigorous climates of the North and the mild climates of the South and adjacent to the modifying influences of the Chesapeake Bay and Atlantic Ocean to the east and the Appalachian Mountains to the west. The net effect is to produce a more equable climate compared to inland locations of the same latitude.

Rainfall distribution throughout the year is rather uniform; however, the greatest intensities are confined to the summer and early fall, the season for hurricanes and severe thunderstorms. Rainfall during this period occurs principally in the form of thundershowers, and rainfall totals during these months vary appreciably, depending on the number of thundershowers that occur largely by chance in a given locality. Hurricane-force winds, however, may occur on rare occasions due to a severe cold front or a severe thunderstorm. The greatest damage by hurricanes is that produced along waterfronts and shores by the high tides and waves.

In summer, the area is under the influence of the large semipermanent high-pressure system commonly known as the Bermuda High and centered over the Atlantic Ocean near latitude 30°N. This high-pressure system brings a circulation of warm, humid air masses over the area from the deep South. The proximity of large water areas and the inflow of southerly winds contribute to high relative humidities during much of the year.

January is the coldest month, and July the warmest. Winter and spring have the highest average windspeeds. Snowfall occurs on about 25 days per year on the average; however, an average of only 9 days annually produce snowfalls greater than 1.0 in. Although heaviest amounts of snow generally fall in February, occasional heavy falls occur as late as March. Records for the period August 1950 through December 1967 indicate that the average date of the last temperature as low as 32° in the spring is April 15, while the average date of the first temperature as low as 32° in the autumn is October 26 (NOAA, 1993a).

Glaze or freezing rain occurs on an average of two to three times per year, generally in January or February, although some occurrences have been noted in November and December. Some years pass without the occurrence of freezing rain, while in others it occurs on as many as eight to ten days. Sleet is observed on about five days annually. The sleet season begins as early as November in some years, and ends as late as March in some cases, with the greatest frequency of occurrence in January (DOC, 1993c).

D.2.2.2 Boston, MA

The Port of Boston is located on Massachusetts Bay about 93 km (50 mi) west of Cape Cod and is the largest seaport in New England. Boston North Channel is the main entrance to Boston Harbor and Boston South Channel and The Narrows are alternative entrances. A Federal project on the North Channel (to the Mystic River) provides for a channel width of 460 m (1,500 ft) and a depth of 12.2 m (40 ft) in the eastern section, and a width of 270 m (900 ft) and depth of 10.7 m (35 ft) in the western section (DOC, 1993a).

Although there are many obstructions in the Harbor approaches, they are marked by a number of powerful lights, and the principal dangers are buoyed. Because of the heavy traffic to the Harbor, there is a traffic separation scheme extending over 160 km (100 mi) out to sea (DOC, 1993a).

The Massachusetts Port Authority (Massport) is a quasi-governmental authority created by the State Legislature in 1956. The Maritime Division is responsible for the operation, development, and maintenance of the port's three public terminals, including two container terminals (Moran and Conley) and one general cargo facility (Harbor Gateway Terminal) (POB, 1993). A map of this port is provided in Figure D-33.

Moran Terminal: Moran Terminal is located about 7.2 km (4.5 mi) upstream of the Inner Harbor Entrance, on the left side of the ascending bank of the Mystic River in Boston's Charlestown section. It is the largest container terminal in New England and is operated by Massport. The facility consists of 20.2 ha (50 acres) of open storage space, storage capacity for 4,000 20-ft equivalent units, and two container cranes [46 and 71 metric tons (51 and 78 tons)]. It has 335 m (1,100 ft) of marginal wharf and depth alongside of 12.2 m (40 ft). Vessels are limited by the 41.2 m (135 ft) clearance under the Tobin Memorial Bridge (Jane's, 1992; AAPA, 1993 and 1994; D&B, 1993; POB, 1993).

Moran Terminal is situated about 1.6 km (1 mi) from the intersection with I-93 with access via city streets through the densely populated Charlestown area. The terminal is served by the Boston & Maine Railroad, whose tracks enter the terminal and extend to the pier apron.

Conley Terminal: The Conley Terminal on Castle Island is less than 6.4 km (4 mi) from the designated entrance to Boston Harbor. The northern approach to the terminal is obstructed by islands and shoals that extend 6.4 km (4 mi) from the entrance for a combined distance of about 13 km (8 mi). It is located at the entrance of the Inner Harbor on the South Boston waterfront. The Terminal is operated by a subcontractor to Massport. It has 305 m (1,000 ft) of marginal wharf, and consists of Berths 11-15, and Berth 17. The depth alongside is 12.2 m (40 ft).

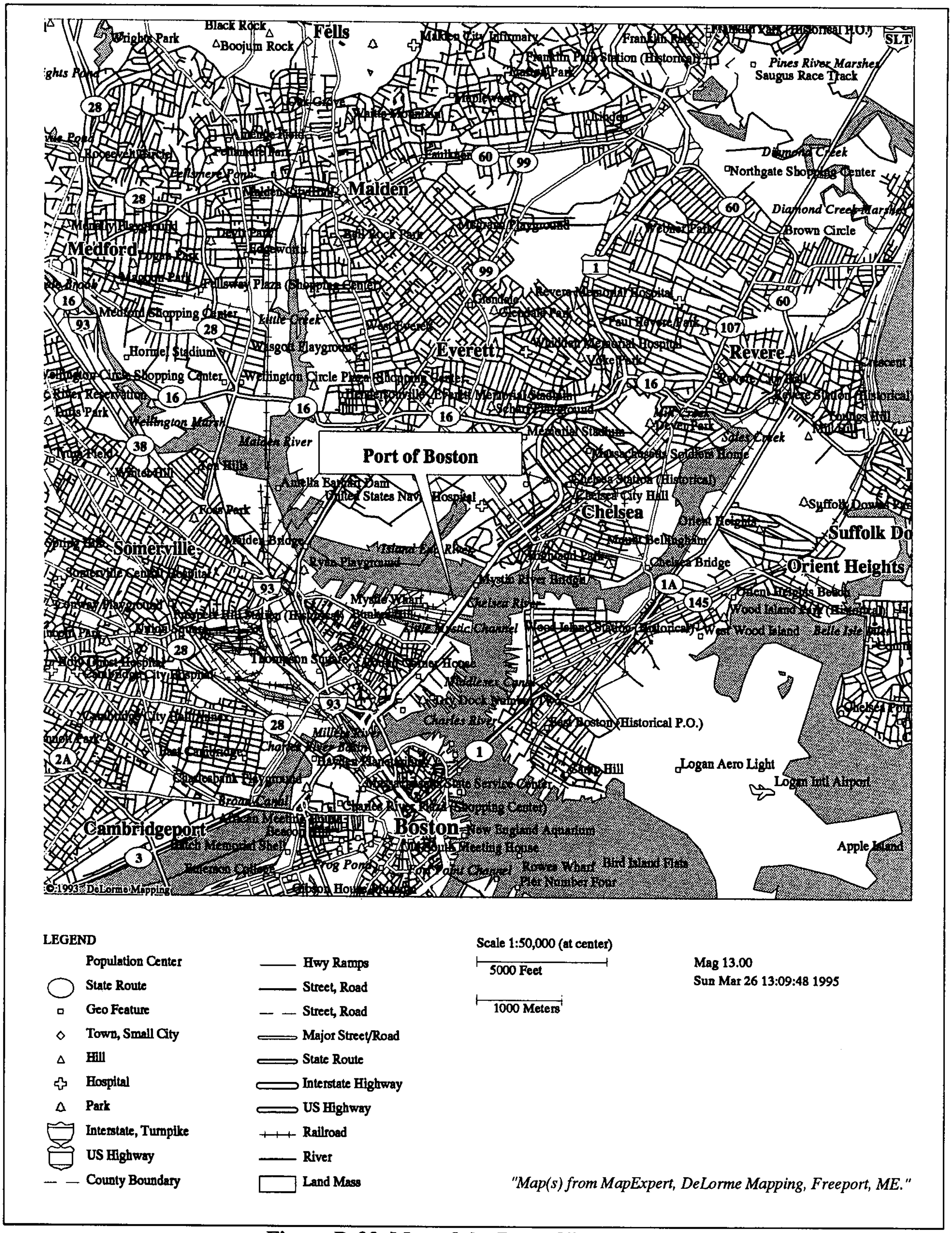


Figure D-33 Map of the Port of Boston, MA

The container terminal, Berth 11, has two 41 metric ton (45 ton) container cranes and an open storage area of 4 ha (9.9 acres). Berth 12 is presently undergoing a $50 million improvement program (to be completed in 1995), and Berths 13-15 are leased to automobile importers. Berths 16 and 17 are served by one container crane (31 metric ton) and are also leased by automobile importers (Jane's, 1992; AAPA, 1993 and 1994; D&B, 1993; POB, 1993). The terminal is approximately 3.2 km (2 mi) from Route I-93, which is part of the Greater Boston Beltway, which then connects with I-95 and I-90 (the Massachusetts' Turnpike). Access to the terminal is via East and West Broadway, a busy South Boston thoroughfare running through an area of primarily small businesses with some old residential housing. Construction of the Third Harbor Tunnel/Seaport Access Road began in 1992 for better interstate access. The terminal is served by Conrail whose tracks are located outside and at the rear of the terminal.

Massport Marine Terminal: This is a 16 ha (40 acre) facility used for cruise ships and the discharge of automobiles (roll-on/roll-off) and bulk cargo. This terminal is about 1.6 km (1 mi) from I-93 via Northern Avenue (a truck route to the Boston Fish Pier) and other industrial users along the waterfront (Jane's, 1992; AAPA, 1993 and 1994; D&B, 1993; POB, 1993).

Other Pertinent Information: Massport has its own security force, which has police powers at State-owned terminals. Although there is no officially designated space for segregating hazardous materials, the port would provide one if necessary. There are no known regulatory restrictions against handling of spent nuclear fuel at Massport terminals; the Deputy Port Director for Operations did not know if the port has ever handled spent nuclear fuel (Moriconi, 1993).

Massport relies on its fire department, which also has a fireboat, for emergency response for hazardous materials accidents, and on Coast Guard supervision. The port also coordinates its activities with State hazardous materials safety personnel. Massport has a training program for terminal workers at Moran, and recently began an introductory course for longshoremen. Training at leased facilities, like Moran Terminal, is the responsibility of the terminal operator (Moriconi, 1993).

Moran Container is located in the densely populated Charlestown area on the Mystic River across from petroleum and natural gas terminals, and a residential condominium/marina complex. Conley Terminal is in an industrial area with less conflicting use, but access is through South Boston, also a densely populated commercial/residential area.

There are no known special environmentally sensitive areas within the port. The likelihood of severe natural phenomena, such as high winds and earthquakes, is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Boston, the Uniform Building Code requires buildings to withstand wind speeds up to 140 km/hr (85 mph). The port is located in a moderate seismic zone with an acceleration of 0.30 g.

The 1990 population within 16 km (10 mi) of the port terminals was 1,466,233. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 1,080,000; Oak Ridge Reservation, 912,000; Idaho National Engineering Laboratory, 716,000; Hanford Site, 785,000; and Nevada Test Site, 796,000. Populations along rail routes to these sites are much larger. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 1,734 km (1,079 mi); Oak Ridge Reservation, 1,600 km (995 mi); Idaho National Engineering Laboratory, 4,180 km (2,600 mi); Hanford Site, 4,850 km (3,016 mi); and Nevada Test Site, 4,560 km (2,832 mi). Distances along rail routes are about the same for Hanford Site and Idaho National Engineering Laboratory, and are slightly longer for Savannah River Site, Oak Ridge Reservation, and Nevada Test Site.

Climatic Conditions

Three important influences are responsible for the main features of Boston's climate (DOC, 1993a). First, the latitude 42°N places the city in the zone of prevailing west to east atmospheric flow, which encompasses the northward and southward movements of large bodies of air from tropical and polar regions. This results in variety and changeability of the weather elements. Secondly, Boston is situated on or near several tracks frequently followed by systems of low air pressure. The consequent fluctuations from fair to cloudy or stormy conditions reinforce the influence of the first factor, while also ensuring a rather dependable precipitation supply. The third factor, Boston's east coast location, is a moderating factor affecting temperature extremes of winter and summer.

Hot summer afternoons are frequently relieved by the locally celebrated "sea-breeze," as airflows inland from the cool water surface to displace the warm westerly current. This refreshing east wind is more commonly experienced along the shore than in the interior of the city or the western suburbs. In winter, under appropriate conditions, the severity of cold waves is reduced by the nearness of the then relatively warm water. The average date of the last occurrence of freezing temperature in spring is April 8; the latest is May 3, 1874 and 1882. The average date of the first occurrence of freezing temperature in autumn is November 7; the earliest on record is October 5, 1881. In suburban areas, especially away from the coast, these dates are later in spring and earlier in autumn by up to one month in the more susceptible localities.

Boston has no dry season. For most years the longest run of days with no measurable precipitation does not extend much more than two weeks. This "dry spell" may occur at any time of year.

Much of the rainfall from June to September comes from showers and thunderstorms. During the rest of the year, low-pressure systems pass more or less regularly and produce precipitation on an average of roughly one day in three. Coastal storms, or "northeasters," are prolific producers of rain and snow. The main snow season extends from December through March. The average number of days with four inches or more of snowfall is four per season, and days with seven inches or more come about twice per season. Periods when the ground is bare or nearly bare of snow may occur at any time in the winter.

Relative humidity has been known to fall as low as five percent (May 10, 1962), but such desert dryness is very rare. Heavy fog occurs on an average of about two days per month, with its prevalence increasing eastward from the interior of Boston Bay to the open waters beyond. Winds from the east to southwest bring fog and westerly and northerly winds clear the fog away.

At all seasons the heaviest gales are usually from the northeastward or eastward. Although winds of 32 mph or higher may be expected on at least 1 day in every month of the year, gales are both more common and more severe in winter (DOC, 1993a).

D.2.2.3 Eddystone, PA

The location of Penn Terminals at Eddystone is on the former site of Pennsylvania Shipbuilding Company's North Yard Wharf, just upstream of the entrance to Ridley Creek in Eddystone, PA. It is located approximately 18 km (11 mi) south of Philadelphia. It is approximately 1.5 km (1 mi) above the small port of Chester, PA. Penn Terminals, Inc. is one of several independent Delaware River port terminal operators who come under the marketing umbrella of the Delaware River Port Authority (AAPA, 1994). A map of the port is shown in Figure D-34.

Geophysical and navigational data for Penn Terminals is, with the exception of the approach to the Terminal, the same as for Philadelphia and other Delaware River Ports in the immediate vicinity (AAPA, 1994).

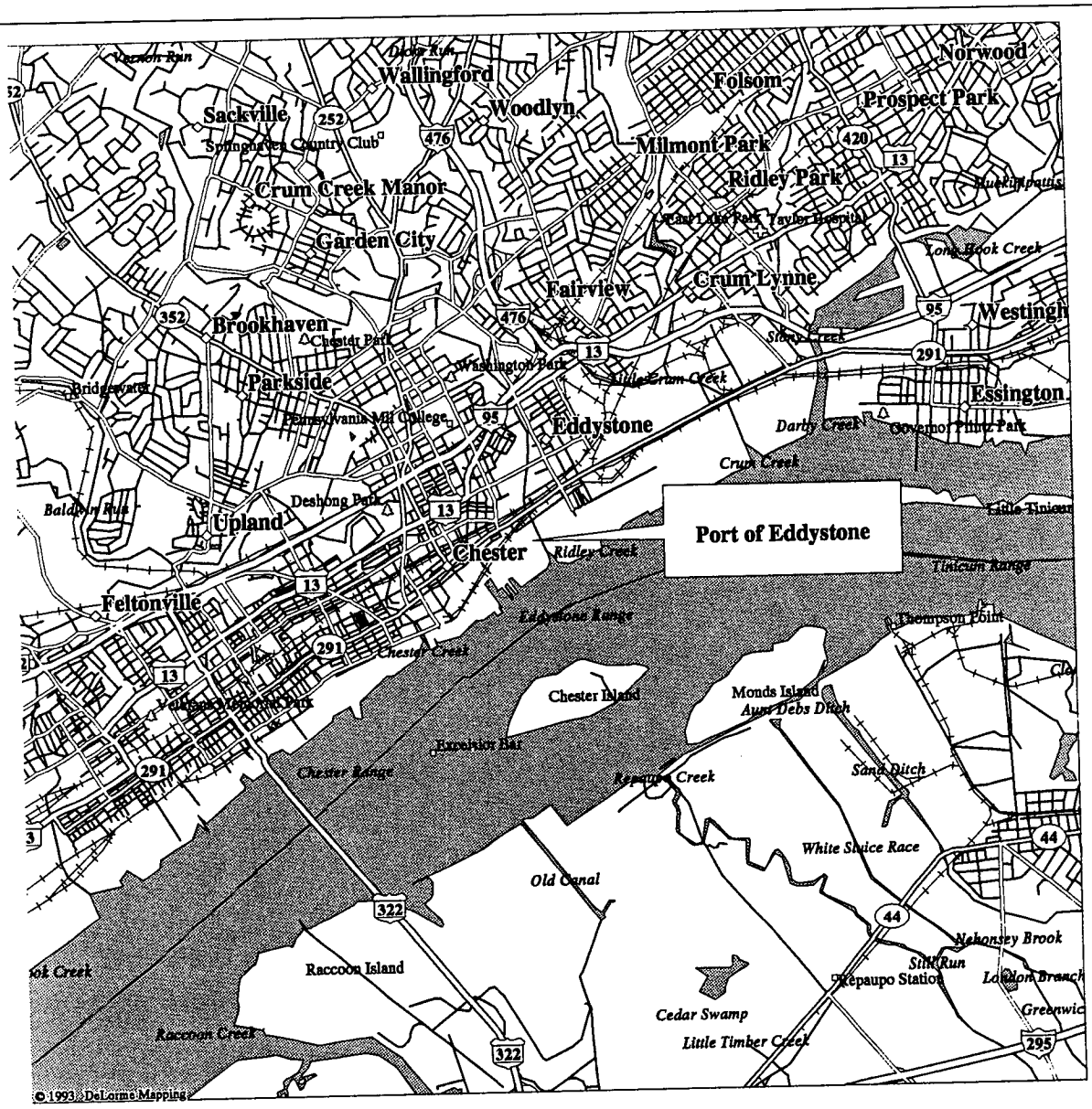


Figure D-34 Map of the Port of Eddystone, PA

Penn Terminals was founded in 1986 to manage containerized cargoes but subsequently expanded its scope of services to include breakbulk and project cargoes. Penn Terminals' brochure states that they handle about 250 ship calls a year (PT, 1994). A port official reported that the Terminal handles 30,000 to 50,000 20-ft equivalent units a year, including some hazardous and radioactive materials (Davis, 1994). According to the Sandia National Laboratory's Radioactive Materials Postnotification (RAMPOST) Database, on April 17, 1991, this port was used for receipt of about 1.4 x 10^{16} Bq [366,000 curies (Ci)] of cobalt-60 for shipment to Dickerson, MD, in a Type B cask comparable to those used for spent nuclear fuel shipments (SNL, 1994). There was no indication of foreign research reactor spent nuclear fuel receipts since October 1984, when the database was established.

The Terminal features 40.7 ha (71 acres) of storage area, including 23,200 m^2 (250,000 ft^2) of covered storage. The terminal has 335 m (1,100 ft) of marginal wharf, container gantry cranes, a 27 metric ton (30 ton) and a 41 metric ton (45 ton) and a heavy lift truck crane with a capacity of 220 metric tons (240 tons). Rail service is provided by Conrail. Access to Interstate 95 is about 1.6 km (1.0 mi) from the terminal via industrial and old residential streets (PT, 1994; AAPA, 1994).

The likelihood of severe natural phenomena, such as high winds and earthquakes, is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Eddystone, the Uniform Building Code requires buildings to withstand wind speeds up to 130 km/hr (80 mph). The port is located in a low seismic zone with an acceleration of 0.075 g.

The 1990 population within 16 km (10 mi) of the port terminals was 609,241. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 400,000; Oak Ridge Reservation, 300,000; Idaho National Engineering Laboratory, 600,000; Hanford Site, 600,000; and Nevada Test Site, 700,000. Populations along rail routes to these sites are slightly larger. These populations are shown in Tables D-7 through D-16 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 1,170 km (725 mi); Oak Ridge Reservation, 1,060 km (660 mi); Idaho National Engineering Laboratory, 3,930 km (2,440 mi); Hanford Site, 4,590 km (2,850 mi); and Nevada Test Site, 4,180 km (2,600 mi). Distances along rail routes are about the same.

Environmental Conditions

Monds Island and Chester Island are directly across the shipping channel from the port, and Little Tinicum Island is 1.8 km (1.1 mi) upriver. Tidal flats surround these islands, which are comprised of marshes and wetlands. The Tinicum National Environmental Center, located approximately 3.5 km (2.2 mi) to the northeast on Darby Creek, is a nationally recognized wetlands and environmental education center.

The Port of Eddystone is located within Zone 4 (tidal river) of the Delaware River. Protected water uses for Zone 4, which encompasses River Miles (RM) 79-95, are water supply (industry), wildlife, resident fish maintenance, anadromous fish passage, secondary contact, and navigation (DRBC, 1994). However, several uses within Zone 4 are currently impacted, including: fish and other aquatic life due to low dissolved oxygen levels from point source discharges, and fish and shellfish consumption due to chlordane and PCB contamination from point and nonpoint source discharges.

The Delaware River at Eddystone is classified as a low salinity estuarine (generally 0.5 to 5 ppt) and tidal freshwater habitat. Aquatic organisms that are typically found in the waters of this area include: American shad, Atlantic sturgeon, American eel, blueback herring, shad, alewife, white catfish, brown bullhead, perch, striped bass, bluegill, crappie, pumpkinseed, largemouth bass, carp, and chain pickerel

(FWS, 1980f). In addition, the Delaware River is used as a migratory area by the shortnose sturgeon, a Federally listed endangered species. The Water Quality Section of the Pennsylvania Department of Environmental Resources reported that 67 species of fish are full or part-time residents of this part of the Delaware estuary (Boyer, 1994). Most importantly, the area of the river between Monds Island, Chester Island, and Little Tinicum Island and the islands' backwaters, is an important spawning site for the striped bass.

This area of the Delaware River serves as a sport fishery for striped bass, American shad, blue-claw crabs, white perch, largemouth bass, and catfish. There is also limited commercial fishing for American eels and American shad. There is only low to medium recreational use of this part of the Delaware River due to the high volume of tanker and freighter traffic (Boyer, 1994).

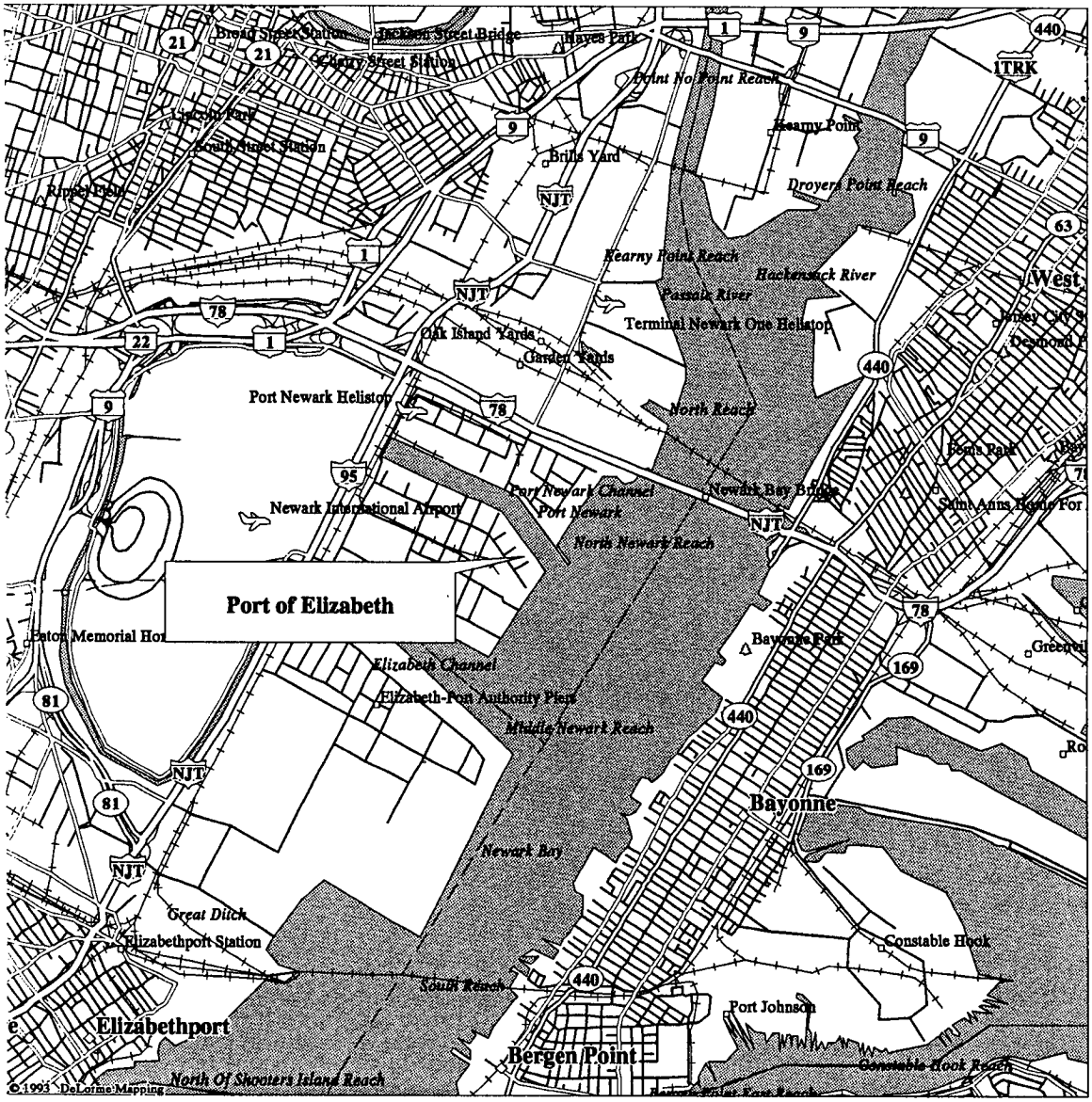
The U.S. Fish and Wildlife Service reported that except for occasional transient species, no Federally listed or proposed threatened or endangered species under their jurisdiction are known to exist in the port's impact area (Perry, 1994). Similarly, the Pennsylvania Natural Diversity Inventory reported that it did not expect any impact on rare, threatened, or endangered plant species in this location (PNDI, 1994).

Climatic Conditions

The climate of the Eddystone region is similar to that of Philadelphia, PA. The area is moderated by the Appalachian Mountains to the west and the Atlantic Ocean to the east. These geographic features cause periods of extreme temperatures to be short-lived in this region (generally, four days). On occasion during the summer months, the area is dominated by maritime tropical air masses, which contribute to elevated local temperature and humidity levels. The average annual precipitation of 105.2 cm (41.42 in) is relatively evenly distributed throughout the year; with maximum amounts occurring during the late summer months. The summer precipitation regime is dominated by localized thunderstorms and are subject to the influence of the urban heat island effect and local topography, which create varying rainfall amounts across the city for an individual event. Singular snowfall events that generate accumulated totals of greater than 25.4 cm (10 in) have a 5-year recurrence interval on average. The prevailing wind direction has a bimodal distribution, being southwesterly during summer and northwesterly in the winter months. The annualized average prevailing wind direction is from the west-southwest. Due to this region's inland location, destructive winds are comparatively rare from tropical cyclones and tornadoes. High winds are generally associated with frontal passages/low pressure systems and thunderstorms in the winter and summer months, respectively. However, flooding on the Schuylkill River normally occurs twice annually, usually associated with strong thunderstorms, with the duration of these events generally lasting less than 12 hrs. The Delaware River is rarely observed at or above flood stage (NOAA, 1992h).

D.2.2.4 Elizabeth, NJ

New York Harbor is the principal entrance by water to New York City and the surrounding ports. The harbor is divided by the Verrazano Narrows into the Lower Bay and Upper Bay. Using the Verrazano Narrows Bridge as a reference point, Port Elizabeth is approximately 18 km (11 mi) from the Lower Bay and the Atlantic Ocean via Kill Van Kull. The Battery, the southern tip of Manhattan, is at the junction of the East River and Hudson River. New York Harbor includes New York City, Staten Island, and the New Jersey principal ports of Perth Amboy, Port Elizabeth, Port Newark, and Bayonne. The project depth of the channels leading from the sea through the Lower Bay, Narrows and Upper Bay is 13.7 m (45 ft). Depths in the Kill Van Kull leading to the New Jersey container terminals is 10.7 m (35 ft). The approaches to New York Harbor are open, but highly trafficked. The 13 km (8 mi) down the Kill Van Kull to Port Elizabeth is restricted (DOC, 1993b). A map of the port is provided in Figure D-35.



LEGEND

- Population Center
- State Route
- Geo Feature
- Town, Small City
- Park
- Interstate, Turnpike
- US Highway
- Airfield
- County Boundary
- Hwy Ramps
- Street, Road
- Major Street/Road
- State Route
- Interstate Highway
- US Highway
- Railroad
- River
- Open Water

Scale 1:50,000 (at center)

5000 Feet

1000 Meters

Mag 13.00
Mon Mar 27 09:14:55 1995

"Map(s) from MapExpert, DeLorme Mapping, Freeport, ME."

Figure D-35 Map of the Port of Elizabeth, NJ

Unlike many ports of the world, no single governmental or public agency in New York is responsible for controlling the overall operation of the port. Port administration is divided among many organizations, both private and public, which have an institutional interest in port activities.

The Port Authority of New York and New Jersey (Port Authority) is a quasi-public agency established in 1921 by treaty between the states of New York and New Jersey to deal with the planning and development of terminal and transport facilities, and to improve and protect the commerce of the port district.

The Port Authority's main maritime facilities are located in Elizabeth, Port Newark, and Hoboken, New Jersey, and in New York, at Erie Basin and Columbia Street terminals in Brooklyn. The City of New York owns the South Brooklyn Marine Terminal, Red Hook Marine Terminal (also in Brooklyn), and Howland Hook Marine Terminal on Staten Island. The latter is a major container terminal now leased to the Port Authority. Global Terminal, a privately owned and operated container facility, is located in Jersey City. All told, there are five separate container areas within the harbor equipped with a total of 35 container cranes along a total quay length of 8,000 m (approximately 5 mi), and a total berth area of about 500 ha (1,236 acres) (Jane's, 1992; AAPA, 1993).

With the exception of Global Terminal, all of the foregoing terminals are leased from the Port Authority or the City of New York and operated by terminal operating companies or steamship lines. Since virtually any one of these terminals would be physically capable of handling containers of spent nuclear fuel, description of the port's capabilities is limited to a single terminal, the Port Authority Marine Terminal, within the Port Authority's Port Elizabeth/Port Newark container complex. The Port Elizabeth/Newark area has direct access to the New Jersey Turnpike and is farthest removed (relatively) from centers of population.

Sea-Land Terminal (Elizabeth NJ): Berths 88-98 on the southeast corner of Elizabeth Channel have 1,403 m (4,603 ft) of marginal wharf. The terminal has 12.2 m (40 ft) depth alongside at mean low water. Sea-Land has crane capacities of six 40.6 metric ton (44.8 ton) container gantry cranes. Truck access to the New Jersey Turnpike (I-95) is via Port Newark (Exit 14) or Exit 13A in Elizabeth. The latter is reached via McLester Street to State Route 81 to the Turnpike. The route is almost entirely within the Port Authority Marine Terminal complex and distance traveled is estimated to be about 4.8 to 6.4 km (3 to 4 mi), respectively. The Sea-Land Terminal is adjacent to the Conrail Portside and the Port Authority intermodal rail yards.

In addition to Sea-Land, the Terminal is used by Hanjin Shipping Lines, Ltd., Italia Line, Nedlloyd, P & O Containers, Samskip, S.C.I. Line, Spanish Line, and Transroll Navegacao, SA. The list of container lines calling at other terminals is extensive and represents the major container carriers of the world (Jane's, 1992; AAPA, 1993).

Other Pertinent Information: Individual Terminals are responsible for their own security arrangements. However, it is believed that the New York Port Association controls and may serve as watchmen. All terminals are fenced with controlled access and 24-hour surveillance. A port official did not know what type of short-term storage arrangements exist at the Sea-land Terminal; however, he believed there is provision for segregating hazardous cargoes. He also did not know if there are any restrictive ordinances pertaining to spent nuclear fuel or if the port has handled it (Hennessy, 1993). Available data indicates spent nuclear fuel shipments have not been handled at least since 1979 (NRC, 1993; SNL, 1994).

The Kill Van Kull waterway, serving Port Elizabeth/Newark terminals, is also the approach route to the refineries and petroleum storage depots located along the Arthur Kill to the south. There is a great diversity of traffic and cargoes in the harbor but, due to the layout of the terminals, this diversity and traffic are not considered a major concern.

The Coast Guard and fire departments from the cities of Elizabeth and Newark, respond to hazardous materials incidents within terminals located within their municipalities. The Union County hazardous materials team responds to accidents in Port Elizabeth, and the Newark hazardous materials team in Port Newark. Sea-Land and other terminal operators have contracts with private companies for oil and chemical spill cleanup and/or decontamination work. It is not known what type of hazardous materials training is provided by terminal operators and/or the Port Authority (Hennessy, 1993). Training normally is provided in such large port operations. This was not investigated further because the port was not included in the final list selected for detailed assessment due to the extremely large populations around the port.

The Port Elizabeth/Newark terminals are separated from the urban city centers bearing their names. However, both are adjacent to Newark Airport and areas of heavy industrialization and heavy traffic on the Turnpike. There are also areas of dense population on the east side of Newark Bay in the cities of Bayonne and Jersey City. The 1990 population within 16 km (10 mi) of the port terminals was 3,223,038. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 316,000; Oak Ridge Reservation, 290,000; Idaho National Engineering Laboratory, 536,000; Hanford Site, 585,000; and Nevada Test Site, 782,000. Populations along rail routes to these sites are much larger. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 1,320 km (828 mi); Oak Ridge Reservation, 1,190 km (738 mi); Idaho National Engineering Laboratory, 3,860 km (2,396 mi); Hanford Site, 4,520 km (2,812 mi); and Nevada Test Site, 4,300 km (2,672 mi). Distances along rail routes are slightly longer.

There are no known special environmental concerns in the greater New York/New Jersey port area. The likelihood of severe natural phenomena, such as high winds and earthquakes, are reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Elizabeth, the Uniform Building Code requires buildings to withstand wind speeds up to 140 km/hr (85 mph). The port is located in a low seismic zone with an acceleration of 0.075 g.

Climatic Conditions

New York Harbor is located on the Atlantic coastal plain at the mouth of the Hudson River. The terrain is flat and diversified by numerous waterways; all but one of the city's five boroughs are situated on islands. Elevations range from less than 15 m (50 ft) over most of Manhattan, Brooklyn, and Queens to almost 90 m (300 ft) in the northern part of Manhattan and the Bronx, and over 120 m (400 ft) in Richmond (Staten Island).

Despite its nearness to the ocean and the numerous bays and rivers nearby, the port has a climate which more closely resembles the continental type of climate than it does the maritime type. Its modified continental climate follows from the fact that weather conditions affecting the city usually approach from a westerly direction and not from the ocean on the east. Some important exceptions to this must be noted, since the oceanic influence is by no means entirely absent. During the summer, local "sea breezes," winds

blowing onshore from the cool water surface often moderate the afternoon heat; and most often in winter, coastal storms, accompanied by easterly winds, produce, on occasion, considerable amounts of precipitation.

From November through April the prevailing winds are from the northwest; for the remainder of the year the prevailing winds are southwesterly. Gales with velocities of 64 km/hr (40 mph) or more are predominantly from the northwest.

The mean annual temperature is slightly higher than that of most places in the United States of the same latitude, with the exception of localities near the Pacific coast. Precipitation is both moderate and distributed evenly throughout the year. Most of the rainfall from June through September comes from thunderstorms, therefore, is usually of brief duration, but relatively intense. From October to April, however, precipitation is generally associated with widespread storm areas, so that day-long rain or snow is common. Over the entire year, the city receives 59 percent of the sunshine hours possible at its latitude. This value compares favorably with that for any region east of the Mississippi, except the Southeast. Relative humidity averages about 66 percent for the year, showing that the city has a relatively damp climate.

Winds play an important role by affecting currents in the harbor. During the winter, west and northwest winds prevail, with northerlies and southwesterlies in secondary roles. The strongest winds are out of the west through northwest at 13 to 15 knots, from January through April. The sheltering effect of the land is apparent when looking at frequencies of winds of 28 knots or more. These winds blow at Ambrose Light about eight to nine percent of the time compared to one percent at Kennedy Airport and Floyd Bennet Field. Summer winds are often out of the south and southwest with a 10 to 12 knot afternoon peak. Fog in the harbor area is more closely related to land-type fogs. In winter, fog is common on clear, calm mornings and more frequent than at Ambrose Light. Southerlies can also bring winter fogs of the advection type. During the spring and early summer, the harbor and its approaches are susceptible to advection fog, riding in on east through south winds. A morning peak still exists in the harbor, while Ambrose Light exhibits an afternoon maximum (DOC, 1993b).

D.2.2.5 Fernandina Beach, FL

The Port of Fernandina is located about 9.3 km (5 mi) above the Entrance Seabuoy to the St. Marys River and Cumberland Sound. The entrance is bordered by two jetties on the approach to the cities of Fernandina Beach (located on Amelia Island) and St. Marys, GA, the Naval Submarine Base in Kings Bay, and an inland passage to St. Andrew sound via the Cumberland River (DOC, 1993d). The entrance is approximately 37 km (20 mi) north of the entrance to the Port of Jacksonville, which is located on the St. Johns River. A map of the port is shown in Figure D-36. Amelia Island is a small, historic, coastal resort town. Fort Clinch, a State Park, museum, and recreation area is located on the north end of Amelia Island at the inshore end of the south entrance jetty (DOC, 1993d).

The Port of Fernandina is a forest products and general cargo container port. It handles around 25,000 20-ft equivalent units of containerized freight and about 272,000 metric tons (299,000 tons) of forest products annually, but the container volume has varied considerably from year to year. Much of the port's trade is with South and Central America. There is also eastbound monthly service to the Mediterranean (Southern Shipper, 1993; American Shipper, 1994; Stubbs, 1994). Reportedly, the current controlling depth of the entrance, and that of approach channel to the submarine base, is 14.3 m (47 ft) and the controlling width is 122 m (400 ft). The same width channel with 10.3 m (34 ft) controlling depth is available to the Ocean Highway and Port Authority Terminal in Fernandina Beach. There is a 1.8 m (6 ft)

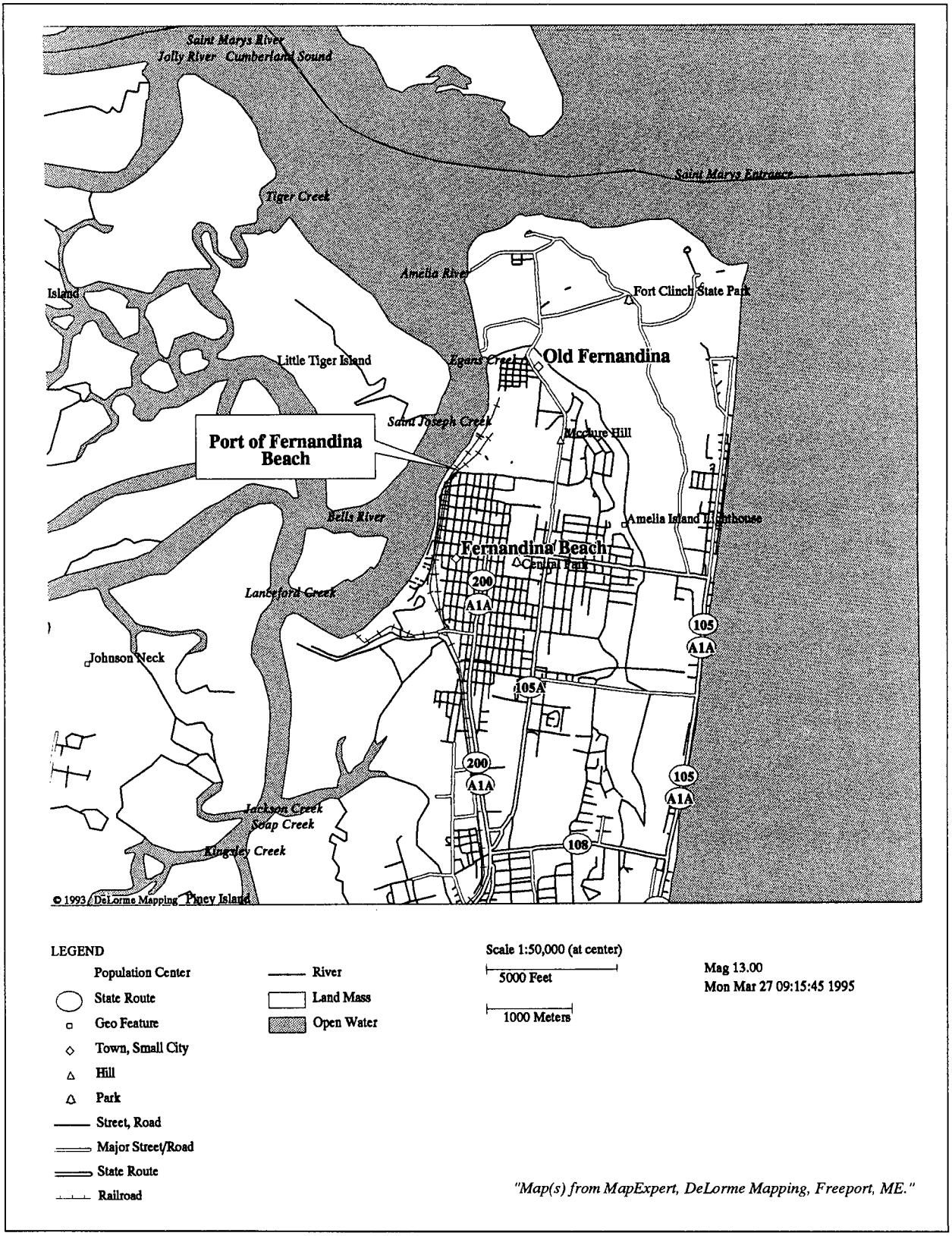


Figure D-36 Map of the Port of Fernandina Beach, FL

range of tide at Fernandina Beach. Tidal currents at the entrance have considerable velocity and are dangerous at times. A strong current "set" occurs at the St. Mary's entrance under certain weather conditions, it has been reported as high as 2.6 mi-per-sec (5 knots) (DOC, 1993d).

The Forest Products Terminal, located about 12 km (8 mi) above the channel entrance, is a publicly owned facility operated by Nassau Terminals, a private terminal operating and stevedoring company. Following a port expansion in 1992, the Terminal consists of 366 m (1,200 ft) of useable berthing situated on the left ascending bank of the Amelia River. The new capacity of the port is about 50,000 20-ft equivalent units per year. The Terminal is equipped with two 36 metric ton (40 ton) container cranes and other container handling equipment, a 4,645 m^2 (50,000 ft^2) container freight station, 2.0 ha (5 acres) of open storage area, and is served by the CSX Railroad with pierside rail trackage (DOC, 1993d; Southern Shipper, 1993). The port handles an average of two vessels a day, typically a cruise vessel and a cargo vessel. The only products normally handled by the port are forest products for a paper mill located in the area, and containers loaded with food and paper products. The passenger or cruise ship business is small, using smaller vessels for cruises in the near islands and offshore (Robas, 1994).

The port terminal is located in the downtown section of the town of Fernandina Beach. Truck access to the port is through the downtown area and mixed residential/business structures for a distance of about 8 km (5 mi). Total distance to Interstate 95 is about 24 km (15 mi), much of which is divided multi-lane highway of mostly rural character.

Other Pertinent Port Information: Terminal property is fenced and lighted and has 24-hour watchman service. Rail openings into the port are not secured. The port has little experience in handling hazardous materials, in that hazardous materials are not normally shipped in or out of the port (Robas, 1994).

The U.S. Army Corps of Engineers was to award a contract in October 1994 for deepening the harbor channel to 11 m (36 ft) and constructing a 366 m (1,200 ft) turning basin. The approach channel to the Terminal passes through a State aquatic preserve for the manatee and other marine animals. Nassau Terminals occasionally handles some containerized hazardous materials; however, a port official thought there would be considerable local opposition to handling spent nuclear fuel shipments for fear of the effect of adverse publicity on tourism in this popular resort area (Stubbs, 1994).

The likelihood of severe natural phenomena, such as high winds and earthquakes, is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Fernandina Beach, the Uniform Building Code requires buildings to withstand wind speeds up to 150 km/hr (95 mph). The port is located in a low seismic zone with an acceleration of 0.075 g or less.

The 1990 population within 16 km (10 mi) of the port terminals was 32,952. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 45,000; Oak Ridge Reservation, 185,000; Idaho National Engineering Laboratory, 590,000; Hanford Site, 650,000; and Nevada Test Site, 650,000. Populations along rail routes to these sites are slightly larger. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 610 km (380 mi); Oak Ridge Reservation, 920 km (570 mi); Idaho National Engineering Laboratory, 4,000 km (2,500 mi); Hanford Site, 4,700 km (2,900 mi); and Nevada Test Site, 4,200 km (2,600 mi). Distances along rail routes are slightly longer for Western sites, and about the same for Eastern sites.

Environmental Conditions

The State of Florida has classified the Amelia River near the St. Mary's Entrance as a Class III water body. This classification indicates that the waters are suitable for recreation, and propagation and maintenance of a healthy, well balanced population of fish and wildlife (FL DEP, 1994). In addition, the State of Florida has designated certain waters in the vicinity of Fernandina Beach as "Outstanding Florida Waterways", which are afforded special protection. Outstanding Florida Waters are generally waters located within national parks, state parks, national seashores, marine sanctuaries, or aquatic preserves. Waters located near the Port of Fernandina Beach designated as Outstanding Florida Waters include Fort Clinch State Park, Fort Clinch State Park Aquatic Preserve, Nassau Valley State Reserve, and the Nassau River-St. Johns River Marshes Aquatic Preserve (FL DEP, 1994).

The Amelia River, in the vicinity of the Port of Fernandina Beach, is characterized as a mid- salinity estuarine habitat (generally 5 to 16.5 parts per thousand). There are both commercial and recreational fish and invertebrates found in the vicinity of the port. These aquatic species include: blue crabs, shrimp, American eel, Atlantic menhaden, tarpon, sea catfish, sheepshead, spotted seatrout, weakfish, spot, Atlantic croaker, kingfish, drum, flounder, silver perch, bluefish, mullet, pinfish, pigfish, ladyfish, and snapper (FWS, 1980e).

The Fort Clinch State Park and Fort Clinch State Park Aquatic Preserve are located on Amelia Island adjacent to Fernandina Beach. Birds that can be found in Fort Clinch State Park include various types of shorebirds, wading birds, waterfowl, raptors, songbirds, and seabirds. Endangered or threatened bird species in Fort Clinch State Park include: brown and white pelican, great egret, snowy egret, tricolored heron, little blue heron, black-crowned night heron, yellow-crowned night heron, least bittern, wood stork, white ibis, bald eagle, northern harrier, osprey, American kestrel, merlin, peregrine falcon, clapper rail, piping plover, American oystercatcher, least tern, black skimmer, royal tern, caspian tern, sandwich tern, worm-eating warbler, yellow-throated warbler, prairie warbler, Louisiana waterthrush, and American redstart (Fort Clinch State Park, 1994). Species with special status found in the area include the loggerhead sea turtle, the manatee, the American alligator, the least tern, and the burrowing four-o'clock (Murray, 1994). The loggerhead sea turtle, a Federally protected species, uses much of Amelia Island and Cumberland Island as nesting areas. In addition, the U.S. Fish and Wildlife Service reports that the following protected marine species may occur in Nassau County: west indian manatee (endangered), Kemp's ridley sea turtle (endangered), leatherback sea turtle (endangered), loggerhead sea turtle (threatened), hawksbill sea turtle (endangered), and the green sea turtle (threatened). Protected bird species include the wood stork (endangered) and red-cockaded woodpecker (endangered) (Bentzien, 1994).

Climatic Conditions

As with the other more northern ports, the climate of this area is also modified by the influence of the Atlantic Ocean. Easterly winds occur roughly 40 percent of the time, producing a true maritime climate for the area. The greatest rainfall occurs during summer, usually associated with afternoon and evening thunderstorms. During summer, measurable precipitation can be recorded nearly every two days. The prevailing winds are northeasterly in the fall and winter months and become more southwesterly during spring and summer. Although this region is located along the eastern Florida coast, it has been very fortunate in escaping hurricane-force winds. The majority of systems in recent years that have reached this latitude have moved parallel to the coastline, keeping well offshore. Others have weakened significantly moving over land prior to reaching the area. The combination of these two factors has spared the area from any major devastation due to tropical systems in recent years (NOAA, 1992e).

D.2.2.6 Freeport, TX

Freeport harbor is located about 64 km (40 mi) southwest of the Galveston, Texas harbor entrance, and about 5 km (3 mi) from the Gulf of Mexico on the Brazos River (DOC, 1992a), with the Gulf Intracoastal Canal crossing the river, making deepwater activity available. The main channel is maintained at 13.6 m (45 ft) and leads to a 364 m (1,200 ft) turning basin (D&B, 1993). Freeport is principally involved in petroleum and petrochemical transport (AAPA, 1994). However, in 1992, 188,400 metric tons (207,711 tons) of containerized cargo (approximately 20,000 20-ft equivalent units) were handled in the port. Primary inbound cargoes were bananas and fruit, and primary outbound cargoes were rice and chemicals (AAPA, 1994).

The harbor is regulated by the Navigation and Canal Commissioners of the Brazos River Harbor Navigation District, and is known locally as Brazosport (DOC, 1992a). The ship channel has been improved by construction of jetties on either side of the entrance. A map of the port is shown in Figure D-37.

Berth assignments at the Port of Freeport are made by the Terminal Superintendent. The port has five general breakbulk berths, 664 m (2,190 ft) in length with 10.9 m (36 ft) depth alongside. There is 19 ha (47 acres) of open storage adjacent to the wharves (D&B, 1993). The port has rail facilities with dual tracks on Berths 1, 1A (Brazos Harbor Public Facility Wharf), and 2 (Brazos River Harbor Wharf No. 2). Both facilities have substantial covered storage available for short-term storage. General cargo is usually handled by the ship's tackle, and no container cranes are available at the port [a floating 450 metric ton (500-ton) derrick is available for heavy lifts by special arrangement] (DOC, 1992a; AAPA, 1994).

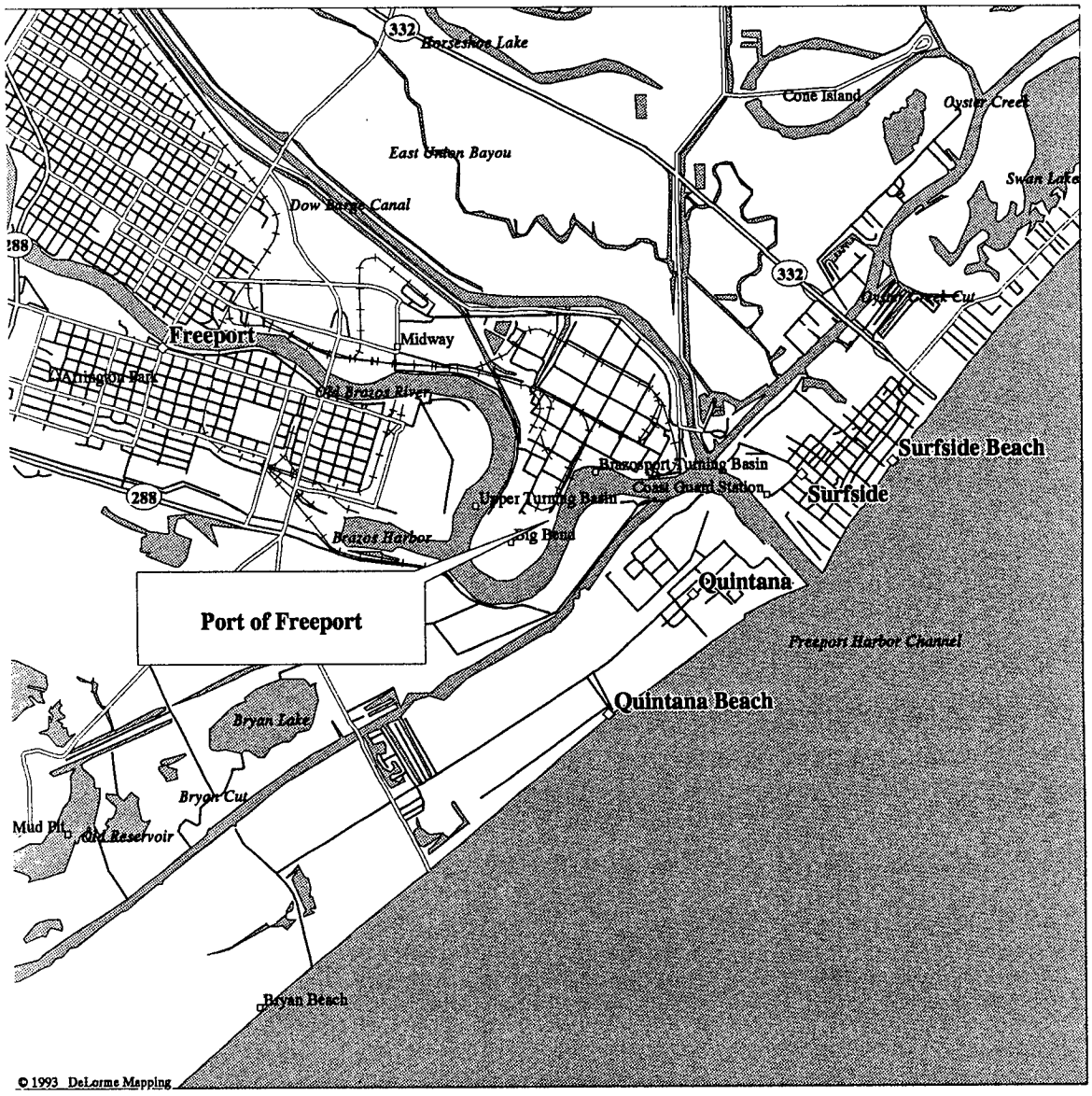
Highway connection from the port is via State Highways 227 and 288, for approximately 56 km (35 mi) to Houston, where Interstate-10 is accessed.

Other Pertinent Information: There are no known restrictions on receipt of foreign research reactor spent nuclear fuel at the port, but there are substantial conflicting activities at the port, including petrochemicals and hazardous chemicals (AAPA, 1994). The likelihood of severe natural phenomena, such as high winds and earthquakes, is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Freeport, the Uniform Building Code requires buildings to withstand wind speeds up to 110 km/hr (100 mph). The port is located in a very low seismic zone with an acceleration of less than 0.075 g.

The 1990 census population of Freeport was 12,600. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 360,000; Oak Ridge Reservation, 300,000; Idaho National Engineering Laboratory, 480,000; Hanford Site, 530,000; and Nevada Test Site, 530,000. Populations along rail routes to these sites are slightly higher for Savannah River Site and Oak Ridge Reservation, but slightly lower for Idaho National Engineering Laboratory, Hanford Site, and Nevada Test Site. The approximate distances to the five potential sites on interstate routes are: Savannah River Site, 1,600 km (1,000 mi); Oak Ridge Reservation, 1,600 km (1,000 mi); Idaho National Engineering Laboratory, 3,100 km (1,900 mi); Hanford Site, 3,700 km (2,300 mi); and Nevada Test Site, 3,100 km (1,900 mi). Distances along rail routes are about the same.

Climatic Conditions

Weather in this area is only an occasional navigational problem. Winds blow at 28 knots (32 mph) or more approximately 3 to 4 percent of the time in November and from January through April. Average speeds are 12 to 14 knots (14 to 16 mph) during this period. Fog is also a winter problem, and visibilities drop below 160 m (0.25 mi) on approximately three to six days each month from November through April.



LEGEND

- Population Center
- State Route
- Geo Feature
- Town, Small City
- Hwy Ramps
- Street, Road
- Major Street/Road
- State Route
- Railroad
- River
- Land Mass
- Open Water

Scale 1:50,000 (at center)

5000 Feet

1000 Meters

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"Map(s) from MapExpert, DeLorme Mapping, Freeport, ME."

Figure D-37 Map of the Port of Freeport, TX

Thunderstorms are most frequent from April through September, during the afternoon and evening. These thunderstorms are usually air mass types as opposed to the less frequent but more severe thunderstorms that occur with fronts and squall lines from fall through spring. Tropical cyclones, particularly severe hurricanes, are most likely in August and September (DOC, 1992a).

D.2.2.7 Gulfport, MS

Gulfport, the seat of Harrison County, MS, is a seaport and tourist center located on the north side of Mississippi Sound, approximately 26 km (16 mi) from the entrance to the Ship Island Bar Channel on the Gulf of Mexico. Gulfport is located approximately 97 km (60 mi) east of New Orleans, LA. The approach to Gulfport is through a dredged channel marked by lighted buoys. Federal project depths are 9.7 m (32 ft) for the bar channel and 9.1 m (30 ft) for the Gulfport Channel and Harbor Basin. The harbor was deepened to 10.97 m (36 ft) mean low water in 1993 (DOC, 1992a; AAPA, 1993; Southern Shipper, 1993). A map of the port is shown in Figure D-38.

The State-owned Port of Gulfport is a small, but growing, niche port on the Gulf Coast primarily handling containerized banana imports and dry bulk commodities. The port has a growing general cargo outbound container tonnage as the fruit carriers fill otherwise empty containers on the return leg of voyages. Container traffic for fiscal year 1991 included 68,000 20-ft equivalent units amounting to approximately 664,973 mt (733,000 ton) of cargo (AAPA, 1993). By 1993, container volume increased to 736,100 mt (811,559 tons), or approximately 75,000 20-ft equivalent units (AAPA, 1994).

Gulfport has 10 berths with a total of 1,768 m (5,800 ft) of lineal berthing space. There is an open storage area of four ha (10 acres) and a shed area of 19,000 m^2 (204,500 ft^2). A second container berth (East Pier) is used for self-contained container ships. The port's West Pier container berth is approximately 750 m (2,460 ft) long, whereas the East Pier is approximately 200 m (656 ft) long. Gulfport has two 30.5 metric ton (34 ton) container cranes at its West Pier (AAPA, 1994).

The port is located immediately adjacent to the City of Gulfport, which forms the northern boundary of the terminal area. The Terminal has almost immediate access to U.S. Highway 90, and is about 5 mi from I-10, a major east-west roadway. U.S. Highway 49, which begins at the terminal gate and connects with I-10, runs through the center of the City. The port is served by the CSX and Mid-South Railroads with connections to the Norfolk Southern at Hattiesburg. Double trackage extends to the container berth.

Gulfport is presently served by one common carrier combination container/breakbulk ship operator, ABC Line, which operates five large ships on North European around-the-world trade routes. Three other containerized fruit carriers also regularly call at Gulfport (AAPA, 1994; Southern Shippers, 1993).

Other Pertinent Information: Gulfport employs a port security firm that maintains 24-hour guard service. The port is fenced with controlled access to vehicles and personnel. It does not appear that there are any regulations preventing the importation of spent nuclear fuel, although the port indicates that the Coast Guard may impose bans on especially hazardous shipments (Edwards and Burns, 1993). Gulfport has no prior experience handling spent nuclear fuel (NRC, 1993; SNL, 1994) and, as far as is known, there are no hazardous cargoes routinely handled at Gulfport. Port personnel provide First Response augmented by the Gulfport Fire and Police Departments. The Port of Gulfport conducts hazardous materials training of port personnel (Edwards and Burns, 1993). There is a former small cruise ship terminal at the East Pier as well as a floating casino located near the street entrance to the port. The United States Coast Guard indicated that the East Dock is presently slated for casino development, and there are two casinos on the north end of

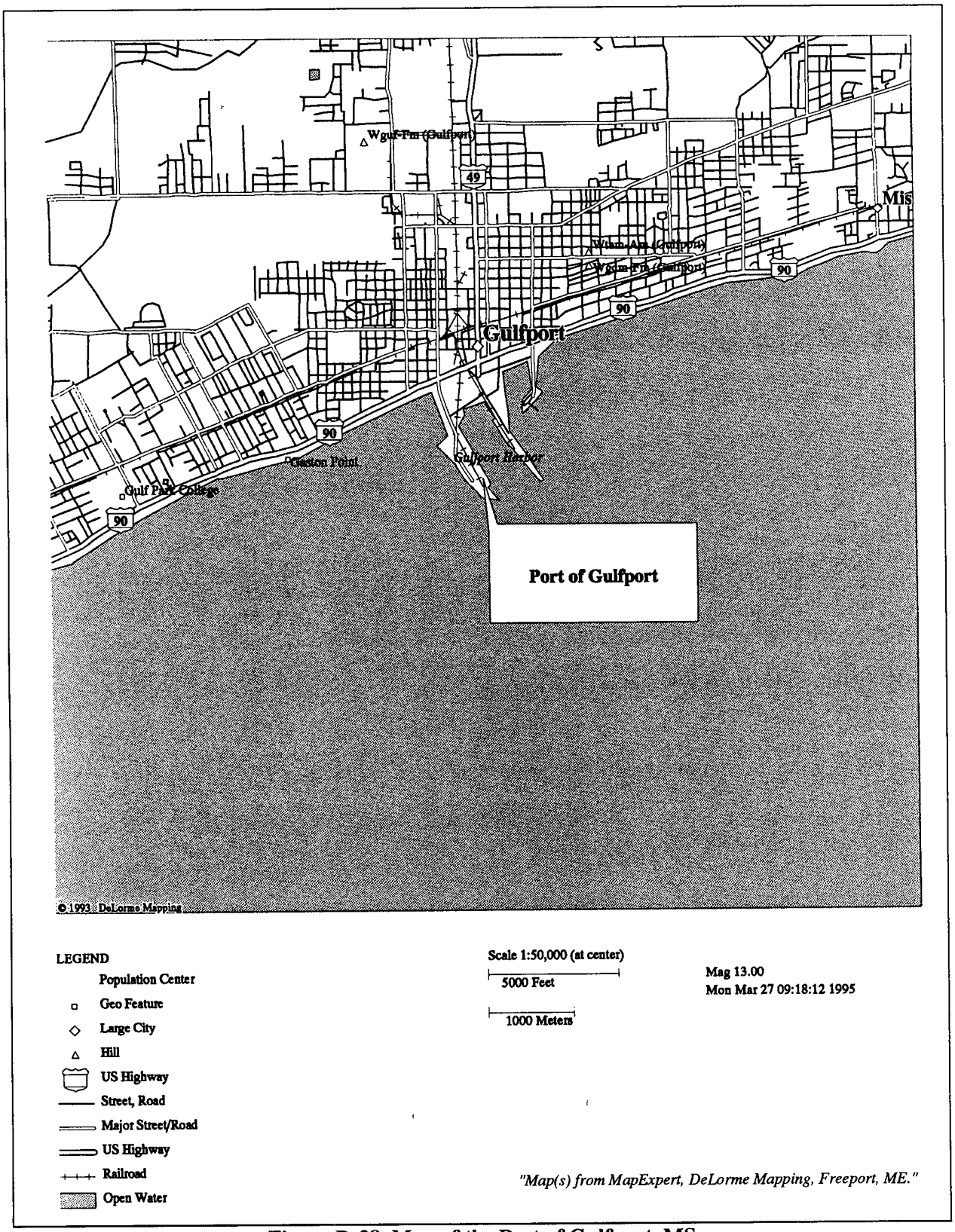


Figure D-38 Map of the Port of Gulfport, MS

the West Dock. As a result, the hazardous materials area at the north end of the West Dock has been eliminated for explosives. Also, the facility of particular hazard cannot be used for foreign research reactor spent nuclear fuel, and is not secure or well lit. (Brown, 1995)

There are no known sanctuaries or wildlife habitats in the immediate port area. However, to enter Gulfport, ships must pass close to the protected Gulf Islands National Seashore. The port is subject to severe hurricane and tropical storms. The likelihood of severe natural phenomena, such as high winds and earthquakes, are reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Gulfport, the Uniform Building Code requires buildings to withstand wind speeds up to 160 km/hr (100 mph). The port is located in a very low seismic zone with an acceleration of 0.075 g or less.

The 1990 population within 16 km (10 mi) of the port terminals was 113,153. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 194,000; Oak Ridge Reservation, 146,000; Idaho National Engineering Laboratory, 435,000; Hanford Site, 484,000; and Nevada Test Site, 683,000. Populations along rail routes to these sites are slightly larger. These populations are shown in Tables D-7 through D-16 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 910 km (565 mi); Oak Ridge Reservation, 920 km (573 mi); Idaho National Engineering Laboratory, 3,570 km (2,219 mi); Hanford Site, 4,240 km (2,635 mi); and Nevada Test Site, 3,530 km (2,195 mi). Distances along rail routes are slightly longer.

Environmental Conditions

The Mississippi Sound is separated from the Gulf of Mexico by a series of uninhabited barrier islands. Vessels approaching the port from the Gulf enter the Ship Island Channel, which runs between the west end of Ship Island and Ceat Island and the east end of Cat Island. Ship Island, along with Horn Island and Petit Bois Island, which are further to the east, comprise the Gulf Islands National Seashore. These islands serve as a wintering and migratory area for the protected Peregrine Falcon as well as various shorebirds. Ships entering the Ship Island Channel from the Gulf pass directly north of the northern end of the Chandeleur Islands that comprise the Breton National Wildlife Refuge and Breton Wilderness. The Breton National Wildlife Refuge and Breton Wilderness, which includes areas of black mangroves, serves as a breeding area for the protected loggerhead sea turtle and brown pelican, and a migratory area for the protected peregrine falcon. This area is also home to a variety of shorebirds, wading birds, waterfowl, raptors, seabirds, and songbirds (FWS, 1982a).

The U.S. Fish and Wildlife Service reported that several Federally-listed protected species may occur in the Port of Gulfport area. These species include the endangered brown pelican and Kemp's ridley sea turtle and the threatened gulf sturgeon and loggerhead sea turtle (Goldman, 1994). According to the Mississippi Natural Heritage Program, four protected species of bird have been spotted feeding or loafing in the area of the Port of Gulfport. These species include the royal tern, black rail, reddish egret, and the piping plover (Gordon, 1994). Commercial harvesting areas for the eastern oyster are located throughout the Mississippi Sound, including several areas within a few miles of the port. Breeding areas for the State-protected Least tern also are located along the coast of Gulfport (FWS, 1982a).

The waters in the vicinity of the port have been classified by the State of Mississippi for "recreation" but not as a water supply (Reaves, 1994). The nearshore waters of the Mississippi Sound are characteristic of a middle salinity estuarine habitat (generally 5 to 20 parts per thousand). Aquatic organisms that are

typically found in the waters of this area include: shrimp, blue crab, seatrout, croaker, drum, spot, kingfish, flounder, catfish, mullet, Florida pompano, bluefish, Gulf menhaden, bay anchovy, Crevalle jack, blue runner, Alabama shad, and Atlantic bottlenose dolphin (FWS, 1982a).

Climatic Conditions

Because of Gulfport's geographic location, the local weather is greatly influenced by the Gulf of Mexico. Generally, summers are warm but temperatures are more moderate than those observed at inland locations because of the diurnal sea breeze circulation. Winter weather is generally mild, with the exception of the occasional cold air outbreak. These events occur at 3-10 day intervals between October and April in the Gulf of Mexico region, generally lasting less than three days. The annual rainfall in this region is among the highest in the continental United States. The precipitation is fairly evenly distributed throughout the year with a maximum coinciding with the summer thunderstorm season and minimum occurring during the late Fall months. However, extended rainy periods are rare in this region. Thunderstorm frequencies are highest in July and August, where they may occur every other day, but rarely do they reach intense or violent levels. However, the area is quite vulnerable to tropical systems (e.g., Hurricane Camille, 1969), which originate in the West Indies, West Caribbean, and the Gulf of Mexico (NOAA, 1992i; Wayland and Raman, 1989).

D.2.2.8 Houston, TX

Houston is the largest city in the State of Texas, and the Port of Houston is one of the largest ports in the United States (in terms of total tonnage handled). Morgans Point, approximately 37 km (23 mi) from the entrance to Galveston Bay, marks the beginning of an extensive industrial area lining the Houston Ship Channel. Houston is at the head of the channel, 71 km (44 mi) from the Gulf of Mexico. The transit of large ships is restricted to the ship channel across Galveston Bay and through parts of the San Jacinto and Buffalo Bayou. A Federal project provides for a 12.2 m (40 ft) channel from the entrance to the Gulf of Mexico to Houston (Brady Island) DOC, 1992a). The Houston Ship Channel is 12.2 m (40 ft) deep, and its width ranges from about 76 m to 120 m (250 to 400 ft), making the transit difficult for the large number of ship transits each year (D&B, 1993). A map of the port is shown in Figure D-39.

The Port of Houston is a 40.2 km-(25 mi)-long complex of diversified public and private facilities located on both banks of the Houston Ship Canal, which empties into and transits Galveston Bay. Bulk cargoes, dry and liquid, (including petroleum and petrochemicals) comprise the major share of tonnage handled by the port. Estimated tonnage for 1992 amounted to a total of 114.3 million metric tons (126 million short tons), of which bulk accounted for 72 percent, breakbulk 6.6 percent, and container 3.4 percent.

The Houston Port Authority owns and operates six public cargo facilities including: the Turning Basin Terminal (general cargo) located at the head of the Houston Ship Channel; Jacintoport Terminal (general cargo) located on the north side of the channel near Channelview, Texas; and Barbours Cut Container Terminal located at the head of Galveston Bay on the left ascending bank of the Houston Ship Channel (Jane's, 1992; AAPA, 1993; POHA, 1993).

Barbours Cut Container Terminal: About 40 km (25 mi) from the entrance to the ship channel, this terminal is designed to handle containers, roll-on/roll-off ships. The Barbours Cut Container Terminal is equipped with eight container cranes and five container berths [each is 305 m (1,000 ft) long], plus a separate roll-on/roll-off terminal. The terminal occupies 87 ha (215 acres) of developed land, including 17.8 ha (44 acres) of paved marshalling area for roll-on/roll-off cargoes. Barbours Cut Container Terminal

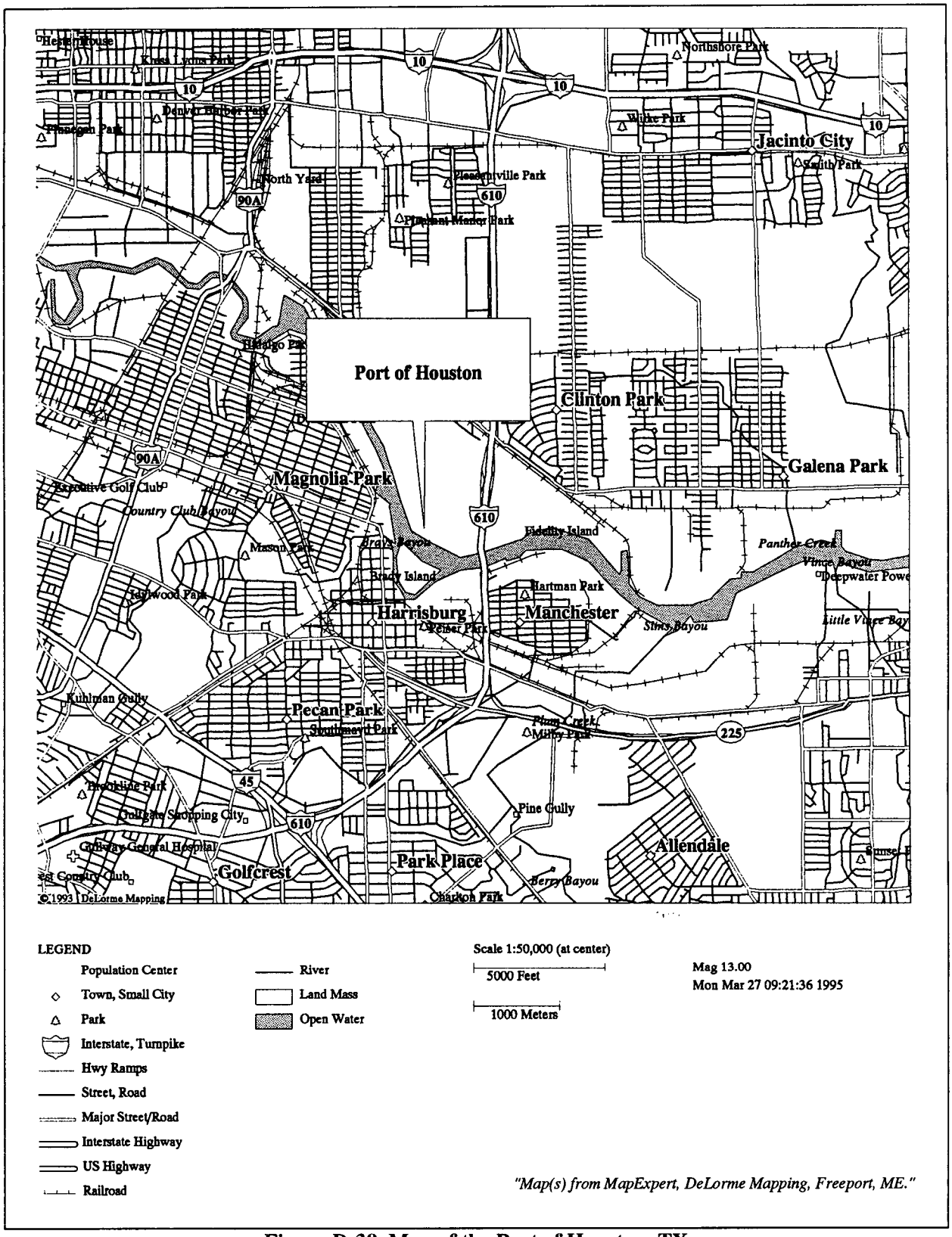


Figure D-39 Map of the Port of Houston, TX

has depths of 12.2 m (40 ft) at mean low water. Crane capacity for Barbours Cut Container Terminal is six 40.6 metric ton (45 ton) container cranes and two 30.5 metric ton (34 ton) container cranes (Jane's, 1992; AAPA, 1993).

Turning Basin Terminal: This terminal has several berths, the largest of which is 243.8 m (800 ft) long and can handle a 228.6 m (750 ft) ship. Turning Basin Terminal's depths are 10.97 m (36 ft) at mean low water. Crane capacity for this terminal is one 40.6 metric ton (45 ton) container crane and one 76.2 metric ton stiff-leg crane.

Barbours Cut Container Terminal has three entry points (gates) with a total of 21 truck lanes that are reached via Barbours Cut Boulevard, a multi-lane limited access roadway. Access to I-610, the Houston Beltway, and other interstate highways is via State Highway 146, which connects with State Highway 225 about 4.8 km (3 mi) from the Terminal. The Route 225 connector is an east-west highway about 22.5 km (14 mi) long. It appears that these routes run through commercial/residential areas with the opportunity for congestion. Barbours Cut Container Terminal is served by the Port Terminal Railroad Association and the Santa Fe Railroad. The Railroad Association connects with all other railroads including the Southern Pacific, Union Pacific, Burlington Northern, and the Houston Belt and Terminal Railroad. Trailer-on-Flat-Car shipments are possible within the terminal, but trackage does not extend to the container berths (Jane's, 1992; AAPA, 1993).

Barbours Cut Container Terminal is host to a large number of major international container and roll-on/roll-off ship lines. A partial listing includes: ABC Container Line, A. Bottacchi, ACL/Gulf Container Line, Afram Lines Ltd, America/Africa/ Europe Line, Atlantic Cargo Services, Baltic Shipping Co., Bank Line, Barber Blue Sea, CGM, CNAN, Columbus Line, COSCO, Costa Container Service, DB Turkish Cargo Line, Djakarta Lloyd, East Asiatic Ltd, Ellerman Line, Farrell Lines, Gulf Mideast Lines, Hapag-Lloyd, Hoegh Lines, Hyundai Merchant Marine, Italian Line, Ivaran Lines, Jugolinija, Kingwood Container Line, Maersk Line, Mediterranean Shipping Company, Nedlloyd Lines, SafBank Line, Sea-Land, Shipping Corp of India, Delmas-Vieljeux, Spanish Line, Torm Lines, Trans Freight Lines, United Arab Shipping Co., Waterman-Isthmian Line, and Zim Line (Jane's, 1992, AAPA, 1993).

Other Pertinent Information: The Houston Port Authority has its own 24-hour security force and all of its terminals are fenced with controlled access. A fireboat is stationed at Barbours Cut Container Terminal, which also has a full-service fire department. There is space within Barbours Cut Container Terminal for temporary segregation of hazardous cargoes (Horan, 1993).

A Port Authority Official was unaware of any regulations prohibiting the importation of spent nuclear fuel. The Houston Port Authority handles a lot of hazardous cargoes including radioactive substances, but the official did not know if the port has ever handled spent nuclear fuel (Horan, 1993). Available data indicates the port has not handled spent nuclear fuel at least since 1979 (NRC, 1993; SNL, 1994). The Houston Ship Channel and Galveston Bay are host to many petroleum and petrochemical berths and terminals served by a large amount of tanker and tank barge traffic. Many of these facilities are located upstream of Barbours Cut Container Terminal, which does not appear to have any conflicting use within its boundaries. The Houston Port Authority has its own emergency response team and fire department. The Houston Fire Department's hazardous materials team is used as a backup in emergencies. The Houston Port Authority has a hazardous materials training program for its terminal operating personnel. It is not known if longshoremen also receive this training (Horan, 1993).

There have been a number of ship accidents, tanker fires, and pipeline accidents at facilities near the Port of Houston in recent years. The United States Coast Guard data indicates that for the period 1991 to 1993, there were about 7,100 ship transits of the channel that resulted in 32 collisions, 33 allisions, 5 ship fires,

and 59 hard groundings (USCG, 1994b). Because the accident statistics also reflect barge traffic risks, the accident rate for oceangoing vessels is probably lower, but there is not data to refine that estimate available yet.

The Turning Basin Terminal is located at the terminus of the Ship Channel in a densely populated area above all other public and private terminal facilities within the port. Barbours Cut Container Terminal is remotely located from the City of Houston with relatively good separation from other terminals and traffic in the area (see II.E above). However, the two small communities of Morgan Point and La Porte (with a population of about 20,000) are located adjacent to the Terminal on the south.

There are no special plant, fish, or wildlife sanctuaries in the vicinity of Barbours Cut Container Terminal. The port is subject to hurricanes and tropical storms. The likelihood of severe natural phenomena, such as high winds and earthquakes, is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Houston, the Uniform Building Code requires buildings to withstand wind speeds up to 150 km/hr (95 mph). The port is located in a very low seismic zone with an acceleration of less than 0.075 g.

The 1990 census city population was 1,630,553, with the density estimated at 1,083 persons/km^2. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 349,000; Oak Ridge Reservation, 283,000; Idaho National Engineering Laboratory, 471,000; Hanford Site, 579,000; and Nevada Test Site, 524,000. Populations along rail routes to these sites are slightly smaller for Idaho National Engineering Laboratory, Hanford Site and Nevada Test Site, but slightly larger for Savannah River Site and Oak Ridge Reservation. The distances to the five potential sites on interstate routes are: Savannah River Site, 1,550 km (964 mi); Oak Ridge Reservation, 1,480 km (918 mi); Idaho National Engineering Laboratory, 3,000 km (1,866 mi); Hanford Site, 3,610 km (2,282 mi); and Nevada Test Site, 2,930 km (1,818 mi). Distances along rail routes are about the same except for Savannah River Site, which is slightly longer.

Climatic Conditions

The climate of Houston is predominantly marine. The terrain includes numerous small streams and bayous, which together with the nearness to Galveston Bay, favor the development of both ground and advective fogs. Prevailing winds are from the southeast and south, except in January, when frequent passages of high-pressure areas brings invasions of polar air on prevailing north winds.

Temperatures are moderated by the influence of winds from the Gulf, which results in mild winters and, on the whole, relatively cool summer nights. Another effect of the nearness of the Gulf is abundant rainfall, except for rare extended dry periods. Polar air penetrates the area frequently enough to provide stimulating variability in the weather.

The average number of days with minimum temperatures of 32°F or lower is only about 7 per year at the city's National Weather Service office and about 15 per year at William P. Hobby Airport, which is about 16 km (10 mi) southeast of the city. Most freezing temperatures last only a few hours because they are usually accompanied by clear skies.

Monthly rainfall is evenly distributed throughout the year. In past years, about 75 percent of the total precipitation has been between 76.2 and 152.4 cm (30-60 in). Since thundershowers are the main source of rainfall, precipitation may vary substantially in different sections of the city on a day-to-day basis.

Records of sky cover for daylight hours indicate about one-fourth of the days per year as clear with maximum of clear days in October. Cloudy days are relatively frequent from November to May, and partly cloudy days are more frequent from June through September.

Snow rarely occurs; however, on February 14-15, 1895, 51 cm (20 in) of unmelted snow was measured. Heavy fog occurs on an average of 16 days a year, and light fog occurs about 62 days a year in the city, but the frequency of heavy fog is considerably higher at William P. Hobby Airport. Destructive windstorms are fairly infrequent, but both thundersqualls and tropical storms occasionally pass through the area (DOC, 1992d).

D.2.2.9 Lake Charles, LA

The city of Lake Charles, the seat of Calcasieu Parish, is located on the east side of the Lake. It is the center of large industries such as chemical, petroleum, natural gas, fish oil, synthetic rubber, salt, seafood, and rice. The Port of Lake Charles is situated 3 km (2 mi) south of the city on the east bank of the Calcasieu Lake, and is 52 km (32 mi) from the Gulf of Mexico (DOC, 1992a). A map of the port is shown in Figure D-40.

A Federal project provides for a channel 12.8 m (42 ft) deep across the outer bar, from 12.2 to 12.8 m (40 to 42 ft) through the jetties, and 12.2 m (40 ft) to the Port of Lake Charles.

The United States Coast Pilot (DOC, 1992a) reports: "In recent years a substantial number of oceangoing vessels of increased size and draft have been entering the Calcasieu River Channel and proceeding to and from berths as far up the channel as the Port of Lake Charles. The channel, however, has not been appreciably widened in recent years. Based upon reported marine casualties to vessels and upon reported navigational problems arising from the increased oceangoing traffic, and after consultation with local marine interests, the Coast Guard Captain of the Port (COTP) has developed certain guidelines to enhance safe navigation."

The longest berth in the terminal is 274 m (900 ft). Lake Charles has no international container carriers serving the port and serves primarily as a breakbulk, dry bulk, and project cargo niche port (AAPA, 1993 and 1994; Southern Shipper, 1993). It can handle limited container traffic on breakbulk vessels (about 30,000 20-ft equivalent units in 1992) (Southern Shipper, 1993). Most of the area around Calcasieu Lake is wetlands, and ships entering the port pass by the Sabine National Wildlife Refuge.

Like all Gulf Coast ports, it is subject to severe hurricanes and tropical storms. The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Lake Charles, the Uniform Building Code requires buildings to withstand wind speeds up to 160 km/hr (100 mph). The port is located in a very low seismic zone with an acceleration of less than 0.075 g.

Lake Charles, LA's climatic and environmental conditions are similar to those of the Port of New Orleans, LA. Port of New Orleans information is presented in Section D.2.2.14.

The 1990 census population estimate for this port vicinity was approximately 73,800 with a population density on the order of 940 persons/km^2 (2,434 persons/mi^2). The approximate distances to the five potential sites on interstate routes are: Savannah River Site, 1,100 km (700 mi); Oak Ridge Reservation, 960 km (600 mi); Idaho National Engineering Laboratory, 3,400 km (2,100 mi); Hanford Site, 4,000 km (2,500 mi); and Nevada Test Site, 3,200 km (2,000 mi). Distances along rail routes are about the same.

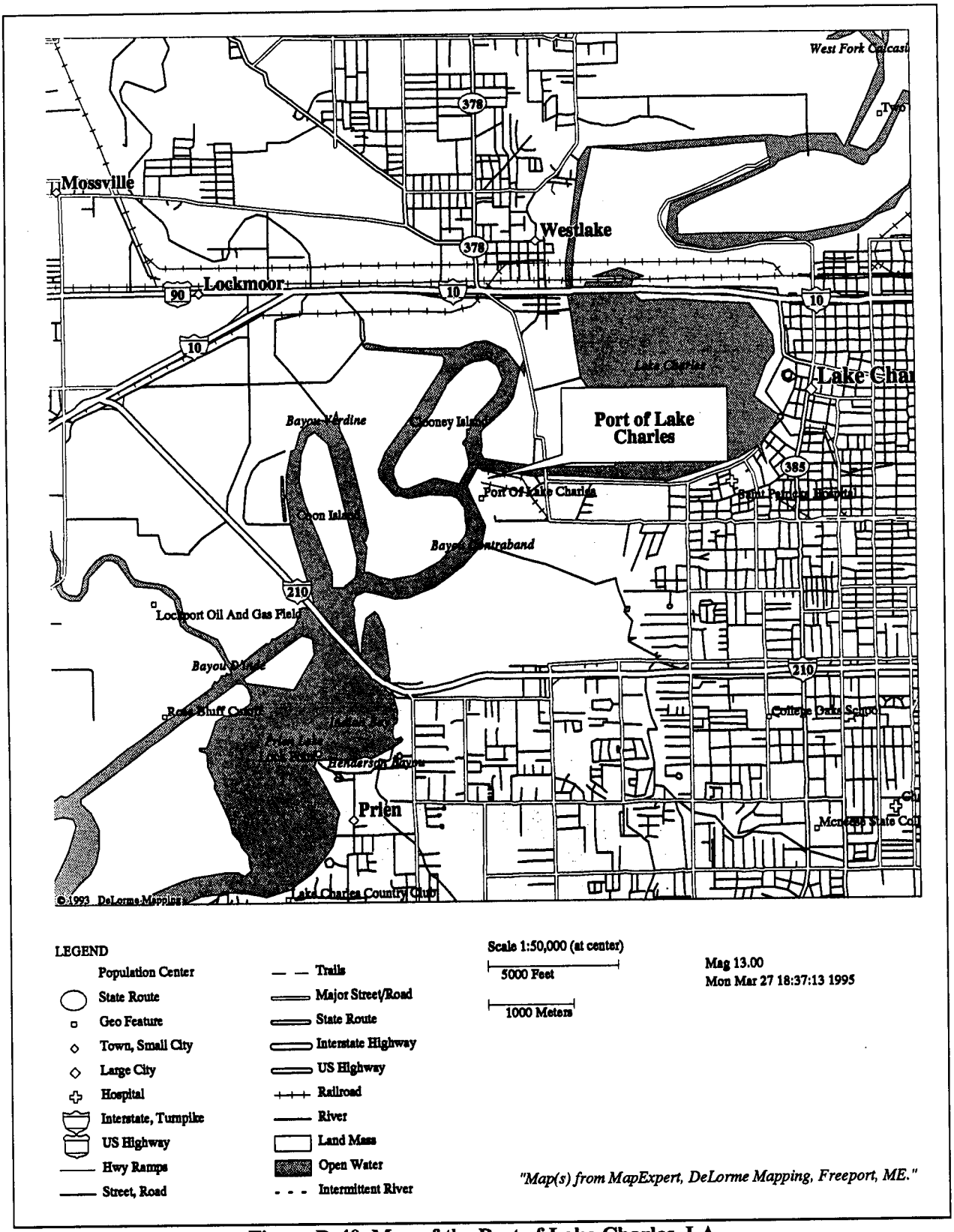


Figure D-40 Map of the Port of Lake Charles, LA

D.2.2.10 Long Beach, CA

Long Beach and Los Angeles Harbors, although divided by a political boundary, form a single geographic and economic port entity. The harbors occupy a major part of San Pedro Bay. The Port of Long Beach, one of the largest ports on the Pacific Coast, has extensive foreign and domestic traffic with modern facilities for the largest vessels. Most of the channels in Long Beach Harbor are maintained at more than the project depth of 10.7 m (35 ft). The entrance to Middle Harbor is 3.5 km (2.2 mi) from the Queens Gate entrance at the Pacific Ocean. The channel from the Pacific Ocean is straight, short, and direct (DOC, 1992b). A map of the port is shown in Figure D-41.

The Long Beach Harbor Department is a semi-autonomous agency of the City of Long Beach, CA. The Department is responsible for the operation, control, and development of the municipally owned port facilities. Long Beach is a large port (a load center) with 1,040 ha (2,816 acres) of land area, 12 piers, and 77 operational berths serving about 5,700 vessels annually. The port handles about 75 million metric tons (83 million tons) of revenue cargo annually, of which approximately 35 million metric tons (39 million tons) is containerized general cargo equivalent to 1.8 million 20-ft equivalent units (POLB, 1993a-d; AAPA, 1993).

Long Beach is a multi-terminal port and is host to seven container terminals with 38 container cranes and 243 ha (600 acres) devoted to container handling facilities. Additionally, there are facilities for petroleum and petroleum-related products, dry bulk materials, automobiles, steel, citrus, palletized general cargoes, and other commodities. The port functions as a "landlord" port leasing out its facilities to terminal and ship operating companies. Two of the container terminals (California United Terminals - Pier E, and Pacific Container Terminal - Pier J) are operated as "public" facilities. California United Terminals also has two roll-on/roll-off ramps and rail spurs (POLB, 1993a-d; AAPA, 1993; Janes's, 1992).

The dock/quay length available for cargo ships is as follows: California United, Pier E, Berths E24-E26 — 594 m (1,950 ft) long, and Pacific, Pier J, Berths J245-J247 — 1,006 m (3,300 ft) long. The corresponding depths alongside at mean low water are: California United with 14-15.2 m (46 to 50 ft), and Pacific Container with 14.9 m (49 ft). The five cranes at California United are all 40 metric ton (44 ton) container cranes. Pacific Container has six, 40 metric ton container cranes (Jane's 1992; AAPA, 1993; POLB, 1993a-d).

California United Terminals is served by an 11 lane main gate, which appears to be about 0.8 km (0.5 mi) from the "on" ramp to I-710 (the Long Beach Freeway), all within the confines of the port area. Pacific Container Terminal has similar ease of access to I-710, estimated to be a distance of about 1.9 km (1.2 mi), also within the port terminal. California United Terminals has shipside rail service provided by the Harbor Belt Line Railroad. Plans are to extend Belt Line rail service to Pacific Container Terminal by April 1994. The line connects with the major rail systems serving the Greater Los Angeles/Long Beach areas such as the Union Pacific, Santa Fe, and Southern Pacific Railroads. The latter operates a 97 ha (240 acre) intermodal container transfer facility which was built by the POLB to serve the marine terminals of both Long Beach and Los Angeles. The terminals are about 6.4 km (4.0 mi) from the double stack intermodal container transfer facility yard. The Santa Fe and Union Pacific railroads offer similar intermodal transfer facilities at their respective yards in east Los Angeles (D&B, 1993; Jane's, 1992; AAPA, 1993).

The port is served by a number of the world's largest container ship lines including: ACL, BHP/MTL, CCNI, COSCO, CGM, Cho Yang, Cool Carriers, DSR-Senator Line, EAC, Hanjin, Hapag-Lloyd, Hyundai, K-Line, Maersk Line, Nedlloyd Lines, OOCL, Philippine National Line, P & O, Sea-Land and TMM (Jane's, 1992; D&B, 1993; AAPA, 1993).

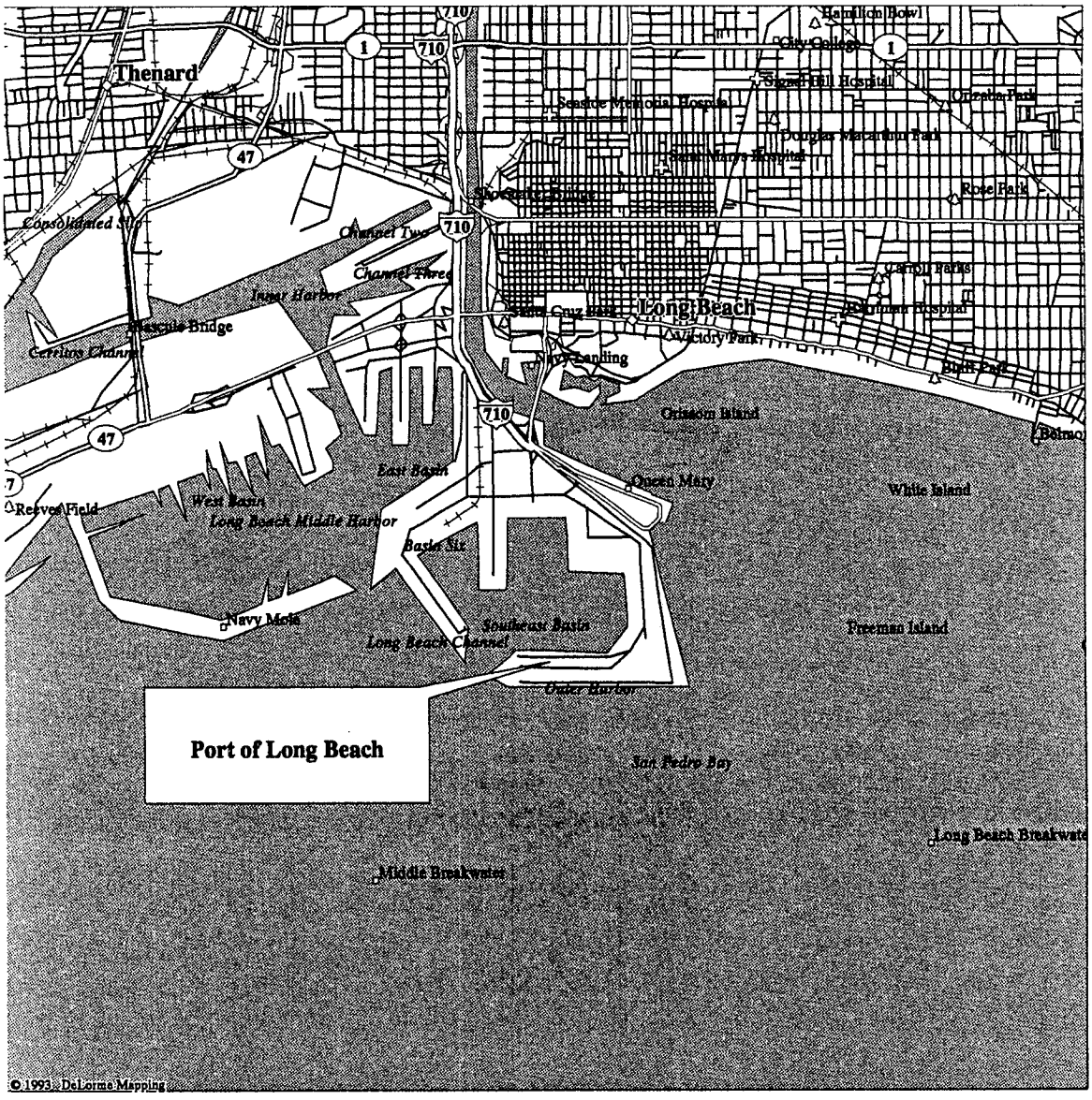


Figure D-41 Map of the Port of Long Beach, CA

Other Pertinent Information: Terminal operators are responsible for the security of their respective facilities. Container terminals are fenced with controlled access and the security forces are port employees (Powell et al., 1994). The port contracts with the City of Long Beach for police and fire protection services. The City of Long Beach stations two fireboats within the port area. There are locations within the terminals for temporary storage of hazardous materials (Hilliard, 1993) but no special areas set aside (Powell et al., 1994).

There are no known environmentally sensitive areas within the harbor area. However, the port claims a long-term interest in maintaining a high quality environment and supports a number of programs to prevent contamination of air and harbor water quality. It was the first recipient of the American Association of Port Authorities Environmental Improvement and Protection Award, and enforces strict safety policies as well. "In the past 50 years, there have been no collisions between commercial vessels resulting in injuries . . . and no significant oil spills from oil transfers." (POLB, 1993b).

The port Marketing Manager did not know of any regulation prohibiting the handling of spent nuclear fuel (Hilliard, 1993). According to available data, the port has not handled spent nuclear fuel since at least 1979 (NRC, 1993; SNL, 1994). The Port of Long Beach does handle other hazardous cargoes and has a number of deep-draft petroleum and petrochemical terminals with attendant tanker traffic, including very large crude carriers. There appears to be good separation between these terminals and the two public container terminals at Pier E and Pier J (POLB, 1993a-d; Jane's, 1992).

Terminal operators contract with private hazardous materials response organizations to contain and control hazardous materials incidents on their premises. The Coast Guard and the Long Beach Fire Department's hazardous materials team are also used for emergency response. Hazardous materials training within the port is the responsibility of the port's Security Division. Port employees receive first responder training for hazardous cargo accidents (no Department of Transportation training), but the Fire Department is the responder for all port accidents (Powell et al., 1994). The Fire Department also calls on the county hazardous materials team as needed (Powell et al., 1994).

The port is physically separated from downtown Long Beach and has excellent highway connections. However, truck and/or rail passage from the terminals must pass through the heart of the adjoining communities that are large and densely populated, which makes the port less than ideal for spent nuclear fuel shipments.

The port is subject to severe earthquakes. The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. These requirements are shown in the Uniform Building Code (UBC, 1991). For the Port of Long Beach, the Uniform Building Code requires buildings to withstand wind speeds up to 110 km/hr (70 mph). The port is located in a very high seismic zone with an acceleration of 0.40 g (the highest Uniform Building Code ranking). Nearby San Fernando, CA was the site for one of the worst recorded earthquakes in the contiguous United States with a Modified Mercalli Intensity XI, in February 1971 (Bolt, 1978). Numerous other serious earthquakes with Intensities ranging from IX to X have also occurred in the last century. Long Beach was the site for a Intensity IX earthquake on March 10, 1933, which also resulted in numerous deaths, injuries, and building damage (Bolt, 1978).

The 1990 population within 16 km (10 mi) of the port terminals was 1,014,418. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 914,00; Oak Ridge Reservation, 823,000; Idaho National Engineering Laboratory, 692,000; Hanford Site, 617,000; and Nevada Test Site, 518,000. Populations along rail routes to these sites are slightly larger. These populations are shown in Figures D-8 through D-7 in Section D.1. The distances to

the five potential sites on interstate routes are: Savannah River Site, 3,940 km (2,443 mi); Oak Ridge Reservation, 3,610 km (2,246 mi); Idaho National Engineering Laboratory, 1,580 km (979 mi); Hanford Site, 2,000 km (1,241 mi); and Nevada Test Site, 645 km (401 mi). Distances along rail routes are slightly longer.

Environmental Conditions

The environmental conditions for Long Beach are the same as those for Los Angeles. These are reported in Section D.2.2.11 below.

Climatic Conditions

Similar to the Los Angeles area, the climate of Long Beach, CA, is influenced significantly by the local topography. The Pacific Ocean has a moderating effect on the diurnal temperature range, which is greater than that observed further inland at the Los Angeles International Airport. In general, winter months are cool and wet followed by warm, dry summer months. Early morning clouds and fog, which are quite common during the late evening and early morning hours, generally burn off by late morning, resulting in sunny, pleasant daytime conditions during summer (NOAA, 1993f).

D.2.2.11 Los Angeles, CA

Los Angeles and Long Beach Harbors, although divided by a political boundary, form a single geographic and economic port entity. The harbors occupy a major part of San Pedro Bay. The Port of Los Angeles, one of the largest ports on the Pacific Coast, has a history of leading the Pacific Coast ports in terms of tonnage handled. It has extensive facilities to accommodate all types of traffic, and is the only southern California port at which passenger vessels call regularly (POLA, 1994).

The channel from the Pacific Ocean is straight, short, and direct. The Los Angeles Main Channel is maintained at 13.7 m (45 ft). The Super Tanker Channel to the deep draft facilities is maintained at 12.2 m (40 ft). The majority of the port facilities are located within 4.8 km (3 mi) of the harbor entrance (DOC, 1992b). A map of the port is shown in Figure D-42.

Worldport LA, the name adopted by the Los Angeles Harbor Department for the Port of Los Angeles, is a proprietary and self-supporting department of the City of Los Angeles reporting to a Board of Harbor Commissioners. The Worldport LA functions as a landlord operator administering its own budget, operations, and development programs (POLA, 1994).

Worldport LA is one of the country's largest, multi-terminal ports, and claims the title of the busiest container port in the United States. In fiscal year 1992, Worldport LA handled 2,154,890 20-ft equivalent units — the highest volume in the port's history. The port is also a cruise ship terminus handling over three-quarter million passengers in 1992 (AAPA, 1993; POLA, 1994).

Worldport LA encompasses approximately 1,684 ha (4,160 acres) of land area and 1,425 ha (3,520 acres) of sheltered waters. It has 36 cargo handling terminals, including six dedicated container terminals and three "Omni" terminals (which handle containers and breakbulk) with a total of 34 container cranes, on 45 km (28 mi) of waterfront. Of the three Omni terminals, Berths 142-146 (operated by Worldport LA) is a public facility with no "tenant" ship lines. The remaining two Omni terminals, RDP and Indies Terminals, are managed by private terminal operating companies but are open to public use (Jane's, 1992; AAPA, 1993; D&B, 1993). A multi-billion dollar, outer harbor Pier 300 development is underway with completion scheduled by the year 2010 (some terminals may be open during the period analyzed in this EIS) (POLA, 1994).

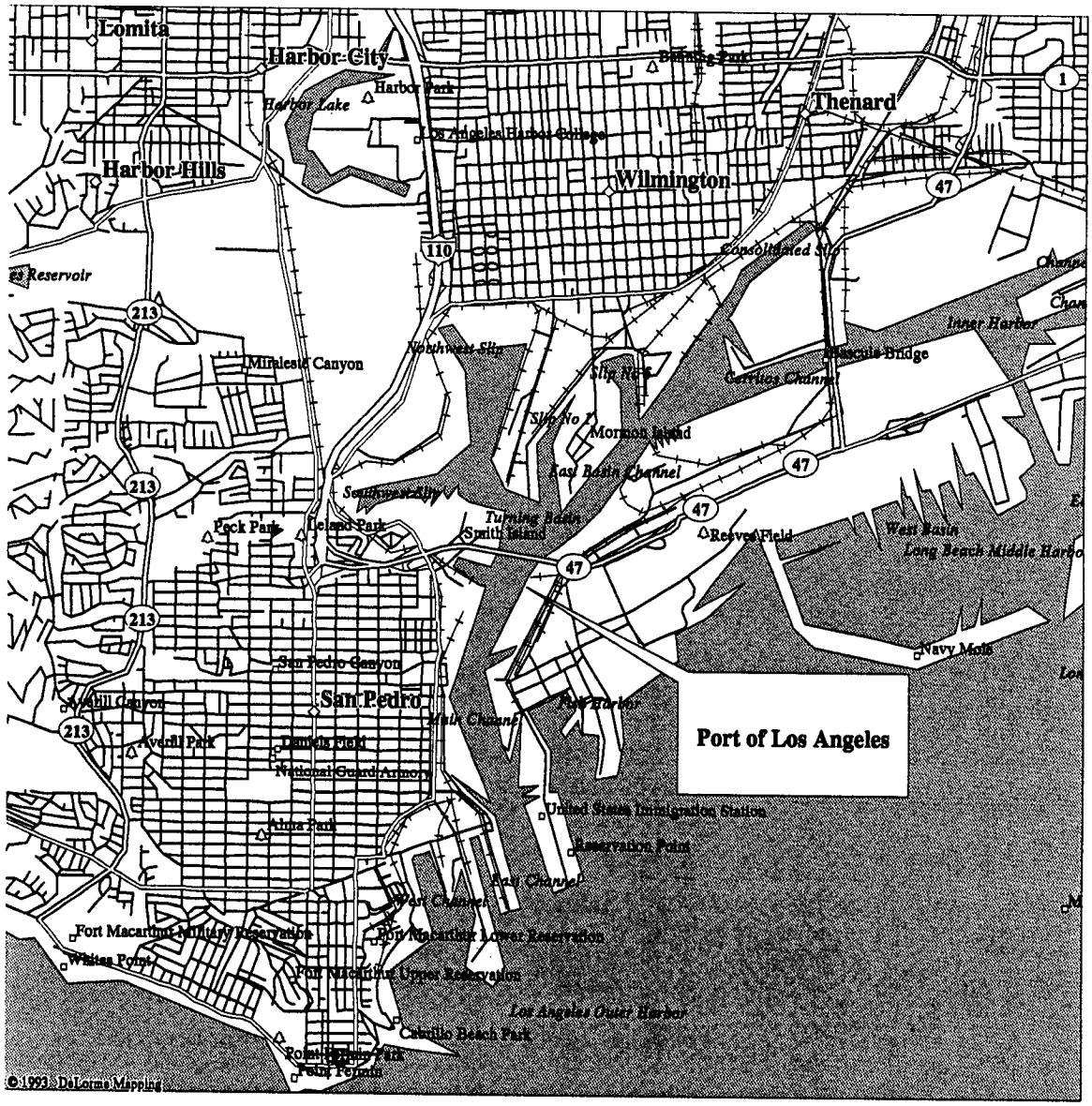


Figure D-42 Map of the Port of Los Angeles, CA

Worldport LA Berths 142-146: Dock/Quay lengths are 853 m (2,800 ft) and depths alongside at mean low water are 10.67-11.3 m (35-37 ft) at mean low water. Worldport LA berths have crane capacities of three 40.6 metric ton (45 ton) container cranes (Jane's, 1992; AAPA, 1993).

RDP Terminal: Berths 174-181 have lengths of 1,006 m (3,300 ft) and depths of 10.67 m (35 ft) at mean low water. Capacity of RDP cranes is two 40.6 metric ton container cranes (Jane's, 1992; AAPA, 1993).

Indies Terminal: Berths 216-227 have total lengths of 1,128 m (3,700 ft) and depths of 13.72 m (45 ft) at mean low water. The Indies berths have three 40.6 metric ton (45 ton) container cranes (Jane's, 1992; AAPA, 1993).

Los Angeles terminals are served by the Harbor Freeway (I-110) and Terminal Island Freeway (Route 47) which connect with Interstate Highways 5, 10, 15, and 40. The Harbor Freeway begins within the Worldport LA port complex. Worldport LA is connected to the Southern Pacific Transportation Co., Union Pacific, and Santa Fe railroads by the Harbor Belt Line Railroad, jointly owned by the Los Angeles Harbor Department and the three railroads. Belt Line tracks extend to cargo ship berths at each of the Omni Terminals. Intermodal connections are presently made at the intermodal container transfer facility described for the Port of Long Beach, which is approximately 8 km (5 mi) away. A new intermodal container transfer facility is under construction on Terminal Island and there are major infrastructure improvement projects underway to facilitate and expedite rail and truck traffic to the port through the Greater Los Angeles Metropolitan area (POLA,1994).

Worldport LA is host to more than a dozen cruise ship lines and about 40 cargo ship lines. A partial list of container lines calling at the port include: American President Lines, Australia-New Zealand Direct Line, Orient Overseas Container Line, Philippines, Micronesia & Orient Lines, Yang Ming Line, Mitsui O.S.K. Lines, Kawasaki Kisen Kaisha ("K" Line), Dole Fresh Fruit, Columbus Line, Blue Star PACE Ltd., Matson Navigation Co, NYK Line, Neptune Orient Lines, Evergreen Line, Barber Wilhelmsen, Blue Star Line, d'Amico Line, Italia Line, Nedlloyd Lines, and Slosna Plovba (Jane's, 1992; D&B, 1993).

Other Pertinent Information: The Port of Los Angeles has its own police force that patrols the waterfront around the clock by boat, helicopter, automobile, and bicycle (Leong, 1993). Port security is extensive and extremely well-organized. The port police are responsible for the safety and security of all passenger, cargo, and vessel operations at Worldport LA. They also monitor vessel berthings for possible wharf damage and issue hazardous cargo and dangerous goods permits. In addition, terminal operators have their own unarmed security personnel. All terminals also have areas for segregation and temporary storage of dangerous cargoes (Verhoef et al., 1994).

Fire protection is provided by the Los Angeles Fire Department which maintains five fire stations within the port and operates five fireboats. Two additional fireboat berths and stations are under construction. Response time is within five minutes. First responders for accidents receive Occupational Health and Safety Administration training but do not yet receive Department of Transportation training (Leong, 1993; Verhoef et al., 1994).

A port spokesperson did not know of any ordinances prohibiting the importation of spent nuclear fuel (Leong, 1993). A port spokesperson thought the port had handled spent nuclear fuel shipments in the past (Note: Database searches of shipments over the last decade do not show Los Angeles as a port for receipt of spent nuclear fuel; presumably these past shipments were other types of radioactive materials) (Leong, 1993). Item 1715 of Los Angeles Port Tariff No. 4, effective July 1, 1990, provides for the handling of radioactive and/or fissile materials, provided special written permission is received from the Executive

Director and U.S. Department of Transportation/Coast Guard Regulations are fully complied with (POLA, 1994). However, a spokesperson indicated that it was unlikely the port would accept spent nuclear fuel shipments (Verhoef et al., 1994).

The port police are the primary responders to hazardous materials incidents, backed up by the Los Angeles Fire Department and the United States Coast Guard. Based on Tariff Item 1715 referred to above, and the fact that radioactive shipments have occurred in the past, it is assumed port police have an adequate handling plan in place for radioactive materials. Worldport LA is an active participant in the Shoreline Emergency Network, a regional oil spill network organized to respond to coastal oil spill emergencies. The port police are trained in hazardous materials handling and are in charge of such operations. It is not known to what extent individual terminal operators are trained in hazardous materials response, but given the size and complexity of the port activities, it is assumed adequate hazardous materials training is provided. The combined ship accident history for the Ports of Long Beach and Los Angeles for the period of 1991-1993 is the lowest of all the major west coast ports (USCG, 1994b).

Worldport LA has a number of environmental programs underway that are designed to mitigate damage done to the marine environment in the past, and to prevent or lessen additional negative environmental impacts in the future. The port has a very active recreational/tourist component and, due in part to the presence of oil production facilities within the port, there is heightened environmental sensitivity on the part of the port community. The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Los Angeles, the Uniform Building Code requires buildings to withstand wind speeds up to 110 km/hr (70 mph). The port is located in a very high seismic zone with an acceleration of 0.45 g. Like most Southern California cities, the port is subject to severe earthquakes. Two relatively recent severe earthquakes in Southern California (along the San Andreas fault system along the Pacific and North American tectonic plates) occurred March 10, 1993, in Long Beach (Modified Mercalli Intensity IX) and February 9, 1971, in nearby San Fernando (Modified Mercalli Intensity VIII-XI). Both resulted in numerous deaths and injuries and caused massive structural damage to buildings.

The 1990 population within 16 km (10 mi) of the port terminals was 1,124,493. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 936,000; Oak Ridge Reservation, 639,000; Idaho National Engineering Laboratory, 519,000; Hanford Site, 725,000; and Nevada Test Site, 334,000. Populations along rail routes to these sites are slightly larger. These populations are shown in Tables D-7 through D-16 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 3,930 km (2,440 mi); Oak Ridge Reservation, 3,550 km (2,204 mi); Idaho National Engineering Laboratory, 1,510 km (940 mi); Hanford Site, 2,070 km (1,286 mi); and Nevada Test Site, 580 km (359 mi). Distances along rail routes are slightly longer.

Environmental Conditions

Several wildlife refuges are located around the San Pedro Bay area. The Seal Beach National Wildlife Refuge is approximately 16 km (10 mi) east from the port area. The Bolsa Chica Ecological Reserve is located about 20 km (11 mi) east from the port area. The Abalone Cove Ecological Reserve is about 16 km (10 mi) around Point Fermin to the west of the port area. Several areas of biological significance lie along the passageway to the ports. These include the Channel Islands National Marine Sanctuary, about 60 km (43 mi) to the southwest of the port entrance, and the Santa Catalina Island Area of Special Biological Significance, about 28 km (17 mi) southwest of the port entrance (FWS, 1981c).

The water quality of the harbor waters at the ports is generally considered good. Areas in the inner harbor with limited waterflow experience infrequent periods of poor water quality. There is a wider range of salinity in the inner harbor than in the outer harbor, with higher values at the bottom than at the surface (U.S. Army, 1990).

The waters of the Los Angeles-Long Beach Harbor contain a variety of marine habitats, some natural and some manmade. Numerous fish species use the habitats in the harbor, including several recreational (e.g., barred sand bass and white croaker) and commercial (e.g., anchovy and halibut) value, for all or part of their life cycle (U.S. Army, 1990). Commercial fishing operations for crabs and spiny lobsters also are in San Pedro Bay. Other sport-fishing in the bay includes flatfish, grunions, California halibut, white seabass, kelp bass, Pacific bonito, and Pacific barracuda (FWS, 1981c). Shallow waters are important nursery areas for several fish species. At least 60 species of water-associated birds use the harbor, primarily for resting and foraging (U.S. Army, 1990).

Several threatened or endangered species are present at least seasonally in San Pedro Bay (Kobetich, 1994; U.S. Army, 1990). The endangered California least tern breeds in the area from April through August. California brown pelicans are present all year feeding on the fish in the harbor and resting on the breakwaters and other structures. Peregrine falcons are present in the region but are seldom sighted in the harbor. Other endangered birds around the ports include the light-footed clapper rail and the marbled morrelat. The western snowy plover (threatened) and the long-billed curlew, which is a candidate species, have been spotted infrequently in the harbor. Other candidate species, including the elegant tern, harlequin duck, loggerhead shrike, reddish egret, and white-faced ibis, can be found in the harbor area.

Within the Seal Beach National Wildlife Refuge, the wetlands portion supports a wide variety of fish and invertebrate as well as residential and migratory bird populations. The bay provides habitat for the light-footed clapper rail, Belding's savannah sparrow, the California least tern and the California brown pelican, all of which are endangered (U.S. Army, 1990). The Bolsa Chica Ecological Reserve provides habitat for the California least tern, the light-footed clapper rail, the California brown pelican, Belding's savannah sparrow (State protected), and the salt marsh bird's-beak, a member of the figwort family. The Belding's savannah sparrow is strictly associated with pickleweed, which is not found within the ports; therefore this species is not expected to be found directly in the ports. The reserve is also used by the coast horned lizard, monarch butterfly, snowy plover, and numerous bird species such as gulls, terns, sandpipers, herons, and egrets.

With regard to marine mammals, no species of cetaceans (whales, dolphins) actually inhabit regions in-shore of the breakwater, and their occurrence within the harbor is sporadic and infrequent. Visitors include the common dolphin, the Pacific white-sided dolphin, and gray whale (endangered). Groups of bottlenose dolphins have been observed swimming just outside the breakwater. The eastern Pacific gray whale migrates through California waters twice yearly in a route between the Bering Sea and Baja California. The southward migration occurs between November and February, while the northward return generally takes place off of California between March and May. While the gray whales usually stay outside the harbor mouth, approximately three to four accidently enter the harbor every year. The California sea lion and the harbor seal, both nonendangered, have been sighted in the area of the harbor. The California sea lion is known to occasionally haul-out on the harbor breakwater and sometimes can be seen swimming in the harbor. The harbor is not considered a birthing or important feeding habitat for the California sea lion, although sea lions could presumably forage within the harbor (U.S. Army, 1990).

Climatic Conditions

The dominant geographic influences on the climate of the Los Angeles basin are the Pacific Ocean and the southern California coastal mountain ranges. Marine air covers the coastal plain for the majority of the year, but inland air does occasionally migrate into the region. Pronounced differences in temperature, humidity, cloudiness, fog, sunshine, and rain occur over fairly short distances along the coastal plain due to the local topography and the decreased effect of the marine environment further inland. However, in general, temperature ranges are least and humidity highest close to the coast, while precipitation increases with elevation in the foothills. Prevailing daytime winds are from the west, with nighttime and early morning winds generally light and from the east and northeast. During the fall, winter and spring months, dry, gusty northeasterly winds (e.g., Santa Ana winds) blow over the southern California mountains. Precipitation occurs mainly during the winter months. Thunderstorms are rare along the coast, but increase in frequency as one approaches the coastal ranges. Fog and low visibility are frequent problems for aircraft navigation at the Los Angeles International Airport (NOAA, 1993e).

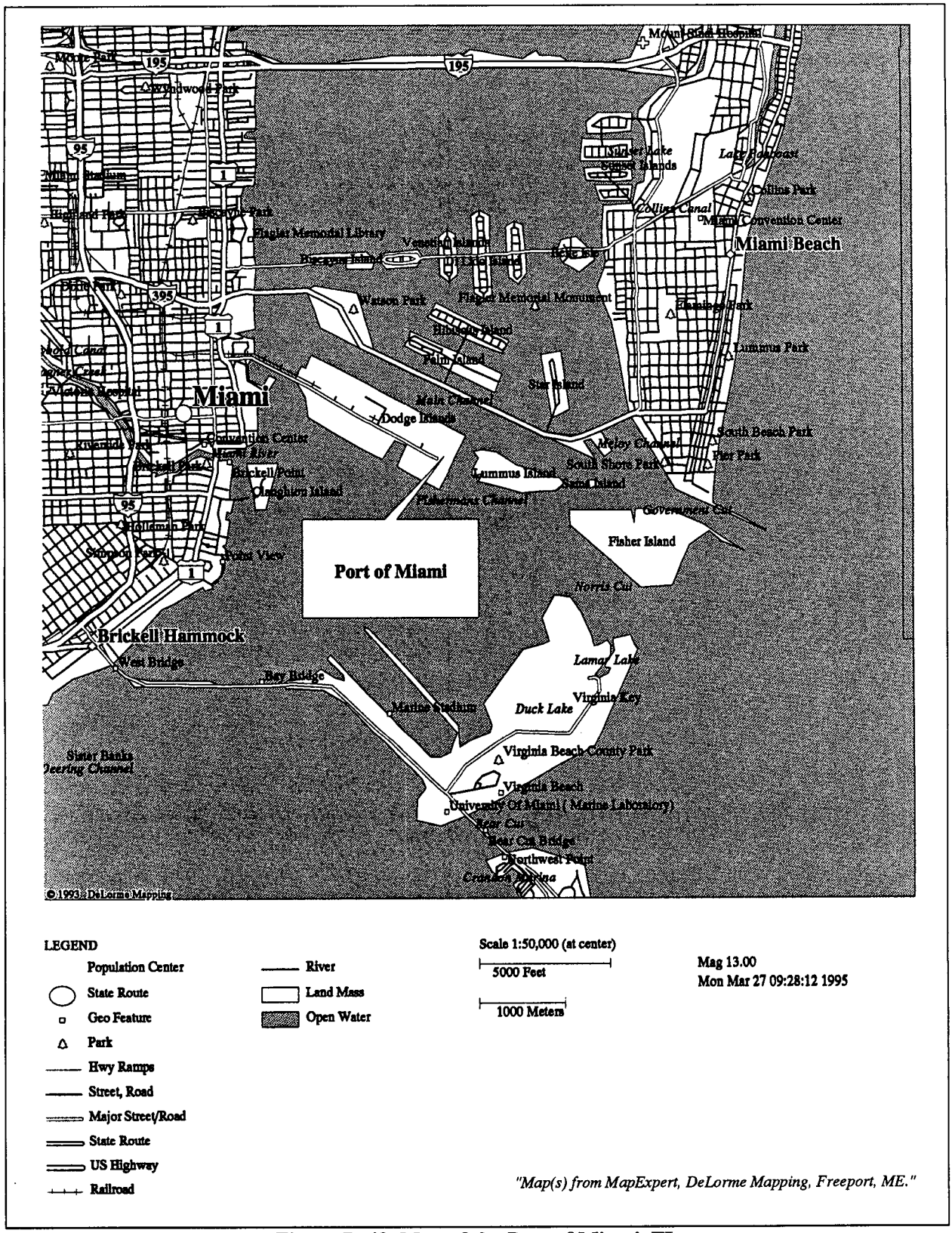
D.2.2.12 Miami, FL

Miami is Florida's most populous city and is located 8 km (5 mi) from the Gulf Stream on the east coast of Florida. It is an internationally famous winter resort and a popular yachting center. Miami is also a deepwater port; considerable foreign commerce passes through Miami and it is a major cruise port. Miami's cruise ship traffic has earned it the title of "Cruise Ship Capital of the World" (Southern Shipper, 1993). In addition to being a major shipping and cruise ship center, the Port of Miami is located in a popular resort area known for its beaches, fishing, recreational boating, and tropical landscape. The approach to Miami is open, but with strong tidal currents of 1.0 to 2.1 meters-per-sec (2 to 4 knots) in the entrance between the jetties. A Federal project provides for depths of 11 m (36 ft) to the main port facilities (DOC, 1993d; Southern Shipper, 1993; AAPA, 1993; Jane's, 1992). The port occupies 273 ha (675 acres) of land. It is situated on two interconnected islands, Dodge and Lummus, which lie in an east-west orientation due east of the City of Miami and west of the barrier island resort area of Miami Beach. The Miami Beach resort area forms the northern boundary of the harbor entrance. The major port facilities are within 5 km (3 mi) of the entrance from the Atlantic Ocean. A map of the port is shown in Figure D-43.

Miami's freight terminals serve as a hub for distribution and transshipment of cargo (largely tropical fruits and vegetables) to and from Latin America. The Port of Miami is an arm of the Dade County Seaport Department which functions as a "landlord" port. Almost 60 shiplines connect the port to most major countries in the world (Jane's, 1992; D&B, 1993; Southern Shipper, 1993). In 1994, nearly 520,000 20-ft equivalent-units were handled in the port (AAPA, 1994).

Lummus Island Terminal: The 91 ha (225 acre) terminal on the south side of the island is seaward of Dodge Island and just inside the entrance to the port. It is Miami's principal container handling facility with six container gantry cranes, including three new post-Panamax cranes and a new roll-on/roll-off berth. Activities at Dodge Island are primarily cruise ship, roll-on/roll-off, and breakbulk cargo oriented. Combined facilities consist of four container berths, 14 roll-on/roll-off berths, and 12 cruise ship berths. A private container terminal for shallow draft vessels is located on Causeway Island at the eastern end of the MacArthur Causeway, which parallels the ship channel north of Lummus and Dodge Islands (Southern Shipper, 1993).

This terminal has marginal wharf area of 1,067 m (3,500 ft). The roll-on/roll-off berths have 413 m (1,356 ft) of marginal wharf while the Dodge Island breakbulk has 853 m (2,800 ft) of marginal wharf. The passenger terminals have 2,373 m (7,785 ft) of marginal wharf. Depths alongside Dock/Quay are



LEGEND

- Population Center
- State Route
- Geo Feature
- Park
- Hwy Ramps
- Street, Road
- Major Street/Road
- State Route
- US Highway
- Railroad
- River
- Land Mass
- Open Water

Scale 1:50,000 (at center)

5000 Feet

1000 Meters

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"Map(s) from MapExpert, DeLorme Mapping, Freeport, ME."

Figure D-43 Map of the Port of Miami, FL

noted as: Lummus Container Berths 1 and 2 with 12.8 m (42 ft) at mean low water. Berths 3 and 4 have 11.73 m (38.5 ft) at mean low water. On the north side of Dodge Island, the depth is 7.62-10.97 m (25-36 ft) at mean low water.

Crane capacities at Lummus Container Berths consist of three 50.8 metric ton (56 ton) container gantry cranes and three 40.6 metric ton (45 ton) container gantry cranes.

The Port of Miami is accessible via a five-lane, fixed bridge spanning the Intracoastal Waterway. It is approximately 1.2 km (0.75 mi) from the Biscayne Boulevard exit of I-395 to Dodge Island via NE 2nd Avenue in downtown Miami. I-395 is a connector to I-95 as well as all other south Florida highways. There are 5.2 km (3.2 mi) of trackage within the Port of Miami including a four-track marshalling yard. Rail connections are with the Florida East Coast and CSX Railroads.

Port users include Agromar, Argentine Line, Barber Blue Sea, Bottachi Line, Central American Shippers, CCNI, CGM, Chilean Line, Ecuadorian Line, Empremar, Flota Mercante Grancolombiana, Hapag Lloyd, Hoegh Line, Italian Lines, Ivaran Lines, Kirk Line, Lykes Line, Maersk Line, Navieras De Puerto Rico, Shipping Corp of India Transnave, Mexican Line, Spanish Line, Wallenius Transroll, and Zim Container Service (Jane's, 1992; Southern Shipper, 1993; D&B, 1993).

Other Pertinent Information: Containers discharged at Lummus Terminal must travel down the center of both islands and past the extensive cruise line terminals located on the north side of Dodge Island. Although travel on city streets on the mainland is for a very short distance, it is through an urban area which is believed to be heavily developed. The port recently completed a new $1.8 million, eight-lane security gate and cargo control facility on Dodge Island to the east of the bridge. Each lane is equipped with Regiscope photographic clearance systems (Southern Shipper, 1993).

Port officials did not respond to a faxed questionnaire or telephone calls for information, and it is not known if there is a designated area for temporary storage of hazardous cargoes. The port has no prior experience handling spent nuclear fuel (NRC, 1993; SNL, 1994). However, the Port of Miami is primarily a general cargo, container, and cruise ship port with no petroleum berths or other terminals for handling hazardous or dangerous goods. Passenger operations are considered a conflicting use. Since port officials did not respond to requests for information regarding emergency response capabilities, it is not known whether hazardous materials or spent nuclear fuel training exists for port workers.

There are no known wildlife habitats or sanctuaries in the immediate area; however, there is a high-level of environmental sensitivity in this area. The port's physically separate island locations, strictly controlled access, and limited use of city thoroughfares are very desirable features. However, the port is in relatively close proximity to the heavily populated Miami Beach area adjoining the harbor entrance (Government Cut) and roughly 0.8 km (0.5 mi) from downtown Miami.

The likelihood of severe natural phenomena, such as high winds and earthquakes, are reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Miami, the Uniform Building Code requires buildings to withstand wind speeds up to 160 km/hr (100 mph). The port is located in a low seismic zone with an acceleration of less than 0.075 g.

The 1990 population within 16 km (10 mi) of the port terminals was 833,057. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 336,000; Oak Ridge Reservation, 443,000; Idaho National Engineering Laboratory, 845,000; Hanford Site, 894,000; and Nevada Test Site, 908,000. Populations along rail routes to these sites are slightly larger. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances

to the five potential sites on interstate routes are: Savannah River Site, 1,200 km (748 mi); Oak Ridge Reservation, 1,460 km (906 mi); Idaho National Engineering Laboratory, 4,570 km (2,842 mi); Hanford Site, 5,240 km (3,258 mi); and Nevada Test Site, 4,740 km (2,945 mi). Distances along rail routes are slightly longer, except for Savannah River Site, which is slightly less.

Environmental Conditions

The State of Florida has classified Biscayne Bay near Port of Miami as a Class III water body. This classification indicates that the waters are suitable for recreation, and propagation and maintenance of a healthy, well balanced population of fish and wildlife (FL DEP, 1994). In addition, the State of Florida has classified the Biscayne Bay, where the Port of Miami is located, as an "Outstanding Florida Waterway." As previously noted, Outstanding Florida Waters are generally waters located within national parks, state parks, national seashores, marine sanctuaries, or aquatic preserves. Other waters located near Port Everglades that are designated as Outstanding Florida Waters include Biscayne Bay National Park and the Bill Bags State Recreation Area. These waterways are afforded special protection by State environmental regulations (FL DEP, 1994).

The Biscayne Bay, in the vicinity of the Port of Miami, is characterized as a high salinity estuarine habitat (generally greater than 20 parts per thousand). There are both commercial and recreational fish and invertebrates found near the port. These aquatic species include: stone crabs, shrimp, spiny lobster, sharks, sand seatrout, drum, kingfish, mullet, Florida pompano, bluefish, mackerel, tarpon, ladyfish, snapper, grouper, grunts, jewfish, snook, greater amberjack, crevalle jack, silver perch, blue runner, Atlantic dolphin, short-finned pilot whale, false killer whale, and pygmy sperm whale (FWS, 1982c).

Protected species found near the Port of Miami include the loggerhead sea turtle and the West Indian manatee (Richards, 1994). The U.S. Fish and Wildlife Service reported that the Port of Miami is located in designated critical habitat for the endangered west indian manatee (Johnson, 1995). In addition, the U.S. Fish and Wildlife Service reports that the following protected, listed marine species are known to occur in Dade County: atlantic hawksbill turtle (endangered), atlantic ridley turtle (endangered), atlantic loggerhead turtle (threatened), atlantic green turtle (endangered), leatherback turtle (endangered), american crocodile (endangered), and the american alligator (threatened/similar appearance). Protected bird species in Dade County include the bald eagle (endangered), cape sable seaside sparrow (endangered), ivory-billed woodpecker (endangered), kirtland's warbler (endangered), arctic peregrine falcon (threatened), wood stork (endangered), everglades snail kite (endangered), bachman's warbler (endangered), roseate tern (threatened), and the piping plover (threatened) (Johnson, 1995).

Wildlife refuges located near the port area are the Bill Baggs Cape Florida State Recreation Area and the Biscayne Bay Aquatic Preserve. They are both located within 20 km (12 mi) of the Port of Miami. Protected species found in these areas include the loggerhead sea turtle, the West Indian manatee, and the peregrine falcon. Birds of interest found in these areas are: the spotted breasted oriole, songbirds, fulvuous whistling duck, and various shorebirds (FWS, 1982c).

Climatic Conditions

The climate of the southeast Florida region is essentially subtropical marine, which features long, warm summers with abundant rainfall, generally followed by a mild, dry winter. The influence of the ocean and numerous bays is seen in the small diurnal temperature range (generally <10°) and the rapid warming of any cold air masses that invade this portion of the State. The predominant windflow is from the east-southeast, which generates conditions right at the coast that are often different than those encountered further inland, due to land-induced frictional effects. Hurricanes occasionally effect the area, with the

months of September and October exhibiting the highest frequencies. However, destructive tornadoes (not associated with tropical systems) are rare. Waterspouts are frequently spotted offshore during the summer months, but rarely cause any loss of life or property damage (NOAA, 1993b).

D.2.2.13 Military Ocean Terminal, Oakland, CA

The Military Ocean Terminal, Bay Area, is located in the Outer Harbor of the Port of Oakland, adjacent to the east entrance to the Oakland Bay Bridge (descriptions of Oakland ship channels also apply to Military Ocean Terminal, Bay Area and are not repeated here). The facility is located approximately 16 km (10 mi) east of the Golden Gate Bridge, which spans the Pacific Ocean entrance to San Francisco Bay to the south and San Pablo Bay to the north. The single pier (Wharf 7) currently available for military cargo is directly opposite the commercial Sea-Land and Public Container Terminals, and located within the Oakland Army Base (MTMCTEA, 1990). The facility has the largest sealift workload of any military traffic ports on the West Coast, averaging on the order of 3,000 metric tons (3,300 tons) of cargo per year (the 1994 shipments of Patriot missiles to South Korea were shipped from Wharf 7). See the descriptions of the Port of Oakland for more information regarding truck and rail access, maps, populations, etc. A map of the terminal is shown in Figure D-44.

The Bay Bridge Terminal, adjacent to Military Ocean Terminal, Bay Area, operates Military Ocean Terminal, Bay Area wharves 6 and 6.5 as Berths 8 and 9 for its commercial operation (Jane's, 1992; MTMCTEA, 1990). Wharf 7 is 445 m (1,459 ft) long, with 10.6 m (35 ft) depth alongside. Wharf 7 has a single 91 metric ton gantry crane for all breakbulk operations and a container spreader that can be attached for limited container handling (MTMCTEA, 1990). A floating crane of comparable capacity is also available. Stern loading roll-on/roll-off operations are not feasible at the wharf.

There are more than 8.1 ha (20 acres) of open storage space near the wharf, and a transit shed at the wharf provides more than 13,000 m^2 (141,000 ft^2) of covered storage. More than 65,000 m^2 (700,000 ft^2) of additional covered space is available on the Army Base (MTMCTEA, 1990).

Trucks can access the wharf for direct loading from ships at the facility. Access to Interstates 580, 680, or 880 is directly adjacent the Army Base through a largely industrial area at the Port of Oakland. Residential areas are within a few kilometers of the Base and the Port of Oakland.

The entire length of Wharf 7 is served by rail, making direct ship-to-rail loading possible for receipt of incoming cargo. Rail movements are carried out by two Base locomotives, which can move rail shipment to the adjacent and expanding Oakland Intermodal Terminal. The Intermodal Terminal is serviced by the Southern Pacific and Union Pacific rail systems and connections with the Atchison, Topeka, and Santa Fe Railroad intermodal yard about 19 km (12 mi) north of the port (MTMCTEA, 1990).

Other Pertinent Information: Since the facility is part of the Oakland Army Base, it is well lighted, fenced, and patrolled by gate guards and roving patrols. There are no full time longshoremen at the facility, and trained, experienced longshoremen are hired from the large pool of stevedores (1,000) normally working at the port.

The likelihood of severe natural phenomena, such as high winds and earthquakes, is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Military Ocean Terminal, Bay Area, the Uniform Building Code requires buildings to withstand wind speeds up to 110 km/hr (70 mph). The port is located in a very high seismic zone with an acceleration of 0.40 g (see seismic information for the Port of Oakland for more details).

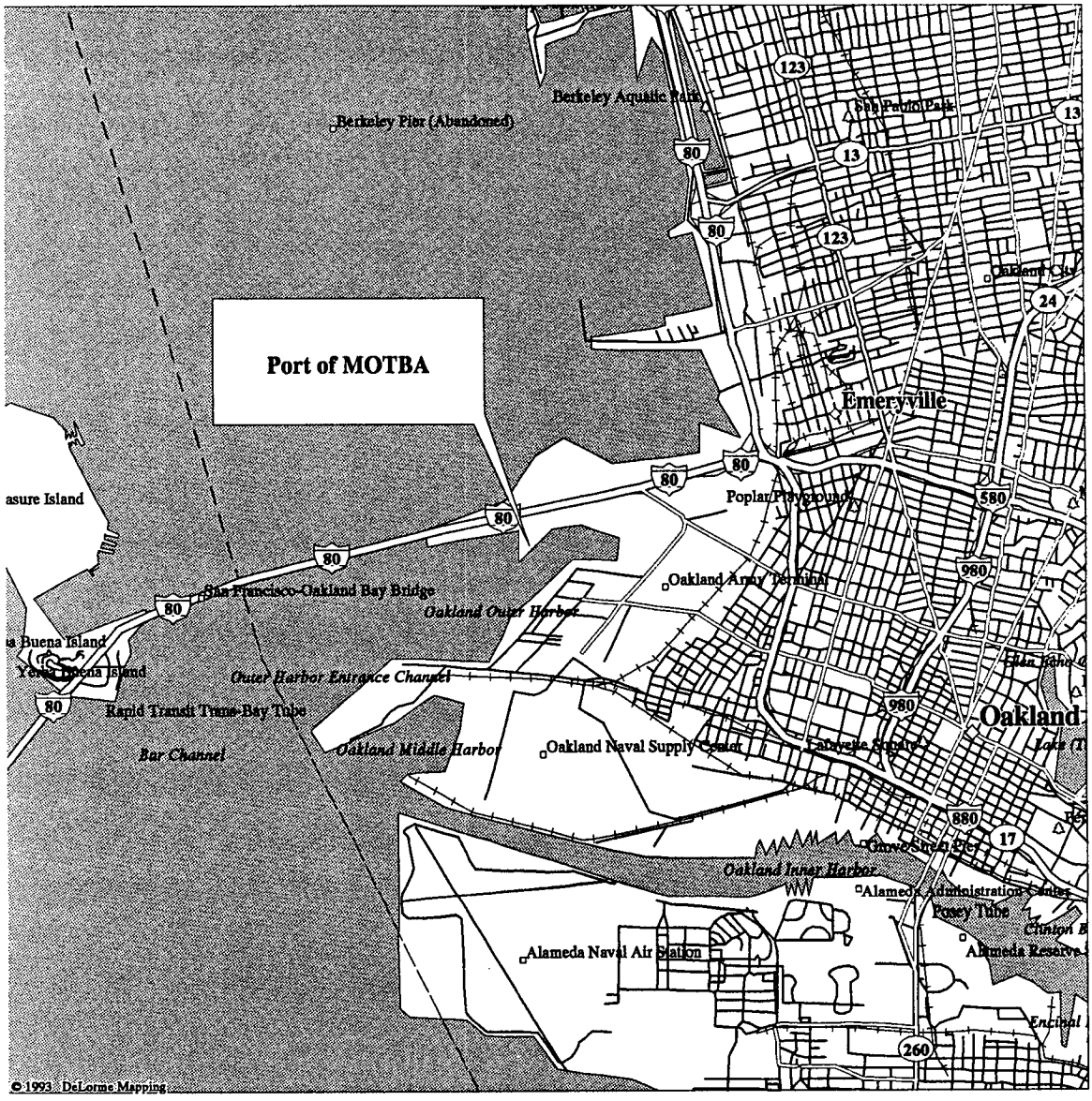


Figure D-44 Map of the Military Ocean Terminal, Oakland, CA

Area 1990 census population and density figures are 1,110,549 and 1,323 persons/km^2 (511 persons/mi^2), respectively. The 1990 population within 16 km (10 mi) of the port terminals was 1,288,899. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 1,080,000; Oak Ridge Reservation, 786,000; Idaho National Engineering Laboratory, 367,000; Hanford Site, 359,000; and Nevada Test Site, 482,000. Populations along rail routes to these sites are slightly larger. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 4,216 km (2,791 mi); Oak Ridge Reservation, 4,121 km (2,563 mi); Idaho National Engineering Laboratory, 1,548 km (963 mi); Hanford Site, 1,407 km (875 mi); and Nevada Test Site, 1,156 km (719 mi). Distances along rail routes are slightly longer.

The Military Ocean Terminal, Bay Area, is located in the Outer Harbor of the Port of Oakland. Climatic and environmental conditions for Military Ocean Terminal, Bay Area are the same as those for the Port of Oakland. These are presented in Section D.2.2.15.

D.2.2.14 New Orleans, LA

The Port of New Orleans is one of the largest ports in the United States. It is located on both sides of the Mississippi River with its lower limit about 129 km (80 mi) above the Head of the Passes from the Gulf of Mexico, and its upper limit about 185 km (115 mi) above Head of the Passes. A Federal project provides for a channel 13.7 m (45 ft) deep over the bar through Southwest Pass to Head of the Passes, and on to New Orleans. The Port of New Orleans' lower limit is about 160 km (98 mi) from the Gulf of Mexico via Southwest Pass. Southwest Pass is straight and well-marked. From the Head of the Passes to New Orleans, the river has a least width of 550 m (1,800 ft) and a clear, unobstructed channel (DOC, 1992a). A map of the port is shown in Figure D-45.

The seven-person Board of Commissioners of the Port of New Orleans, is appointed by the Governor from a list of nominees drawn from industry, civic, and educational groups from the three parishes (counties) in which the Port of New Orleans' terminals are located. The Board, a state agency, sets policies and regulations for port operations. It also appoints the president and chief executive officer of the Port of New Orleans who, together with a staff of professional managers, are responsible for day-to-day operation of the port.

New Orleans is a multi-terminal port with predominantly publicly owned terminals and a few private terminals. The port is strictly a "landlord" operator, leasing all of its terminals to private operators and/or shipping companies. Most of the large publicly owned terminals are located along the banks of the Mississippi (on the New Orleans side of the River), which generally runs in an east-west direction in the vicinity of the City. In 1994, the port handled over 250,00 20-ft equivalent units of containerized cargo (AAPA, 1994).

France Road Container Terminal is the Port of New Orleans' principal container handling facility. It occupies 71.55 ha (177 acres) of land and is situated on the west bank of the industrial canal in the southwestern section of New Orleans at the intersection of the industrial canal with the Mississippi River/Gulf Outlet. Berths 1 and 4 are leased to Sea-Land and Navieras De Puerto Rico respectively, and Berths 5 and 6 are public terminals. Berth 1 has two 30.5 metric ton (34 ton) container cranes. Berths 5 and 6 are supported by three container cranes [one 30.5 metric ton (34 ton) container crane and two 40.64 metric ton (45 ton) container cranes], a marshalling yard of 195,077 m^2 (2.1 million ft^2), two container freight stations with 12,193 m^2 (131,120 ft^2) of consolidating space, and a roll-on/roll-off ramp

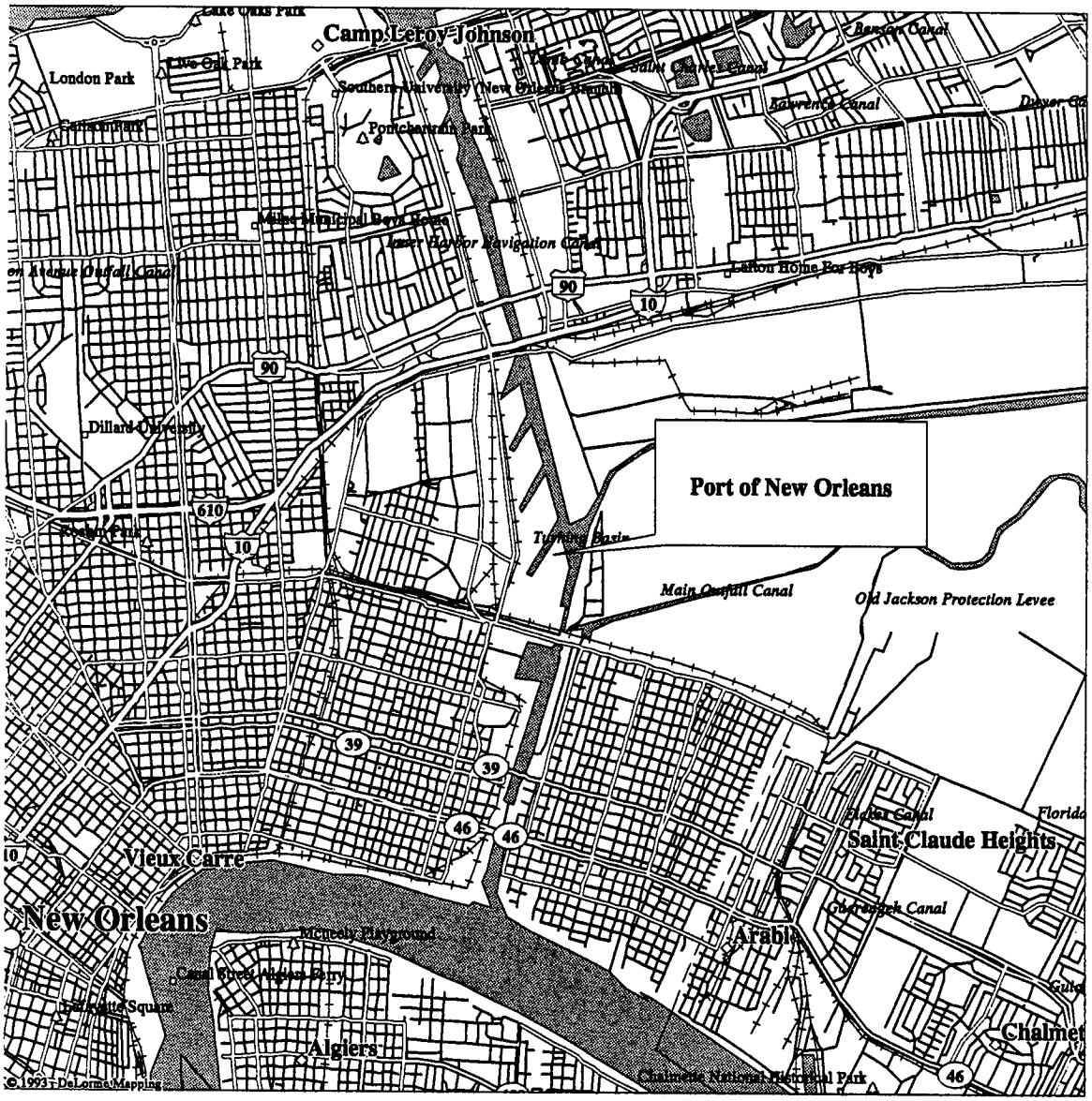


Figure D-45 Map of the Port of New Orleans, LA

at Berth 6. Berths 5 and 6 have a combined length of 518 m (1,700 ft) of marginal wharf with water depth alongside ranging from 9.75 - 10.97 m (32 - 36 ft) at mean low water (AAPA, 1993; Janes's, 1992; D&B, 1993; Southern Shipper, 1993; PON, 1994).

The France Road Public Container Terminal is located in a port industrial district that appears to be separate from residential areas and a considerable distance from the downtown New Orleans business district. This terminal is about 2.4 km (1.5 mi) from Interstate Highway 10 and U.S. Route 90 — major east-west highways — via Alvar Street or Florida Avenue, which are heavy truck routes. I-10 connects with I-49 to Shreveport, where it meets I-20. The Terminal has good truck and rail access, but waterway access is via the relatively narrow industrial canal with a lock near the entrance and several bridges en route. The city-owned Public Belt Railroad connects the France Road and other terminals on the Mississippi, Industrial Canal, and Mississippi/Gulf Outlet with the CSX, Illinois Central, Kansas City Southern, Norfolk Southern, Southern and Union Pacific Railroads. In the case of France Road Terminal, the Belt Railroad tracks serve the site, but not the pier apron.

The Port of New Orleans is port-of-call for over 50 steamship lines providing breakbulk and container freight service to virtually all of the world's major port cities. A partial list of these lines includes ABC Container Line, Argentine Line, ART Ocean Line, Atlantic Container Line, Baltic Shipping, Bank Line East Africa, Boss Line, China Ocean Shipping Co., Contship Container Line, Chilean Line, Daiichi-Chuo Shipping Line, Delmas/AAEL, Egyptian National, Forest Lines Inc., Hapag-Lloyd, Hoegh Line, Hyundai Merchant Marine, Industrial Maritime Carriers, Italia Line, Lykes Brothers Steamship Co., Maersk Inc., NCSCA, Pakistan National Shipping, Pan Ocean, Safbank, Sea-Land, Tecomar, Toko, Torm West Africa, Turkish Cargo Lines, United Arab Shipping, Waterman/LASH, Wilhelmsen Line, and Zim Container Line (Jane's, 1992; D&B, 1993).

Other Pertinent Information: The port has its own security force with police powers. The France Road Terminal is secured by fencing and controlled access. There are locations within the terminal for isolation of hazardous materials. The Port Harbor Police are the first line of defense with respect to hazardous materials accidents, followed by the Coast Guard and Louisiana State Police, who have primary responsibility for enforcing Department of Transportation Regulations. The port has an "elaborate" notification system in case of accidents on Port Authority terminals, beginning with the shipper or consignee of the goods. The New Orleans Fire Department also has a hazardous materials team. Hazardous materials training is the responsibility of the individual terminal operating companies. While the level of training at each terminal is uncertain, given the large quantities of hazardous materials passing through the port, some training is certain (Parker, Spalluto, and Cefalu, 1993).

Port officials know of no ordinances or regulations prohibiting the importation of spent nuclear fuel through the Port of New Orleans, and thought the port may have handled spent nuclear fuel in the past. However, other data indicate the port has not handled spent nuclear fuel since at least 1979 (NRC, 1993; SNL, 1994). The port spokesperson indicated that shipments of radioactive nuclear fuel (not spent nuclear fuel) have been shipped through the port and may still be coming in. Apparently these shipments were from South Africa (Parker, Spalluto, and Cefalu, 1993).

The Port of New Orleans is primarily a breakbulk and general cargo/container port. It is also a major river barge terminus for barge lines on the Mississippi River system. Although there is considerable tank ship and barge traffic on the River, tank terminals tend to be located on the opposite side of the river and/or outside the City limits. Conflicting use of the waterway is not considered a major factor with regard to handling spent nuclear fuel. However, a U.S. Coast Guard accident database established in 1990 shows that an extremely high number of accidents occur on the transit from the Gulf to the port (USCG, 1994a). During the period 1991 through the third quarter of 1993, there were 790 collisions, 825 allisions, and

1,065 hard groundings reported (see 46 CFR 4.05-1 for reporting requirements and definitions). The 2,680 accidents involved one of the following: vessel damage in excess of $25,000 and/or left the vessel unseaworthy, or without power or steering, or severe injury or death. The port 1993-1994 Annual Directory indicates that during this period, there were about 7,100 vessel transits (PON, 1994). Since the accident statistics include barge accidents (and New Orleans has large barge traffic), this number is rather high for oceangoing vessels, but no data are yet available yet to refine the information.

Other than flooding from severe hurricanes and tropical storms, and general environmental concerns, there are no known special environmental or wildlife issues in or near the port area. The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of New Orleans, the Uniform Building Code requires buildings to withstand wind speeds up to 160 km/hr (100 mph). The port is located in a very low seismic zone with an acceleration of less than 0.075 g.

The 1990 population within 16 km (10 mi) of the port terminals was 782,868. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 266,000; Oak Ridge Reservation, 256,000; Idaho National Engineering Laboratory, 455,000; Hanford Site, 504,000; and Nevada Test Site, 687,000. Populations along rail routes to these sites are slightly smaller for Idaho National Engineering Laboratory, Hanford Site, and Nevada Test Site and much larger for Savannah River Site and Oak Ridge Reservation. The distances to the five potential sites on interstate routes are: Savannah River Site, 1,020 km (634 mi); Oak Ridge Reservation, 960 km (594 mi); Idaho National Engineering Laboratory, 3,510 km (2,184 mi); Hanford Site, 4,180 km (2,600 mi); and Nevada Test Site, 3,450 km (2,145 mi). Distances along rail routes are slightly longer.

Environmental Conditions

The State of Louisiana has classified the waters of the Industrial Canal and the Mississippi River Gulf Outlet as suitable for primary and secondary water recreational activities and the propagation of fish and wildlife. The Mississippi River supports all of these uses in addition to being used as a drinking water supply source (Fabens, 1994).

The Mississippi River Gulf Outlet, in the vicinity of the France Road Terminal, is characterized as a high salinity estuarine habitat (generally greater than 20 parts per thousand). The entire canal travels through marshlands. Aquatic species found in these types of marshlands and surrounding areas in Louisiana include: shrimp, blue crab, eastern oyster seatrout, Atlantic croaker, drum, spot, kingfish, sheepshead, flounder, mullet, sea catfish, gulf menhaden, bay anchovy, crevalle jack, and Atlantic bottlenose dolphin (FWS, 1982d).

As ships approach the Mississippi River Gulf Outlet from the north they must travel past the Breton National Wildlife Refuge and Breton Wilderness. Birds of interest in these areas include: peregrine falcon, brown pelican, shorebirds, wading birds, herons, egrets, white ibis, least bittern, gallinules, waterfowl, bird hawks, osprey, magnificent frigate-bird, white pelican, songbirds, warblers and diving ducks. The peregrine falcon and brown pelican are protected species. Aquatic species found in these areas include: loggerhead sea turtle, spotted sea trout, drum, bluefish, cobia, and mackerel. The loggerhead sea turtle is a Federally protected species (FWS, 1982d). Travelling north into the Mississippi Gulf River Outlet towards the France Road Terminal ships must pass near the Biloxi Wildlife Management area.

Climatic Conditions

The city of New Orleans is essentially surrounded by water. Thus, the influence of the Gulf of Mexico and the surrounding bayous, lakes, and marshes are significant. The climate can best be described as humid, with the surrounding water significantly reducing the diurnal temperature range. Between mid-June and mid-September, almost daily, sporadic thunderstorms occur and prevent the temperature from rising much above 90°F. From mid-November through mid-March, the region is influenced alternatively by moist, tropical air masses from the south and from cold, dry continental air masses from the north. The general extratropical storm track is to the north of New Orleans but occasional systems do develop offshore of the city, causing sudden drops in temperature and an increase in precipitation. The cold Mississippi River water and the surrounding marsh areas increase the occurrence of fog in the late winter and early spring months, particularly when light southerly winds are advecting warm, moist tropical air over the area. A rainy period between mid-December through mid-March occurs annually, with the remaining fall/spring months (e.g., October/November, April/May) being relatively dry. The dominant rainfall event during the summer are thunderstorms. Severe thunderstorms with damaging winds are rare. However, the area is subject to the occasional landfalling hurricane. Waterspouts are common in the offshore area, but rarely cause property damage of loss of life (NOAA, 1992l).

D.2.2.15 Oakland, CA

Oakland, located on the eastern shore of the San Francisco Bay, is directly opposite San Francisco. It is the second largest port on the Bay and is a leading containership terminal on the Pacific Coast. The approach to San Francisco and the transit across the Bay to Oakland is open, however, there are restricted areas such as passing under the Golden Gate and Oakland Bay Bridges. There is considerable traffic in the Bay area. A Federal project channel depth of 10.6 m (35 ft) exists to and in the outer harbor. The same depth is maintained in part of the inner harbor. The width passage from the ocean to San Francisco Bay is reduced to approximately 1,125 m (0.7 mi) at the Golden Gate Bridge pier. The distance from the Golden Gate Bridge to the entrance of Oakland Harbor is less than 16 km (10 mi) (DOC, 1992b). A map of the port is shown in Figure D-46.

Oakland is a huge multi-terminal port complex consisting of Outer, Middle, and Inner Harbor cargo terminals leased to terminal operators and/or container shipping lines. The Port of Oakland is part of the Oakland Municipality. The Port Administration is strictly a "landlord" owner and does not operate any facilities. There is a growing trend for "secondary" use by other shipping lines of privately leased terminals, such as Matson's Outer Harbor 7th Street terminal—Berths 32-34, blurring the distinction between public and private use (Jane's, 1992; AAPA, 1993). The port handled over one million 20-ft equivalent units of containerized cargo in 1992 (AAPA, 1994) Public use container and general cargo facilities include:

Outer Harbor: The Seventh Street Marine Container Terminal, Berths 37 and 38, has three container cranes, 14.4 ha (35.6 acres) of terminal area, and storage for over 2,500 20-ft equivalent units. The Outer Harbor Public Container Terminal, Berth 23, has two container cranes, 16.2 ha (40 acres) of terminal area, and storage for over 3,500 20-ft equivalent units. The Bay Bridge Terminal, Berths 8-10, (a combination general cargo (breakbulk), container, and roll-on/roll-off facility) has 20.6 ha (50.9 acres) of terminal area and 7,072 m^2 (76,130 ft^2) of covered storage. This terminal was inoperative for several years due to earthquake damage sustained in 1989 but is now back in operation (Adams and Renteria, 1994). Quay lengths are as follows: Seventh Street Marine Containers Terminal — 592 m (1,942 ft) of marginal wharf; OHPCT — 274 m (900 ft) of marginal wharf; and Bay Bridge Terminal — 926 m (3,038 ft) of marginal wharf.

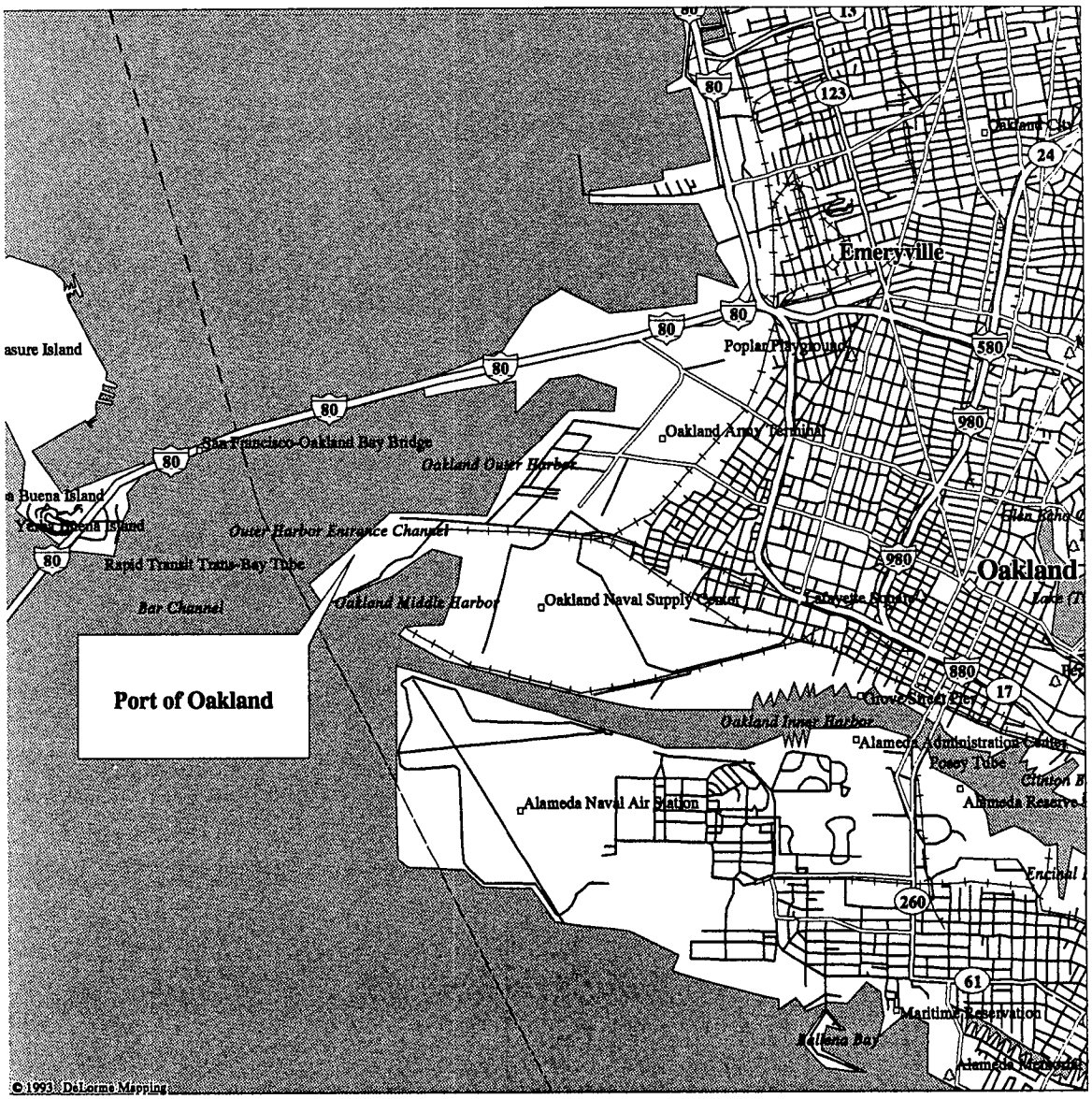


Figure D-46 Map of the Port of Oakland, CA

Crane capacities at Seventh Street Marine Containers Terminal include two 40.6 metric ton (45 ton) container cranes and one 30.5 metric ton (34 ton) container crane. Outer Harbor Public Container Terminal has crane capacity of two 40.6 metric ton (45 ton) container cranes (Jane's, 1992; AAPA, 1993).

Inner Harbor: The Charles Howard Terminal, Berths 67 - 69, has three container cranes, 19.8 ha (48.9 acres) of terminal area, and storage for over 3,000 20-ft equivalent units. Quay lengths at Charles Howard Terminal are as follows: two marginal wharves of 501 m each (1,642 ft) and one 173 m (568 ft) wharf. The Charles Howard Terminal has crane capacity consisting of two 40.6 metric ton (45 ton) container cranes and one 50.5 metric ton (56 ton) container crane (Jane's, 1992; AAPA, 1993).

Seventh Street Marine Containers Terminal, Outer Harbor Public Container Terminal, and Charles Howard Terminal have depths alongside at mean low water of 12.2 m (40 ft). Approach channels are currently limited to 10.6 m (35 ft). A dredging program to 12.8 m (42 ft) is scheduled for completion by 1995 (Jane's, 1992; AAPA, 1993).

Located just south of the Oakland Bay Bridge, the Port of Oakland has immediate access to Highway I-80 for shipments to Idaho National Engineering Laboratory and/or transcontinental shipments, and Highways I-580/I-5 for east coast shipments via the southern route I-40. The truck route from Seventh Street Marine Containers Terminal to the interstate appears to be almost entirely within the port complex in an area dedicated to cargo handling and shipping functions. The Port of Oakland is served by the Union Pacific, Southern Pacific, and Santa Fe Railroads (D&B, 1993). The port has an intermodal container transfer facility, but there does not appear to be direct rail service to container berths at the Seventh Street Marine Containers Terminal (Jane's, 1992; AAPA, 1993).

The Port of Oakland is served by many of the world's largest container lines, including American President Lines, Atlantic Container Lines, Australia-New Zealand Container Line, Cho Yang, DSR Senator Line, EAC Lines, Hanjin Shipping Co., Hapag-Lloyd, Hawaiian Marine, Hyundai, Italian Line, "K" Line, Maersk Lines, Matson Navigation Co., Mitsui OSK, Neptune Orient, NYK Lines, OOCL, Sea-Land Service, and Yang Ming Line (Jane's, 1992; AAPA, 1993; D&B, 1993). Four additional lines switched from San Francisco to Oakland in 1994 (Mitchell, 1994; Adams, 1994).

Other Pertinent Information: Security of the port is provided by perimeter fencing and unarmed guards from the International Longshoremen Union who maintain 24-hour patrol and surveillance (Adams, 1993; Adams and Renteria, 1994). Therefore, it is assumed that foreign research reactor spent nuclear fuel shippers using the port would have to provide their own security force.

The Port Commission has an active ban on the handling of spent nuclear fuel in recognition of community anti-nuclear sentiment which led to a citizens legislative initiative banning such shipments (subsequently struck down by a Federal court). The port handles radioactive and other hazardous materials shipments but officials did not know if Oakland has ever handled spent nuclear fuel shipments (Adams, 1993). The available data shows that Oakland has received spent nuclear fuel shipments, with the last shipment in 1988 (NRC, 1993).

Outer Harbor container and general cargo terminals are situated at the entrance to the port and there appears to be little or no conflict with other hazardous cargoes including petroleum products shipped through the port's breakbulk and liquid bulk terminals located within the Inner Harbor (Adams, 1993; Adams and Renteria, 1994).

Emergency response capability is the responsibility of the individual terminal operators. Each terminal operator must have an Emergency Contingency Plan approved by the Port Commission and the U.S. Coast Guard. The Oakland Fire Department has a hazardous materials response team, and the response time for

emergencies is about five minutes (Adams and Renteria, 1994). Beginning in November 1994, the port is increasing its emergency response capabilities. Financed by a new $50 million bond, the port is adding a new fire station, an Emergency Operations Center, new fire boats, a completely equipped hazardous materials van, and a fire-fighting bucket to be lifted in by helicopter. The port also has agreements with neighboring cities (Berkeley, San Leandro, and Alameda) for emergency response (Adams and Renteria, 1994). It is the responsibility of individual terminal organizations and/or the port to provide hazardous materials instruction to the longshoremen (Adams, 1993; Adams and Renteria, 1994).

The Seventh Street Marine Containers Terminal is located in the Outer Harbor terminal complex seaward of the downtown Oakland business district, in an area primarily dedicated to port industrial usage with excellent connections to highways and rail service. However, the port is located in a large urban area in which congestions are to be expected. The San Francisco Bay Area has had only 31 collisions, but 21 fires were reported during the period 1991 to 1993—the worst fire record for major West Coast ports (USCG, 1994b).

There are no known areas of special environmental concern; however, there is strong concern for preservation of the environment, and this area is prone to severe earthquakes. On April 18, 1906, the Bay area was subjected to one of the largest recorded earthquakes in the contiguous United States, a Modified Mercalli Intensity XI (Bolt, 1978), due to movement along the fault line separating the Pacific and Continental tectonic plates (Hamilton, 1976). The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Oakland, the Uniform Building Code requires buildings to withstand wind speeds up to 110 km/hr (70 mph). Since the port is located in a very high seismic zone (the highest Uniform Building Code ranking), buildings must be constructed to withstand an acceleration of 0.40 g.

The 1990 population within 16 km (10 mi) of the preferred port terminals was 1,387,611. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 1,080,000; Oak Ridge Reservation, 786,000; Idaho National Engineering Laboratory, 367,000; Hanford Site, 359,000; and Nevada Test Site, 482,000. Populations along rail routes to these sites are slightly larger for Savannah River Site, Hanford Site and Nevada Test Site, but slightly smaller for Oak Ridge Reservation and Idaho National Engineering Laboratory. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 4,490 km (2,791 mi); Oak Ridge Reservation, 4,120 km (2,563 mi); Idaho National Engineering Laboratory, 1,550 km (963 mi); Hanford Site, 1,410 km (875 mi); and Nevada Test Site, 1,160 km (719 mi). Distances along rail routes are slightly longer.

Environmental Conditions

The area around the terminal includes the San Francisco Bay to the south and the San Pablo Bay to the north. The Farallon Islands Game Refuge and the Point Reyes-Farallon Islands National Marine Sanctuary lie along the passageway to San Francisco. The San Francisco Bay National Wildlife Refuge and the Redwood Shores Ecological Reserve, both within the San Francisco Bay, are located 33 and 30 km south (20 and 18 mi), respectively from the Port of Oakland. The San Pablo Bay National Wildlife Refuge is located approximately 160 km (99 mi) north of the port.

San Francisco Bay

The Central Bay portion of the San Francisco Bay has several usage classifications, including industrial process supply, industrial service supply, navigation, water contact recreation, noncontact water recreation, ocean commercial and sport fishing, wildlife habitat, preservation of rare and endangered species, fish migration, fish spawning, shellfish harvesting, and estuarine habitat (State of California, 1986).

The San Francisco Bay comprises the largest estuarine ecosystem in California. The estuary encompasses a range of aquatic habitats, from the fresh and brackish waters of the Sacramento-San Joaquin River Delta to the saline waters of the Central and South Bay. The estuary provides habitat for a variety of aquatic species, some of which are important to commercial and recreational fisheries. These waters serve as a nursery area for marine, anadromous, and estuarine species, and provide a migration corridor for several anadromous species. Striped bass, Chinook salmon, steelhead trout, sturgeon, American shad, and English sole support important recreational fisheries in the estuary. Popular recreational fisheries in the Delta also include white catfish, largemouth bass, and sunfish (U.S. Army, 1994). In addition, the area around the port has populations of the common littlenecked clam, the soft-shelled clam, striped bass and flatfish, the California clapper rail, and the salt-marsh harvest mouse (FWS, 1981b).

Historically, marshlands bordering the Bay covered some 300 mi^2; diking for agriculture and filling for development has reduced the marshlands to about 75 mi^2 (U.S. Army, 1994). The marshes and mudflats remaining along the margins of the Bay are very productive and provide habitat for a large number of birds and other wildlife. For instance, the area around the port has populations of the California clapper rail and the salt-marsh harvest mouse (FWS, 1981b). The Bay is a key resting, feeding, and wintering area for birds on the Pacific Flyway. This area annually supports a large number of shorebirds, wintering waterfowl, raptors, seabirds, and passerines. Shorebirds, wading birds, waterfowl, seabirds, songbirds, and other species migrate through the entire coastal zone in the San Francisco area (FWS, 1981b).

Several threatened or endangered species are known to occur or have the potential to occur occasionally or periodically in the San Francisco Bay area. These species include the California least tern, California brown pelican, the American peregrine falcon, and the winter-run chinook salmon (U.S. Army, 1994). The least terns breed in California from mid-May to August and nesting colonies are located on open flat beaches, sand flats, and bare dirt areas with sparse vegetation. The least tern generally migrates from the Bay Area in August and winters south of the United States. The California brown pelican uses the open waters of the central San Francisco Bay for feeding; they roost on rocks, jetties, and piers in the area. Although no brown pelicans breed in the San Francisco area (Bay or offshore), thousands move north and roost on coastal rocks during the June through October nonbreeding season. Several thousand pelicans summer in the San Francisco area. The American peregrine falcon is considered rare in the region. It formerly bred on the Farallon Islands, and though it has yet to breed there again, winter residents have returned and have stabilized in number. The American peregrine falcon is most common to the San Francisco Bay area during the winter, when migrants from farther north concentrate in the estuary. The nesting season is from spring thorough early summer, and several pairs nested on the San Francisco-Oakland Bay Bridge (U.S. Army, 1994). California condors and bald eagles are also found in the coastal zone around San Francisco Bay (FWS, 1981b). The winter-run chinook salmon passes through the Sacramento-San Joaquin Delta, San Pablo Bay, and San Francisco Bay during their upstream and downstream migrations. The adults are present in the Bay area from November to May, and the smelts migrate through the Bay from November through May. The winter-run chinook is fished commercially in North America from Kotzebue Sound, Alaska, to Santa Barbara, California (U.S. Army, 1994).

Open Ocean

Several threatened or endangered species occur either occasionally or periodically in the ocean offshore of the San Francisco area. These include the humpback whale, the blue whale, the sperm whale, and the Stellar sea lion (U.S. Army, 1994). The humpback whale, which has a worldwide range, is typically found in the San Francisco area from March through January. Summer feeding occurs from the Aleutian Islands to the Farallon Islands. The greatest number of blue whales within the Farallon Basin occurs in summer and early fall. The sperm whale regularly occurs in the Gulf of the Farallones in deep oceanic waters, and is rarely reported over the shelf. The Stellar sea lion ranges from California to the Bering Sea. Stellar sea lions have rookeries on Southeast Farallon Islands (as well as other California and Pacific coast sites). The sea lion breeds in the late spring and summer.

Climatic Conditions

The Oakland, CA, area is classified as a marine climate, which is characterized by mild and moderately wet winters, with cool, dry summers. The winter rains, which occur between November and March, account for over 80 percent of the total annual precipitation. Additionally, severe winter storms, with gale-force winds and heavy rains do occur occasionally. The diurnal temperature range is moderated substantially by marine environment. The summer weather is dominated by a cool sea breeze circulation and a sea fog that arrives in the late evening over the area. The fog generally burns-off in the early morning hours, resulting in relatively sunny summer days (NOAA, 1993d).

D.2.2.16 Palm Beach, FL

The Port of Palm Beach is located 2.0 km (1.1 mi) west of the entrance to Lake North Worth Inlet, which consists of a dredged cut, protected by two jetties, through the barrier beach which forms the resort city of Palm Beach. The port borders the communities of Riviera Beach on the north and West Palm Beach on the south, the latter being connected to Palm Beach by highway bridges spanning Lake Worth. The Port of Palm Beach is 110 km (68 mi) north of Miami and 417 km (259 mi) south of Jacksonville. A Federal project provides for a 10.7 m (35 ft) deep entrance channel with a 10.1 m (33 ft) inner channel to a turning basin of the same depth. The 121.9 m (400 ft) wide entrance channel narrows to 91 m (300 ft) and leads into a 442 m by 399 m (1,450 ft by 1,310 ft) turning basin. Port Authority-owned Peanut Island is located between the inlet entrance and Port of Palm Beach terminals. According to the port's 1993 Annual Report, the controlling depth of the entrance and turning basin was 10.1 m (33 ft) to not less than 7.6 m mean low water (25 ft) at the northern terminal extension (POPB, 1994). A map of the port is shown in Figure D-47.

The Port of Palm Beach is a landlord port with 77 ha (190 acres) of land. The Terminal has two slips and four marginal wharves totalling 1,536 m (5,039 ft) of berthing, including six roll-on/roll-off ramps. Pilots limit the maximum size of ships entering the port to 192 m (630 ft) in length. Total tonnage for the fiscal year ending September 1993 was 3,694,034 metric tons (4,071,934 tons), including 158,172 20-ft equivalent units [(1,005,190 metric tons)(1,108021 tons)] of containerized cargo. The port owns one 228 metric ton (251 km) crawler crane, but containers are either handled by ship's gear or with local stevedoring equipment. Primary commodities handled are containerized general cargo, sugar, molasses, and fuel oil for two local power plants (POPB, 1994; AAPA, 1994; Mets, 1994).

Port of Palm Beach Berths 5-6, 7-11, and Berths 12-17 are operated as public terminals for container handling, general cargo, roll-on/roll-off, cruise lines, and heavy lift cargoes. Berths 5 and 6 have 10.1 m (33 ft) depth alongside and have rail service on the pier, which is owned and operated by the port

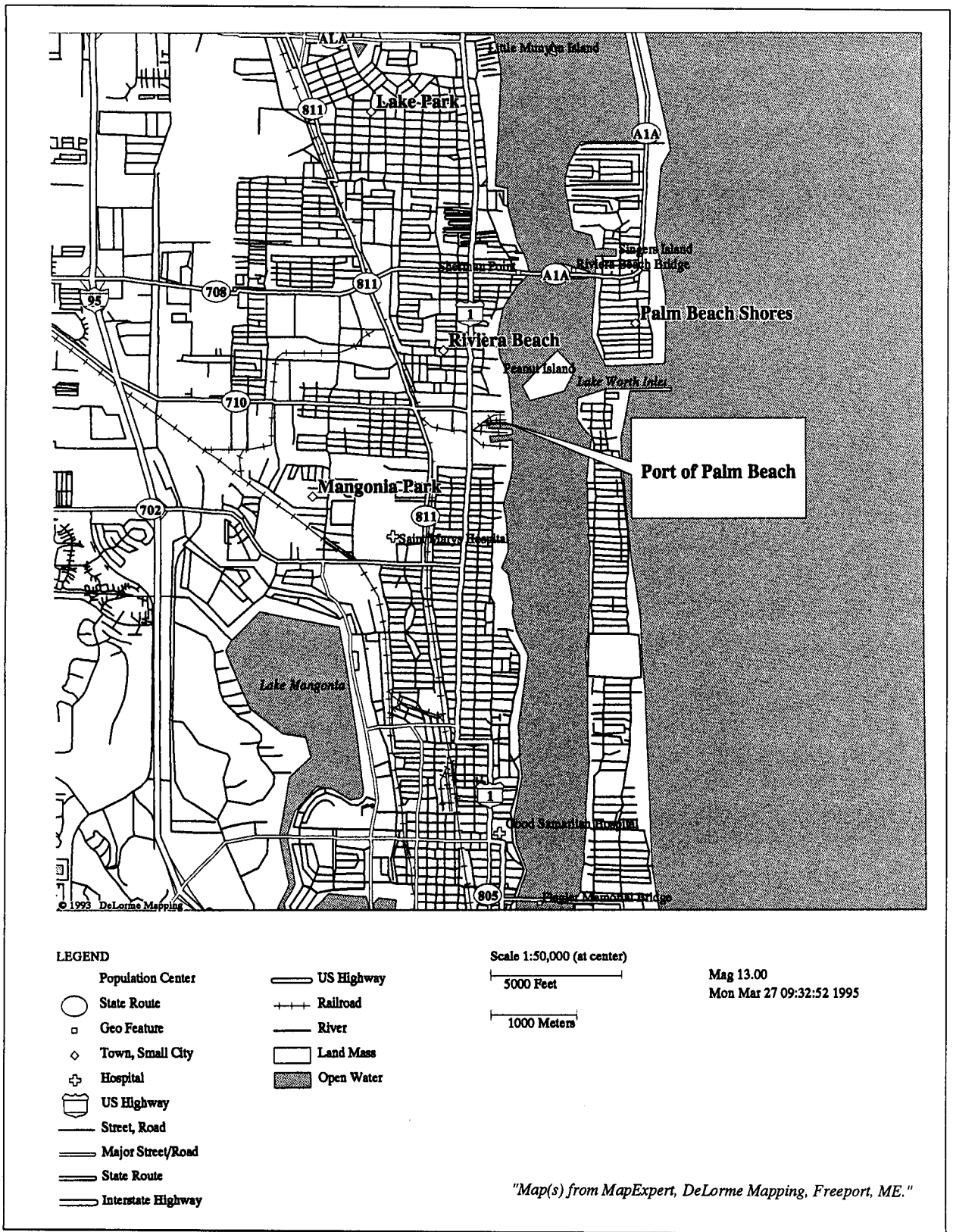


Figure D-47 Map of the Port of Palm Beach, FL

connecting with the Florida East Coast Railroad. The Port of Palm Beach is about 2.4 km (1.5 mi) from I-95 and 8.1 km (5 mi) from the entrance to the Florida Turnpike. The route is through light commercial and residential areas (AAPA, 1994).

Other Pertinent Port Information: Palm Beach has an around-the-clock watchman service, is fenced and lighted and has only one controlled entrance/exit. The port handles explosives and other hazardous goods and according to a port official, the port does not have a prohibition against handling spent nuclear fuel (Mets, 1994). As with other small, multi-use ports, there is some apparent conflict between the handling of petroleum products, cruise ship passengers, and spent nuclear fuel all within the confines of a relatively small, environmentally sensitive harbor complex.

The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Palm Beach, the Uniform Building Code requires buildings to withstand wind speeds up to 160 km/hr (100 mph). The port is located in a very low seismic zone with an acceleration of less than 0.075 g.

Negotiations for the sale of the port's Peanut Island, mentioned above, to the Florida Inland Navigation District are currently underway. Use of the island would be permanently limited to a partial dredge spoil area, as well as habitat preservation, and a passive recreation area (POPB, 1994; Mets, 1994).

The 1990 population of the combined port area (Riviera, Palm, and West Palm Beach) was approximately 115,000, and the average are density was about 650 persons/km^2 (1,600 persons/mi^2). The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are approximately (based on data for nearby Port Everglades): Savannah River Site, 240,000; Oak Ridge Reservation, 350,000; Idaho National Engineering Laboratory, 780,000; Hanford Site, 790,000; and Nevada Test Site, 800,000. Populations along rail routes to these sites are slightly larger. These populations are shown in Tables D-7 through D-16 in Section D.1. The distances to the five potential sites on interstate routes for nearby Port Everglades are approximately: Savannah River Site, 1,125 km (700 mi); Oak Ridge Reservation, 1,366 km (850 mi); Idaho National Engineering Laboratory, 4,501 km (2,800 mi); Hanford Site, 5,145 km (3,200 mi); and Nevada Test Site, 4,662 km (2,900 mi). Distances along rail routes are slightly longer.

Climatic and environmental conditions are similar to those reported for Port Everglades in Section D.2.2.18.

D.2.2.17 Philadelphia, PA

Philadelphia, one of the chief ports of the United States, is located at the junction of the Delaware and Schuylkill Rivers, approximately 130 km (81 mi) above the entrance to the Delaware Capes. Access to the port is via the Delaware River through the Delaware Bay. Situated directly across the Delaware River from Philadelphia is Camden, NJ, an important shipping center. The shipping activities of the two cities are closely allied; large quantities of general cargo are handled at the Philadelphia port in both domestic and foreign trade. Access to the port is gained via the Delaware Bay and Delaware River (DOC, 1993c). A map of the port (including Camden, NJ immediately opposite) is shown in Figure D-48.

The Delaware Bay has natural depths of 15.4 m (50 ft) or more for a distance of 8 km (5 mi) from the entrance. A Federal project provides depths of 12.2 m (40 ft) from the sea through the Delaware Bay and River to Philadelphia. There are restrictions on the passage through the Delaware Bay and up the Delaware River, such as a traffic separation scheme established off the entrance to the Delaware Bay.

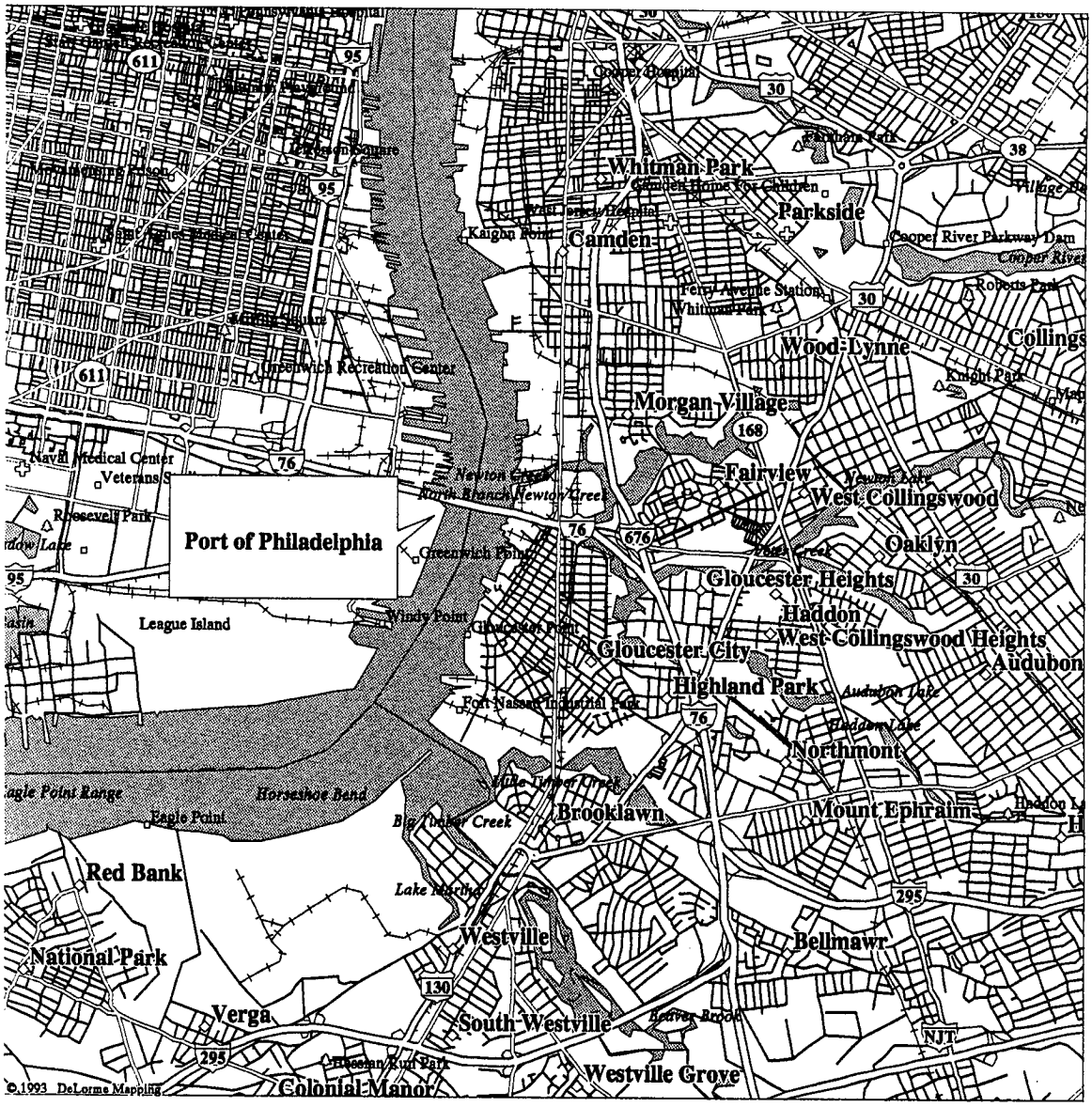


Figure D-48 Map of the Ports of Philadelphia, PA, and Camden, NJ

Ships going to Philadelphia must also pass under the Delaware Memorial Bridge. Roughly 90 percent of the 58,831,000 metric tons (64,849,000 tons) of cargo handled in 1991 were bulk cargo, and a large share of that is known to be crude oil and refinery products (DOC, 1993c; AAPA, 1993).

With the exception of some privately owned terminals, general cargo facilities (including container terminals on the west side of the Delaware River) are owned by the City of Philadelphia. Across the river on the New Jersey side, cargo terminals belong to the South Jersey Port Corporation, a state agency that operates two terminals and leases the remaining ones to private companies. The Philadelphia Regional Port Authority, apparent successor to the Philadelphia Port Corporation, is responsible for City-owned terminals leased to private companies under a landlord-type operation. The Delaware River Port Authority functions as a port planning and economic development division for the facilities controlled by the Philadelphia Regional Port Authority and the South Jersey Port Corporation.

The South Jersey Port Corporation operates two multi-berth terminals, Beckett Street and Broadway. These terminals primarily handle breakbulk general cargoes. Both breakbulk and containers (approximately 4,000 to 5,000 per year) are handled at the Beckett Street terminal during the winter (Castagnola, 1994). Beckett Street terminal has two container cranes, one with a 36.6 metric ton (40 ton) capacity and one with a 77.1 metric ton (85 ton) capacity (Castagnola, 1994). Pier 6, one of the Broadway Berths, is leased to a private company and is equipped with one 72.6 metric ton (80 ton) capacity multi-purpose container crane and one 40.6 metric ton (45 ton) container crane (Jane's, 1992; AAPA, 1993).

Principal container handling facilities owned by Philadelphia Regional Port Authority are the Packer Avenue Terminal, a combination breakbulk/container terminal, and Tioga Container Terminals. The former is located immediately downstream of the Walt Whitman Bridge at the south end of the City's waterfront. The Tioga Terminal is approximately 9.7 km (6 mi) further upstream. Both the Packer Avenue and Tioga Terminals have a depth alongside at mean low water of 12.2 m (40 ft) (Jane's, 1992; AAPA, 1993).

Packer Avenue Terminal: The Packer Terminal is equipped with two 45 metric ton (50 ton) container cranes and one 37.5 metric ton (41 ton) container crane, and has a paved open storage area of 23.5 ha (77 acres). The terminal has 1,184 m (3,885 ft) of marginal wharf (Jane's, 1992; AAPA, 1993).

Tioga Terminal: Tioga has 20.2 ha (50 acres) of paved open storage and is equipped with two 45 metric ton (50 ton) container cranes. The terminal has 796 m (2,612 ft) of marginal container berth; and a 185 m (610 ft) roll-on/roll-off berth.

Both the Packer Avenue and Tioga Terminals are relatively short distances from I-95, which parallels the River and is estimated to be within 0.8 km (0.5 mi) of the container terminals. The Packer Avenue Terminal is served by CSX and Conrail; CSX maintains an intermodal terminal just outside the terminal. On the other hand, the Tioga Terminal has Conrail intermodal service at the terminal. However, neither terminal has ship-side trackage (Jane's, 1992; AAPA, 1993).

A partial list of the diverse liner shipping companies serving these Delaware River terminals include: ABC Container Line, PACE, Atlantik Express Lines, Baltic Shipping Lines, Bangladesh Lines, Barber West Africa, Bottachi, Chilean Line, Colombus, Egyptian National Line, Ellerman, ELMA, Empremar Line, Euro Line, Frota Amazonica, Grandcolumbiana, Hapag-Lloyd, Hoegh, Hyundai, Independent Container Line, Maersk, Netumar, Pakistan National, Shipping Corp of India, SITRAM, Tokai, and Toko (Jane's, 1992).

Other Pertinent Information: The container terminals are fenced with controlled access and 24-hour security. It is not known what arrangements exist for temporary storage of hazardous materials, but it is likely such storage is available in a large port facility (Castagnola, 1993). Spokespersons for the South Jersey Port Corporation (Castagnola, 1993; formerly with the Philadelphia Regional Port Authority) and the Philadelphia Regional Port Authority (Menta, 1993) were unaware of any restrictions on handling spent nuclear fuel, but indicated this was outside their areas of expertise. There are several major oil refineries along the Delaware River below and west of the City of Philadelphia on the Schuylkill River. However, there does not appear to be any serious conflicts in close proximity to the Packer Avenue or Tioga Terminals.

The South Jersey Port Corporation relies on state hazardous materials agencies and the Camden Fire Department for emergency response to the terminals it operates. Private operators are responsible for their own terminals, but basically rely on the fire department. Being a landlord port operator, it is assumed Philadelphia Regional Port Authority terminal operators rely on the Philadelphia Fire Department to respond to hazardous materials incidents. It is not known if there is any hazardous materials training by the Philadelphia Regional Port Authority or the South Jersey Port Corporation (Castagnola, 1993). There are no known special environmental concerns. The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Philadelphia, the Uniform Building Code requires buildings to withstand wind speeds up to 120 km/hr (75 mph). The port is located in a low seismic zone with an acceleration of 0.075 g.

The Philadelphia and Camden waterfronts have become tourist centers due to historical sites and a new aquarium on the Camden waterfront. Veterans Stadium and the Spectrum are located in relatively close proximity to Packer Avenue, as are the Philadelphia Navy Yard and the Philadelphia International Airport.

All terminals in the Greater Philadelphia area are basically located in densely developed and populated industrial/commercial areas. The 1990 population within 16 km (10 mi) of the port terminals (including Camden, NJ) was 1,915,775. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 397,000; Oak Ridge Reservation, 335,000; Idaho National Engineering Laboratory, 513,000; Hanford Site, 622,000; and Nevada Test Site, 756,000. Populations along rail routes to these sites are much larger. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 1,190 km (741 mi); Oak Ridge Reservation, 1,090 km (680 mi); Idaho National Engineering Laboratory, 3,950 km (2,452 mi); Hanford Site, 4,610 km (2,868 mi); and Nevada Test Site, 4,220 km (2,623 mi). Distances along rail routes are slightly longer.

Environmental Conditions

The Delaware River at Philadelphia is classified as a low salinity estuarine (generally 0.5 to 5 ppt) and tidal freshwater habitat. Aquatic organisms typically found in the waters of this area include: American shad, Atlantic sturgeon, American eel, blueback herring, shad, alewife, white catfish, brown bullhead, perch, striped bass, bluegill, crappie, pumpkinseed, largemouth bass, carp, and chain pickerel (FWS, 1980f). In addition, the Delaware River is used as a migratory area by the shortnose sturgeon, a Federally listed endangered species. The U.S. Fish and Wildlife Service reported that except for occasional transient species, no federally listed or proposed threatened or endangered species are known to exist in the port's impact area (Perry, 1994).

The Port of Philadelphia is located within Zone 3 (tidal river) of the Delaware River. Protected water used for Zone 3, which encompasses River Mile (RM) 95-108.4, are water supply (agricultural, industry, and public), wildlife, resident fish maintenance, anadromous fish passage, secondary contact, and navigation (DRBC, 1994). However, several uses within Zone 3 are currently impacted, including: 1) fish and other aquatic life due to low dissolved oxygen levels from point source discharges; and 2) fish and shellfish consumption due to chlordane and polychlorinated biphenyl contamination from point and nonpoint source discharges.

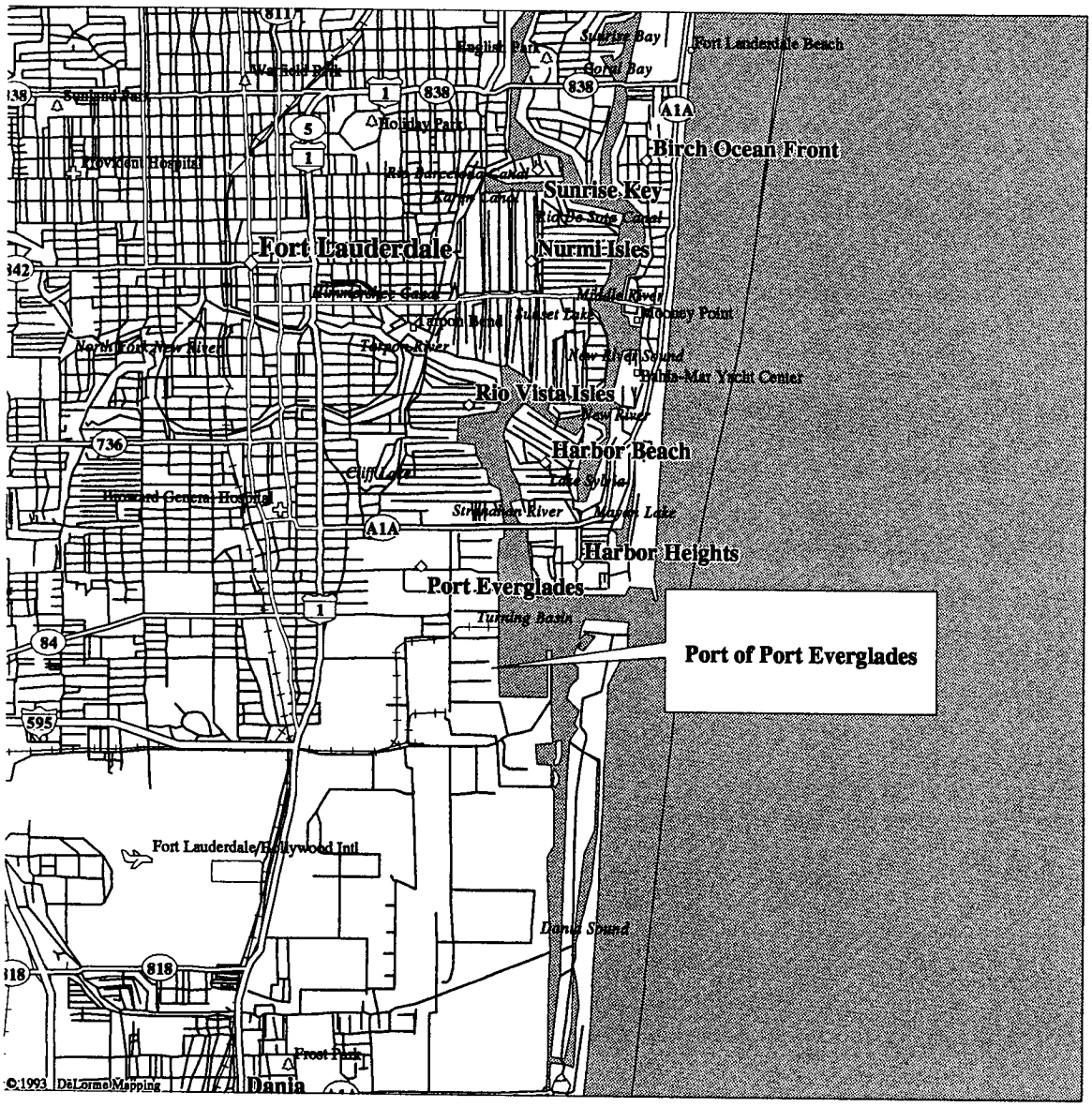
Climatic Conditions

The climate of Philadelphia is moderated by the Appalachian Mountains to the west and the Atlantic Ocean to the east. These geographic features cause periods of extreme temperatures to be short-lived in this region (generally, four days). On occasion during the summer months, the area is dominated by maritime tropical air masses, which contribute to elevated local temperature and humidity levels. The average annual precipitation (41.42 in) is relatively evenly distributed throughout the year, with maximum amounts occurring during the late summer months. The summer precipitation regime is dominated by localized thunderstorms and is subject to the influence of the urban heat island effect and local topography, which create varying rainfall amounts across the city for an individual event. Singular snowfall events that generate accumulated totals of greater than 10-in have a 5-year recurrence interval on average. The prevailing wind direction has a bimodal distribution, being southwesterly during summer and northwesterly in the winter months. The annualized average prevailing wind direction is from the west-southwest. Due to Philadelphia's inland location, destructive winds are comparatively rare from tropical cyclones and tornadoes. High winds are generally associated with frontal passages/low pressure systems in winter and thunderstorms in summer months. However, flooding on the Schuylkill River normally occurs twice annually usually associated with strong thunderstorms, with the duration of these events generally lasting less than 12 hrs. The Delaware River is rarely observed at or above flood stage (NOAA, 1992h).

D.2.2.18 Port Everglades, FL

Port Everglades is a major deepwater port located on Florida's southeast coast. It is located immediately off the Atlantic Ocean along the Inland Waterway, within the three cities of Hollywood, Fort Lauderdale, and Dania (DOC, 1993d; D&B, 1993; Southern Shipper, 1993). The major port facilities are immediately inside the harbor entrance, approximately 1.6 km (1 mi) from the south jetty. The approach to Port Everglades is open, and a relatively short 140 m (450 ft)-wide channel leads directly from the Atlantic Ocean to the port facilities. A Federal project provides for depths of 12.8 m (42 ft) to the main port facilities (DOC, 1993d; D&B, 1993; Jane's, 1992; Southern Shipper, 1993; AAPA, 1994; PEA, 1993).

Port Everglades consists of 850 ha (2,100 acres) of land, of which 360 ha (890 acres) are owned by the Port Everglades Authority Commission (Port Everglades Authority). Considerable foreign commerce passes through Port Everglades, in addition to substantial passenger traffic. Many of the world's large passenger vessels call at Port Everglades (it claims to be the world's second-busiest cruise port) (Southern Shipper, 1993). It is a multi-terminal port with more than 3,800 ship calls annually. The port handles over 2,000,000 cruise passengers as well as 17 million tons of cargo, including 1.4 million metric tons (1,600,000 tons) of containerized general cargo (over 100,000 20-ft equivalent units) and over 14 million metric tons (16,000,000 tons) of bulk cargoes (dry/liquid/scrap) in 1991 (FS, 1992). Port Everglades is also a liberty port for the U.S. and North Atlantic Treaty Organization Navies, and is host to facilities operated by the U. S. Naval Surface Warfare Center in Fort Lauderdale. The port is also bordered on the east by a large State Park and seashore recreation area. A map of the port is shown in Figure D-49.



LEGEND

- Population Center
- State Route
- Geo Feature
- Town, Small City
- Large City
- Hospital
- US Highway
- Hwy Ramps
- Street, Road
- Major Street/Road
- State Route
- Interstate Highway
- US Highway
- Railroad
- River
- Land Mass
- Open Water

Scale 1:50,000 (at center)

5000 Feet

1000 Meters

Mag 13.00
Mon Mar 27 09:36:24 1995

"Map(s) from MapExpert, DeLorme Mapping, Freeport, ME."

Figure D-49 Map of Port Everglades, FL

The Port Everglades Authority is empowered by the State Legislature to act as the governing entity for the operations, maintenance, and management of port and harbor facilities located within the port's jurisdictional area. The Authority is the governing body responsible for strategic planning and policy setting. In November 1994, governing responsibility for the seaport was transferred to the Broward County Government (PEA, 1993).

Principal container handling facilities at the port include Midport and Southport (there is also a Northport terminal as well).

Midport: Midport has three berths (16, 17, and 18), with three container cranes and 17.8 ha (44 acres) of open storage, and is located just inside the harbor entrance. The berths have a total of 502 m (1,650 ft) of marginal wharf area and depths of 11.6 m (38 ft) alongside at mean low water. Crane capacities at Midport consist of one 50.8 metric ton (56 ton) container crane and two 30.5 metric ton (34 ton) container cranes. Access to Midport is via Port Road, Highway 84, which intersects with U.S. 1, I-95, and all major interstate highways. Highway access appears to be exclusively through port property and/or adjacent industrial-use land. Port-owned trackage is leased to the Florida East Coast Railroad, which maintains an intermodal container yard 1.6 km (1 mi) outside the port on State Road 84. There is trackage to Berth 4, but there does not appear to be any rail lines presently serving the container terminals. There are two roll-on/roll-off ramps at Midport (Jane's, 1992; D&B, 1993; Southern Shipper, 1993; AAPA, 1993 and 1994; PEA, 1993).

Southport: Southport is a new 62.7 ha (155 acre) container/roll-on/roll-off complex at the southern end of Port Everglades Harbor. Southport consists of Berths 31 and 32 with a combined 610 m (2,000 ft) of marginal wharf. Berths 30-33C at Southport have depths of 13.4 m (44 ft) alongside at mean low water. Crane capacities for the berths at Southport include three 40.6 metric ton (45 ton) Post-Panamax container cranes. Access to Southport is via the new Port Everglades Expressway (I-595), which begins just outside the Terminal and connects with I-95, the Florida Turnpike, I-75, and State Highway 84, the cross-Florida Everglades Expressway. Highway access appears to be exclusively through port property and/or adjacent industrial-use land. Southport has a 25.5 ha (63 acre) container yard with storage for up to 5,100 containers on chassis or up to 7,872 grounded and stacked 20-ft equivalent units. There are three roll-on/roll-off ramps at Southport, and an additional three ramps are located at Northport.

Port Everglades is served by over a dozen container and breakbulk Liner Shipping Companies offering sailings to major ports of the world, including South and Central America, Caribbean Islands, North Europe, the United Kingdom, Scandinavia, Spain, the Mediterranean, and the Mid-East. Ship lines include Arawak Caribbean Line, Atlantic Cargo Service, Crowley American Transport, Nedlloyd, Inc., P & O Containers, Ltd., Sea-Land Service, Inc., Tecmarine Lines, and Orient Overseas Container Line.

Other Pertinent Information: Twenty-four-hour security is provided by the Broward Sheriff's Office (BSO). All terminal and container facilities are secured with fencing and controlled gates. The port also has its own 65-member Public Safety Department (fire department), fire fighting equipment and vehicles, and a fireboat for first response to hazardous materials incidents. It is backed up by fire departments from Fort Lauderdale and Hollywood, and Broward County's hazardous materials team. Terminal operators are responsible for their own emergency response arrangements. The Public Safety Department basically functions as an emergency coordinating group. Hazardous materials training is carried out by the municipal agencies responsible for emergency response within the port area. It is not known if the Port Authority itself conducts any training. There appears to be ample space at Southport for temporary storage of hazardous cargoes.

There are no known restrictions to the handling of spent nuclear fuel. However, Item 240 of the Port Everglades Authority Tariff states that explosives, hazardous, or highly flammable commodities or materials may only be handled through special arrangement with the Port Authority. Port Officials indicate that their safety policies, which ban oxidizers such as ammonium nitrate and Class A explosives, would also preclude shipments of spent nuclear fuel. As far as is known, spent nuclear fuel shipments have not been handled by the port (Flint et al., 1993).

Port Everglades is the second-largest petroleum distribution facility in the United States (Southern Shipper, 1993). Major oil companies have more than 86 million barrels of tank space for refined petroleum products inshore of the Midport and Northport terminals. With the possible exception of terminal facilities at Southport, which are remote from the tank farms and other conflicting port users, the potential for conflict between cruise ship operations, tanker traffic, and containerized spent nuclear fuel shipments appears to be great.

Southport Terminal is the preferred terminal, as it is relatively remote from the City of Fort Lauderdale, has direct connection to the Interstate Highway system, and is located in a nonresidential port industrial district. The physical layout and constraints of port waterways, however, combined with its intense use by potentially conflicting types of transport (i.e., cruise ships, tankers and tank barges, container and breakbulk vessels, and recreational traffic, plus a State seashore park on its eastern boundary) detracts from its otherwise superb facilities.

The port is subject to severe hurricanes and tropical storms. The likelihood of severe natural phenomena such as high winds and earthquakes is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For Port of Everglades, the Uniform Building Code requires buildings to withstand wind speeds up to 150 km/hr (95 mph). Port Everglades is located in a very low seismic zone with an acceleration of 0.075 g.

The 1990 population within 16 km (10 mi) of the port terminals was 714,176. The affected populations within 0.8 km (0.5 m) of the interstate routes to the 5 potential DOE management sites are: Savannah River Site, 244,000; Oak Ridge Reservation, 352,000; Idaho National Engineering Laboratory, 754,000; Hanford Site, 803,000; and Nevada Test Site, 817,000. Populations along rail routes to these sites are slightly larger. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 1,170 km (726 mi); Oak Ridge Reservation, 1,420 km (884 mi); Idaho National Engineering Laboratory, 4,540 km (2,820 mi); Hanford Site, 5,210 km (3,236 mi); and Nevada Test Site, 4,700 km (2,923 mi). Distances along rail routes are slightly longer.

Environmental Conditions

The State of Florida has classified the waters surrounding Port Everglades as Class III. This classification indicates that the waters are suitable for recreation, and propagation and maintenance of a healthy, well balanced population of fish and wildlife (FL DEP, 1994). As previously noted, Outstanding Florida Waters are generally waters located within national parks, state parks, national seashores, marine sanctuaries, or aquatic preserves. Waters located near Port Everglades designated as Outstanding Florida Waters include the waters within the John U. Lloyd Beach State Recreation Area, West Lake, Snake Warrior Island, North Beach, and the Hugh Taylor Birch State Recreation Area (FL DEP, 1994). These waterways are afforded special protection by the State environmental regulations.

The waters surrounding Port Everglades are characterized as high salinity estuarine habitats (generally greater than 20 parts per thousand). Aquatic species of interest in the vicinity of Port Everglades include: crabs, shrimp, lobster, seatrout, croaker, tarpon, sheepshead, spot, kingfish, drum, silver perch, bluefish, mullet, pompano, pinfish, pigfish, Crevalle jack, grunt, ladyfish, permit, grouper, snapper, jewfish, snook, striped mojarra, and Atlantic bottlenose dolphin (FWS, 1982b).

The John U. Lloyd Beach State Recreation Area is located approximately 4 km (2.5 mi) south of Port Everglades. Additional special land use areas located near Port Everglades are Everglades Wildlife Management Area and Hugh Taylor Birch State Recreation Area. Protected animal species in the Port Everglades vicinity include: the West Indian manatee, loggerhead sea turtle, green sea turtle, and the least tern. Protected plant species in the area are the coontis, sea lavender, and the silver palm (FWS, 1982b).

Port Everglades has several ongoing environmental programs, including the creation of a Manatee Refuge and "Nursery" area within the confines of the port, a wetlands program, and a 22.3 ha (55 acre) permanent mangrove forest and manatee reserve deeded to the Florida Department of Environmental Regulation. The port was awarded the 1991 National American Association of Port Authorities Environmental Award of Excellence (PEA, 1993). The U.S. Fish and Wildlife Service reported that the Port Everglades Midport Terminal is located in designated critical habitat for the manatee (Johnson, 1995).

Climatic Conditions

The climate of this region is essentially subtropical marine, featuring long, warm summers with abundant rainfall, generally followed by a mild, dry winter. The influence of the ocean is seen in the small diurnal temperature range (generally less than 10 degrees) and the rapid warming of any cold air masses that invade this portion of the State. The predominant windflow is from the east-southeast, which generates conditions right at the coast that are often different than those encountered further inland, due to land-induced frictional effects. Hurricanes occasionally affect the area, with the months of September and October exhibiting the highest frequencies. However, destructive tornadoes (not associated with tropical systems) are rare. Waterspouts are frequently spotted offshore during the summer months, but rarely cause any loss of life or property damage (NOAA, 1993b).

D.2.2.19 Richmond, VA

The Port of Richmond Terminal is located on the left ascending bank of the James River, approximately 140 km (89 mi) above the City of Newport News. The port is owned by the City of Richmond and operated by Mecham Overseas Terminal, Ltd. A map of the port is provided in Figure D-50.

Drafts of vessels using the river above Newport News generally do not exceed 4.5 m (15 ft). Vessels drawing more than 7.5 m (24 ft) do navigate it occasionally, but the Virginia Pilots Association restricts ship drafts to 6.7 m (22 ft). A Federal Project provides for dredging depths of 7.6 m (25 ft) to the Richmond Terminals. Numerous stakes, pilings, wrecks and other obstructions are on both sides of the main channel. Travel on the upper river is restricted to daytime hours for ships more than 77.7 m (255 ft) in length (DOC, 1993c). For FY 1993-94, the Terminal handled a total of 445,700 metric tons (491,300 tons) including 313,540 metric tons (345,620 tons) of containerized cargoes (41,286 20-ft equivalent units), and 114,890 metric tons of breakbulk freight (AAPA, 1994; PORT, 1994). Major shipping lines connect the port with the Mediterranean, North Europe, South America, the Middle East, and India (PORT, 1994).

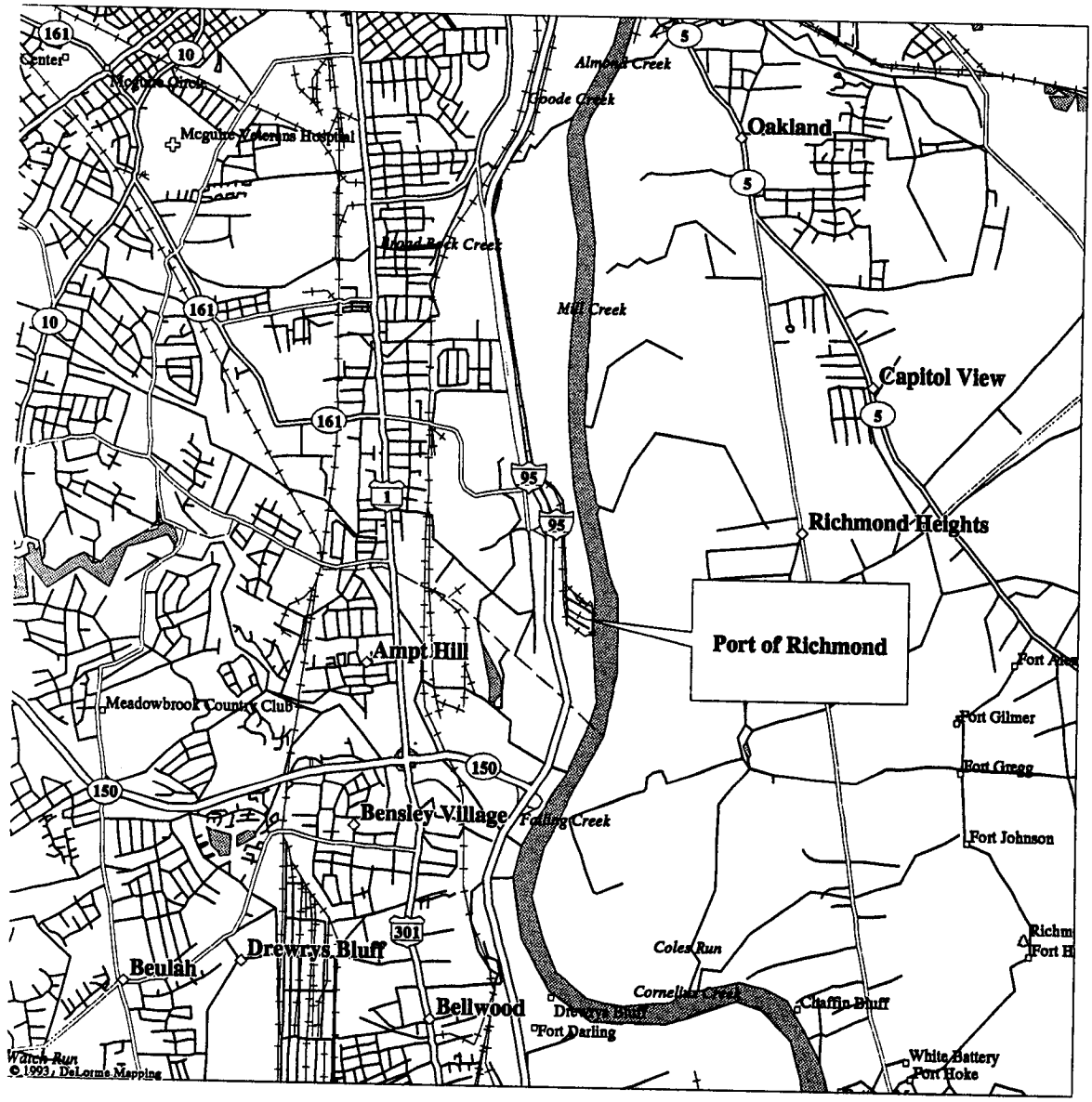


Figure D-50 Map of the Port of Richmond, VA

Richmond Terminal has two marginal berths with a total length of 381 m (1,250 ft) and 7.6 m (25 ft) of water alongside at mean low water. CSX Railroad tracks with multiple sidings serve the port's two warehouses and container storage yards. The Terminal is a container, general cargo, and breakbulk handling facility with roll-on/roll-off vessel and container and trailer on flatcar capabilities. The port has two 209 metric ton (230 ton) and one 319 metric ton (350 ton) capacity crawler cranes outfitted with 22.9 m (75 ft) booms. A new 273 metric ton (300 ton) crane was purchased in April 1994 and set a new accident-free container handling record of 20.43 20-ft equivalent units/hr (PORT, 1994).

The port is about 1.6 km (1 mi) from highway I-95 with travel through an industrial area. It is also served by a trunk railway.

Other Pertinent Port Information: The Port of Richmond has only one entrance which is controlled by a Pinkerton Guard on a 24-hour basis.

The Port of Richmond Terminal is in the midst of an $8-10 million expansion program involving a 96 m (315 ft) wharf extension, new gate entrance and maintenance building, plus upgraded container storage areas (PORT, 1994).

The likelihood of severe natural phenomena such as high winds and earthquakes are reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Richmond, the Uniform Building Code requires buildings to withstand wind speeds up to 120 km/hr (75 mph). The port is located in a low seismic zone with an acceleration of 0.075 g.

The 1990 Census city population was approximately 203,000 and the population density was about 1,304 per km^2 (3,376 per mi^2). The distances to the five management sites on interstate routes are: Savannah River Site, 732 km (455 mi); Oak Ridge Reservation, 784 km (487 mi); Idaho National Engineering Laboratory, 3,900 km (2,426 mi); Hanford Site, 4,570 km (2,842 mi); and Nevada Test Site, 4,070 km (2,529 mi). Distances along rail routes are slightly longer.

Climatic Conditions

Richmond's climate might be classified as modified continental. Summers are warm and humid and winters generally mild. The mountains to the west act as a partial barrier to outbreaks of cold, continental air in winter, the coldest air being delayed long enough to be modified, then further warmed as it subsides in its approach to Richmond. The open waters of the Chesapeake Bay and Atlantic Ocean contribute to the humid summers and mild winters. The coldest weather normally occurs in later December and in January, when low temperatures usually average in the upper twenties and the high temperatures in the upper forties. Temperatures seldom lower to zero.

Precipitation is rather uniformly distributed throughout the year. However, dry periods lasting several weeks do occur, especially in autumn when long periods of pleasant, mild weather are most common. There is considerable variability in total monthly amounts from year to year so that no one month can be depended upon to be normal. Snow has been recorded during seven of the 12 months. Snowfalls of 10 cm (4 in) or more occur on an average of once a year. Snow usually remains on the ground only one or two days at a time. Ice storms (freezing rain or glaze) are not uncommon in winter, but they are seldom severe enough to do any considerable damage. The James River reaches tidewater at Richmond, where flooding has occurred in every month of the year, most frequently in March (28 times in the past 61 years), and only twice in July. Hurricanes and less severe storms of tropical origin have been responsible for most of the

flooding during the summer and early fall. Damaging storms occur mainly from snow and freezing rain in winter, and from hurricanes, tornadoes, and severe thunderstorms in other seasons. Damage may be from wind, flooding, or rain, or from any combination of these (DOC, 1993c).

D.2.2.20 San Francisco, CA

San Francisco, CA, occupies the north portion of the peninsula forming the south entrance to San Francisco Bay. The Port of San Francisco, one of the largest ports on the bay, is the oldest and one of the most important on the Pacific Coast (DOC, 1992b).

San Francisco is a deepwater port stretching approximately 12 km (7.5 mi) along the southern and western shore of the San Francisco Bay. The approach to San Francisco and down the east side of San Francisco is open; however, there are restricted navigational areas. There is also considerable traffic in the bay area, and there is a traffic separation scheme under U.S. Coast Guard traffic control (Mitchell, 1994). Depths of 13.7 m (45 ft), or more, are available from the Golden Gate Bridge to most of the anchorages. Depths up to 12.2 m (40 ft) are available to most piers, including those at the container facilities in the vicinity of Islais Creek. The wide passage from the ocean to San Francisco Bay is reduced to approximately 1.13 km (0.7 mi) at the Golden Gate Bridge pier. The distance from the Golden Gate Bridge to the entrance of facilities near Islais Creek is approximately 19 km (12 mi)(DOC, 1992b). A map of the port is shown in Figure D-51.

The Port of San Francisco is under the control of the City and County of San Francisco, to which it was transferred by the State in 1969. The "authority" reports to an appointed board of Harbor Commissioners. The port is a multi-terminal, multi-function harbor complex that the Authority operates as a Landlord owner. Services of the port range from cargo handling along the southern waterfront to ferry terminals and tourism services — including a cruise ship terminal, ferry plaza, Embarcadero, excursion boat terminals, Fisherman's Wharf, and aquatic park located on the central, northern, and western sides of the port (POSF, 1993).

Principal container handling facilities are located at North Terminal (Pier 80), operated by Metropolitan Stevedore Co., and South Terminal (Piers 94-96) operated by Stevedoring Services of America. Breakbulk general cargo is handled at Piers 27 - 29 in the northern Embarcadero section of the city. Total tonnage handled in calendar year 1991 amounted to 5,994,000 metric tons (6,607,200 tons) and included 223,676 20-ft equivalent units of containerized cargo (AAPA, 1993). With the 1994 loss of four major container lines to Oakland and the closing of the Naval Supply Center, the Port's Chief Wharfinger expected container traffic for the year to drop to about 50,000 20-ft equivalent units (Mitchell, 1994).

South Container Terminal: This terminal has a total area of 30.6 ha (75.6 acres), one container freight station, and four gantry-type container cranes. Dock/quay lengths for cargo ships at South Terminal are three berths totalling 747 m (2,450 ft) in length. Depths alongside dock/quay are 12.19 m (40 ft) at mean low water. North Terminal has three 40.6 metric ton (45 ton) rail-mounted container cranes and two 30.5 metric ton (34 ton) rail-mounted container cranes (Jane's, 1992; AAPA, 1993).

North Container Terminal: This terminal has a square-shaped, finger-type pier comprised of 27.74 ha (68.6 acres), of which 13 ha (32.1 acres) are laid out for container operations. This terminal has five container cranes and its own CFS. Dock/Quay lengths for cargo ships at this terminal are four berths at a total length of 1,552 m (5,092 ft). Depths alongside dock/quay are 12.2 m (40 ft) at mean low water. Crane capacities at South Terminal include four 30.5 metric ton (34 ton) rail-mounted container cranes (Jane's, 1992; AAPA, 1993; Mitchell, 1994).

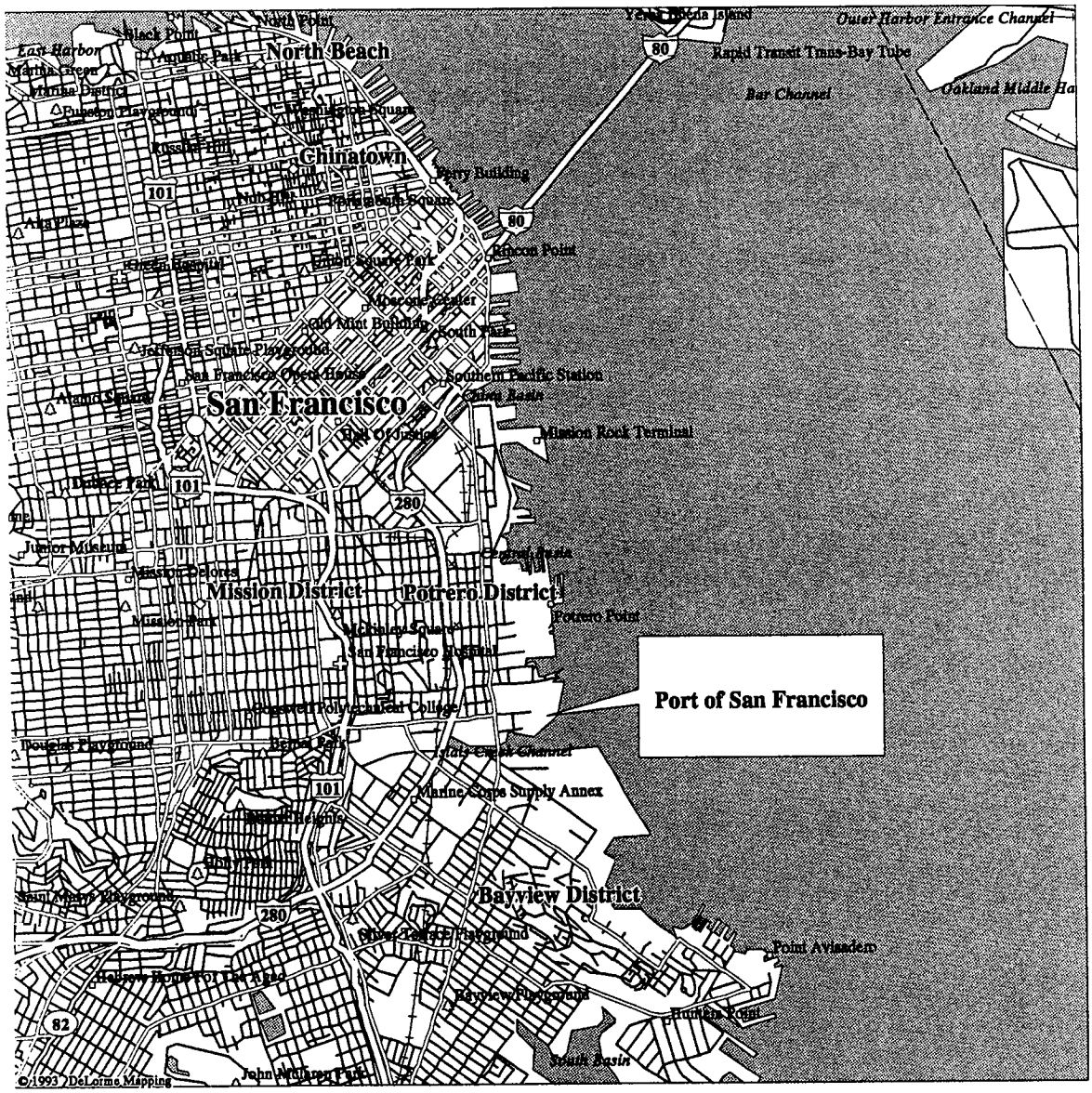


Figure D-51 Map of the Port of San Francisco, CA

Truck access to the container terminals is via Cargo Way and Third Street. Cargo Way connects South Terminal Piers 94 - 96 with 3rd Street. Entrance to the North Container Terminal (Pier 80) is at the intersection of 3rd Street and Army Street, which connects with I-280 and U.S. Highway 101 about 0.8 km (0.5 mi) from the entrance and about 1.6 km (1 mi) from the entrance to the South Container Terminal. These highways link up with the San Francisco/Oakland Bay Bridge (I-80) — the assumed route to Idaho National Engineering Laboratory and/or points east— which is roughly 1.6 to 2.4 km (1 to 1.5 mi) away. The Southern Pacific Railway serves both the North and South Container Terminals, and the Union Pacific also has tracks to the North Terminal's Pier 80. Trackage at South Terminal extends shipside parallel to the berth. Adjacent to the South Container Terminal is a 14.6 ha (36 acre) intermodal container transfer facility (Jane's, 1993; AAPA, 1993).

San Francisco has been served by a number of major container carriers. Lines calling at South Terminal include Grancolombiana and Evergreen. Liner companies using North Terminal include Blue Star Line, Central American Container Line, CSAV (Chilean Line), ELMA, Nedlloyd, NSCP, South Seas Shipping, and Splosna Plovba (Jane's, 1992; AAPA, 1993). However, in 1994, four of its five major container lines moved to Oakland (Adams, 1994; Mitchell, 1994).

Other Pertinent Information: Terminal security is the responsibility of the respective terminal operating companies. Facilities are fenced with controlled access and are patrolled by watchmen supplied by the International Longshoremen Workers Union. There are also City police officers permanently assigned for general port security (Mitchell, 1994). There are places within the container terminals for temporary segregation and storage of hazardous materials (Mitchell, 1993).

There are no regulations prohibiting the handling of containerized spent nuclear fuel. The port handles hazardous cargoes but, as far as known, has not handled spent nuclear fuel. The port allows Class A and B explosives in small amounts only (Mitchell, 1994).

All of San Francisco's marine terminals are located within the densely populated downtown area of the city and the large tourist population. Although there appears to be conflicting use of the Port of San Francisco's marine facilities (primarily attributable to its tourism business, much of which is centered to the north and west of the port's two container terminals) it is not deemed a major consideration. Terminal operators are responsible for accidents within their respective facilities. The Port Authority relies on the City of San Francisco's Fire Department hazardous materials team and the Coast Guard in case of an emergency. The City of San Francisco has a special Engine Company for responding to fires and other dangerous situations within port facilities, with about a five minute response time (Mitchell, 1993 and 1994). The Pacific Maritime Association handles hazardous materials instruction and training, and has just begun a program at the port (Mitchell, 1993). It is noted that U.S. Coast Guard statistics indicate that terminals in the San Francisco Bay have had only 31 reported collisions reported but an unusually high number of fires in recent years (21 fires reported between 1991 and 1993; the worst three-year fire record for major ports on the West Coast) (USCG, 1994b).

There are no known protected habitats or sanctuaries immediately near the terminals that might be affected by an accident in port. However, the predisposition of the City to severe earthquakes, and the high sensitivity of this area to protecting and maintaining environmental quality is considered a basis for concern. The city rests on the edge of the Pacific tectonic plate, while the opposite side of the Bay sits on the Continental plate. This results in the entire Bay area being a highly seismic zone. On April 18, 1906, San Francisco was the site of one of the largest recorded earthquakes in the contiguous United States, a Modified Mercalli Intensity XI (Bolt, 1978) due to movement along the fault line separating the two tectonic plates. The Uniform Building Code requires construction to withstand earthquakes and other severe natural phenomena (UBC, 1991). The Uniform Building Code requires construction for an

acceleration of 0.40 g, the highest seismic ranking in the United States. High winds have not been a problem for the Bay, with a Uniform Building Code minimum basic wind speeds up to 140 km/hr [70 miles per hour (mph)].

The climatic and environmental conditions of the Port of San Francisco are the same as those reported for the Port of Oakland in Section D.2.2.15.

The 1990 population within 16 km (10 mi) of the port terminals was 1,265,529. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 1,060,000; Oak Ridge Reservation, 766,000; Idaho National Engineering Laboratory, 348,000; Hanford Site, 339,000; and Nevada Test Site, 461,000. Populations along rail routes to these sites are slightly larger. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 4,570 km (2,803 mi); Oak Ridge Reservation, 4,130 m (2,567 mi); Idaho National Engineering Laboratory, 1,560 m (970 mi); Hanford Site, 1,420 km (882 mi); and Nevada Test Site, 1,160 km (722 mi). Distances along rail routes are slightly longer.

D.2.2.21 Seattle, WA

The Port of Seattle, WA, is located 230 km (143 mi) from the confluence of the Strait of Juan de Fuca and the Pacific Ocean. Seattle is located on Elliott Bay on the eastern shore of the Puget Sound, about 93 km (50 mi) south of the Strait of Juan de Fuca and about 5 km (3 mi) from the Sound. It is the largest and most important city in the Northwest, and one of the major ports on the Pacific Coast. Access from the Pacific Ocean is gained through the Strait of Juan de Fuca and Puget Sound. The transit from the Pacific Ocean to Seattle is open and considered relatively easy, with very deep waters during the entire approach to Seattle (DOC, 1992b). A map of the port is shown in Figure D-52.

The Port of Seattle is a large, diversified, multi-terminal port. Overall container tonnage for 1992 amounted to 7,510,000 metric tons (8,278,300 tons) and 1,155,000 20-ft equivalent units. It is managed by the Managing Director of the Marine Division and staff. Its facilities are municipally owned and leased to tenants (i.e., the Port Authority operates as a Landlord owner) (POS, 1994).

The port has five container terminals, of which two, Terminals 5 and 18, are considered public facilities:

Terminal 5: T5 is located on the West Waterway and is leased to and operated by American President Lines. Terminal 5 has a total area of 36 ha (89 acres), of which 24 ha (59 acres) can be used for container handling and storage. It has three container berths (Berths 4, 5, and 6), is equipped with six 50.8 metric ton (56 ton) Post-Panamax container cranes, and has two container freight stations. Terminal 5 has 760 m (2,500 ft) of marginal wharf, with 12.19 m (40 ft) of water alongside at mean low water. The terminal has good access to Interstate 5; about 3.8 km (2.4 mi) from the ramp to I-5 following a route entirely within the port's industrial district via North Marginal Way and West Seattle Freeway to South Spokane Street. I-5 is the principal north/south roadway linking Seattle with I-84 at Portland, OR (the assumed preferred, year-around route to Idaho National Engineering Laboratory) and/or I-90/82, which also links up with I-84 near Pendleton, OR. Terminal 5 is served by the Burlington Northern Railroad, whose tracks are located at the rear of the Terminal. The port is considering a proposal to provide Union Pacific service (Benham et al., 1994). Terminal 5 is served by major container lines including APL, OOCL, Star Shipping, and Westwood Shipping (Jane's, 1992; AAPA, 1993; D&B, 1993).

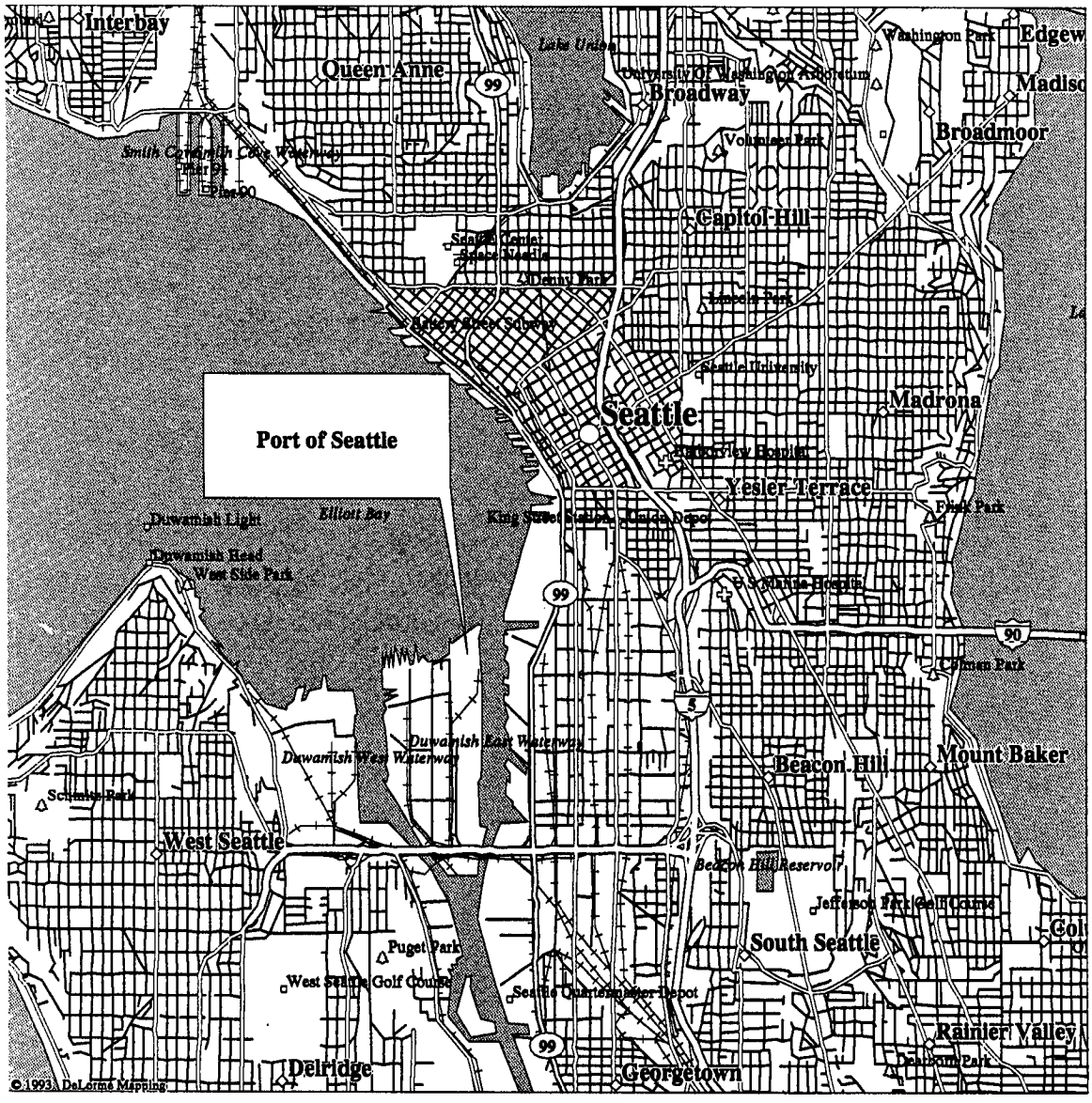


Figure D-52 Map of the Port of Seattle, WA

Terminal 18: T18 is located on the East Waterway (Berths 1 - 4, and 5 - 8), is operated by Stevedoring Services of America, and has a total area of 47 ha (116 acres) devoted to container handling and storage. It is also equipped with six, 40.6 metric ton (45 ton) container cranes and container freight stations. Terminal 18 has 1,844 m (6,049 ft) of marginal wharf, with 15.24 m (50 ft) of water alongside at mean low water. The terminal also has good access to Interstate 5; about 2.9 km (1.8 mi) from the ramp to I-5 following a route that is also entirely within the port's industrial district via South Spokane Street. Terminal 18 is also served by the Burlington Northern as well as the Union Pacific railroads via tracks along the wharf apron (i.e., ship-side).

Terminal 18 is served by several major container lines, including Barber Blue Sea, Grancolombiana Line, COSCO, d'Amico Line, Japan Line, Hyundai, Scindia Line, Chilean Line, ACL/CGM, and P&O Container Line (Jane's, 1992; AAPA, 1993; D&B, 1993; Benham et al., 1994).

Other Pertinent Information: There are potentially conflicting activities near the Terminal; petroleum products are pumped ashore at Terminal 5 (Berths 4 and 5), and across the East Waterway at Terminal 18 (Berths 2 and 3). The terminals are fenced with controlled access and guarded by watchmen on a 24-hour basis. There are areas within the container terminals for segregating hazardous materials cargoes.

The port's Emergency Response Plan relies on the City of Seattle Fire Department for hazardous materials response, with a technical support team including spent nuclear fuel handling experts from the DOE Hanford Site hazardous materials training for port workers is the responsibility of the individual terminal operators (Benham and Schuler, 1993; Benham et al., 1994). As noted in the accident information for Tacoma, the overall ship accident rates in the Puget Sound for the 1991-1993 reporting period are relatively low (USCG, 1994b).

Seattle's container terminals are somewhat separated from the City, which is generally north-east of the terminals. As already noted, these terminals have good access to Interstate highways without passing through congested city streets. However, T5 and T18 are both relatively close to some residential areas in West Seattle.

According to Mr. Schuler, Port Safety Officer, a port Commission resolution banning spent nuclear fuel shipments from the Port of Seattle has been in place for 3 or 4 years (Benham and Schuler, 1993). Reportedly, the Commissioners felt the Federal government was unresponsive to their requests for information concerning material being shipped and decided to ban further spent nuclear fuel shipment. As a result, the port no longer handles spent nuclear fuel and does not want it passing through its facilities. Since discussing this issue with the port safety official, DOE was informed that the Seattle City Council passed a resolution on December 8, 1993, which states the City's position that "high-level nuclear wastes should not be moved through Seattle or the Puget Sound by water or land transportation" (Noland, 1994). This issue is addressed in Section 6.5 of the EIS. Port officials (Benham and Schuler, 1993) thought the port had some prior experience with handling spent nuclear fuel, but this was not confirmed by available data going back to 1979 (NRC, 1993; SNL, 1994).

There are no known particularly environmentally sensitive areas (e.g., such as wildlife sanctuaries) in the immediate area of the terminals, but there is extreme public environmental sensitivity to potential environmental damage to the Puget Sound area.

The entire Puget Sound area is subject to severe earthquakes and volcanism. There have been two major earthquakes in the Puget Sound area this century; a Modified Mercalli Intensity VIII on April 13, 1949 and a Modified Mercalli Intensity VII-VIII on April 29, 1965 (Bott, 1978). On May 18, 1982, Mount Saint Helens suffered a major volcanic eruption (IPA, 1993). All the mountains along the Cascades Range,

from Canada to Northern California, are volcanic in origin and are potentially active (Foster, 1971; Hamilton, 1976; IPA, 1993). The likelihood of severe natural phenomena, such as high winds and earthquakes, is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Seattle, the Uniform Building Code requires buildings to withstand wind speeds up to 130 km/hr (80 mph). The port is located in a high seismic zone with an acceleration of 0.30 g.

The 1990 population within 16 km (10 mi) of the port terminals was 753,296. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 565,000; Oak Ridge Reservation, 395,000; Idaho National Engineering Laboratory, 122,000; Hanford Site, 62,900; and Nevada Test Site, 344,000. Populations along rail routes to these sites are slightly larger. These populations are shown in Figures D-8 through D-17 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 4,670 km (2,900 mi); Oak Ridge Reservation, 4,240 km (2,636 mi); Idaho National Engineering Laboratory, 1,280 km (793 mi); Hanford Site, 360 km (226 mi); and Nevada Test Site, 2,130 km (1,322 mi). Distances along rail routes are slightly longer.

Environmental Conditions

A variety of aquatic species can be found in Puget Sound. Several animal species with special status may also be found in this area. A variety of marine mammals can be found in the central Puget Sound, including the Pacific harbor seal, California sea lion, killer whale, Dall porpoise, and harbor porpoise. In 1991, the U.S. National Marine Fisheries Services reported that the following endangered and/or threatened species may occur in the Puget Sound: the endangered gray whale, the endangered humpback whale, the threatened Stellar sea lion, and the endangered leatherback sea turtle (DOE, 1995). These species are not reported at the port. The U.S. Fish and Wildlife Service reported that the bald eagle and marbled murrelet, both listed protected species, may occur in the vicinity of the port (Frederick, 1994). Bald Eagles can be found throughout this coastal zone and American peregrine falcons are uncommon winter visitors (FWS, 1981a). The FWS's Ecological Inventory for the Puget Sound area indicates that the habitat of Elliott Bay is used by a variety of birds, including: shorebirds, gulls, sandpipers, turnstones, plovers, yellowlegs, herons, rails, great blue heron, waterfowl, loons, grebes, swans, geese, dabbling ducks, diving ducks, mergansers, American widgeon, pintail, mallard, seabirds, cormorants, alcids, common murre, and the pigeon guillemot. Adult concentrations of all of these species may be found in the Bay. Some of these species may also use this area as an overwintering area, a migratory area, and/or a nesting area (FWS, 1981a). It is also indicated that adult concentrations of Chinook salmon, coho salmon, and chum salmon are found in the West Waterway and Duwamish Waterway and use these water bodies and upstream segments as migratory and nursery areas.

According to the State of Washington's Department of Wildlife, the California sea lion uses the waters in the vicinity of Harbor Island as "haulouts" (i.e., areas regularly used by marine mammals for resting). Several seabird colonies also exist in this general area. There is a general lack of wetlands along the southeastern shore of Elliott Bay and along the East and West Waterways and the Duwamish Waterway (WDW, 1994a).

Climatic Conditions

The Strait of Juan de Fuca separates the northern coast of the State of Washington and the southern shore of Vancouver Island, Canada. Also in this general vicinity is the Port of Tacoma, Washington which is located 263 km (142 nautical mi) from the confluence of the ocean and the strait.

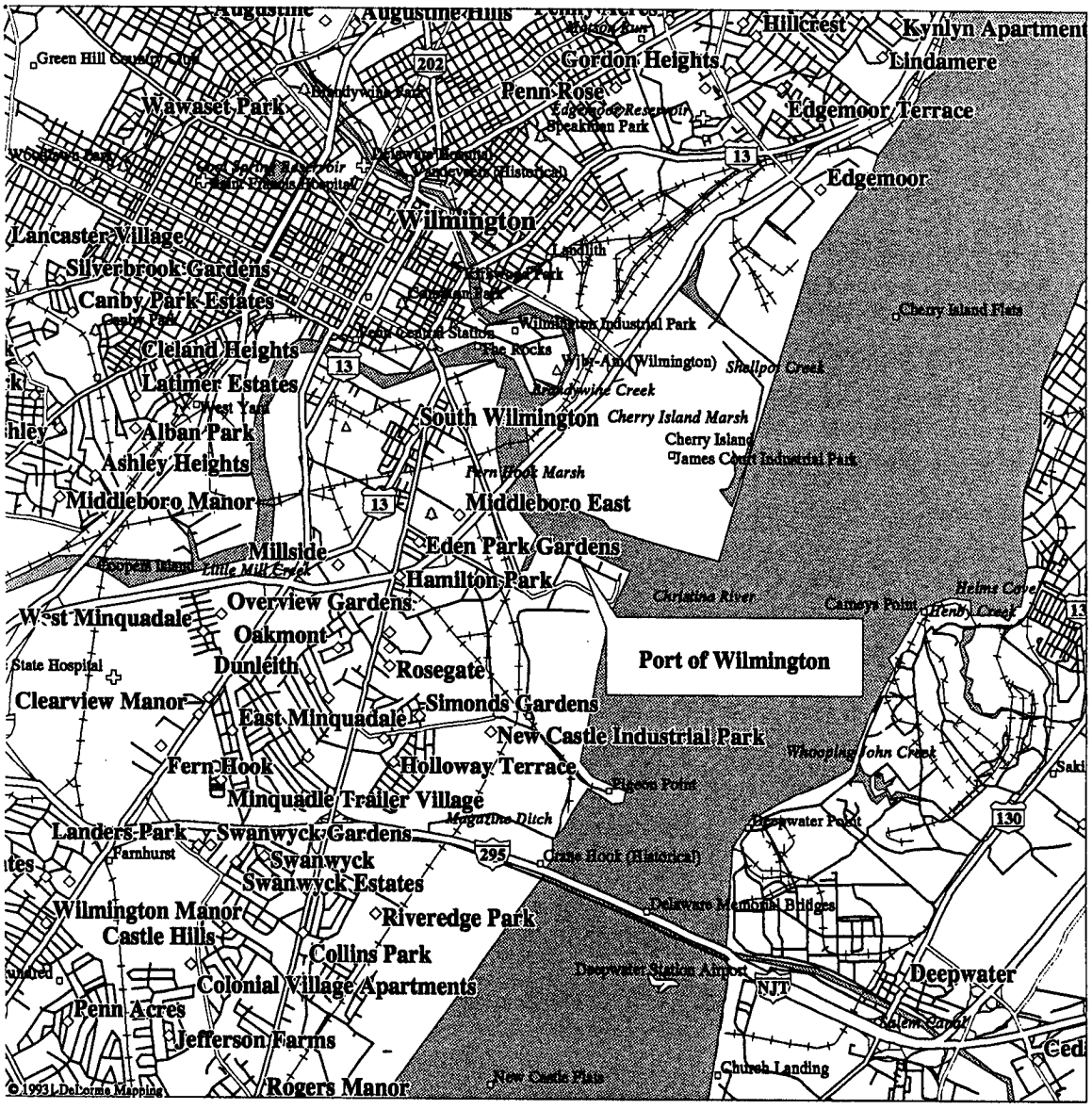
The city of Seattle is situated on a low ridge lying between Puget Sound on the west and the Green River valley on the east. The Olympic Mountains, which rise steeply from the Puget Sound are located approximately 80 km (50 mi) to the northwest. The mild climate of the Pacific Coast is modified by the Cascade Mountains and to a lesser extent by the Olympic Mountains. The climate is characterized by mild temperatures, a well-defined rainy season and prolonged cloud cover, especially during the winter months. The Cascades act as a very effective barrier in both winter and summer, shielding the region from both extreme cold and heat, respectively. The rainy season extends from October through March, with December accounting for the most rainfall. Approximately 75 percent of the annual total precipitation occurs during the winter rainy season. The dry season is centered around July and August. The majority of Seattle's precipitation is associated with normal, mid-latitude disturbances, which are most vigorous during the winter months. During summer, the dominant storm track (e.g., the polar jet) shifts northward into southern Canada, reducing the precipitation in the area. Summer thunderstorms do occur but do not contribute measurably to the annual rainfall budget. Prevailing winds are from the southwest, but occasional severe winter storms will produce strong northerly winds. Summer winds are generally rather light, with the occasional evidence of land-sea breeze effects creating northerly flows. Fog and low-level stratocumulus clouds form over the southern Puget Sound area in the late summer, fall, and early winter months, and often dominate the weather conditions of the early morning hours, reducing surface visibilities. Based on the 1951-1980 climatology, the first occurrence of freezing temperatures should occur around November 11, and the last incidence in spring around March 24 (NOAA, 1992g).

D.2.2.22 Wilmington, DE

The city of Wilmington, DE, sited on the Christina River, has large manufacturing interests. Both sides of the river at the city are lined with wharves that primarily support barge traffic. Deepwater facilities are located at the Port of Wilmington on the south side of the Christina River. The port is located about 3 km (2 mi) north of the Delaware Memorial Bridge on the left ascending bank of the Delaware River, approximately 100 km (62 mi) above the entrance to the Delaware Capes. The port is south of the city of Wilmington and is situated in an area of heavy industrial usage, which appears to be remote from residential, light business, and manufacturing areas (DOC, 1993c). A map of the city is shown in Figure D-53.

Access to the Port of Wilmington is gained via the Delaware Bay and Delaware River. The bay has natural depths of 15.4 m (50 ft) or more for a distance of 8 km (5 mi) from the entrance. A Federal project provides depths of 12.2 m (40 ft) past the entrance to the Christina River where the project depth is 10.6 m (35 ft). A traffic separation scheme has been established off the entrance of the Delaware Bay because of restrictions on passage through the bay and on up the Delaware River. Ships travelling to Wilmington must pass under the Delaware Memorial Bridge (DOC, 1993c).

The port is owned by the City of Wilmington. It is an "operating" port with stevedoring handled by two outside stevedoring companies. Principal cargoes are imported automobiles, dry bulk, roll-on/roll-off and refrigerated containers (primarily bananas and other tropical fruit) (POW, 1994). In 1993, the port handled about 936,000 metric tons (1,026,397 tons) of containerized cargo (about 100,000 20-ft equivalent units; AAPA, 1994). The port has 10,218 m^2 (110,000 ft^2) of chill/heat space and 36,806 m^3 (1,300,000 ft^3) of chill/freeze warehouse space. The terminal has two multi-purpose container cranes and one bulk cargo gantry crane. The marginal wharf area is 1,158 m (3,800 ft) long and there is a 155 m (510 ft) long floating roll-on/roll-off berth. Depth alongside the terminal at mean low water ranges from 11.58 m (38 ft) to 10.67 m (35 ft) due to silting. The port is equipped with one 40.6 metric ton (45 ton) multi-purpose container crane, one 29.1 metric ton (32 ton) multi-purpose container crane, and one 11 m^3 (14 yd^3) Clyde gantry crane (AAPA, 1993; Jane's, 1992; POW, 1994). Approximately half of the cargo going in and out



LEGEND

- Population Center
- Geo Feature
- Town, Small City
- Hill
- Park
- US Highway
- County Boundary
- Hwy Ramps
- Street, Road
- Street, Road
- Major Street/Road
- State Route
- Interstate Highway
- US Highway
- Railroad
- River
- Open Water

Scale 1:50,000 (at center)

5000 Feet

1000 Meters

Mag 13.00
Mon Mar 27 09:41:48 1995

"Map(s) from MapExpert, DeLorme Mapping, Freeport, ME."

Figure D-53 Map of the Port of Wilmington, DE

of the port is food. Improved tropical fruit comprised 35 percent of the traffic in the port, while manufactured food products and finished perishables make up another 15 percent of the cargo traffic. Forest products handle 15 percent of the cargo traffic and imported steel makes up 7 percent. Several bulk commodities that are nonhazardous are the remaining 28 percent of the cargo handled by the port (Brooks, 1994).

The Port of Wilmington has direct access to I-495, a connector to I-95, which appears to be less than 1.6 km (1 mi) from the port and runs through the industrial district surrounding the Terminal. The Conrail and CSX railroads serve the port; it is not known if direct ship/rail transfer is possible.

Other Pertinent Information: Security of the general cargo terminals is maintained by the port police on a 24-hour basis. The wharves are fenced and truck access is via controlled terminal entrances. There is presently no place within the port for segregation and temporary storage of hazardous cargoes. There are no general cargo container lines currently serving the port, and there is no commercial container facility.

According to the Sandia National Laboratories' Radioactive Materials Postnotification Database, the port has not handled spent nuclear fuel since October 1984, when the database was initiated (SNL, 1994). There are no known conflicts with other hazardous materials in the immediate container terminal area. There are, however, chemical plants near the port, as well as a diversity of marine terminals and heavy tanker traffic (ship and barge) on the Delaware River. Other than increased risk of collision, these conflicts are not considered a major factor.

The port relies on the City of Wilmington's fire department for response in the event of a terminal hazardous materials accident. The port claims there is no hazardous materials training program and avoids handling hazardous materials (Casper, 1993).

There are no known protected habitats or sanctuaries near the port. However, at the mouth of the Christina River near the location of the port, there are extensive wetlands along the banks of the Delaware River.

The likelihood of severe natural phenomena, such as high winds and earthquakes, is reflected in the structural requirements for buildings in each area of the United States. These are shown in the Uniform Building Code (UBC, 1991). For the Port of Wilmington, the Uniform Building Code requires buildings to withstand wind speeds up to 130 km/hr (80 mph). The port is located in a low seismic zone with an acceleration of 0.075 g.

The 1990 population within 16 km (10 mi) of the port terminals was 381,502. The affected populations within 0.8 km (0.5 mi) of the interstate routes to the five potential DOE management sites are: Savannah River Site, 359,000; Oak Ridge Reservation, 297,000; Idaho National Engineering Laboratory, 535,000; Hanford Site, 584,000; and Nevada Test Site, 718,000. Populations along rail routes to these sites are slightly larger. These populations are shown in Tables D-7 through D-16 in Section D.1. The distances to the five potential sites on interstate routes are: Savannah River Site, 1,120 km (697 mi); Oak Ridge Reservation, 1,040 km (645 mi); Idaho National Engineering Laboratory, 3,890 km (2,416 mi); Hanford Site, 4,560 km (2,832 mi); and Nevada Test Site, 4,160 km (2,588 mi). Distances along rail routes are about the same.

Environmental Conditions

The Port of Wilmington is located within Zone 5 (Delaware Estuary/Bay) of the Delaware River. Protected water uses for Zone 5, which encompasses River Mi (RM) 48-79, are water supply (industry), wildlife, resident fish propagation and maintenance, anadromous fish passage, primary contact, and navigation (DRBC, 1994). However, within Zone 5, fish and other aquatic life are currently impacted due

to low dissolved oxygen levels from point and nonpoint source discharges. Further south in Delaware Bay (Zone 6), shellfish consumption is an impaired use due to bacterial infestations from local point and nonpoint sources.

The Delaware River at Wilmington is classified as a low salinity estuarine (generally 0.5 to 5 ppt) and tidal freshwater habitat. Aquatic organisms typically found in the waters of this area include: American shad, atlantic sturgeon, American eel, blueback herring, shad, alewife, white catfish, brown bullhead, perch, striped bass, bluegill, crappie, pumpkinseed, largemouth bass, carp, and chain pickerel (FWS, 1980f). In addition, the Delaware River is used as a migratory area by the shortnose sturgeon, a Federally listed endangered species. South of Wilmington, the shoreline of the Delaware River becomes much less developed and numerous fish and wildlife management areas and wetlands are found along the lower Delaware River and Bay. Bald eagles are found throughout these areas. The Delaware Bay supports high densities of geese and ducks along the shores. Waterfowl, particularly loons and grebes, and seabirds, particularly gannet, Wilson's petrel, and greater shearwater are also found in the Bay area. Osprey, peregrine falcon, and Cooper's hawk migrate in fall along the Delaware Bay to Cape May Point. High densities of whitetail deer also occur along the shore of the Bay (FWS, 1980f).

The Delaware Natural Heritage Inventory reported that "there are no Species of Special Concern within 0.8 km (0.5 mi) of the Port of Wilmington" (Dalton, 1994). However, the Inventory reported that the Peregrine falcon (Federally listed endangered) has nested 2.4 km (1.5 mi) from the port, and the short-nosed sturgeon (Federally listed endangered) is found in the Delaware River. It was the opinion of the Inventory that "these species would not be affected by normal operations at the port."

Climatic Conditions

Geographically, Delaware is part of the Atlantic Coastal Plain, which consists mainly of flat lowland and marshes. Small streams and tidal estuaries comprise the major drainage systems for the State. The Delaware River, Delaware Bay, and Atlantic Ocean form the eastern border of the State, while the Chesapeake Bay is the western boundary [approximately 56 km (35 mi) to the west]. These large water bodies contribute significantly to the climate of the Wilmington, DE, region.

Generally, summers are warm and humid and winters are considered rather mild. Summer temperatures rarely exceed 100°F, and average daily temperature during January (the coldest month) is 32°F. The majority of winter precipitation falls as rain, but precipitation during the winter months is often mixed rain, snow, and sleet. However, frozen precipitation rarely remains on the ground more than a few days. The proximity of the water masses causes humidity to remain relatively high year-round, which causes frequent fog events. Light southeasterly winds (e.g., off the Delaware Bay) tend to be most favorable for fog formation, while north-northeast winds tend to transport industrial pollution from the Philadelphia metropolitan area into the region. Rainfall distribution is fairly uniform throughout the year, but the greatest amounts normally come during the summer months in the form of thunderstorms. During the fall, winter, and spring seasons, the majority of rainfall is associated with extratropical and tropical cyclones track along the eastern seaboard of the United States. Hurricane-force winds are rarely experienced in the Wilmington, DE, region. However, strong south and southeasterly winds can cause high tides in Delaware Bay and the Delaware River, causing lowland flooding and damage to bayfront and riverfront properties (NOAA, 1992k).

D.3 Main Routes

The routes selected for potential marine transport are discussed in Appendix C. These routes cover the transport of the spent nuclear fuel from the country of origin to the first port of call in the United States. In the port incident-free and accident analysis it has been assumed that the vessel carrying the spent nuclear fuel would not unload the material at its first port of call. Intermediate port calls have been assumed in the analysis. In the marine impact accident and incident-free analysis, the intermediate port calls result in additional travel time which has been incorporated into both analyses. In the port analysis, this results in additional workers who could be affected by incident-free impacts and additional locations where accidents could occur. Due to the large variability associated with the movement of the vessel between U.S. ports, no specific route has been identified for use in the analysis. With the approach used in this analysis, the specific routes used between the U.S. ports would not affect the results of the risk assessment.

D.4 Accident-Free Impacts: Methods and Results

D.4.1 Introduction

This section of the appendix provides an overview of the approach used to assess the risks associated with port activities involved in transferring the spent nuclear fuel from the vessel to a vehicle for transport to the management site. Included here is a discussion of the incident-free risk assessment methodology and the results of the analyses, including an assessment of the cumulative risk associated with the marine transportation of the foreign research reactor spent nuclear fuel through U.S. ports.

The risk assessment results are presented in terms of a per shipment risk, annual risks from incident-free transport, as well as for the total risks associated with the program.

D.4.2 Scope

All foreign research reactor spent nuclear fuel shipments that would require ocean transport are expected to occur via one of four types of vessels: container ships, roll-on/roll-off vessels, general cargo (breakbulk) vessels, or purpose built vessels. In the incident-free analysis, it has been assumed that all shipments are made on either a breakbulk or a container vessel, an assumption intended to provide bounding assessments of the risks associated with port activities required for the transfer of spent nuclear fuel.

D.4.2.1 Nonradiological Risk of Marine Transportation Related Activities

This portion of the risk assessment is limited to estimating the human health risks incurred during spent nuclear fuel unloading and handling during port operations at U.S. ports and during the vessel's approach to the port and movement within the port. The nonradiological risks from these activities were assessed as resulting in a negligible impact on the health of the public and workers. Approximately 56,000 port calls involving vessels engaged in foreign trade are made at U.S. ports every year (DOC, 1994). As discussed in Appendix C, each of these vessels has the capacity to carry hundreds of pieces of cargo of the size of a container carrying a spent nuclear fuel transportation cask (typically, container vessels carry between 800-1,000 containers, while some carry many more). This translates to millions of pieces of cargo every year. To fulfill the needs of the basic implementation of Management Alternative 1 of the proposed action, less than 60 transportation casks would need to be shipped per year. This is less than 0.001 percent

of the total number of pieces of cargo (originating in foreign countries) to be handled at U.S. ports each year. The limited number of shipments per year should not result in a significant change to the risks to the public including the port workers.

D.4.2.2 Radiological Risks of Marine Transportation

The risks that result from the radioactive nature of the shipments are addressed for both incident-free transportation and accident conditions. The radiological risks associated with the incident-free shipping conditions result from the potential exposure of members of the crew and dock workers to external radiation in the vicinity of the packaged fuel. No other exposure is considered, due to the relative isolation of the material from the general public during all phases of the port activities associated with the transfer of the spent nuclear fuel from the ocean going vessel to the overland transportation mode.

All radiologically-related impacts are calculated in terms of committed dose and associated health effects in the exposed populations. The radiation dose calculated is the total effective dose equivalent, which is the sum of the effective dose equivalent (EDE) from the external radiation exposure and the 50-year committed effective dose equivalent from internal radiation exposure. The EDE is the sum of the tissue and organ weighted dose equivalents for all irradiated tissues and organs. The committed effective dose equivalent considers the initial exposure and the effects of radioactive decay and elimination of the radionuclide through ordinary metabolic processes over the 50-year period. Radiation doses are presented in units of person-rem for collective population and rem for individuals. The impacts are further expressed as health risks, primarily in terms of latent cancer fatalities (LCF). The health risk conversion factors were derived from International Commission of Radiological Protection Publication 60 (ICRP, 1991).

D.4.3 Port Facility Operations

This section describes the principal activities that are performed at a port facility to transfer a radioactive material package ("cask") from an ocean vessel to a surface conveyance, such as a truck trailer or railcar. The purpose of this description is to assist in establishing an estimate of the ionizing radiation dose to personnel that could be associated with the port intermodal transfer. The description of activities, and estimates of durations of specific tasks and personnel requirements is presented later in this section.

The off-load operation would take place at a "facility of particular hazard," as defined in 33 CFR 126.05, that is designated by the Captain of the Port. The Captain of the Port is a U.S. Coast Guard officer that enforces, within his/her respective port, safety, security and marine environmental protection regulations. These include, without limitation, regulations for the protection and security of vessels, harbors, and waterfront facilities; anchorages; security of vessels; waterfront facilities; security zones; safety zones; regulated navigation areas; deepwater ports; water pollution; and ports and waterway safety. The Captain of the Port designates and permits "facilities of particular hazard."

Such a facility is allowed to handle "cargoes of particular hazard" including "highway route controlled quantities of radioactive material," which includes spent nuclear fuel. The Captain of the Port could establish a safety zone or security zone around the vessel, if necessary. These zones would prohibit unauthorized personnel from entering the area. Usually a "facility of particular hazard" will have a secured area onsite for the storage of "cargoes of particular hazard." This facility would be used for the temporary storage of spent nuclear fuel, if necessary. Usually, these cargoes are loaded on a truck or train that departs for its destination soon after being checked by a facility employee and inspected by the proper authorities.

Each "facility of particular hazard" has an operations manual that outlines procedures for handling "cargoes of particular hazard," the personnel used and their qualifications, emergency procedures, and contact numbers. Only the Captain of the Port can approve the required operations manual, and only the Captain of the Port can approve any changes made to the operations manual. The content of the operations manuals can vary by port location and size, and by the type of materials handled. The operations manual of the facility under consideration for off-load operations should be studied prior to receipt of any spent nuclear fuel.

D.4.3.1 Intermodal Transfers

The intermodal transfer of the container (or cask) is largely a mechanical lifting operation with somewhat limited personnel participation. Unloading of vessels is generally performed by members of the International Brotherhood of Longshoremen (East Coast and Gulf Ports), or the International Longshoremen and Warehouseman Union ("Longshoreman") (West Coast ports), sometimes with support from the vessel's crew.

There are various configurations of container (or cask) storage aboard ship that could arise. However, as a preference, containers (or casks) are transported below decks. The following sections describe the principal operations that must occur to achieve both transfer of the container (or cask) from the ship, and to prepare it for departure from the port. It should be noted that as a general rule, departure from the port occurs as soon as is practicable, since the intermodal transfer is merely part of an "in progress" transportation activity, and radioactive materials transport should be expeditious. Infrequently, containers (or casks) may be (temporarily) stored at port facilities for some reason, such as bad weather.

D.4.3.1.1 Container Transfer to Truck Trailer or Railcar

If the port routinely receives containerized freight, it will be equipped with a crane adapted to handle containers. These cranes use a spreader bar equipped with International Standards Organization twistlocks at each of its four corners. The length of the spreader bar is automatically adjustable to accommodate the two International Standards Organization standard container lengths of 6.1 m (20 ft) or 12.2 m (40 ft). Casks are normally shipped in the 6.1-m (20-ft) containers. The twistlocks mate with standard fittings in the corner posts of the container, and are automatically actuated by the crane operator to attach the spreader bar to the container. Typically, no personnel are on the container when the spreader bar is attached. Engagement can be verified by the crane operator or, depending on the container stacking arrangement or port practice, by Longshoremen on the deck. The crane operator is in an enclosed cabin and is usually separated by a considerable distance from the cargo. The procedures described below apply to so-called cellular container ships or combination container/breakbulk ships.

Once engaged, the container is lifted from the hold of the ship, up and over the side to a container trailer, or railcar, on the dock. Engaging the container and moving it to the transporter, takes about 1.5 minutes on average (about 45 containers per hour).

The routine unloading is to install the container on a standard over-the-road container trailer which is pulled by a specially made tractor used at ports. These dock tractors have a single person cab and a hydraulically driven "fifth-wheel" which is used to raise the front end of the container trailer much higher than it would be for regular transport. This allows the Longshoremen to move the container trailer without having to raise and lower the trailer front landing gear at each re-positioning of the trailer. The dock tractor then moves the container to a freight staging area, parks it, connects to an empty container trailer, and re-positions under the container crane. Usually, several dock tractors are used to continuously move containers from "under the hook." Dock tractors are not suitable for over-the-road use.

The receiver (or the agent for the receiver) generally arranges with the Longshoremen to install the cask container directly onto the container trailer, or railcar, which will be used for overland transport, and which has already been inspected. The container trailer will be pulled by the tractor which is to be used for transport.

If the containerized cask is placed on a dock container trailer, sometimes called a "bombcart," then it must be later moved to the trailer which is to be used for transport. This transfer can be made using a large, industrial fork lift, top lift, or a small mobile crane ("forklift") specifically designed to move containers in the port freight staging areas. A bombcart is a special container trailer, used only within the port facility, that does not have twistlocks at its four corners to secure the container being loaded or unloaded.

Spotting the container on its designated trailer (or railcar) and securing it using the trailer mounted International Standards Organization locks, requires two (2), or four (4) longshoremen (at each end of the trailer) and takes about 30 seconds. Four (4) longshoremen have been used for this task at some ports. Once the container has been loaded onto its trailer, it moves immediately away from the container unloading area to a staging area so that ship unloading can continue. The staging area is established by port authorities, but must be approved by the Captain of the Port.

The staging area is usually close to the container unloading area, on the port property, and may be an area where hazardous materials are routinely handled. It may be an indoor location, such as a warehouse. It is used for the conduct of any inspections or surveys that may be desired, to verify documentation received from the ship's captain, to verify marks and labels on the containers, to verify securement of the load, to assemble required documentation for the overland portion of the transport, and install or verify placards. (It should be noted that foreign origin shipments are prepared in accordance with International Atomic Energy Agency standards, which are generally compatible with NRC and the Department of Transportation regulations. In accordance with International Atomic Energy Agency regulations, containers usually are prepared with an oversized label, which is an International Atomic Energy Agency permitted substitute for placards. Even if placarded, the placards usually do not conform to the "Highway Route Controlled Quantity" placard used for these types of shipments in the United States. The overland portion of the transport leaves from this area. Inspections are described in Section D.4.4.

The National Defense Authorization Act for Fiscal Year 1994 requires that, to the extent practicable, casks containing spent nuclear fuel should be moved expeditiously from the port. However, infrequently, continuation of the transport may not occur immediately. This may be due to unplanned events such as severe weather, equipment breakdown or inspection discrepancy, or to planned actions such as queuing of the receipt of individual containers at the receiving site. If one or more containers must remain at the port, they are normally moved to a bonded warehouse, with the container remaining on its transporter. The warehouse is considered a secure area, and it typically meets the requirements of a "safe haven."

Specific handling for rail shipments depends upon the location of rail track with respect to the container handling crane "foot print." If the rail line is within the foot print, then containers are loaded directly onto the railcars and secured using International Standards Organization locks in the deck of the railcar. Typically, two containers are loaded onto each railcar. If the rail line is not in the foot print, then the container is loaded onto a dock container trailer and moved to the rail line. An industrial forklift is used to transfer the container to the railcar. Railcars may be moved by a switch engine, but more commonly, a railcar tugger is used.

For spent fuel shipments, the railcars carrying loaded containers are separated from each other by buffer cars. These cars are usually empty gondolas or flat cars. A caboose is usually provided for escorts and required security equipment. The buffer cars are selected so that the escorts can have a good view of the container cars. Containers mounted on container trailers are not shipped on the railcar in a "piggyback" configuration because of concerns related to the resulting high center of gravity.

D.4.3.1.2 Container Transfer Using Jib-Type Cranes

The port may not have a container crane and instead rely on a dockside, pedestal mounted, or ship installed, jib crane. Containers are moved using this type of crane by attaching a four-legged sling to the crane hook, and extending one leg of the sling to each of the four corners of the container. The sling must be manually attached to (and later removed from) the International Standards Organization fitting at the top of the corner posts of the container. The attachment and removal is done by two longshoremen, who must climb on top of the container.

The attachment of the sling can take as long as three minutes. The reason for this is that, typically, the longshoremen climb onto the container before the crane operator has positioned the crane and lower the sling for attachment. The longshoremen also provide hand signals to direct the positioning for the crane. Disconnecting the sling from the container is done more quickly, and it is usually not necessary to climb onto the top of the container. Two longshoremen usually lock the container to the container trailer and disconnect the sling, but sometimes four are used.

If the ship is equipped with a jib crane, it may also be used to remove containers. The process is the same as with a dock mounted crane, but the crane is operated by a member of the ships crew. Except for the operation of a ship mounted crane, members of the ships crew do not generally have a role in the unloading of the ship.

D.4.3.1.3 Roll-on/Roll-off Operations

In the roll-on/roll-off configuration the casks (either containerized, freestanding, or palletized) are already on the trailer that is used for overland transport. After unlashing, the trailer is moved to the staging area by a longshoreman using a dock tractor.

Unlashing of the trailer may involve up to four longshoremen, and require up to 5 minutes. Transfer of the trailer to the staging area can take as long as 15 minutes depending on the ship's hold and ramp conditions and the distance to the staging area. After the trailer is spotted in the staging area it is connected to the tractor that is used for over-the-road transport.

Since the trailer has not been available for inspection, if an inspection is required [other than that done by the tractor driver(s)], it is performed at the staging area. If the trailer is foreign owned, temporary apportioned motor vehicle tags are provided by the receiver or receivers' agent.

D.4.3.1.4 General Cargo Operations

Breakbulk operations could involve either a containerized or free standing cask. Typically, a free standing cask is mounted on a pallet to facilitate the handling of the cask using the cranes and winches commonly found on ships and at dock side. Handling of a containerized cask would follow the same operation described in Section D.4.3.1.1.

Breakbulk cargo handling of a free standing cask is more labor intensive, since the cask must be unlashed from the deck and may have to be moved using winches to a hatch opening. A crane is used to lift the cask out of the hold and onto the dock. Up to 4 longshoremen may be used to move the cask in the hold and attach crane rigging to the cask or pallet. Two (2) or more longshoremen may be required to complete the transfer to the dock. At the dock, the pallet is typically placed on a standard flat bed trailer and secured with chains or other binders. Total handling time is less if the cask is transported in the center of the hold, as it likely would be if a chartered vessel were used.

In general, breakbulk cargo requires the longest unloading times, compared to containerized freight and roll-on/roll-off configurations. While a good unloading time for general cargo is about 5 minutes per crane load, radioactive materials transfer can take as long as 20 minutes if the cask is not transported on a pallet and must be rigged separately.

Breakbulk shipment of free standing spent nuclear fuel casks is perceived to result in a somewhat less reliable tiedown of the cask to the deck of the vessel. There is also an increased risk of damage to the cask or its pallet due to the variability in lift fixtures on each pallet. For these reasons breakbulk shipments of spent fuel casks have not been routinely made since the mid 1970's. This mode of shipment is not expected to be routinely used for the transport of spent nuclear fuel, except as it would apply to the use of purpose-built ships.

D.4.3.2 Key Intermodal Tasks and Task Durations

This section summarizes the key intermodal handling tasks, and estimates the personnel requirements and task durations for the transfer of the casks from the vessel to the land conveyance. These summaries are based on the narratives presented previously. Actual handling times and resource requirements can be widely variable, depending in large degree upon the cask configuration, transport vessel, intermodal handling equipment, port practice, and specific procedures which could be implemented for a given shipment or shipping program.

Port inspections are described separately in Section D.4.4.

D.4.3.2.1 Intermodal Handling of Containerized Casks

Ports equipped for intermodal handling of containers have achieved average rates of transfer of general cargo containers between the vessel and dock of 45 per hour, or about one container each 80 seconds. This rate may not be achieved for containers carrying spent nuclear fuel. For conservatism, a transfer time of 2 minutes per container is assumed. Longer transfer times would be expected if the port is not equipped with container cranes. A transfer time of 3 minutes is assumed if jib or boom type cranes are used with slings to lift the containers. Containers are assumed to be installed on the container trailer which would be used in over-the-road transport.

Port practices, such as union rules and safety procedures, would dictate the number of personnel used to unlash, transfer, and lash the container to its transporter. Consequently, the number of personnel required for each task could vary slightly between ports.

Each shipment, consisting of one or more containers, is expected to be observed by one or more persons who represent various interests in the shipment. These observers would have no active role in the transfer of the container, and would be expected to be 9.1 m (30 ft) or more away from the container.

Vessel crew members do not normally participate in container transfer operations, except for a member having responsibility for the cargo. Only this individual is considered to be present during transfer, stationed at the vessel hatch.

Table D-8 summarizes the handling of a container on a container ship. All of the distances are assumed to be from the container surface, or the projected container surface if an open container is used. There are no tasks which require contact with the cask surface.

Table D-8 Container Transfer Summary

Task / *Personnel/Location*	*Unlash Cargo*	*Attach to Crane*[a]	*Transfer to Dock*	*Lash to Transporter*	*Move to Staging*
0-.9 m (0-3 ft)	2 - 4[a,b]	1[b]	-	2 - 4[b]	-
duration (min)	0.25	0.5	-	0.25	-
1.5-3 m(5-10 ft)	-	-		-	-
duration (min)		-	-	-	-
3-6 m (10-20 ft)	-	-	-	1[c]	1[c]
duration (min)	-	-	-	0.25	3
6-9 m (20-30 ft)	1[b]	2[d]	1[d]	1[d]	-
duration (min)	0.25	0.5	1	0.1	-
9 m (30 ft)	1[e]	1[e]	1[e]	4[f]	4[f]
duration (min)	0.25	0.5	0.1	0.25	0.25

[a] *Crane attachment to containers is automated.*

[b] *longshoremen*

[c] *truck driver*

[d] *crane operator*

[e] *ships crew*

[f] *observer*

Containerized casks could be shipped aboard container or general cargo vessels. No significant difference in transfer times is expected between these vessel types.

D.4.3.2.2 Intermodal Handling of Roll-on, Roll-off Casks

Casks in a roll-on/roll-off configuration, either containerized or palletized are assumed to be transported on a roll-on/roll-off vessel and received at a port equipped to support roll-on/roll-off operations. Assumptions regarding port practices, observers and crew members are the same as those made for containerized or palletized cask transfer.

Removal of the trailered cask from the vessel is assumed to be done using a port tractor. Attachment of the trailer to the tractor which would be used for over-the-road transport must be done in the freight ready area, or the staging area.

All of the distances are assumed to be from the trailer or personnel barrier surface, or the projected trailer surface if there is no personnel barrier. There are no tasks which require contact with the cask surface.

Table D-9 summarizes the cask unloading and transfer activities for a roll-on/roll-off cargo vessel.

Transfer of roll-on/roll-off configured casks is not expected to occur on vessels not equipped with a ramp. Consequently, lifting of the trailered cask by crane is not expected to occur.

Table D-9 Roll-on/Roll-off Cask Transfer Summary

Task / *Personnel/Location*	*Unlash Cargo*	*Attach to Crane*	*Transfer to Dock*	*Lash to Transporter*	*Move to Staging*
0-.9 m (0-3 ft)	4[a]	2[a]	-	4[a]	-
duration (min)	4	0.5	-	0.5	-
1.5-3 m (5-10 ft)	-	-	1[b]	-	-
duration (min)	-	-	0.25	-	-
3-6 m (10-20 ft)	1[a]	1[b]	1[b]	2[b]	1[b]
duration (min)	4	0.5	2	0.5	3
6-9 m (20-30 ft)	1[c]	1[c]	1[c]	-	-
duration (min)	4	0.5	0.25	-	-
9 m (30 ft)	-	-	-	4[d]	4[d]
duration (min)	-	-	-	0.5	0.25

[a] *longshoremen*

[b] *truck driver*

[c] *ships crew*

[d] *observer*

D.4.3.2.3 Intermodal Handling of Free-Standing (Palletized) Casks

As previously noted, casks are expected to be mounted on a skid, cradle or pallet ("pallet") to facilitate handling, lifting, and stowage. Transfer of these casks is usually somewhat more labor intensive than handling containerized casks, since the pallets are not standardized. The pallets are usually uniquely designed to accommodate a specific cask. Consequently, more effort is usually required to secure the cask in stowage, and to install lift slings for transfer. In addition, some care is needed to ensure that lifting and handling operations do not damage the cask.

Assumptions regarding port practices, observers, and crew members are the same as those made for containerized cask transfer.

It is assumed that the palletized cask would be installed on a flat bed trailer not necessarily having the tiedown fixtures required to secure the pallet. Some additional effort is expected to be required to secure the pallet to a trailer, compared to that required for containerized casks. However, it is assumed that the pallet is placed on the trailer that would be used for over-the-road transport so that no subsequent transfer of the pallet is needed.

Table D-10 summarizes the palletized cask unloading and transfer activities for a breakbulk cargo vessel. Distances are from the edge of the pallet, or its projected edge. There are no tasks which require contact with the cask surface.

D.4.4 Port Inspection Activities

There are several agencies, both Federal and State that could make an inspection of the cargo at any point from when the vessel docked while the cargo is still on board, until the cargo reaches its final resting place in the facility. The U.S. Coast Guard has recently designated personnel to inspect hazardous cargoes, specifically containers laden with hazardous cargo. The U.S. Coast Guard, however, has no current programs in place for the training of inspectors of radioactive materials. This may change in the near future. The U.S. Coast Guard does have an aggressive program for container inspection and compliance. The U.S. Coast Guard would perform an inspection on the vessel, including all documentation (bills of

Table D-10 Palletized Cask Transfer Summary

Task / Personnel/Location	Unlash Cargo	Move to Hatch[a]	Attach to Crane	Transfer to Dock	Lash[b] to Transporter	Move to Staging
0-.9 m (0-3 ft)	4[c]	0 - 4[c]	2[c]	-	4[c]	-
duration (min)	4	0 - 5	0.5	-	4	-
1.5-3 m (5-10 ft)	-	-	-	-	-	-
duration (min)	-	-	-	-	-	-
3-6 m (10-20 ft)	-	-	-	-	-	1[d]
duration (min)	-	-	-	-	-	3
6-9 m (20-30 ft)	2[c,e]	0 - 2[c,e]	2[c,e]	1[c,e]	4[c,e]	4[f]
duration (min)	4	0 - 5	0.5	0.1	4	0.25
9 m (30 ft)	-	-	1[g]	1[g]	1[g]	-
duration (min)	-	-	0.5	2	0.5	-

[a] *this task is not required if the cask is in the center of the ships hold*

[b] *transporter is to be used for over-the-road transport*

[c] *longshoremen*

[d] *truck driver*

[e] *ships crew*

[f] *observer*

[g] *crane operator*

lading and dangerous cargo manifests) and container placarding. Once the cargo is off-loaded, NRC may require an inspection of the container or cask and perform a radiation survey. Also, state agencies that are designated with such responsibilities as safety and transportation may require an inspection, especially on the tractor and semi-trailer transporting the casks. These latter inspections could take place dockside, at the facility, at a staging area, or at the gate area of the port. It is also possible that there would not be any inspections made by any agency.

The principal kinds of inspections that normally occur are: (1) verification of container (or cask) marks and labels to the accompanying documentation; (2) verification of radiation readings around the container (or cask); and (3) inspection of the transport vehicle, typically a tractor-trailer rig. Other inspections, such as condition of a container, can also be performed. Most of the inspections performed are done at the staging area, although inspection on the ship is also possible.

Port inspections are discretionary in that there is no regulatory requirement that they be performed by any party, with two exceptions. One exception is that a radiation survey map must be prepared for overland transport by truck and rail. This map must show the radiation levels at 2 m (6.6 ft) from the container or cask, and it must show the radiation level in the truck normally occupied by the driver. The agent for the receiver normally completes this map. A second exception is that State laws may require a permit for the transport of the spent fuel. Typically, this permit requires an inspection of the transporter for road worthiness, and sometimes a review of other documents. Inspections of railcars are normally not done by state inspectors. The performance of additional inspections may be established by (local) policy, procedures, or preference. In this context, inspections may occur more than once. The reason for this is that Federal agencies, such as the Department of Transportation and the U.S. Coast Guard, and the States (and the port authority), have a right of inspection. For any given shipment or individual cask, those agencies may not be represented, and even if represented, the right of inspection may not be exercised.

The representative of the receiver normally verifies that the marks and labels of the container conform to the documentation supplied by the shipper, that radiation levels are within U.S. regulatory limits, and that they conform to the radiation survey documents supplied with the shipping papers. These verifications are usually made after the container is removed from the ship and is in place on its transporter. Surveys of the container can also be performed aboard ship. This may be done for example, if there was a belief that actual radiation readings could be higher than those reported in the shipment documentation because of some event that occurred in transit, or for information.

Inspections of the transport equipment may be required by the State. These inspections are normally done prior to loading of the container on the bed of the trailer or railcar. This ensures that the container is loaded on an acceptable transporter. There is no radiation exposure which is attributable to this inspection. Verification of container tiedown is performed by the truck driver, or rail crew, as required by current regulations. Typically, tiedowns are also verified by a representative of the consignee. Tasks and personnel requirements are summarized in Table D-11.

Table D-11 Summary of Inspection Tasks and Personnel Requirements Per Container[a]

		Federal Agencies[b]					
		USCG	*DOT*	*NRC*	*State*	*Local/Port*	*Receiver*
Container	Personnel	1	1	1	1	1	1
	Time (min)	5	2	2	2	5	5
Roll-on/Roll-off	Personnel	1	1[c]	1	1[c]	1	1
	Time (min)	2	15	10	15	5	5
Breakbulk	Personnel	1	1[c]	1	1[c]	1	1
	Time (min)	2	15	10	15	5	5

[a] *Personnel expected to be within 3 m (10 ft) of the container.*

[b] *Discretionary inspections which may be performed; USCG = U.S. Coast Guard, DOT = Department of Transportation.*

[c] *Includes trailer inspection.*

D.4.5 Port Worker Incident-Free Analysis Methodology

Incident-free impacts of the offloading of foreign research reactor spent nuclear fuel have been estimated for port workers, inspectors, and observers of the activity. It has been assumed that no member of the public, other than the above-mentioned workers, would be present at the port during offloading. Ports tend to be relatively large areas with little or no access by the general public. Impacts of the incident-free shipment of foreign research reactor spent nuclear fuel on the general public would not be expected until the shipment leaves the port area. It has also been assumed that all foreign research reactor spent nuclear fuel would be shipped in containers, regardless of whether transport occurs via container or general cargo vessels.

Once a shipment arrives in port, the spent nuclear fuel packages would be inspected by customs officials, U.S. Coast Guard personnel, port officials, etc. Up to six inspections performed by Federal, State, and local agencies, and the shipping agent are assumed to occur for each cask shipment. The durations of these inspections are provided in Table D-11. The assumption is made that the container is opened only for the inspection conducted when the cask is first off-loaded from the vessel.

In addition to the personnel involved in the inspections, there are other port workers (longshoremen, port officials, security personnel, etc.) who would be directly involved in or co-located near the off-loading of the container, its securing to the tractor-trailer, and in the movement of the container to a staging area. (The incident-free impact of offloading operations on the ship's crew were addressed in the marine impact analysis presented in Appendix C). While arrangements are expected to be made for the immediate departure of the spent nuclear fuel from the port of entry, it is recognized that situations could occur where there may be some delay in departing the port. For example, these delays could be caused by weather or road conditions. A delay of up to 24 hours is assumed for all shipments. To account for the impact of these delays, the dose to workers not directly involved in offloading activities was estimated. In addition to workers identified in Tables D-8 through D-9, it was assumed that 50 workers are exposed to the cask for 8 hours at a distance of 50 m (163 ft). This provides a dose estimate for the 24-hour storage period.

These dose estimates are independent of port location or type. Two types of cargo vessels have been addressed in the analysis, encompassing the range of times required for offloading activities. Container vessels required the least amount of time to offload; breakbulk vessels the longest. It has been assumed that offloading operations for both containerized breakbulk cargo and container cargo at all potential ports of entry is similar. These estimates are intended to bound the potential doses associated with port activities. As discussed above, breakbulk transport of the containerized fuel casks are expected to result in the largest dose to workers due to port operations due to the longer times associated with activities that bring workers into proximity of the casks.

External radiation for an intact shipping package must be below specified limits that control the exposure of the handling personnel and general public. These limits are set forth in 49 CFR 173.

The limit of interest established therein is a limit of 10 mrem per hour at any point 2 m (6.6 ft) from the vertical planes projected by the outer lateral surfaces of the transport vehicle. This limit is associated with an "exclusive-use" shipment, that is one in which no other cargo is loaded in the container used for the spent fuel transportation casks, not that the ship is an exclusive use vessel. All shipments within this program would be expected to fall within this category. In general, much of the foreign research reactor spent nuclear fuel potentially to be received would have cooled for a significant amount of time prior to shipment, resulting in external dose rates much less than the regulatory limit. Shipments of research reactor fuel in the past have had doses averaging approximately 2.3 mrem per hour at 1 m (3.3 ft) from the cask surface (see Section F.5 of Appendix F). Due to the scope of this program and the possibility that some of the fuel could be shipped fresher than has been done previously, the above cited regulatory limit has been used to estimate the worker exposures for all shipments. Appendix F, Section F.5, provides exposure rate versus distance for a transportation cask that is loaded with spent fuel that results in a dose rate at 2 m (6.6 ft) of 10 mrem per hour. This relationship was used to assign dose rates for the port activities.

Table D-12 and D-13 describe the types and numbers of personnel involved in the port activities associated with offloading the spent nuclear fuel. The times, distances, and maximum doses associated with these activities are listed for each type of personnel (all doses are simply the product of the dose rate to which the worker is exposed, based upon distance from the transportation cask, and the time the worker is exposed to this dose rate). The total port worker population and the maximally exposed individual doses are also provided. During incident-free port operations, the highest individual exposure would be to handlers and inspectors of the casks. Exposures are port-independent since it is assumed that operations would be similar at any of the potential or alternative ports of entry.

Table D-12 Port Worker Consequences from Shipment of Foreign Research Reactor Spent Nuclear Fuel on Breakbulk Vessels

Exposed Workers	Exposure Distance (m)	Dose Rate (mrem/hr)	Exposure Time (minutes/cask)	Dose/Person/ Cask (mrem)	Exposed Workers	Collective Dose (Person-rem)	Individual Risk (LCF)	Collective Risk (LCF)
Longshoreman A1	0.50	37[b]	0.25	0.15	2	0.00031	6.2E-08	1.2E-07
Longshoreman A2	0.50	37[b]	3.3	2.0	2	0.0040	8.0E-07	1.6E-06
Longshoreman A3	6.00	6.4[b]	0.25	0.027	1	0.000027	1.1E-08	1.1E-08
Longshoreman B1	0.50	34	1.0	0.57	4	0.0023	2.3E-07	9.1E-07
Maximum				2.0[a]			8.0E-07a	
Subtotal						0.0066		2.6E-06
Crane Operator 1	9.00	1.8	3.0	0.090	1	0.00009	3.6E-08	3.6E-08
Maximum				0.090[a]			3.6E-08[a]	
Subtotal						0.00009		3.6E-08
Truck Driver	3.00	7.1	3.0	0.36	1	0.00036	1.4E-07	1.4E-07
Maximum				0.36[a]			1.4E-07[a]	
Subtotal						0.00036		1.4E-07
Observers	6.00	3.2	0.25	0.013	4	0.000053	5.3E-09	2.1E-08
Observers	50	0.01	480	0.0802	50	0.0040	3.2E-08	1.6E-06
Maximum				0.080[a]			3.2E-08[a]	
Subtotal						0.0041		1.6E-06
USCG Inspector	1.5	15	2.0	0.5	1	0.00050	2.0E-07	2.0E-07
DOT Inspector	1.5	15	15	3.8	1	0.0038	1.5E-06	1.5E-06
NRC Inspector	1.5	15	10	2.5	1	0.0025	1.0E-06	1.0E-06
State Inspector	1.5	15	15	3.8	1	0.0038	1.5E-06	1.5E-06
Local/Port Inspector	1.5	15	5	1.3	1	0.0013	5.0E-07	5.0E-07
Receiver	1.5	15	5	1.3	1	0.0013	5.0E-07	5.0E-07
Maximum				3.8[a]			1.5E-06[a]	
Subtotal						0.013		5.2E-06
Maximum				3.8[a]			1.5E-06[a]	
Total						**0.024**		**9.6E-06**

[a] *Maximum individual exposure/risk.*

[b] *Includes dose from second cask in hold.*

USCG = U.S. Coast Guard, DOT = Department of Transportation

Table D-12 was developed using the information pertaining to the offloading of containerized foreign research reactor spent nuclear fuel from a breakbulk vessel. The exposure times and the distances from the transportation cask used to develop the dose estimates were derived from Table D-8 and assuming the longer transfer times associated with jib or boom cranes. The exposures (worker doses) resulting from the offloading activities associated with this type of vessel are the highest, on a per cask basis, of the three types of vessels considered for transport of the foreign research reactor spent nuclear fuel: breakbulk, container, and roll-on/roll-off (the chartered or purpose-built ship could conceivably be of any of these designs). Therefore, the dose estimates derived from this data provide the upper limit to the doses that could be calculated for the offloading activities.

Alternatively, the worker doses resulting from the offloading of a foreign research reactor spent nuclear fuel cask from a container vessel result in the lowest doses per cask of the types of vessels considered for use in the shipment of the foreign research reactor spent nuclear fuel. Table D-13 was developed using the exposure times and the distances from the transportation cask developed for a container vessel which are provided in Table D-8.

Table D-13 Port Worker Consequences from Shipment of Foreign Research Reactor Spent Nuclear Fuel on Containerized Vessels

Exposed Workers	Exposure Distance (m)	Dose Rate (mrem/hr)	Exposure Time (minutes/cask)	Dose/Person/ Cask (mrem)	Exposed Workers	Collective Dose (Person-rem)	Individual Risk (LCF)	Collective Risk (LCF)
Longshoreman A1	0.50	37[a]	0.25	0.15	3	0.00046	6.2E-08	1.9E-07
Longshoreman A2	0.50	37[a]	0.75	0.46	1	0.00046	1.9E-07	1.9E-07
Longshoreman A3	6.00	6.4[a]	0.25	0.027	1	0.000027	1.1E-08	1.1E-08
Longshoreman B1	0.50	34	0.25	0.14	4	0.00057	5.7E-08	2.3E-07
Maximum				0.46[a]			1.9E-07[a]	
Subtotal						0.0015		6.1E-07
Crane Operator 1	6.00	32	0.50	0.027	1	0.000027	1.1E-08	1.1E-08
Crane Operator 2	6.00	32	1.6	0.085	1	0.000085	3.4E-08	3.4E-08
Maximum				0.085[a]			3.4E-08a	
Subtotal						0.00011		4.5E-08
Truck Driver	3.00	7.1	3.3	0.38	1	0.00038	1.5E-07	1.5E-07
Maximum				0.38[a]			1.5E-07[a]	
Subtotal						0.00038		1.5E-07
Observers	6.00	3.2	0.5	0.027	4	0.00011	1.1E-08	4.3E-08
Observers	50	0.01	480	0.080	50	0.0040	3.2E-08	1.6E-06
Maximum				0.080[a]			3.2E-08[a]	
Subtotal						0.0041		1.6E-06
USCG Inspector	1.5	15	5.0	1.3	1	0.0013	5.0E-07	5.0E-07
DOT Inspector	1.5	15	2.0	0.5	1	0.00050	2.0E-07	2.0E-07
NRC Inspector	1.5	15	2.0	0.5	1	0.00050	2.0E-07	2.0E-07
State Inspector	1.5	15	2.0	0.5	1	0.00050	2.0E-07	2.0E-07
Local/Port Inspector	1.5	15	5.0	1.3	1	0.0013	5.0E-07	5.0E-07
Receiver	1.5	15	5.0	1.3	1	0.0013	5.0E-07	2.0E-07
Maximum				1.3[a]			5.0E-07[a]	
Subtotal						0.0053		2.1E-06
Maximum				1.3[a]			5.0E-07[a]	
Total						**0.011**		**4.6E-06**

[a] *Maximum individual exposure/risk.*

[b] *Includes dose from second cask in hold.*

USCG = U.S. Coast Guard, DOT = Department of Transportation

In both of these cases it was assumed that two transportation casks were being shipped on a single vessel and the two casks were both in the same hold. By making this assumption, the dose to the workers in the ship's hold is the result of exposure to two radiation fields during the offloading of the first casks. The impact of the presence of the second transportation cask has been included in the dose rates for the longshoremen who are in the ship's hold during the offloading activity. To simplify the analysis, it has been assumed that the dose rates for the offloading of the two casks are the same (i.e., even though when the second cask is being offloaded there is only one transportation cask in the hold, the exposures are calculated assuming that there are two casks in the hold). The total number of transportation casks shipped on a single vessel would not impact the results of this analysis. The per shipment results are for the shipment of a single cask, assuming two casks per hold. Annual exposures and exposures for the entire program do not depend on the number of transportation casks per shipment. Under the assumption that a vessel carrying more than two casks would be loaded two casks per hold, these results are solely dependent on the number of cask shipments per year and the total number of cask shipments.

There is approximately a factor of two difference between the total worker dose resulting from the use of a breakbulk vessel and the use of a container vessel per transportation cask. There is a larger difference between the dose to the maximally exposed individual (MEI). The MEI for the breakbulk vessel receives a dose of 3.8 mrem per transportation cask offloading while for the offloading of a transportation cask from a container vessel the MEI receives a dose of 1.3 mrem.

Another consideration that could affect the total worker exposure is the possibility that the vessel transporting the foreign research reactor spent nuclear fuel could make intermediate port calls between the foreign port at which the transportation cask is loaded and the port of entry for the foreign research reactor spent nuclear fuel. At the intermediate ports of call, it is possible that cargo being shipped on the vessel and in the same hold as the transportation casks could be loaded/offloaded or moved. The analysis was expanded to consider the impacts on port workers at these intermediate ports. Table D-14 provides the information used to estimate the dose to the port workers in intermediate ports. The estimates consider that the hold in which the transportation casks are being stowed have been fully loaded and that all of the cargo in the vicinity of the transportation casks must be moved at one of the intermediate ports of call. The vessel assumed in the intermediate port analysis was a breakbulk vessel. As in the analysis of the impact of the offloading of the transportation casks, this assumption results in calculations based on the type of vessel that will result in the largest estimated impact on the port workers.

Table D-14 Port Worker Exposure - Each Intermediate Port

Exposed Workers	*Distance (m)*	*Dose Rate*[a] *(mrem/hr)*	*Exposure Time (minutes)*	*Dose/Person (mrem)*	*Number of Workers*[b]	*Collective Dose (person-rem)*	*Individual Risk (LCF)*	*Risk per Port Call (LCF)*
Longshoreman	1.5	18	5	1.5	4	--	--	--
	5	6.4	6	0.64	4	--	--	--
	8	4.6	1	0.08	4	--	--	--
Total				**2.2**	**4**	**0.0089**	**0.00000089**	**0.0000035**

[a] *The dose rate includes the dose rate from two casks stored in the same hold.*

[b] *The same four workers are assumed to receive the entire dose from cargo handling activities in each intermediate port stop.*

The per shipment data provided in Tables D-12 through D-14 was used to develop estimates of the incident-free impact of the marine shipment of 721 transportation casks on port workers. (The number of shipments required is derived in Appendix B. The 721 shipments used in this portion of the analysis exclude all shipments of Canadian origin which are expected to be overland shipments). Table D-15 provides the results of this analysis. Data is provided for two possible shipment conditions. In the first a breakbulk vessel is used to transport all of the foreign research reactor spent nuclear fuel and this vessel is assumed to make two intermediate port calls on every voyage. During these intermediate port calls the cargo in the same hold as the transportation casks is assumed to be moved (loaded and/or offloaded) twice. The impact on port workers, in terms of population exposure and risk, in the intermediate ports is therefore twice the impact presented in Table D-14. The second set of assumptions used is that all shipments are made on a container vessel that does not make intermediate port calls. These assumptions result in a lower estimate of port worker risk since the impact of intermediate port calls is eliminated and the offloading activities for a container vessel result in lower overall doses to the port workers. These two sets of assumptions, therefore, provide estimates of the range of potential impacts on port workers.

In calculating the MEI, it was necessary to estimate the number of shipments to which a single worker could be exposed. Using the information in Table C-1, the shipments of foreign research reactor spent nuclear fuel were divided into eastern and western shipments. The eastern shipments are those that would

Table D-15 Integrated Port Worker Dose for the Basic Implementation of Management Alternative 1

	Breakbulk Vessel with 2 Intermediate Port Calls				*Container Vessel - No Intermediate Port Calls*			
	Maximally Exposed Individual (rem)	*Collective Dose to Workers (person-rem)*	*MEI Risk (LCF)*	*Worker Risk LCF)*	*Maximally Exposed Individual (rem)*	*Collective Dose to Workers (person-rem)*	*MEI Risk (LCF)*	*Worker Risk (LCF)*
Inspectors	2.0[a]	9.4	0.00080	0.0037	0.67	3.8	0.00027	0.0015
Port Handlers - Intermediate Ports	1.2	13	0.00047	0.0051	----	----	----	----
Port Handlers - Port of Entry	1.1	4.8	0.00043	0.009	0.25	1.1	0.00010	0.00044
Port Staging Personnel	0.19	3.2	0.000076	0.0013	0.21	3.3	0.00008	0.0013
Total	----	**30.2**	----	**0.012**	----	**8.2**	----	**0.0033**
Maximum	**2.0[a]**	----	**0.00080**	----	**0.67**	----	**0.00027**	----

[a]*This dose is above the allowed limit of 100 mrem/yr for the general population and would be mitigated to below the limit.*

be expected to be shipped to a port on the East Coast of the United States if the shortest shipping distance were used. Western shipments are those that would be shipped to the West Coast port. From Table C-1, 535 shipments would be considered East Coast shipments; 186 West Coast. In determining the MEI, it was assumed that all of these East Coast shipments were made through the same port, and the same workers were involved in the offloading of the transportation casks for all shipments.

The total impact on the worker population was determined by using the full 721 transportation cask shipments. Both the MEI and the collective dose to the workers have been converted into a risk estimate of LCF resulting from the doses received in offloading the transportation casks loaded with foreign research reactor spent nuclear fuel. The range of impacts for the program is from 8.2 person-rem (0.0033 LCF) (for the use of container vessels with no intermediate port calls) to 30 person-rem (0.012 LCF) (for the use of breakbulk vessels with two intermediate port calls). These risks imply that there is between a three-in-a-thousand and a one-in-a-hundred chance that this program will result in one LCF as a result of the incident-free impact on port workers. The relationship between worker dose and cancer fatalities is that 1 rem is equivalent to 0.0004 LCF.

Under the basic implementation of Management Alternative 1, shipments would be received over a 13-year period, the 10-year period for spent nuclear fuel generation plus 3 additional years to allow for the coordination of available storage, transportation casks, shipping arrangements, etc. Assuming that the shipments were evenly distributed over the 13-year period, the doses to the MEI could be in excess of the DOE and NRC limits for doses to the general public (100 mrem per year). If breakbulk vessels were used, the MEI would receive approximately 150 mrem per year on average, if no mitigation steps were taken. If container vessels were used, no individuals are expected to receive a dose in excess of the public dose limits.

The above calculations were all performed assuming that every transportation cask was shipped with an external dose rate at the selected exclusive use regulatory limit of 10 mrem hour at 2 m (6.6 ft) from the surface of the container. This provides an estimate of the upper limit to what the incident-free impacts of the offloading of the transportation casks could be. To determine a more realistic estimate of these impacts, the analysis was redone using historical data on the external dose rates associated with the transportation of research reactor spent nuclear fuel. This analysis results in an average dose rate of

approximately 2.3 mrem per hour at 1 m (3.3 ft) from the cask surface, which is equivalent to a dose rate of 1 mrem per hour at 2 m (6.6 ft) from the cask surface. If the added distance from the cask surface to the container surface is not credited, this dose rate is one-tenth of the dose rate derived from the "exclusive use" regulatory limit. (See Appendix F, Section F.5)

Tables D-16 through D-19 provide the results of this analysis. No other assumptions were modified between this analysis from those used to develop the data presented earlier in this section. All of the results using the "historical" data are an order-of-magnitude lower than results derived from the use of the regulatory limit dose rates.

Table D-16 Port Worker Consequences from Shipment of Foreign Research Reactor Spent Nuclear Fuel on Breakbulk Vessels (Historical Data)

Exposed Workers	*Exposure Distance (m)*	*Dose Rate (mrem/hr)*	*Exposure Time (minutes/cask)*	*Dose/ Person/Cask (mrem)*	*Exposed Workers*	*Collective Dose (Person-rem)*	*Individual Risk (LCF)*	*Collective Risk (LCF)*
Longshoreman A1	0.50	3.7[b]	0.25	0.015	2	3.1E-05	6.2E-09	1.2E-08
Longshoreman A2	0.50	3.7[b]	3.3	0.20	2	4.0E-04	8.0E-08	1.6E-07
Longshoreman A3	6.00	0.64[b]	0.25	0.0027	1	2.7E-06	1.1E-09	1.1E-09
Longshoreman B1	0.50	34	1.0	0.057	4	2.3E-04	2.3E-08	9.1E-08
Maximum				0.20[a]			8.0E-08a	
Subtotal						6.6E-04		2.6E-07
Crane Operator 1	9.00	0.18	3.0	0.009	1	9.0E-06	3.6E-09	3.6E-09
Maximum				0.009[a]			3.6 E-09[a]	
Subtotal						9.0E-06		3.6E-09
Truck Driver	3.00	0.71	3.0	0.036	1	3.6E-05	1.4E-08	1.4E-08
Maximum				0.036[a]			1.4E-08[a]	
Subtotal						3.6E-05		1.4E-08
Observers	6.00	0.32	0.25	0.0013	4	5.3E-06	5.3E-10	2.1E-09
Observers	50	0.001	480	0.008	50	4.0E-04	3.2E-09	1.6E-07
Maximum				0.008[a]			3.2E-09[a]	
Subtotal						4.1E-04		1.6E-07
USCG Inspector	1.5	1.5	2.0	0.05	1	5.0E-05	2.0E-08	2.0E-08
DOT Inspector	1.5	1.5	15	0.38	1	3.8E-04	1.5E-07	1.5E-07
NRC Inspector	1.5	1.5	10	0.25	1	2.5E-04	1.0E-07	1.0E-07
State Inspector	1.5	1.5	15	0.38	1	3.8E-04	1 .5E-07	1.5E-07
Local/Port Inspector	1.5	1.5	5	0.13	1	1.3E-04	5.0E-08	5.0E-08
Receiver	1.5	1.5	5	0.13	1	1.3E-04	5.0E-08	5.0E-08
Maximum				0.38			1.5E-07	
Subtotal						1.3E-03		5.2E-07
Maximum				0.38[a]			1.5E-07[a]	
Total						**2.4E-03**		**9.6E-07**

[a] *Maximum individual exposure/risk.*

[b] *Includes dose from second cask in hold.*

USCG = U.S. Coast Guard, DOT = Department of Transportation

The total population dose (dose to the port workers) ranges from 3.0 person-rem (breakbulk vessel with two intermediate port calls) and 0.7 person-rem (container vessel with no intermediate port calls). This corresponds to a risk of 0.0012 to 0.00033 LCF, that is, a one-in-a-thousand to a one-in-three thousand chance of incurring one LCF. For a population of workers, the relationship between exposure and LCF is

Table D-17 Port Worker Consequences from Shipment of Foreign Research Reactor Spent Nuclear Fuel on Containerized Vessels (Historical Data)

Exposed Workers	Exposure Distance (m)	Dose Rate (mrem/hr)	Exposure Time (minutes/cask)	Dose/Person/ Cask (mrem)	Exposed Workers	Collective Dose (Person-rem)	Individual Risk (LCF)	Collective Risk (LCF)
Longshoreman A1	0.50	3.7[a]	0.25	0.015	3	4.6E-05	6.2E-09	1.9E-08
Longshoreman A2	0.50	3.7[b]	0.75	0.046	1	4.6E-05	1.9E-08	1.9E-08
Longshoreman A3	6.00	0.64[b]	0.25	0.0027	1	2.7E-06	1.1E-09	1.1E-09
Longshoreman B1	0.50	340	0.25	0.014	4	5.7E-05	5.7E-08	2.3E-08
Maximum				0.046[a]			1.9E-08[a]	
Subtotal						1.5E-04		6.1E-08
Crane Operator 1	6.00	0.32	0.5	0.0027	1	2.7E-06	1.1E-09	1.1E-09
Crane Operator 2	6.00	0.32	1.6	0.0085	1	8.5E-06	3.4E-09	3.4E-09
Maximum				0.0085[a]			3.4E-09[a]	
Subtotal						1.1E-05		4.5E-09
Truck Driver	3.00	0.71	3.3	0.038	1	3.8E-05	1.5E-08	1.5E-08
Maximum				0.038[a]			1.5E-08[a]	
Subtotal						3.8E-05		1.5E-08
Observers	6.00	0.32	0.5	0.0027	4	1.1E-05	1.1E-09	4.3E-09
Observers	50	0.001	480	0.0080	50	4.0E-04	3.2E-09	1.6E-07
Maximum				0.0080[a]			3.2E-09[a]	
Subtotal						4.1E-04		1.6E-07
USCG Inspector	1.5	1.5	0.5	0.13	1	1.3E-04	5.0E-08	5.0E-08
DOT Inspector	1.5	1.5	0.2	0.050	1	5.0E-05	2.0E-08	2.0E-08
NRC Inspector	1.5	1.5	0.2	0.050	1	5.0E-05	2.0E-08	2.0E-08
State Inspector	1.5	1.5	0.2	0.050	1	5.0E-05	2.0E-08	2.0E-08
Local/Port Inspector	1.5	1.5	0.5	0.013	1	1.3E-04	5.0E-08	5.0E-08
Receiver	1.5	1.5	0.5	0.13	1	1.3E-04	5.0E-08	5.0E-08
Maximum				0.13[a]			5.0E-08[a]	
Subtotal						5.3E-04		2.1E-07
Maximum				0.13[a]			5.0E-08[a]	
Total						**1.1E-03**		**4.5E-07**

[a] *Maximum individual exposure/risk.*

[b] *Includes dose from second cask in hold.*

USCG = U.S. Coast Guard, DOT = Department of Transportation

Table D-18 Port Worker Exposure - Intermediate Ports (Historical Cask External Dose Rate Data)

Exposed Workers	Distance (m)	Dose Rate[a] (mrem/hr)	Exposure Time (minutes)	Dose/Person (mrem)	Number of Workers[b]	Collective Dose (person-rem)	Individual Risk (LCF)	Risk per Port Call (LCF)
Longshoreman	1.5	1.8	5	0.15	4	--	--	--
	5	0.6	6	0.06	4			--
	8	0.5	1	0.01	4	--	--	--
Total				**0.22**	**4**	**0.00089**	**0.000000089**	**0.00000035**

[a] *The dose rate includes the dose rate from two casks stored in the same hold.*

[b] *The same four workers are assumed to receive the entire dose from cargo handling activities in each intermediate port stop.*

Table D-19 Integrated Port Worker Dose for the Basic Implementation of Management Alternative 1 (Historical Cask Dose Rates)

	Breakbulk Vessel with 2 Intermediate Port Calls				*Container Vessel - No Intermediate Port Calls*			
	Maximally Exposed Individual (rem)	*Collective Dose (person-rem)*	*MEI Risk (LCF)*	*Risk (LCF)*	*Maximally Exposed Individual (rem)*	*Collective Dose (person-rem)*	*MEI Risk (LCF)*	*Risk (LCF)*
Inspectors	0.20	0.94	0.00008	0.00037	0.07	0.38	0.00002	0.00015
Port Handlers - Intermediate Ports	0.12	1.3	0.000047	0.00051	----	----	----	----
Port Handlers - Port of Entry	0.11	0.5	0.000043	0.00019	0.03	0.11	0.000010	0.000044
Port Staging Personnel	0.02	0.3	0.000008	0.00013	0.02	0.33	0.000009	0.00013
Maximum	0.20[a]		0.00008[a]		0.07[a]		0.000027[a]	
Total		**3.0**		**0.0012**		**0.8**		**0.00033**

[a] *Maximally exposed individual.*

1 rem is equivalent to 0.0004 LCF. The MEI would receive a dose of 0.2 rem over the 13-year period of the basic implementation of Management Alternative 1. This is approximately 15 mrem per year, which is well below the NRC and DOE limits for exposure to the public (100 mrem per year).

The results of these analyses indicate that some of the port personnel that handle and inspect foreign research reactor spent nuclear fuel shipping containers could receive doses that exceed public exposure limits established by DOE and the NRC, especially when the dose rate from the casks are assumed to be at the regulatory limit for exclusive use shipments of 10 mrem per hour measured 2 m (6.6 ft) from the surface of the shipping container. The analyses results are conservative due to three factors. First, it is estimated that for most shipments the external dose rate for the loaded transportation cask would be near the historic dose rates, which average a factor of ten below the regulatory limit. Second, the analyses assumed that the same port inspectors and handlers handle all shipments. In reality, most port personnel work on shifts, so the likelihood of all shipments being handled by the same shift is low. Finally, all of the shipments passing through any East Coast port were assumed to pass through the same port. In reality, it is more than likely that the shipments would be made through more than a single port.

However, the existence of some shipments with external dose rates closer to the exclusive use regulatory limit suggests that DOE should provide a means to assure that individual port personnel do not receive doses in excess of the public dose limits. As a minimum, the program should establish administrative procedures that would maintain records of the exposure rates associated with each shipment and the ports of departure and entry. The measurement of interest for the record keeping would be the external dose rates outside the container, which houses the transportation cask since the port personnel do not enter the container. These measurements could be used to identify shipments that would result in port personnel exposures above those calculated based on the historical spent nuclear fuel transportation external dose rate. By tracking this information, DOE would be able to identify if and when additional precautions to reduce individual exposures should be taken.

D.4.6 Cumulative Port Impact Analysis Methodology

Analyses have been carried out to estimate the maximum occupational doses associated with the port activities segment of the transportation of foreign research reactor spent nuclear fuel. Since port workers are expected to be exposed to other shipments of radioactive materials, the cumulative impact of all

radioactive material shipments has been estimated. The cumulative analysis is necessary to determine the impact on port workers from doses received through actions associated with the foreign research reactor spent fuel return program and through other actions, both DOE and commercially initiated.

The maximum exposure for a worker involved in transporting the foreign research reactor fuel is predicted to result from activities associated with the unloading of the spent fuel casks in port, cask inspection, and cask preparation for truck shipment to the management sites. If the same individuals were present for all proposed shipments of foreign research spent nuclear fuel on an annual basis (a conservative assumption), the maximum dose would be approximately 150 mrem, as discussed in the previous section. This estimate is based on the use of the "exclusive use" regulatory external dose rate. Based on historical spent nuclear fuel shipment data, this maximum annual dose would be 15 mrem.

Since commercial ports routinely receive other shipments of radioactive materials under other DOE programs or other commercial activities, the port worker would also be potentially exposed to additional sources of radiation. To estimate the annual exposure rate of port workers resulting from handling of commercial radioactive material shipments, the following must be determined.

- Number of radioactive packages handled per year
- Length of exposure time per package
- Dose rate per package

Records of shipments through the potential ports of entry were used to estimate the annual throughput of packages with radioactive contents. Radioactive materials were identified by the product code listed for each shipment. The radioactive shipments were then grouped into six categories and exposure rates at 1 m (3.3 ft) from the outer surface of the package were assigned for each group as follows:

• enriched uranium hexafluoride	(0.5 mrem per hour)
• normal uranium hexafluoride	(0.2 mrem per hour)
• depleted uranium	(0.2 mrem per hour)
• uranium oxide	(0.2 mrem per hour)
• spent nuclear fuel (foreign research reactor)	10 mrem per hour [at 2 m (6.6 ft) from the container surface]
• other radioactive materials	(0.2 mrem per hour)

Each shipment record lists the weight and number of packages included in the shipment. Since package descriptions were not uniform and included units, containers, cases, boxes, barrels, drums, packages, cartons, etc., the assumption was made that the radioactive shipments would be stacked on skids and the total number of skids per shipment, rather than the number of packages per shipment, would be used to estimate the dose received by workers. The weight and number of individual shipments was examined for each shipment to estimate the number of skids. In most cases, boxes, cartons, barrels, and drums were assumed to be handled four to a skid. When a large number of light packages was included in one shipment, these were assumed to be handled as either eight or 32 packages per skid.

The annual dose to port workers resulting from handling commercial radioactive shipments were estimated based on the number of shipments passing through the port and an estimated handling time of ten minutes per skid or cylinder. Each port typically uses three shifts per day and therefore workers were assumed to be exposed to one-third of the packages passing through the port. This is a conservative assumption given that there are typically many berths and terminals within one port, thus making it unlikely that one individual would be present for even one-third of the shipments of radioactive materials. The estimated dose to the MEI from these commercial shipments is shown in Table D-20.

Table D-20 Estimated Maximum Exposure to Dock Workers from Commercial Shipments of Radioactive Material

Port	*Average No. of Radioactive Shipments per Year*	*Estimated Maximum Exposure per Year (mrem)*	*Port*	*Average No. of Radioactive Shipments per Year*	*Estimated Maximum Exposure per Year (mrem)*
Baltimore, MD	31	3.4	New Orleans, LA	7	3.9
Boston, MA	2	0.2	Norfolk, VA	30	3.9
Charleston, SC	16	3.1	New York, NY	104	16.8
Fernandina Beach, FL	21	less than 0.1	Oakland, CA	39	9.0
Galveston, TX	1	less than 0.1	Philadelphia, PA	1	less than 0.1
Houston, TX	14	4.0	Portland, OR	1	0.6
Jacksonville, FL	4	0.3	Portsmouth, VA	28	5.5
Long Beach, CA	1	less than 0.1	Port Everglades, FL	7	0.1
Los Angeles, CA	6	0.2	Savannah, GA	7	1.5
Miami, FL	1	less than 0.1	Wilmington, NC	2	1.2

As this table shows, yearly exposures for the commercial shipments are typically less than 10 mrem per year, which is well within the regulatory limit of 100 mrem per year established for a member of the general public. New York (at 16.8 mrem per year), which had the most commercial shipments of radioactive material on a yearly basis, was the only port to exceed 10 mrem per year. However, the Port of New York consists of three terminals in Elizabeth (NJ), Brooklyn, and Manhattan. This diversity means that in practice, the average port worker would be involved in only a portion of the shipments through "New York."

Some of the potential ports are being used or have the potential to be used for other DOE-initiated activities. These activities include the purchase of Russian low enriched uranium (LEU) under the agreement Suspending the Antidumping Investigation of Uranium from the Russian Federation and the import of Russian LEU derived from the dismantling of nuclear weapons in Russia. Estimated maximum exposures from these activities are 0.9 mrem and 1.4 mrem per year, respectively.

The impact of all of these shipments can be viewed in two ways. If the foreign research reactor spent nuclear fuel shipments were to have dose rates like the historical data indicate they would, the total maximum worker exposure from all of these activities would be well below the public dose limits (by at least a factor of three). If the foreign research reactor spent nuclear fuel shipments were to be closer to the external dose rate allowed by the "exclusive use" regulatory limit, these other activities do not significantly alter the maximum worker dose. In this case, DOE's response to the worker exposure would be dictated by the exposure resulting from the shipment of foreign research reactor spent nuclear fuel.

D.4.7 Incident-Free Port Impacts of Alternatives to the Basic Implementation of Management Alternative 1

Three alternatives to the basic implementation of Management Alternative 1 were identified that could impact the incident-free port risk calculations that were performed. (Chapter 2 describes the alternatives to the basic implementation of Management Alternative 1.) The implementation subalternative of *accepting spent nuclear fuel only from developing countries*, which are identified as countries other than high-income economies, would result in a reduction in the amount of spent nuclear fuel transported by ship. Table C-12 listed the countries that are considered to be countries other than high-income economies and the number of foreign research reactor spent nuclear fuel shipments that would be required to transport their spent nuclear fuel to the United States. One hundred sixty-eight transportation casks would be shipped to the United States under this implementation subalternative. Under the *foreign research reactor spent nuclear fuel for 5-years only* implementation subalternative, the number of shipments of foreign research reactor spent nuclear fuel would be reduced to 586 shipments requiring ocean transport. (The derivation of the number of shipments required in this alternative is presented in Appendix B.)

The third alternative, with the capability to impact the results of the incident-free port risk analysis, is the *overseas processing of the foreign research reactor spent nuclear fuel with the shipment of the vitrified waste to a storage facility in the United States*. Under this alternative, eight transportation cask shipments of vitrified waste could be made.

In addition to these alternatives, a hybrid alternative was analyzed. In this alternative, those countries that have the capability to store high-level waste would be encouraged to process the aluminum-based research reactor spent nuclear fuel and to accept for storage the resulting high-level waste. (For this alternative these countries are assumed to be Belgium, France, Germany, Italy, Spain, Switzerland, and the United Kingdom). The United States would accept for storage the foreign research reactor spent nuclear fuel from those countries deemed not to have the high-level waste storage capability. In this alternative, this includes all of the countries identified in Table C-1, except for those listed above. Under this hybrid alternative, 452 shipments of foreign research reactor spent nuclear fuel are assumed to be sent to the United States, excluding overland shipments of Canadian origin.

The incident-free port risks associated with these three alternatives are discussed in the following sections.

Implementation Subalternative 1a of Management Alternative 1 – Acceptance of Foreign Research Reactor Spent Nuclear Fuel Only From Developing Countries: Developing countries are defined as countries other than high-income economies. As stated above, this implementation subalternative would result in the shipment of 168 transportation casks of foreign research reactor spent nuclear fuel. The assumptions used in the analysis of the basic implementation of Management Alternative 1 incident-free port impact have been used in the analysis of this subalternative. To compare this subalternative to the basic implementation of Management Alternative 1, it is only necessary to perform the analysis using one external dose rate, either the regulatory dose limit or the historic dose rate. The regulatory dose rate was chosen for the comparison.

Included in the assumptions that have not changed in this analysis are the following:

- The worker exposure times and distances from the transportation cask are as detailed in Tables D-8 through D-10.
- The intermediate port stops are considered for the breakbulk vessel but not for the container vessel.

- Two transportation casks are being transported in the same hold on each cargo vessel.

The per shipment incident-free impact on the port workers would be identical to that calculated for the basic implementation of Management Alternative 1. None of the assumptions used to generate the per shipment information change. The 168 shipments required to meet the needs of this subalternative would result in a reduction in the total (program) impacts by approximately 77 percent. The total population exposure would range from 7.0 person-rem (for the breakbulk vessel with two intermediate port calls) to 1.9 person-rem (for the container vessel with no intermediate port stops). This corresponds to an incident-free risk of 0.0028 to 0.00076 LCFs (i.e., a chance of between three-in-a-thousand and seven-in-ten thousand of incurring one LCF).

Implementation Subalternative 2a of Management Alternative 1 – Acceptance of Foreign Research Reactor Spent Nuclear Fuel for 5 Year Policy Duration: As stated above, this implementation subalternative would result in the shipment of 586 transportation casks of foreign research reactor spent nuclear fuel. The assumptions used previously for incident-free port impact have been used in the analysis of this subalternative. This implementation subalternative has been analyzed using the "exclusive use" regulatory limit transportation cask external dose rates. To compare this implementation subalternative to the basic implementation of Management Alternative 1, it is only necessary to perform the analysis using one external dose rate.

Included in the assumptions that have not changed in this analysis are the following:

- The worker exposure times and distances from the transportation cask are as detailed in Tables D-8 through D-10.
- The intermediate port stops are considered for the breakbulk vessel but not for the container vessel.
- Two transportation casks are being shipped in the same hold of each cargo vessel.

The per shipment incident-free impact on the port workers would be identical to that calculated for the basic implementation of Management Alternative 1. Therefore, none of the assumptions used to generate the per shipment information change. The 586 shipments required to meet the needs of this implementation subalternative would result in a reduction in the total (program) impacts to approximately 81 percent of the impacts associated with the basic implementation of Management Alternative 1. The total population exposure would be 25 person-rem (for the breakbulk vessel with two intermediate port calls) to 6.7 person-rem (for the container vessel with no intermediate port stops). This corresponds to an incident-free risk of 0.0098 to 0.0027 LCFs (i.e., a chance of between one-in-a-hundred and three-in-a-thousand of incurring one LCF).

Management Alternative 2, Subalternative 1b – Overseas Reprocessing with Shipment of the Vitrified Waste to a U.S. Storage Facility: In this subalternative under Management Alternative 2, the foreign research reactor spent nuclear fuel would be processed overseas (most probably in Great Britain or France) and the waste products are contained within several vitrified waste logs. This high-level waste may be brought to the United States for storage in one of the storage facilities evaluated under this EIS. Under these conditions, up to eight transportation casks containing vitrified waste would be shipped from Europe to the United States. This analysis addresses the incident-free port risks associated with transporting these eight casks of vitrified waste from Europe to the United States.

As with the shipment of foreign research reactor spent nuclear fuel as spent nuclear fuel, the primary incident-free port impacts of shipping vitrified waste would be upon the workers in the ports. The assumptions used in the analysis of the incident-free port impact of the basic implementation of Management Alternative 1 have been used in the analysis of this subalternative. Differences between the foreign research reactor spent nuclear fuel transportation casks and the vitrified waste transportation casks are not expected to significantly alter the work requirements in port. For the purposes of this analysis, it has been assumed that the vitrified waste would be transported on a chartered vessel, and there would be no intermediate port calls.

This alternative has been analyzed using the regulatory limit transportation cask external dose rates. Little information is available on the casks to be used to transport the vitrified waste. No attempt was made to extrapolate limited historical data to determine the port worker incident-free impacts from any other exposure rate other than the limit set forth in NRC and DOE regulations.

Included in the assumptions that have not changed in this analysis are the following:

- The worker exposure times and distances from the transportation cask are as detailed in Tables D-8 through D-10.
- The intermediate port stops are not considered for the container vessel.
- Two transportation casks are being transported in the same hold of the cargo vessels.

The per shipment incident-free impact on the port workers would be identical to that calculated for the basic implementation of Management Alternative 1. None of the assumptions used to generate the per shipment information change. The eight shipments required to meet the needs of this subalternative would result in a reduction in the total (program) impacts by a factor of approximately one hundred. The total population exposure would be 0.0091 person-rem for the container vessel with no intermediate port stops. This corresponds to an incident-free risk of 0.0000036 LCFs (i.e., a chance of approximately four-in-a-million of incurring one LCF).

Hybrid Alternative – Acceptance of Foreign Research Reactor Spent Nuclear Fuel From Countries Without High-Level Waste Disposal Capability: As stated above, this hybrid alternative results in the marine shipment of 452 transportation casks of foreign research reactor spent nuclear fuel. The assumptions used in the analysis of the incident-free port impact of the basic implementation of Management Alternative 1 have been used in the analysis of this alternative. This alternative has been analyzed using external dose rates derived from the exclusive use regulatory limit for a transportation cask.

Included in the assumptions that have not changed in this analysis are the following:

- The worker exposure times and distances from the transportation cask.
- The intermediate port stops are considered for the nonchartered vessel but not for the chartered vessel.
- Two transportation casks are being shipped in the same hold of each cargo vessel.

The per-shipment incident-free impact on the port workers would be identical to that calculated for the basic implementation of Management Alternative 1. None of the assumptions used to generate the per-shipment information changes. The 452 shipments required to meet the needs of this hybrid alternative would result in a reduction in the total (program) impacts to approximately 63 percent of the impacts associated with the basic implementation of Management Alternative 1. Therefore, the total

population exposure would be 19 person-rem (for regularly scheduled commercial vessel with two intermediate port calls) to 5.1 person-rem (for the chartered vessel with no intermediate port calls). This corresponds to an incident-free risk of 0.0076 to 0.0021 LCFs (i.e., a chance of between approximately one-in-five hundred to less than one-in-a-hundred of incurring one LCF).

D.5 Accident Impacts: Methods and Results

D.5.1 Introduction

This section describes the approach used to assess the risks associated with in-port accidents that could result in a release of radioactive material from the transportation cask containing foreign research reactor spent nuclear fuel. The discussion addresses both the accident risk assessment methodology and the results of the analyses. The risk assessment results are presented in terms of a per-shipment accident risk and the total port-accident risks associated with various alternative under the proposed action.

Spent nuclear fuel shipments could occur via any of four types of vessels, container ships, roll-on/roll-off vessels, breakbulk vessels, and purpose-built (dedicated) vessels. In the incident-free analysis, only breakbulk vessels and container vessels were studied, since these two provide a bounding assessment of the risks associated with port activities. Under the assumptions used in the port accident analysis, the type of vessel used to transport the foreign research reactor spent nuclear fuel would not impact the result of the analysis.

All radiologically-related impacts are calculated in terms of committed dose and associated health effects in the exposed populations. The radiation dose calculated is the total effective dose equivalent, which is the sum of the effective dose equivalent (EDE) from the external radiation exposure and the 50 year committed effective dose equivalent from internal radiation exposure. Radiation doses are presented in units of person-rem for collective population and rem or mrem for individuals. The impacts are further expressed as health risks, specifically in terms of LCF. The health risk conversion factors were derived from International Commission on Radiological Protection Publication 60 (ICRP, 1991). See Chapter 4 for a more complete explanation of radiation measurement and health risks.

D.5.1.1 Accident Risks

Risk (R) is the product of the magnitude (M) of an unfavorable consequence and the probability of occurrence (P) of that consequence. Thus,

$$R = PM.$$

For accidents that happen during the transportation of radioactive materials, the unfavorable consequences of the accident may include exposure of people to radiation emitted by the radioactive materials released to the atmosphere by the accident and the occurrence of radiation induced health effects that the exposure may cause. The magnitude of these consequences depends on the amount of radioactivity released to the atmosphere, the degree to which the radioactive materials are diluted during downwind transport, and the size of the population that is exposed to radiation from the passing plume or from materials deposited on the ground or in the water from the plume. The amount of dilution experienced by a plume during downwind transport depends principally on atmospheric stability and windspeed. The size of the exposed population is determined by the direction the wind is blowing at the time of the accident and the number of people in that direction. Thus, the probability that a given consequence occurs is given by the following product,

$$P = P_{st}P_wP_p$$

where P_{st} is the probability of the source term (the amount of radioactive material released), P_w is the probability of the prevailing weather conditions, and P_p is the exposure probability of the population that is exposed to radiation, given the direction that the wind is blowing at the time of the accident.

D.5.1.2 Ship Accident Risks

The total risk caused by transporting foreign research reactor spent fuel to and within the United States is the sum of the risks for transport by land and by ship. Thus,

$$R_{total} = R_{land} + R_{ship}$$

For ships, the risk is given by:

$$R_{ship} = R_{sea} + R_{coast} + R_{port}$$

where R_{sea}, R_{coast}, and R_{port} are the risk while at sea, while sailing in coastal waters, and while in the port (R_{sea} and R_{coast} were addressed in Appendix C). Each risk term has an incident-free and an accident contribution, so

$$R_{port} = R_{port\text{-}incident\text{-}free} + R_{port\text{-}accident}$$

The accident risks associated with the foreign research reactor spent nuclear fuel while it is on a ship in the port, $R_{port\text{-}accident}$, is the subject of this section. $R_{port\text{-}incident\text{-}free}$ was covered in D.4 of this appendix.

The only port accidents considered are those where the ship carrying the spent nuclear fuel is struck by another ship. Accidents where the spent nuclear fuel transport ship rams a fixed structure (a bridge or a dock), rams another ship (a collision where the spent nuclear fuel ship is the striking ship), or runs aground are neglected for the following reasons.

First, ship accident data show that when a ship rams a fixed structure or collides with another ship, damage to the striking ship is confined to its prow and to the forwardmost hold. Even in these cases, the forces exerted on cargo in the forward hold are less than the forces exerted on cargo in the case where a striking ship impacts the cargo hold.

Second, because keel structures are massive and very sturdy, groundings rarely lead to significant damage to cargo, although monetary losses due to sinking of cargo or the ship can be significant. Immersion to the depths of harbor channels is unlikely to damage a spent nuclear fuel cask or pose a significant retrieval problem; therefore, groundings are also neglected in this study.

D.5.2 Risk Analysis Methods

The consequences of ship collisions that occur in ports were estimated using the MELCOR Accident Consequences Code System (MACCS) (Jow et al., 1990, Sprung et al., 1990), originally developed by Sandia National Laboratories and the NRC for use in estimating the consequences of nuclear power plant accidents. The MACCS code was selected for these analyses because it can model an accident that takes place at a specific location and, more importantly, can model the site-specific population distribution around that location including space that is ocean and thus unpopulated.

If a ship transporting spent nuclear fuel is struck by another ship, and the collision leads to the failure of the spent fuel cask, the prevailing winds would transport the radioactive gases and aerosols in the plume released to the atmosphere during the accident away from the accident scene. During transport by the prevailing winds, downwind populations would likely be exposed to radiation, and land, buildings, and crops located below the plume trajectory might be contaminated by the radioactive materials deposited from the plume. Estimation of the range and probability of the health effects induced by the radiation exposures, and of the economic costs and losses that would result from any contamination of land, buildings, and crops is the objective of a MACCS accident consequence analysis.

MACCS calculations require the following accident and site data:

The radioactive inventory of the cask at the time of the accident for those radionuclides important for the calculation of accident consequences.

Release fractions and probability of release for the source term caused by the accident.

Plume characteristics for the radioactivity released to the atmosphere by the accident, the sensible heat content and the release time and duration.

Meteorological data characteristic of the region where the port is located, usually one year of hourly readings of windspeed, atmospheric stability, and rainfall.

The population distribution about the port where the accident occurs.

Emergency response assumptions, such as evacuation time and average speed; building shielding factors and the time when people take shelter if nearby populations are instructed to take shelter.

Land usage (habitable land fractions and farmland fractions) for the region surrounding the port.

Given these data, MACCS predicts:

The downwind transport, dispersion, and deposition of the radioactive materials released from the failed spent fuel cask.

The radiation doses received by the exposed populations via direct (cloudshine, inhalation, groundshine, resuspension) and indirect (ingestion) exposure pathways.

The mitigation of these doses by emergency response actions (evacuation, sheltering, and post-accident relocation of people).

Health effects that might occur in the population exposed to radiation as a result of the accident, both LCF and acute injuries (if short-term exposures are large).

The potential costs of emergency response actions, and of the decontamination, temporary interdiction, and condemnation of milk, crops, land, and buildings located in the region around the port, if necessary.

D.5.3 MACCS Input Data

D.5.3.1 Source Terms

MACCS source terms are specified by five input quantities: the probability (P_{st}) of the accident that leads to the release; the time (t) and duration (delta t) of the release (for ship accidents there may be both a mechanical release following the collision and a later thermal release if the accident progression leads to a fire); and the accident release fraction (f_i) and cask inventory (I_i) of each radionuclide (i) important for the calculation of accident consequences.

D.5.3.1.1 Source Term Probabilities

In the Environmental Assessment for the Urgent Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel (DOE, 1994d), accident risks were estimated using six categories of accident severity. To facilitate comparison of the risk estimates developed for this EIS to those developed for the Environmental Assessment, the EIS retained these six categories of accidents. Table D-21 presents the six categories of accident severity used in the EIS (and Environmental Assessment), the values of the conditional release probabilities (conditional on the occurrence of the specified accident), and the radionuclide release fractions used in the EIS for each severity category.

Inspection of the table shows that no radioactive releases are expected for accidents that fall into severity categories 1 or 2. Accidents that fall into category 3 fail the cask's seal but not the fuel elements contained within the cask. Thus, only radioactivity produced by activation of chemical deposits located on the outside of the fuel elements corrosion deposits can be released. Since research reactor fuel is not significantly plagued by corrosion deposit formation, corrosion deposits are negligible for research reactor spent fuel. Although the accident phenomenology specified for category 6 is more severe than that for category 5, and that for category 5 is more severe than that for category 4, in the Environmental Assessment all three of these categories were assigned a conditional probability of occurrence of 0.0004. Since increasing accident severity should mean decreasing accident probability, the conditional probabilities assigned to these categories should not be identical. Although the Environmental Assessment release fractions given in the table were retained as the base case for analysis, a method to develop new estimates of the conditional probabilities of occurrence for categories 4, 5, and 6 was formulated. That method is presented below.

D.5.3.1.2 EIS Source Term Probability Considerations

Table D-22 presents a sequence of events that encompasses the accident conditions associated with accident severity categories 4, 5, and 6. This sequence of events provides a reasonable description of a severe collision between large ships that leads both to a severe fire and to a release of radioactivity from the violated spent fuel cask.

This construct allows source term probabilities (P_{st}) to be estimated as the product of the probabilities of occurrence for the seven events. Table D-23 shows how values for P_{st} were calculated in this analysis for accident severity categories 4 through 6. $P_{collision}$ and $P_{severe\ fire}$ were estimated from ship accident data. Because data were sparse for some of the ports studied, these probabilities were not developed separately for each port (i.e., dependencies on port traffic were neglected). P_{hold} and $P_{engulfing\ fire}$ were derived from ship specifications (number of cargo holds and the dimensions of these holds for the prototypic breakbulk freighter used in the impact and crush analyses). P_{impact} and P_{crush} were estimated, as is described in

Table D-21 Accident Severity Categories Used in the EIS

Accident Severity Category	*Accident Conditions*	*Conditional Probabilities*	*Radionuclide Release Fractions*[a]
1	Conditions do not exceed those for a Type B package; no release of contents.	0.603	Co 0 Kr 0 Cs 0 Ru 0 Part 0
2	Conditions equal to those for Type B certification tests; no release of contents.	0.395	Co 0 Kr 0 Cs 0 Ru 0 Particulate 0
3	Seal damage creates leak path, but fuel undamaged; only corrosion deposits, if present, released from package.	0.002	Co 0.012 Kr 0 Cs 0 Ru 0 Particulate 0
4	Impact damage great enough to cause damage to spent fuel; fuel particulates and fission gases may be released.	0.0004	Co 0.012 Kr 0.010 Cs 0.00000001 Ru 0.00000001 Particulate 0.00000001
5	Impact damage to seals plus fire severe enough to cause the cask to leak with release of fission gases, volatiles, and particulates.	0.0004	Co 0.012 Kr 0.100 Cs 0.0009 Ru 0.000001 Particulate 0.00000005
6	Severe impact damage plus fire severe enough to oxidize fuel with release of greater amounts of volatiles than Category 5.	0.0004	Co 0.012 Kr 0.100 Cs 0.00098 Ru 0.000042 Particulate 0.00000005

[a]*No credit was taken for the deposition of fission product vapors or aerosols released from a failed cask onto surfaces of the ship or cargo.*

Table D-22 Event Sequence for a Severe Ship Accident

Event	*Event Probability*
Collision between large ships	$P_{collision}$
Foreign research reactor spent nuclear fuel hold struck	P_{hold}
Foreign research reactor spent nuclear fuel hold penetrated (the cask and fuel are subjected to impact forces)	P_{impact}
Cargo compression (the cask is subjected to crush forces)	P_{crush}
Severe fire ensues	$P_{severe\ fire}$
Fire engulfs the cask (heat loads are sufficient to vaporize cesium)	$P_{engulfing\ fire}$
Convective flow of air through cask causes ruthenium to oxidize	$P_{convection}$

Attachment D4, using the methods of Minorsky (Minorsky, 1959) and results from previous studies of ship accidents (ORI, 1981b). $P_{convection}$ was estimated by review of data on fires and on the temperatures required to oxidize ruthenium to RuO_4, which is necessary to yield the higher ruthenium release fractions.

Table D-23 EIS Source Term Probability Expressions

Accident Severity Category	*Probability*
4	$P_{st} = P_{collision}P_{hold}(P_{impact} + P_{crush})$
5	$P_{st} = P_{collision}P_{hold}(P_{impact} + P_{crush})P_{severe\ fire}P_{engulfing\ fire}$
6	$P_{st} = P_{collision}P_{hold}(P_{impact} + P_{crush})P_{severe\ fire}P_{engulfing\ fire}P_{convection}$

D.5.3.1.3 Probabilities Developed From Accident Data

Fifteen years of Lloyd's casualty data (Lloyds, 1991) and previous studies of ship accidents (Warwick, 1976; SRI, 1978; ORI, 1981a; Abkowitz, 1985) were reviewed to develop (1) the probability of a severe collision ($P_{collision}$) between large ships that occurs dockside in ports or while sailing in port channels, and (2) the probability that such a collision leads to a severe fire (P_{fire}).

Collision Probability

Ship accident casualty data for the years 1978 through 1993 and U.S. port call data for the years 1992 and 1993 were obtained from Lloyd's Maritime Information Services, Inc. Searches of the port call data for the 2-year period 1992-1993 identified the number of port calls made in U.S. ports by all ships, all dry cargo ships, and all dry cargo ships of deadweight 10 to 20 thousand long tons (equivalent to approximately 10,160 to 20,321 metric tons or 11,200 to 22,400 tons). The searches were performed twice, once restricting the results to collision that occurred in port waters only and once adding collisions that occurred in restricted approaches (rivers) that lead to the port. The addition of restricted approach waters was done to permit comparison to results from the literature that included or seemed to include collisions in the river that leads to a port.

The collision frequency per port call is based on a relatively small numbers of collisions. The 15 years of Lloyd's data contained only 69 collisions that occurred in U.S. ports or the restricted river waters that lead to them. Because of this, it is inappropriate to select a value for $P_{collision}$ that is significantly more precise than an order-of-magnitude estimate. The Lloyd's data indicate that for all types of commercial vessels in all U.S. ports, the number of collisions per port call is 0.000077. Other studies provide a range of values for collisions per port call (Warwick, 1976; SRI, 1978; ORI, 1981a; Abkowitz, 1985); however, the Lloyd's database is the most inclusive and the largest (based on approximately 900,000 port calls), so the result based on their data was used here. As discussed earlier, only an order-of-magnitude value is warranted, so the 0.000077 collision per port call was rounded up to 0.0001 ($P_{collision} = 0.0001$).

Probability of Severe Fires

The sources of information cited above were examined to determine an estimate of the probability of a severe fire, given a ship collision. Four estimates of this probability were developed. The 15 years of Lloyd's casualty data contains 1,073 ship collisions in ports located anywhere in the world. Eleven of these collisions led to fires, five caused extensive fire damage, and one involved buckling of structures due to thermal loads. Therefore, the Lloyd's data suggest that the chance that a ship collision leads to a severe fire is 5/1073 = 0.0045.

Only one of the 83 collisions identified by Warwick and Anderson (Warwick, 1976) led to a fire. However, that fire consumed one of the ships involved, the *Sea Witch*. Thus, the Warwick and Anderson data suggest that the chance that a collision will lead to a severe fire is 1/83 = 0.012.

Only 17 of the 391 collisions in the Abkowitz and Galarraga study (Abkowitz, 1985) led to fires of any severity. Thus, the probability that a collision leads to a fire of any severity is 17/391 = 0.044. SRI data suggest that about five percent of all ship fires involve an entire hold (SRI, 1978). Thus, the chance that a ship fire on a cargo ship will involve an entire hold is about 0.05. Combining these last two results allows the probability that a cargo ship collision leads to a severe fire to be estimated as follows:

(fires per collision) x (fires involving an entire hold per fire) =

$$(4.4 \times 10^{-2}) \times (0.05) = 0.0022 \text{ severe fires per collision}$$

Fires on cargo ships were reviewed by several countries for the International Maritime Organization. The French submission (IMO, 1992) to the International Maritime Organization developed data for 599 cargo ship fires that took place during the 11-year period 1978-1988. Only 2 of the 599 fires were caused by ship collisions. Thus, the probability that a collision leads to a fire of any severity is 2/599 = 0.017. Of the 599 fires, 122 led to immediate total loss, and 195 led to damage first thought to be repairable but which later was determined to be beyond repair. Thus, the chance that a fire is severe is greater than 122/599 = 0.20 and less than (122+195)/599 = 0.53. If the average of these two estimates is used, then the probability that a collision leads to a severe fire can again be calculated as was just done above:

(fires per collision) x (fires resulting in total loss per fire) =

$$(1.7 \times 10^{-2}) \times (0.37) = 0.0063 \text{ severe fires per collision}$$

If these four estimates for severe fires per collision are averaged, a value of 0.0063 results. Rounding to the nearest order-of-magnitude suggests that $P_{\text{severe fire}} = 0.01$ is a reasonable estimate for the chance that a severe fire will be caused by a ship collision.

No credit is taken for fighting of hold fires during accidents that occur in U.S. ports, all of which have fire fighting equipment, even though fighting of hold fires with water should keep fire temperatures well below those assumed in this study.

D.5.3.1.4 Probability of Mechanical Loads That Cause Damage

A severe ship collision could damage a spent nuclear fuel transportation cask and the elements contained in the cask by subjecting the cask to impact forces, crush forces, and/or thermal loads. Because force is the derivative of energy with distance, both impact forces and crush forces at any penetration distance (d) can be estimated by differentiating expressions that give the dependence on distance of the kinetic energy that is dissipated during the collision. Attachment D4 provides the details of this analysis. In Section 1 of Attachment D4, the kinetic energy associated with ship collisions is discussed. Next, in Section 2, the impact forces required to damage a cask and/or the fuel elements inside the cask are estimated. The crush forces required to damage a cask or the fuel elements inside the cask are described in Section 3.

The kinetic energy associated with ship collisions has been studied (Minorsky, 1959) and extended to develop correlations between penetration depth and energy absorbed. The methodology addresses the evaluation of the kinetic energy, impact forces, and crush forces and their relationship to the impact and crush probabilities (P_{impact} and P_{crush}) associated with ship collisions. The results of this evaluation concluded that P_{crush} is equal to 0.40, and P_{impact} is equal to 0.0.

D.5.3.1.5 Probabilities Developed From Ship Design Data

Two probabilities can be derived from the general ship design data, P_{hold} and $P_{engulfing\ fire}$. The first of these probabilities addresses the likelihood that the collision results in damage to the hold in which the spent nuclear fuel cask resides. (If the cask is stowed in an aft hold and the collision results in damage to a forward hold, no cask damage would be expected.) The second probability addresses the likelihood that the severe fire resulting from the accident (see Section D.5.3.1.3) is located in the same hold and on the same deck as the cask of spent nuclear fuel.

If foreign research reactor spent fuel casks were shipped one at a time, as is assumed here, then P_{hold}, the probability that the hold that contains the cask is the hold that is struck, can be approximated by $1/N_{hold}$, where N_{hold} is the number of holds in the ship transporting the spent nuclear fuel cask. The representative breakbulk freighter used in the impact and crush analyses described below has seven holds. Therefore, for this prototypic ship, $P_{hold} = 1/7 = 0.143$.

The total cargo area of this typical breakbulk freighter is about 3,066 m^2 (33,000 ft^2). Each hold includes two, three, or four decks. Together, the seven holds encompass 21 decks. Thus, the area of each deck is about 3,066/21 = 146 m^2 (33,000/21 = 1,600 ft^2). The Pegase cask used as a prototype in this study has a 2.1-m by 3-m (7-ft by 10-ft) base. This cask should be completely engulfed by a pool fire that has a diameter of 9.1 m (30 ft), provided that the fire occurs in the same hold and on the same deck that the cask is stored on. Since a pool fire of diameter 9.1 m (30 ft) occupies about 65 m^2 (700 ft^2), any engulfing fire will probably involve an entire deck in a hold. If a collision can lead to a fire on any deck in the hold, the $P_{engulfing\ fire} = 1/21$. Limiting the location of the fire to the struck hold or an adjacent hold reduces the number of decks on which the fire could occur. In this case, the number of holds of interest is approximately ten, and therefore, $P_{engulfing\ fire} = 1/10$. Using the larger estimate gives $P_{engulfing\ fire} = 0.1$.

D.5.3.1.6 Probability of Convective Flow Through the Failed Cask

Nonuniform heating of the cask during engulfing fires is expected to produce substantial flow of gases through the cask if two or more small holes or one medium hole have been produced in the cask by the ship collision. Because transportation cask bottoms and lid seats are welded to the cylindrical shell of the cask using full-penetration welds that are as strong or stronger than the parent material, when the cask shell is subjected to a severe stress (e.g., high impact or crush forces), the cask shell should yield before the welds fail. In fact, extra-regulatory 97 km/hr (60 mph) drop tests produced large plastic strains in the cylindrical shell of the test cask without failing its welds (Ludwigsen and Ammerman, 1995). Thus, during a ship collision, crush forces should collapse the cask walls inward without producing catastrophic failure of the lid, its seat, or the welds that attach the seat or the bottom of the cask to the cask walls. Therefore, an unusual configuration of cargo and/or deformed ship structures must be produced during the ship collision in order to subject the cask to forces that will produce failures substantially worse than failure of the lid seal. Either the lid seat must be bent significantly, or at least two penetrations must break, or the cask walls must be sheared or punctured. Although data for such failures is lacking, because cask designs normally do not fail by these mechanisms, the probability that a failure substantially worse than seal failure occurs is conservatively assumed to be no larger than 0.1, therefore $P_{convection} = 0.1$.

D.5.3.1.7 Source Term Probability Values

Table D-24 summarizes the estimates developed for the probabilities that enter the EIS source term probability expressions presented in Table D-23.

Table D-24 Estimated Values for Probabilities in Source Term Probability Expressions

Severity Category	Probability	Estimated Value[a]
	$P_{collision}$	0.0001
	P_{hold}	0.143
	P_{impact}	0.0
	P_{crush}	0.40
	$P_{severe\ fire}$	0.01
	$P_{engulfing\ fire}$	0.1
	$P_{convection}$	0.1
4	$P_{st} = P_{collision}P_{hold}(P_{impact}+ P_{crush})$	0.000006
5	$P_{ST} = P_{collision}P_{hold}(P_{impact}+ P_{crush})P_{severe\ fire}P_{engulfing\ fire}$	5×10^{-9}
6	$P_{ST} = P_{collision}P_{hold}(P_{impact}+ P_{crush})P_{severe\ fire}P_{engulfing\ fire}\ P_{convection}$	6×10^{-10}

[a]*Severity category 6 is a subset of severity category 5, which in turn is a subset of severity category 4. Therefore, the final estimated value for each P was adjusted to account for this.*

D.5.3.1.8 Source Term Magnitudes

In MACCS, source term magnitudes (M_{sti}) are given by the product of the inventory (I_i) of radionuclides (i) available for release and the fraction (f_i) of that inventory that is released during the accident being examined. Therefore,

$$M_{sti} = I_i f_i.$$

Cask radionuclide inventories were developed for three types of research reactor fuel — Training, Research, Isotope, General Atomic (TRIGA), RHF, and BR2 — for use in the port accident analysis (see Appendix B). Table D-25 presents these inventories. Because it is partly metallic, the TRIGA fuel may undergo exothermic oxidation if exposed to air while at elevated temperatures during an accident involving an enveloping fire.

Because of the large number of casks that might be used to transport foreign research reactor spent nuclear fuel, analyses could not be performed for all possible cask/inventory combinations. Since the size of the cask, rather than the details of its construction, determines the size of the cask's inventory, construction details were obtained for one typical spent nuclear fuel transportation cask, and these construction data were the basis for analyses that depended on cask properties. See Appendix B for description and figures of transportation casks.

For base case analyses, the values for the release fractions (f_i) for the five representative elements, cobalt, krypton, cesium, ruthenium, and other (particulate), presented in Table D-21, were taken to be the same as the values presented that were used in the Environmental Assessment of Urgent Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel (DOE, 1994d). During the sensitivity studies described below, MACCS calculations were performed that used release fraction values and an inventory for foreign research reactor spent nuclear fuel that were taken from the DOE Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement (Programmatic SNF&INEL Final EIS) (DOE, 1995). Although both the Environmental Assessment and the Programmatic SNF&INEL Final EIS contain release fractions for all six of the severity categories used in the Environmental Assessment, calculations were not performed for the first two categories, because cask failure does not occur for either category, and only a limited number of sensitivity calculations were performed for category 3 because only

Table D-25 Curie Content of Fully Loaded Transportation Casks for Three Representative Fuel Types

Nuclide	Fuel		
	BR-2	RHF	TRIGA
Hydrogen-3	8.6	37	13
Krypton-85	2,470	1,070	363
Strontium-89	40,800	17,600	275
Strontium-Yttrium-90	20,800	8,930	3,160
Yttrium-91	73,000	31,400	4,560
Zirconium-95	107,000	46,300	6,480
Niobium-95	220,000	94,900	12,800
Ruthenium-103, Rh-103m	8,900	3,770	844
Ruthenium-106, Rh-106m	21,500	9,160	2,540
Tin-123	427	184	27
Antimony-125	890	381	119
Tellurium-125m	212	91	29
Tellurium-127m	887	382	56
Tellurium-129m	189	80	23
Cesium-134	16,400	4,000	1,160
Cesium-137	20,600	8,870	3,190
Cerium-141	5,740	2,440	697
Cerium-144	312,000	135,000	25,500
Promethium-147	48,300	24,600	7,020
Promethium-148m	75	29	47
Europium-154	620	163	42
Europium-155	130	46	23
Uranium-234	0.0009	0.0004	0.0001
Uranium-235	0.014	0.01	0.008
Uranium-238	0.0003	0.0002	0.007
Plutonium-238	64	10	3
Plutonium-239	1.8	0.09	0.6
Plutonium-240	1.2	0.4	2
Plutonium-241	284	68	213
Americium-241	0.4	0.1	0.4
Americium-242m	0.001	0.0001	0.009
Americium-243	0.004	0.004	0.0004
Curium-244	1.3	0.009	0.007
Curium-242	1.8	0.1	3

corrosion product are released in a category 3 accident, and only minor amounts of corrosion product deposits form on research reactor spent nuclear fuel. To examine the possible impacts of corrosion products release, during the sensitivity studies, one category 3 accident calculation was performed during which 350 Ci of Co-60 was the only nuclide released, and one calculation was performed that added the same amount of Co-60 to the base case calculation.

D.5.3.1.9 Source Term Timing and Sensible Heat

Ship accident source terms may have both a puff (an immediate release of most material) and a tail (a gradual release of the material over an extended time), where the puff follows the mechanical failure of the cask due to the collision forces, and the tail is produced by the slow heating of the cask contents by an ensuing fire. Because ship collisions are short duration events, if the collision causes a mechanical release,

it should be of relatively short duration and the gases released from the cask should be cold (no significant sensible heat content) and thus not subject to plume rise. Conversely, because a substantial engulfing fire that burns for approximately an hour is required to heat both the cask and the spent nuclear fuel elements in the cask to temperatures where cesium compounds (for example, CsOH) vaporize to a significant extent, thermal releases will be delayed (release won't occur until about one hour after the collision) and will not take place rapidly (release duration of about one hour). Of course, if cask failure is caused by thermal rather than mechanical loads, any radioactivity released inside of the cask by the collision will not be released from the cask until the cask fails due to those thermal loads. Moreover, if heat loads cause the fuel elements in the cask to fail at essentially the same time that the cask seals fail due to thermal stress, a delayed short duration release could occur. Thus, ship accident source terms can have four release patterns: (1) a single short (15 minute) release caused by the mechanical forces engendered by the collision; (2) a single short (15 minute) release caused by the mechanical forces engendered by the collision followed by a longer (60 minute) release caused by the thermal loads produced by an ensuing fire; (3) a single long duration (60 minute) release caused by thermal loads on the cask if the collision does not lead to failure but an ensuing fire does; and (4) a single delayed short (15 minute) duration release if cask failure and burst rupture of fuel elements occur together.

Because a substantial engulfing fire of significant duration is required to cause a thermal release, for such thermal releases the radioactivity released from the failed cask will be assumed to be released into the fire plume, which typically will have a bulk gas temperature of about 1,200°K (1,700°F). Therefore, the sensible heat content of that plume will be 100 kilowatts for severity category 5 releases and 150 kilowatts for severity category 6 releases.

The start time and duration of the four release patterns described above are presented in Table D-26. For base case calculations, the first release pattern will be assumed for severity Category 4 accidents and the second pattern for severity Category 5 and 6 accidents. The third and forth release patterns will be examined by sensitivity studies.

Table D-26 Release Timing Patterns

Pattern	*Puff*		*Tail*	
	Release Start (min)	*Release Duration (min)*	*Release Start (min)*	*Release Duration (min)*
1	0	10		
2	0	10	60	60
3			60	60
4			90	10

D.5.3.2 Population Distributions

MACCS calculations require as input a population distribution and site-specific weather conditions. The populations along each of the sixteen compass sectors (N, NNE, NE, etc.) are used to determine the exposed population for each combination of site weather and wind rose conditions. Depending upon the shape of the plume, the exposed population includes the people along one or more adjacent sectors.

The required population distributions were generated for two locations at each of thirteen ports. Table D-27 lists the ports selected for examination in this study.

Table D-27 Ports Analyzed

Coast	*High Population*	*Medium Population*	*Low Population*
East	Philadelphia, PA New York, NY	Hampton Roads, VA Jacksonville, FL	Charleston, SC MOTSU, NC Savannah, GA Wilmington, NC
West	Long Beach, CA	Concord NWS, CA Portland, OR Tacoma, WA	
Gulf			Galveston, TX

Two accident locations were considered for each port, one at dockside and one channel location near the population center where a major ship collision would be possible. Two exceptions were made for ports able to share the same channel accident location due to their close proximity to each other. These exceptions are the Port of Wilmington and MOTSU, NC, as well as the Wando Terminal and the Charleston NWS in greater Charleston, SC. Population distributions were constructed on a compass-sector polar coordinate grid that has eleven radial interval (1.6, 3.2, 4.8, 6.4, 8.0, 16, 32, 48, 64, and 20 km or 1, 2, 3, 4, 5, 10, 20, 30, 40, and 50 mi). The distributions were constructed from 1990 block census data using Sandia's SECPOP90 code (Humphreys et al., 1994). The coordinates of the midpoint of the compass-sector polar coordinate grid were selected by inspection of navigational maps for the ports examined. Table D-28 gives the coordinates of these dockside and channel locations, which represent the selected locations for possible accidents. The population distributions generated by SECPOP90 represent the population in an 80.5 km (50 mi) radius around each potential accident site.

The 26 population distributions constructed (two per port) using SECPOP90 were entered into the site data file for the dockside or channel accident location at each of the thirteen ports. Examination of these files shows that many of the cells in the 26 population distributions are empty because they are covered by water (ocean, rivers, bays, harbor channels).

At many ports, the work force population is probably much larger than the residential population, at least in the commercial area near to the port. Therefore, the work force population was estimated for one port, Elizabeth, and added to the distribution that has been constructed for that port using SECPOP90. Then, during the sensitivity studies, the effect of the work force population on consequences of accidents at Elizabeth was examined.

D.5.3.3 Meteorological Data

MACCS calculations examine all possible combinations of a representative set of weather sequences and a representative set of population distributions. MACCS calculations require a site wind rose, to give the exposure probability of the compass sector population distributions and one year of hourly readings of wind speed, atmospheric stability, and rainfall rate. These data may be recorded either at the accident site or at some not-too-distant meteorological station that has similar meteorology and topography as the accident site. These data are used to determine dispersion as a function of downwind transport distance. Site wind rose and rainfall data were available for each of the ports studied. One year of hourly meteorological data was available from National Weather Service Stations located in the port city for only two of the 13 ports studied. For the other 11 ports, hourly meteorological data recorded at a nearby National Weather Service station was used during the base case calculations. Table D-29 presents the locations of the National Weather Service Stations where the hourly meteorological data files used in this study were recorded, and indicates the ports with which each file was used.

Table D-28 Accident Location Map Coordinates

Port	Location	Description	Coordinates	
			Latitude	Longitude
Elizabeth, NJ (for New York)	Dock	Marine Terminal, Sealand Pier	40°39'35"N	74°08'52"W
	Channel	Narrows	40° 36'29"N	74° 02'21"W
Philadelphia, PA	Dock	Packer Avenue Marine Terminal(container berths)	39° 53'55"N	75° 08'09"W
	Channel	Commodore Berry Fixed Bridge	39° 49'43"N	75° 22'18"W
Norfolk, VA (for Hampton Roads)	Dock	Portsmouth Marine Terminal	36° 51'25"N	76° 19'45"W
	Channel	Willoughby Bank, Northside	36° 59'57"N	76° 18'43"W
MOTSU, NC	Dock	Sunny Point, Wharf 1	33° 59'39"N	77° 51'21"W
	Channel	Lower Swash Channel	33° 54'39"N	78° 01'12"W
Charleston, SC	Dock	Pier at Wando Terminal	32° 49'51"N	79° 53'34"W
	Dock	Naval Weapons Station	32°56'12"N	79°56'11"W
	Channel	Commercial anchorage area D	32° 47'05"N	79° 55'10"W
Savannah, GA	Dock	Savannah Ocean Terminal	32° 05'00"N	81° 05'18"W
	Channel	Intersection Savannah River and Intracoastal Waterway at Elba Island Cut	32° 04'26"N	80° 58'17"W
Galveston, TX	Dock	Container Terminal, Pier 9	29° 19'00"N	94° 46'53"W
	Channel	Cross of Bolivar Roads Channel and Galveston Channel	29° 20'27"N	95° 46'12"W
Concord NWS, CA	Dock	Naval Weapons Station	38° 03'32"N	122° 00'49"W
	Channel	San Francisco Bay Temporary Anchorage No. 7 Shipping Lane Route	37°49'24"N	122°23'47"W
Tacoma, WA	Dock	Port of Tacoma Pier No. 7	47° 16'03"N	122°24'49"W
	Channel	Intersection of 4 shipping lanes in Puget Sound north of Port Townsend	48° 11'24"N	122°49'48"W
Wilmington, NC	Dock	Main Dock Wilmington Terminal	34° 13'03"N	77°57'09"W
	Channel	Lower Swash Channel	33° 54'39"N	78° 01'12"W
Jacksonville, FL	Dock	Blount Island Terminal	30° 23'16"N	81° 33'00"W
	Channel	St. John's River Ferry crossing to Mayport	30° 23'40"N	81° 26'00"W
Long Beach, CA	Dock	Pier E	33° 45'43"N	118° 12'31"W
	Channel	Breakwater East Side	33° 43'23"N	118° 10'53"W
Portland, OR	Dock	Terminal 2	45° 32'54"N	122° 41'56"W
	Channel	St. Johns Bridge	45° 35'04"N	122° 45'58"W

Table D-29 Locations of National Weather Service Stations

Port	National Weather Service Station
Elizabeth, NJ	New York City, NY
Philadelphia, PA	New York City, NY
Norfolk, VA	Cape Hatteras, NC
MOTSU, NC; Wilmington, NC	Cape Hatteras, NC
Charleston, SC; Savannah, GA; Jacksonville, FL	Charleston, SC
Long Beach, CA; Concord NWS, CA	Santa Maria, CA
Portland, OR; Tacoma, WA	Seattle, WA
Galveston, TX	Lake Charles, LA

Although MACCS calculations can use constant meteorology, one year of hourly meteorological data is preferred because adverse results are often the result of meteorological sequences that involve changing meteorological conditions. MACCS uses an importance sampling method to find these less probable sequences that yield adverse results. The sampling method examines all of the 8,760 weather sequences in one year of hourly data and selects the start times of the approximately 100 weather sequences that are used during a variable meteorology calculation. The impact of using constant versus variable meteorology is the subject of one of the sensitivity calculations.

D.5.4 MACCS Calculations

All of the MACCS calculations performed during this study used a source term probability of one. Thus, the consequence estimates generated and the probabilities associated with those estimates are conditional on the release of the source term (i.e., the estimates are conditional on the accident having occurred).

For any source term, a MACCS calculation generates results for all possible combinations of a representative set of weather sequences and a representative set of exposed downwind populations. Since the probability of occurrence of each weather sequence and the exposure probability of each population distribution is known, the variability of consequences due to weather and population conditional on the accident having occurred can be displayed by plotting the probability that a consequence magnitude will be equaled or exceeded against consequence magnitude. Such a plot is called a Complementary Cumulative Distribution Function.

Two types of MACCS accident consequence calculations were performed, base case calculations and sensitivity calculations. Base case calculations used:

- the inventories given in Table D-25,
- the release fractions presented in Table D-21 for severity categories 4, 5, and 6,
- the release timings specified in Table D-26 (pattern 1 was used for severity category 4 releases and pattern 3 for category 5 and 6 releases),
- one year of hourly meteorological data recorded at the National Weather Service Station listed in Table D-29, and
- population distributions calculated using SECPOP90 for the dockside and channel locations presented in Table D-28.

Population distributions and other site-specific data are input to MACCS via a site data file.

Sensitivity calculations modified the input used in the base case calculations to identify the influence on consequences:

- of using variable meteorology recorded offsite at a nearby National Weather Service station rather than constant meteorology recorded onsite at the harbor,
- of using source terms that contained 17 nuclides for which acute health effect dose conversion factors were not available,
- of neglecting the enhanced shielding likely to be afforded to population near to the harbor by the masonry buildings that typify construction in urban commercial neighborhoods,

- of using release fractions developed for the Programmatic SNF&INEL Final EIS (DOE, 1995) for truck and rail accidents,
- of adding the harbor work force population to the residential population distribution,
- of modeling extremely high temperature effects on aluminum-based and TRIGA fuels release fractions,
- of modeling accidents that lead to severe fires using a puff and a tail (two segment release) rather than only a puff, and
- of adding cobalt-60 to the inventory so that corrosion products release can be calculated.

The results of these sensitivity calculations are presented in Section D.5.4.3.

Both the variable meteorology and the constant meteorology MACCS calculations performed for this study consist of a large number of individual trials (about 1,750 trials for each variable meteorology calculation; about 1,150 trials for each constant meteorology calculation). By accumulating the results of the individual trials, an expected (mean) result and a Complementary Cumulative Distribution Function are generated for each output quantity (result) calculated. In addition, for each output calculated, the value of the largest result obtained for any individual trial, the probability of occurrence of that trial, and the weather sequence used in that trial are saved by MACCS.

D.5.4.1 Acute Health Effects

The MACCS code can calculate the numbers of fatalities and injuries that are caused by acute exposures that occur over time periods of a few days (due to dose to the stomach or the intestines) to one year (due to internal dose to the lungs). Of the seven acute injuries that MACCS can examine, prodromal vomiting is the acute injury most likely to appear at low doses and dose rates. Because the occurrence of acute health effects would be cause for considerable concern, acute fatalities and cases of prodromal vomiting were calculated during every MACCS run made during this study; and the output of every run was inspected to see if either acute effect had occurred. Inspection of all of the MACCS output generated showed that no acute fatalities and no cases of prodromal vomiting were ever predicted to occur for any output quantile (i.e., the mean result, all quantile values on the Complementary Cumulative Distribution Function, and the result obtained for the least favorable weather sequence were all zero for acute fatalities and cases of prodromal vomiting).

D.5.4.2 Base Case Calculations

The base case calculations estimated the consequences that might result if any one of nine ship accidents (the combination of three cask inventories presented in Table D-25, with the release fractions for accident severity categories 4, 5, and 6) occurred at any of the 25 accident locations examined (one dockside and one channel location at each of the 13 ports, except MOTSU and Wilmington, which share a channel accident location). Thus, 3 x 3 x 25 = 225 base case MACCS calculations were performed and are presented in this assessment.

D.5.4.2.1 Typical Output

Table D-30 presents MACCS output for one base case calculation, the calculation for the channel accident location at Elizabeth performed with the BR-2 source term and severity categories 4, 5, and 6 release fractions. Using as an example the severity category 5 results, the first group of results in this table are

Table D-30 Sample Output from MACCS

SITE=NEW LOC=CHANNEL INV=BR-2 ST=EA4 VAR MET=NYC

		PROB NON-ZERO	MEAN	QUANTILES 50TH	90TH	95TH	99TH	99.9TH	PEAK CONS	PEAK PROB	PEAK TRIAL
EARLY + CHRONIC RESULTS											
HEALTH EFFECTS CASES											
CAN FAT/TOTAL	0-1.6 KM	0.5675	4.16E-05	2.43E-07	1.30E-04	2.15E-04	4.38E-04	8.02E-04	1.13E-03	2.50E-04	73
CAN FAT/TOTAL	0-80.5 KM	1.0000	1.64E-04	7.15E-05	4.38E-04	6.29E-04	9.89E-04	1.29E-03	1.50E-03	2.50E-04	73
POPULATION DOSE (SV)											
EDEWBODY TOT LIF	0-1.6 KM	0.5675	9.45E-04	5.56E-06	2.90E-03	4.96E-03	1.03E-02	1.56E-02	2.56E-02	2.50E-04	73
EDEWBODY TOT LIF	0-8.1 KM	0.8016	2.42E-03	1.01E-03	7.02E-03	9.14E-03	1.60E-02	2.50E-02	3.30E-02	2.50E-04	73
EDEWBODY TOT LIF	0-16.1 KM	0.8848	3.04E-03	1.18E-03	8.37E-03	1.16E-02	2.04E-02	2.59E-02	3.37E-02	2.50E-04	73
EDEWBODY TOT LIF	0-80.5 KM	1.0000	3.76E-03	1.65E-03	9.67E-03	1.33E-02	2.27E-02	3.13E-02	3.41E-02	2.50E-04	73
CENTERLINE DOSE AT SOME DISTANCES (SV)											
EDEWBODY TOT LIF	0-1.6 KM	1.0000	5.98E-07	4.09E-07	1.13E-06	1.48E-06	2.39E-06	NOT-FOUND	3.66E-06	3.45E-03	73
CHRONIC RESULTS ONLY											
HEALTH EFFECTS CASES											
CAN FAT/TOTAL	0-1.6 KM	0.5675	3.50E-05	2.28E-07	1.11E-04	1.86E-04	3.60E-04	6.54E-04	9.36E-04	2.50E-04	73
CAN FAT/TOTAL	0-80.5 KM	1.0000	1.40E-04	6.32E-05	3.67E-04	5.20E-04	8.26E-04	1.11E-03	1.24E-03	2.50E-04	73
EDEWBODY POP. DOSE (SV)	0-80.5 KM										
TOTAL LONG-TERM PATHWAYS DOSE		1.0000	3.35E-03	1.46E-03	9.03E-03	1.21E-02	2.05E-02	2.58E-02	2.96E-02	2.50E-04	73
TOTAL INGESTION PATHWAYS DOSE		1.0000	5.65E-05	4.28E-05	1.18E-04	1.60E-04	2.50E-04	3.14E-04	3.57E-04	2.24E-05	28
LONG-TERM GROUNDSHINE DOSE		1.0000	2.66E-03	1.15E-03	6.82E-03	9.90E-03	1.43E-02	2.13E-02	2.39E-02	2.50E-04	73
ECONOMIC COST MEASURES ($)	0-80.5 KM										
TOTAL ECONOMIC COSTS		0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0
CROP DISPOSAL COST		0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0
MAXIMUM LONG-TERM ACTION DISTANCE (KM)											
CROP DISPOSAL DIST.		0.0000	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0

SITE=NEW LOC=CHANNEL INV=BR-2 ST=EA5 VAR MET=NYC

		PROB NON-ZERO	MEAN	QUANTILES 50TH	90TH	95TH	99TH	99.9TH	PEAK CONS	PEAK PROB	PEAK TRIAL
EARLY + CHRONIC RESULTS											
HEALTH EFFECTS CASES											
CAN FAT/TOTAL	0-1.6 KM	0.6818	9.85E-02	2.32E-06	2.71E-02	2.60E-01	2.60E+00	6.86E+00	1.75E+01	7.65E-05	45
CAN FAT/TOTAL	0-80.5 KM	1.0000	2.90E+00	1.22E+00	7.38E+00	1.17E+01	2.91E+01	3.89E+01	5.53E+01	7.65E-05	45
POPULATION DOSE (SV)											
EDEWBODY TOT LIF	0-1.6 KM	0.6818	2.36E+00	5.22E-05	6.05E-01	6.11E+00	6.21E+01	1.74E+02	4.21E+02	7.65E-05	45
EDEWBODY TOT LIF	0-8.1 KM	0.8854	1.57E+01	2.08E-01	3.35E+01	6.23E+01	3.23E+02	5.13E+02	9.27E+02	9.81E-05	45
EDEWBODY TOT LIF	0-16.1 KM	0.9686	3.30E+01	3.13E+00	9.40E+01	1.48E+02	5.48E+02	8.50E+02	1.25E+03	1.16E-05	44
EDEWBODY TOT LIF	0-80.5 KM	1.0000	6.93E+01	2.84E+01	1.80E+02	2.61E+02	7.09E+02	9.41E+02	1.33E+03	7.65E-05	45
CENTERLINE DOSE AT SOME DISTANCES (SV)											
EDEWBODY TOT LIF	0-1.6 KM	1.0000	1.17E-03	1.60E-06	5.29E-03	6.69E-03	1.52E-02	NOT-FOUND	4.12E-02	1.06E-03	45
CHRONIC RESULTS ONLY											
HEALTH EFFECTS CASES											
CAN FAT/TOTAL	0-1.6 KM	0.6371	9.83E-02	2.14E-07	2.71E-02	2.60E-01	2.60E+00	6.86E+00	1.75E+01	7.65E-05	45
CAN FAT/TOTAL	0-80.5 KM	0.9943	2.90E+00	1.22E+00	7.38E+00	1.17E+01	2.88E+01	3.89E+01	5.53E+01	7.65E-05	45
EDEWBODY POP. DOSE (SV)	0-80.5 KM										
TOTAL LONG-TERM PATHWAYS DOSE		0.9943	6.92E+01	2.84E+01	1.80E+02	2.61E+02	7.09E+02	9.41E+02	1.33E+03	7.65E-05	45
TOTAL INGESTION PATHWAYS DOSE		0.9943	1.70E+00	2.50E-01	6.02E+00	8.37E+00	1.07E+01	1.24E+01	1.66E+01	9.94E-06	25
LONG-TERM GROUNDSHINE DOSE		0.9942	6.72E+01	2.61E+01	1.77E+02	2.57E+02	7.09E+02	9.41E+02	1.32E+03	7.65E-05	45
ECONOMIC COST MEASURES ($)	0-80.5 KM										
TOTAL ECONOMIC COSTS		0.0038	1.80E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NOT-FOUND	5.64E+03	2.44E-03	16
CROP DISPOSAL COST		0.0038	1.33E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NOT-FOUND	4.15E+03	2.44E-03	16
MAXIMUM LONG-TERM ACTION DISTANCE (KM)											
CROP DISPOSAL DIST.		0.0038	6.12E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NOT-FOUND	1.61E+00	3.80E-03	16

SITE=NEW LOC=CHANNEL INV=BR-2 ST=EA6 VAR MET=NYC

		PROB NON-ZERO	MEAN	QUANTILES 50TH	90TH	95TH	99TH	99.9TH	PEAK CONS	PEAK PROB	PEAK TRIAL
EARLY + CHRONIC RESULTS											
HEALTH EFFECTS CASES											
CAN FAT/TOTAL	0-1.6 KM	0.6713	8.02E-02	7.79E-07	1.48E-02	1.73E-01	2.59E+00	7.25E+00	1.91E+01	7.65E-05	45
CAN FAT/TOTAL	0-80.5 KM	1.0000	2.84E+00	1.14E+00	6.92E+00	1.14E+01	3.15E+01	4.36E+01	6.04E+01	7.65E-05	45
POPULATION DOSE (SV)											
EDEWBODY TOT LIF	0-1.6 KM	0.6713	1.92E+00	1.98E-05	3.56E-01	3.03E+00	6.20E+01	1.88E+02	4.59E+02	7.65E-05	45
EDEWBODY TOT LIF	0-8.1 KM	0.8854	1.43E+01	2.64E-02	2.23E+01	4.25E+01	3.31E+02	5.41E+02	1.01E+03	7.65E-05	45
EDEWBODY TOT LIF	0-16.1 KM	0.9686	3.02E+01	5.66E-01	7.75E+01	1.32E+02	5.82E+02	8.62E+02	1.37E+03	1.16E-05	44
EDEWBODY TOT LIF	0-80.5 KM	1.0000	6.77E+01	2.71E+01	1.61E+02	2.57E+02	7.46E+02	1.08E+03	1.45E+03	7.65E-05	45
CENTERLINE DOSE AT SOME DISTANCES (SV)											
EDEWBODY TOT LIF	0-1.6 KM	1.0000	9.53E-04	3.45E-07	1.32E-03	6.25E-03	1.75E-02	NOT-FOUND	4.50E-02	1.06E-03	45
CHRONIC RESULTS ONLY											
HEALTH EFFECTS CASES											
CAN FAT/TOTAL	0-1.6 KM	0.5752	8.01E-02	0.00E+00	1.48E-02	1.73E-01	2.59E+00	7.25E+00	1.91E+01	7.65E-05	45
CAN FAT/TOTAL	0-80.5 KM	0.9879	2.83E+00	1.14E+00	6.92E+00	1.13E+01	3.15E+01	4.36E+01	6.04E+01	7.65E-05	45
EDEWBODY POP. DOSE (SV)	0-80.5 KM										
TOTAL LONG-TERM PATHWAYS DOSE		0.9879	6.76E+01	2.71E+01	1.61E+02	2.57E+02	7.46E+02	1.08E+03	1.45E+03	7.65E-05	45
TOTAL INGESTION PATHWAYS DOSE		0.9879	1.83E+00	2.61E-01	6.23E+00	8.54E+00	1.09E+01	1.29E+01	1.81E+01	9.94E-06	25
LONG-TERM GROUNDSHINE DOSE		0.9879	6.54E+01	2.46E+01	1.59E+02	2.55E+02	7.42E+02	1.06E+03	1.44E+03	7.65E-05	45
ECONOMIC COST MEASURES ($)	0-80.5 KM										
TOTAL ECONOMIC COSTS		0.0038	1.80E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NOT-FOUND	5.64E+03	2.44E-03	16
CROP DISPOSAL COST		0.0038	1.33E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NOT-FOUND	4.15E+03	2.44E-03	16
MAXIMUM LONG-TERM ACTION DISTANCE (KM)											
CROP DISPOSAL DIST.		0.0038	6.12E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NOT-FOUND	1.61E+00	3.80E-03	16

Health Effect Cases. The first health effect considered is the number of cancer fatalities expected to occur among the population located within 1.6 km (1 mi) of the accident location. For this population group, the table shows:

- that the probability of getting a nonzero result is 0.6818 which means that not even a fractional cancer fatality was predicted to occur in this population group for 31.82 percent of the approximately 1,750 trials run during this calculation (conversely, at least a fractional cancer death was predicted to occur in 68.18 percent of the trials);
- that the expected (mean) number of cancer fatalities for this population group is 0.098;
- that the 90th and 99th quantiles of the Complementary Cumulative Distribution Function of cancer fatalities for this population group have values of 0.0271 and 2.60; and
- that the largest number of cancer fatalities predicted for this population group for any weather trial was 17.5, that this result had a probability of occurrence of 0.000077, and that the 45th weather sequence selected by the importance sampling scheme led to this result. While the number of LCF is two orders of magnitude higher than the mean, the probability of occurrence of this peak value is four orders of magnitude lower than the mean value.

Figure D-54 presents the Complementary Cumulative Distribution Function for cancer fatalities among the population located within 1.6 km (1 mi) of the channel accident location at Elizabeth, for a severity category 5 accident release fraction. Figure D-54 shows that there is one chance in a thousand (probability = 0.001) that an accident that leads to a severity category 5 release from a cask that contains the BR-2 inventory will produce at least seven cancer deaths. Thus, the 99.9th quantile of the Complementary Cumulative Distribution Function has a value of about seven. Inspection of the Complementary Cumulative Distribution Function also shows that the tail of the distribution has a probability of occurrence of 0.0001 and a magnitude of about 17. These are the values produced by the weather trial that led to the largest result among the full set of weather trials.

The results presented in Table D-30 illustrate a pattern that is general over all of the calculations performed: population dose increases monotonically as distance range increases (e.g., 0-1.6 km, 0-8.1 km, ..., 0-80.5 km). Although not shown in Table D-30, this applies to cancer deaths also. Note that all doses are in Sieverts.

The centerline dose to an individual standing under the plume decreases monotonically with increasing distance, as it should, until it reaches the last computational interval (64.4-80.5 km or 40-50 mi, not shown on D-30) where counter-intuitively it increases. It increases because, during all calculations, rain was artificially forced to occur when the radioactive plume entered this computational interval in order to ensure that all radioactive particulates in the plume deposit onto the ground before the plume exits the computational grid at 80.5 km (50 mi) from the accident location. Deposition of all remaining radioactive particulates onto the ground within the last computational interval ensures that all radioactivity that might enter food pathways at some time after the accident does enter those pathways.

Another pattern that can be seen from Table D-30 is that total population dose is caused almost entirely by long-term groundshine exposures (external direct exposure to radiation emitted by radionuclides deposited on the ground).

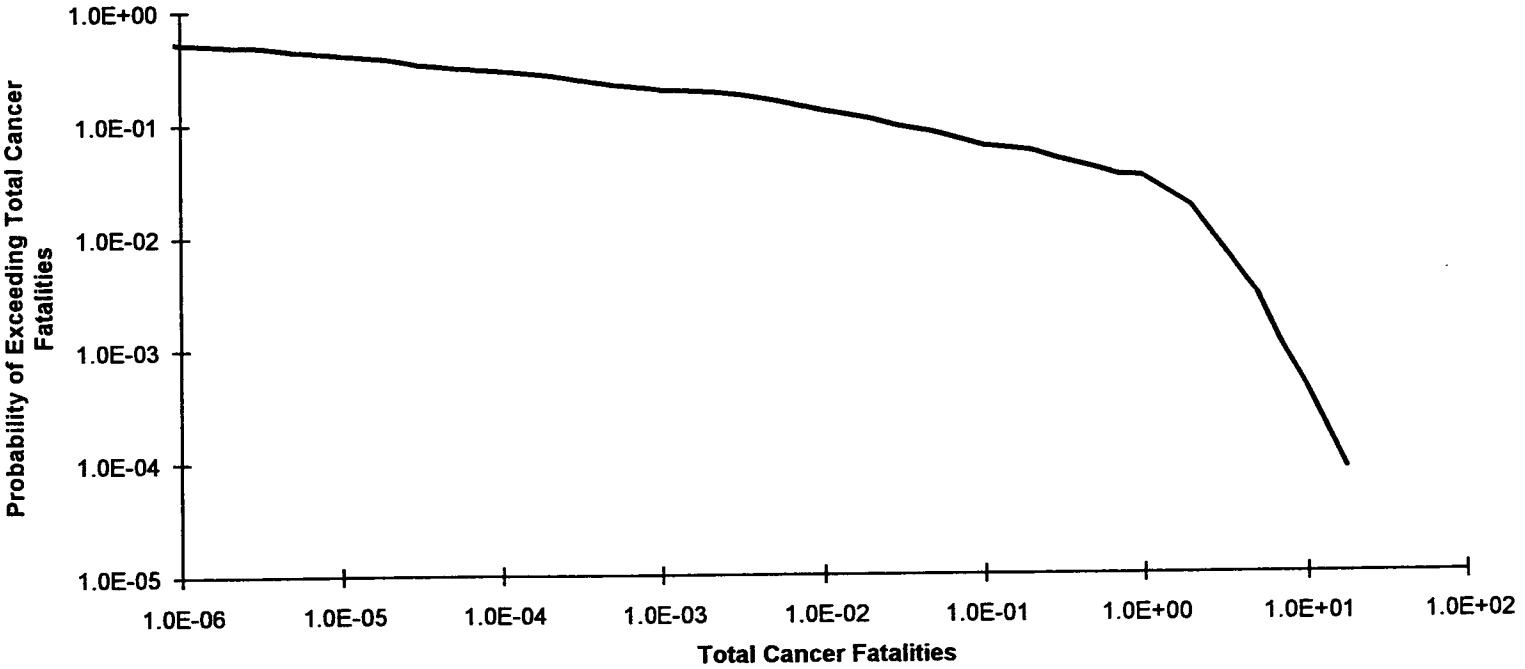


Figure D-54 Total Cancer Fatalities, 0-1.6 km (0-1 mi), Elizabeth Channel, Variable Meteorology, BR-2 Inventory, Severity Category 5

D-30 also shows that the economic losses (costs) caused by the accident are very small (expected value of $18.00; peak value of $5,640) and are entirely attributable to the disposal of contaminated crops and milk by farms located close to the accident site (the largest disposal distance found was 1.6 km or 1 mi). This also is typical of the MACCS output for all accidents analyzed.

The values of mean (expected) centerline dose (D_{cl}) (not shown in Table D-30) for severity category 5 release fractions are plotted versus distance (d) in Figure D-55. The figure shows that on a log-log plot dose decreases linearly with distance with a slope very close to minus one. Therefore, as one would expect, individual centerline dose is inversely proportional to distance ($D_{C1} \propto 1/d$).

Table D-30 presents a breakdown of long-term population dose (calculated as a wholebody dose by the Effective Dose Equivalent method and thus labeled EDEWBODY POP. DOSE) by exposure pathways. Inspection of this breakdown and comparison of the total long-term pathway dose to the total population dose for release category 5, mean results, in the 0-80.5 km (0-50 mi) ranges shows:

- that the total population dose 6,930 rem (69.3 Sv), is almost entirely due to the 6,920 rem (69.2 Sv) dose delivered by long-term exposure pathways;
- that short-term (acute) pathways deliver only a minor dose of 10 rem (0.1 Sv), which is the difference between the 69.3 Sv and the 69.2 Sv;
- that the long-term dose of 6,920 rem (69.2 Sv) is caused mainly by direct exposure pathways [6,750 rem (67.5 Sv)] and only secondarily by ingestion pathways [170 rem (1.7 Sv)];
- that groundshine [6,720 rem (67.2 Sv)] causes almost all of the long-term direct dose; resuspension (external direct exposure to radiation emitted by radionuclides resuspended from the ground) causes the rest of the long-term pathway dose, 30 rem (0.3 Sv);
- that the dose from radioactivity deposited directly on food crops [125 rem (1.25 Sv)] or on grass consumed by milk cows [30 rem (0.30 Sv)] accounts for most ingestion dose; and
- that the rest of the ingestion dose is caused by root uptake [to food crops, 10 rem (0.10 Sv); to grass and fodder crops, 4 rem (0.04 Sv)] with drinking of contaminated water causing only a very small dose of 1 rem (0.01 Sv).

D.5.4.2.2 Principal Base Case Consequence Results

Accident consequence mean (expected) values for whole body population dose and total cancer fatalities for the distance range 0-80.5 km (0-50 mi), and individual centerline dose and individual centerline cancer risk for the distance range 0-1.6 km (0-1 mi) are presented in Table D-31. Table D-32 provides 99.9th quantile values for whole body population dose and total cancer fatalities for the range 0-80.5 km (0-50 mi). Table D-33 presents the largest (peak) result calculated for individual centerline dose and cancer risk in the range 0-1.6 km or 0-1 mi. Table D-34 presents probabilities of the largest results calculated.

Table D-31 shows that the expected total population dose within 80.5 km (50 mi) of the accident location varies from a low of 0.000972 person-rem (0.00000972 person-Sv) for the MOTSU dock calculation that used the TRIGA inventory, severity category 4 (EA4) release fractions, and Cape Hatteras weather to a high of 6,930 person-rem (69.3 person-Sv) for the Elizabeth channel calculation that used the BR-2 inventory, severity category 5 (EA5) release fractions, and New York City weather. Since the total

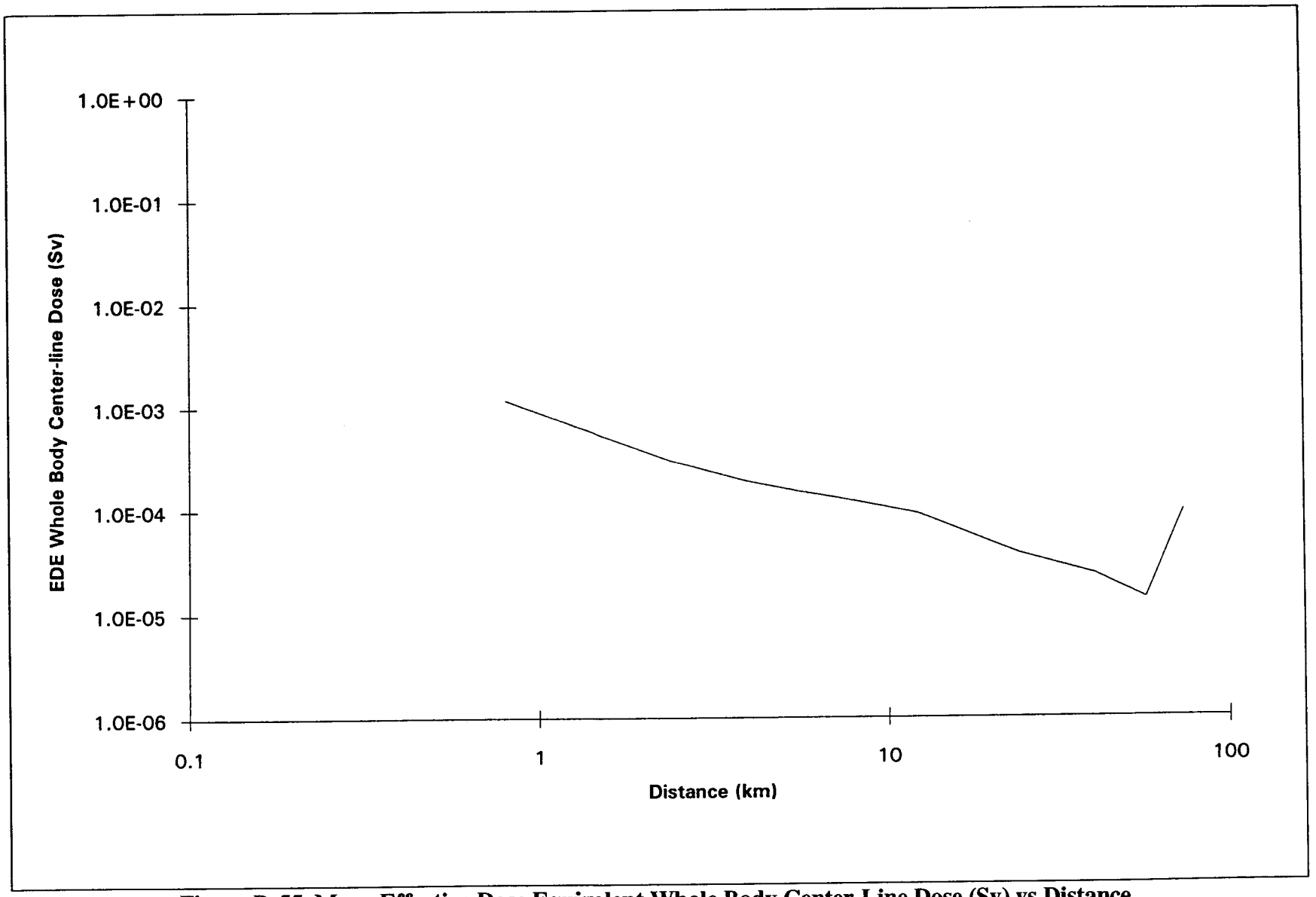


Figure D-55 Mean Effective Dose Equivalent Whole Body Center-Line Dose (Sv) vs Distance, Elizabeth Channel, Variable Meteorology, BR-2 Inventory, Severity Category 5

Table D-31 Mean Results, Variable Meteorology

EDE Whole Body Population Dose, 0-80 KM (SV)

	BR-2			RHF			TRIGA		
Site/Loc	EA4	EA5	EA6	EA4	EA5	EA6	EA4	EA5	EA6
CHA-D	2.40E-04	4.15E+00	4.13E+00	9.55E-05	1.54E+00	1.53E+00	2.97E-05	5.32E-01	5.26E-01
CHA-C	3.78E-04	4.18E+00	4.21E+00	1.51E-04	1.55E+00	1.56E+00	4.58E-05	5.35E-01	5.37E-01
CNC-D	4.40E-04	2.07E+01	2.21E+01	1.76E-04	7.97E+00	8.51E+00	5.43E-05	2.78E+00	2.97E+00
CNC-C	9.44E-04	3.31E+01	3.40E+01	3.77E-04	1.29E+01	1.32E+01	1.13E-04	4.52E+00	4.63E+00
GAL-D	7.26E-04	1.44E+01	1.58E+01	2.90E-04	5.45E+00	6.00E+00	8.94E-05	1.90E+00	2.08E+00
GAL-C	3.23E-04	1.42E+01	1.55E+01	1.29E-04	5.36E+00	5.89E+00	4.13E-05	1.86E+00	2.04E+00
JAC-D	2.79E-04	6.82E+00	6.76E+00	1.11E-04	2.55E+00	2.52E+00	3.48E-05	8.84E-01	8.71E-01
JAC-C	2.58E-04	5.33E+00	5.45E+00	1.03E-04	1.99E+00	2.03E+00	3.22E-05	6.87E-01	6.99E-01
LOS-D	2.13E-03	4.71E+01	4.82E+01	8.52E-04	1.85E+01	1.89E+01	2.54E-04	6.49E+00	6.62E+00
LOS-C	8.09E-04	4.26E+01	4.40E+01	3.23E-04	1.67E+01	1.73E+01	9.72E-05	5.86E+00	6.05E+00
MOT-D	7.24E-05	2.08E+00	2.21E+00	2.88E-05	7.45E-01	7.91E-01	9.72E-06	2.54E-01	2.70E-01
NEW-D	2.33E-03	6.55E+01	6.51E+01	9.30E-04	2.58E+01	2.56E+01	2.77E-04	9.07E+00	9.00E+00
NEW-C	3.76E-03	6.93E+01	6.77E+01	1.50E-03	2.73E+01	2.67E+01	4.46E-04	9.60E+00	9.37E+00
NOR-D	5.52E-04	8.54E+00	8.32E+00	2.20E-04	3.25E+00	3.15E+00	6.69E-05	1.13E+00	1.09E+00
NOR-C	3.02E-04	6.65E+00	6.64E+00	1.21E-04	2.51E+00	2.50E+00	3.70E-05	8.73E-01	8.67E-01
PHI-D	1.77E-03	2.81E+01	2.78E+01	7.08E-04	1.10E+01	1.08E+01	2.11E-04	3.84E+00	3.79E+00
PHI-C	8.48E-04	2.74E+01	2.81E+01	3.39E-04	1.07E+01	1.09E+01	1.02E-04	3.74E+00	3.83E+00
POR-D	7.70E-04	1.17E+01	1.19E+01	3.07E-04	4.45E+00	4.50E+00	9.32E-05	1.55E+00	1.56E+00
POR-C	5.33E-04	1.12E+01	1.15E+01	2.13E-04	4.26E+00	4.36E+00	6.52E-05	1.48E+00	1.51E+00
SAV-D	5.60E-04	4.91E+00	5.01E+00	2.23E-04	1.80E+00	1.83E+00	6.82E-05	6.18E-01	6.28E-01
SAV-C	1.34E-04	3.82E+00	3.93E+00	5.32E-05	1.38E+00	1.42E+00	1.75E-05	4.74E-01	4.86E-01
SEA-C	1.31E-04	7.54E+00	8.29E+00	5.21E-05	2.84E+00	3.12E+00	1.68E-05	9.86E-01	1.08E+00
TAC-D	5.55E-04	1.73E+01	1.83E+01	2.21E-04	6.67E+00	7.02E+00	6.81E-05	2.33E+00	2.45E+00
TAC-C	3.87E-04	1.43E+01	1.50E+01	1.55E-04	5.50E+00	5.73E+00	4.75E-05	1.92E+00	2.00E+00
WIL-D	3.80E-04	4.82E+00	5.02E+00	1.51E-04	1.79E+00	1.86E+00	4.66E-05	6.19E-01	6.43E-01
WIL-C	9.65E-05	2.07E+00	2.20E+00	3.84E-05	7.47E-01	7.96E-01	1.24E-05	2.56E-01	2.72E-01
CHN-D	1.67E-04	4.76E+00	4.74E+00	6.63E-05	1.76E+00	1.77E+00	2.13E-05	6.09E-01	6.08E-01

Total Cancer Fatalities, 0-80 KM

	BR-2			RHF			TRIGA		
Site/Loc	EA4	EA5	EA6	EA4	EA5	EA6	EA4	EA5	EA6
CHA-D	1.05E-05	1.89E-01	1.90E-01	4.20E-06	6.97E-02	6.95E-02	1.24E-06	2.40E-02	2.39E-02
CHA-C	1.66E-05	1.90E-01	1.93E-01	6.65E-06	7.01E-02	7.08E-02	1.90E-06	2.41E-02	2.43E-02
CNC-D	1.91E-05	8.96E-01	9.57E-01	7.63E-06	3.44E-01	3.67E-01	2.23E-06	1.20E-01	1.28E-01
CNC-C	4.10E-05	1.41E+00	1.45E+00	1.65E-05	5.48E-01	5.62E-01	4.63E-06	1.92E-01	1.97E-01
GAL-D	3.17E-05	6.39E-01	7.02E-01	1.27E-05	2.41E-01	2.65E-01	3.70E-06	8.35E-02	9.17E-02
GAL-C	1.39E-05	6.30E-01	6.92E-01	5.57E-06	2.37E-01	2.60E-01	1.71E-06	8.20E-02	9.01E-02
JAC-D	1.22E-05	3.07E-01	3.06E-01	4.88E-06	1.14E-01	1.13E-01	1.45E-06	3.94E-02	3.91E-02
JAC-C	1.13E-05	2.42E-01	2.49E-01	4.51E-06	8.95E-02	9.16E-02	1.34E-06	3.09E-02	3.15E-02
LOS-D	9.32E-05	1.99E+00	2.04E+00	3.75E-05	7.79E-01	7.97E-01	1.04E-05	2.73E-01	2.79E-01
LOS-C	3.51E-05	1.80E+00	1.86E+00	1.41E-05	7.05E-01	7.28E-01	3.96E-06	2.47E-01	2.55E-01
MOT-D	3.16E-06	9.94E-02	1.06E-01	1.25E-06	3.53E-02	3.76E-02	4.13E-07	1.20E-02	1.28E-02
NEW-D	1.02E-04	2.75E+00	2.73E+00	4.09E-05	1.08E+00	1.07E+00	1.13E-05	3.80E-01	3.77E-01
NEW-C	1.64E-04	2.90E+00	2.84E+00	6.62E-05	1.14E+00	1.12E+00	1.83E-05	4.01E-01	3.92E-01
NOR-D	2.42E-05	3.77E-01	3.70E-01	9.71E-06	1.42E-01	1.39E-01	2.76E-06	4.94E-02	4.82E-02
NOR-C	1.32E-05	2.96E-01	2.97E-01	5.30E-06	1.11E-01	1.11E-01	1.53E-06	3.85E-02	3.84E-02
PHI-D	7.75E-05	1.20E+00	1.19E+00	3.12E-05	4.66E-01	4.61E-01	8.67E-06	1.63E-01	1.61E-01
PHI-C	3.70E-05	1.17E+00	1.20E+00	1.49E-05	4.53E-01	4.66E-01	4.19E-06	1.59E-01	1.63E-01
POR-D	3.37E-05	5.18E-01	5.27E-01	1.35E-05	1.95E-01	1.98E-01	3.85E-06	6.78E-02	6.87E-02
POR-C	2.33E-05	4.97E-01	5.12E-01	9.34E-06	1.87E-01	1.92E-01	2.70E-06	6.50E-02	6.66E-02
SAV-D	2.46E-05	2.28E-01	2.34E-01	9.87E-06	8.28E-02	8.46E-02	2.83E-06	2.84E-02	2.90E-02
SAV-C	5.88E-06	1.79E-01	1.85E-01	2.32E-06	6.45E-02	6.65E-02	7.42E-07	2.20E-02	2.27E-02
SEA-C	5.61E-06	3.37E-01	3.70E-01	2.23E-06	1.26E-01	1.39E-01	6.93E-07	4.36E-02	4.79E-02
TAC-D	2.41E-05	7.54E-01	7.95E-01	9.66E-06	2.88E-01	3.04E-01	2.81E-06	1.00E-01	1.06E-01
TAC-C	1.68E-05	6.26E-01	6.55E-01	6.75E-06	2.38E-01	2.49E-01	1.95E-06	8.30E-02	8.66E-02
WIL-D	1.66E-05	2.19E-01	2.29E-01	6.66E-06	8.09E-02	8.43E-02	1.93E-06	2.79E-02	2.90E-02
WIL-C	4.22E-06	9.76E-02	1.04E-01	1.68E-06	3.50E-02	3.74E-02	5.22E-07	1.20E-02	1.28E-02
CHN-D	6.76E-06	2.17E-01	2.19E-01	2.67E-06	7.98E-02	8.03E-02	8.44E-07	2.75E-02	2.76E-02

CHA = Charleston (Wando Terminal), SC; CNC = Concord, CA; GAL = Galveston, TX; JAC = Jacksonville, FL; LOS = Long Beach, CA; MOT = MOTSU, SC; NEW = Elizabeth, NJ; NOR = Norfolk, VA; PHI = Philadelphia, PA; POR = Portland, OR; SAV = Savannah, GA; SEA = Seattle, WA; TAC = Tacoma, WA; WIL = Wilmington, NC; CHN = NWS Charleston, SC

Table D-31 Mean Results, Variable Meteorology (Continued)

Individual Center-line EDE Whole Body Dose, 0-1.6 KM (SV)

	BR-2			RHF			TRIGA		
Site/Loc	EA4	EA5	EA6	EA4	EA5	EA6	EA4	EA5	EA6
CHA-D	8.60E-07	6.83E-04	7.10E-04	3.44E-07	2.70E-04	2.81E-04	9.71E-08	9.51E-05	9.88E-05
CHA-C	8.60E-07	6.83E-04	7.10E-04	3.44E-07	2.70E-04	2.81E-04	9.71E-08	9.51E-05	9.88E-05
CNC-D	1.07E-06	2.28E-04	2.17E-04	4.29E-07	9.01E-05	8.59E-05	1.21E-07	3.17E-05	3.02E-05
CNC-C	1.07E-06	2.28E-04	2.17E-04	4.29E-07	9.01E-05	8.59E-05	1.21E-07	3.17E-05	3.02E-05
GAL-D	9.29E-07	6.52E-04	6.91E-04	3.71E-07	2.58E-04	2.74E-04	1.05E-07	9.08E-05	9.62E-05
GAL-C	9.29E-07	6.52E-04	6.91E-04	3.71E-07	2.58E-04	2.74E-04	1.05E-07	9.08E-05	9.62E-05
JAC-D	8.60E-07	6.83E-04	7.10E-04	3.44E-07	2.70E-04	2.81E-04	9.71E-08	9.51E-05	9.88E-05
JAC-C	8.60E-07	6.83E-04	7.10E-04	3.44E-07	2.70E-04	2.81E-04	9.71E-08	9.51E-05	9.88E-05
LOS-D	1.07E-06	2.28E-04	2.17E-04	4.29E-07	9.01E-05	8.59E-05	1.21E-07	3.17E-05	3.02E-05
LOS-C	1.07E-06	2.28E-04	2.17E-04	4.29E-07	9.01E-05	8.59E-05	1.21E-07	3.17E-05	3.02E-05
MOT-D	5.32E-07	6.24E-04	5.51E-04	2.12E-07	2.47E-04	2.18E-04	6.04E-08	8.69E-05	7.67E-05
NEW-D	5.98E-07	1.17E-03	9.53E-04	2.39E-07	4.63E-04	3.77E-04	6.81E-08	1.63E-04	1.33E-04
NEW-C	5.98E-07	1.17E-03	9.53E-04	2.39E-07	4.63E-04	3.77E-04	6.81E-08	1.63E-04	1.33E-04
NOR-D	5.32E-07	6.24E-04	5.51E-04	2.12E-07	2.47E-04	2.18E-04	6.04E-08	8.69E-05	7.67E-05
NOR-C	5.32E-07	6.24E-04	5.51E-04	2.12E-07	2.47E-04	2.18E-04	6.04E-08	8.69E-05	7.67E-05
PHI-D	1.01E-06	6.31E-04	6.59E-04	4.02E-07	2.50E-04	2.61E-04	1.14E-07	8.78E-05	9.16E-05
PHI-C	1.01E-06	6.31E-04	6.59E-04	4.02E-07	2.50E-04	2.61E-04	1.14E-07	8.78E-05	9.16E-05
POR-D	7.54E-07	7.56E-04	7.97E-04	3.01E-07	2.99E-04	3.15E-04	8.57E-08	1.05E-04	1.11E-04
POR-C	7.54E-07	7.56E-04	7.97E-04	3.01E-07	2.99E-04	3.15E-04	8.57E-08	1.05E-04	1.11E-04
SAV-D	8.60E-07	6.83E-04	7.10E-04	3.44E-07	2.70E-04	2.81E-04	9.71E-08	9.51E-05	9.88E-05
SAV-C	8.60E-07	6.83E-04	7.10E-04	3.44E-07	2.70E-04	2.81E-04	9.71E-08	9.51E-05	9.88E-05
SEA-C	7.54E-07	7.56E-04	7.97E-04	3.01E-07	2.99E-04	3.15E-04	8.57E-08	1.05E-04	1.11E-04
TAC-D	7.54E-07	7.56E-04	7.97E-04	3.01E-07	2.99E-04	3.15E-04	8.57E-08	1.05E-04	1.11E-04
TAC-C	7.54E-07	7.56E-04	7.97E-04	3.01E-07	2.99E-04	3.15E-04	8.57E-08	1.05E-04	1.11E-04
WIL-D	5.32E-07	6.24E-04	5.51E-04	2.12E-07	2.47E-04	2.18E-04	6.04E-08	8.69E-05	7.67E-05
WIL-C	5.32E-07	6.24E-04	5.51E-04	2.12E-07	2.47E-04	2.18E-04	6.04E-08	8.69E-05	7.67E-05
CHN-D	8.60E-07	6.83E-04	7.10E-04	3.44E-07	2.70E-04	2.81E-04	9.71E-08	9.51E-05	9.88E-05

Individual Center-line Cancer Risk, 0-1.6 KM

	BR-2			RHF			TRIGA		
Site/Loc	EA4	EA5	EA6	EA4	EA5	EA6	EA4	EA5	EA6
CHA-D	4.10E-08	2.85E-05	2.96E-05	1.66E-08	1.13E-05	1.17E-05	4.29E-09	3.96E-06	4.11E-06
CHA-C	4.10E-08	2.85E-05	2.96E-05	1.66E-08	1.13E-05	1.17E-05	4.29E-09	3.96E-06	4.11E-06
CNC-D	5.12E-08	9.50E-06	9.06E-06	2.08E-08	3.75E-06	3.58E-06	5.36E-09	1.32E-06	1.26E-06
CNC-C	5.12E-08	9.50E-06	9.06E-06	2.08E-08	3.75E-06	3.58E-06	5.36E-09	1.32E-06	1.26E-06
GAL-D	4.43E-08	2.72E-05	2.88E-05	1.80E-08	1.08E-05	1.14E-05	4.63E-09	3.78E-06	4.01E-06
GAL-C	4.43E-08	2.72E-05	2.88E-05	1.80E-08	1.08E-05	1.14E-05	4.63E-09	3.78E-06	4.01E-06
JAC-D	4.10E-08	2.85E-05	2.96E-05	1.66E-08	1.13E-05	1.17E-05	4.29E-09	3.96E-06	4.11E-06
JAC-C	4.10E-08	2.85E-05	2.96E-05	1.66E-08	1.13E-05	1.17E-05	4.29E-09	3.96E-06	4.11E-06
LOS-D	5.12E-08	9.50E-06	9.06E-06	2.08E-08	3.75E-06	3.58E-06	5.36E-09	1.32E-06	1.26E-06
LOS-C	5.12E-08	9.50E-06	9.06E-06	2.08E-08	3.75E-06	3.58E-06	5.36E-09	1.32E-06	1.26E-06
MOT-D	2.51E-08	2.60E-05	2.30E-05	1.02E-08	1.03E-05	9.08E-06	2.64E-09	3.62E-06	3.19E-06
NEW-D	2.80E-08	4.88E-05	3.97E-05	1.14E-08	1.93E-05	1.57E-05	2.96E-09	6.78E-06	5.52E-06
NEW-C	2.80E-08	4.88E-05	3.97E-05	1.14E-08	1.93E-05	1.57E-05	2.96E-09	6.78E-06	5.52E-06
NOR-D	2.51E-08	2.60E-05	2.30E-05	1.02E-08	1.03E-05	9.08E-06	2.64E-09	3.62E-06	3.19E-06
NOR-C	2.51E-08	2.60E-05	2.30E-05	1.02E-08	1.03E-05	9.08E-06	2.64E-09	3.62E-06	3.19E-06
PHI-D	4.80E-08	2.63E-05	2.75E-05	1.95E-08	1.04E-05	1.09E-05	5.01E-09	3.66E-06	3.82E-06
PHI-C	4.80E-08	2.63E-05	2.75E-05	1.95E-08	1.04E-05	1.09E-05	5.01E-09	3.66E-06	3.82E-06
POR-D	3.55E-08	3.15E-05	3.32E-05	1.44E-08	1.25E-05	1.31E-05	3.74E-09	4.38E-06	4.62E-06
POR-C	3.55E-08	3.15E-05	3.32E-05	1.44E-08	1.25E-05	1.31E-05	3.74E-09	4.38E-06	4.62E-06
SAV-D	4.10E-08	2.85E-05	2.96E-05	1.66E-08	1.13E-05	1.17E-05	4.29E-09	3.96E-06	4.11E-06
SAV-C	4.10E-08	2.85E-05	2.96E-05	1.66E-08	1.13E-05	1.17E-05	4.29E-09	3.96E-06	4.11E-06
SEA-C	3.55E-08	3.15E-05	3.32E-05	1.44E-08	1.25E-05	1.31E-05	3.74E-09	4.38E-06	4.62E-06
TAC-D	3.55E-08	3.15E-05	3.32E-05	1.44E-08	1.25E-05	1.31E-05	3.74E-09	4.38E-06	4.62E-06
TAC-C	3.55E-08	3.15E-05	3.32E-05	1.44E-08	1.25E-05	1.31E-05	3.74E-09	4.38E-06	4.62E-06
WIL-D	2.51E-08	2.60E-05	2.30E-05	1.02E-08	1.03E-05	9.08E-06	2.64E-09	3.62E-06	3.19E-06
WIL-C	2.51E-08	2.60E-05	2.30E-05	1.02E-08	1.03E-05	9.08E-06	2.64E-09	3.62E-06	3.19E-06
CHN-D	4.10E-08	2.85E-05	2.96E-05	1.66E-08	1.13E-05	1.17E-05	4.29E-09	3.96E-06	4.11E-06

CHA = Charleston (Wando Terminal), SC; CNC = Concord, CA; GAL = Galveston, TX; JAC = Jacksonville, FL; LOS = Long Beach, CA; MOT = MOTSU, SC; NEW = Elizabeth, NJ; NOR = Norfolk, VA; PHI = Philadelphia, PA; POR = Portland, OR; SAV = Savannah, GA; SEA = Seattle, WA; TAC = Tacoma, WA; WIL = Wilmington, NC; CHN = NWS Charleston, SC

Table D-32 99.9th Quantile Results, Variable Meteorology

EDE Whole Body Population Dose, 0-80 KM (SV)

	BR-2			RHF			TRIGA		
Site/Loc	EA4	EA5	EA6	EA4	EA5	EA6	EA4	EA5	EA6
CHA-D	1.20E-03	4.63E+01	5.26E+01	3.82E-04	1.71E+01	2.04E+01	1.30E-04	6.21E+00	7.13E+00
CHA-C	3.40E-03	9.03E+01	9.75E+01	1.23E-03	3.70E+01	4.13E+01	3.98E-04	1.22E+01	1.37E+01
CNC-D	3.31E-03	9.47E+01	1.02E+02	1.29E-03	3.41E+01	3.56E+01	3.87E-04	1.17E+01	1.22E+01
CNC-C	1.06E-02	1.55E+02	1.73E+02	3.77E-03	5.55E+01	5.20E+01	1.17E-03	1.91E+01	1.97E+01
GAL-D	5.03E-03	1.33E+02	1.38E+02	2.01E-03	4.90E+01	4.92E+01	5.35E-04	1.66E+01	1.92E+01
GAL-C	1.37E-03	8.70E+01	1.16E+02	6.77E-04	3.72E+01	3.93E+01	2.01E-04	1.30E+01	1.38E+01
JAC-D	1.29E-03	7.23E+01	7.86E+01	5.59E-04	2.78E+01	3.07E+01	1.45E-04	1.01E+01	1.05E+01
JAC-C	1.26E-03	6.40E+01	6.77E+01	5.28E-04	2.45E+01	2.69E+01	1.55E-04	8.55E+00	9.22E+00
LOS-D	NOT-FOUND	2.67E+02	2.70E+02	NOT-FOUND	1.02E+02	1.04E+02	NOT-FOUND	3.32E+01	3.64E+01
LOS-C	3.66E-03	2.19E+02	2.41E+02	1.38E-03	9.72E+01	9.84E+01	5.13E-04	3.14E+01	3.12E+01
MOT-D	5.03E-04	2.46E+01	2.63E+01	1.80E-04	8.87E+00	9.48E+00	6.25E-05	2.90E+00	2.95E+00
NEW-D	1.20E-02	5.87E+02	6.37E+02	4.24E-03	2.42E+02	2.52E+02	1.34E-03	8.29E+01	8.68E+01
NEW-C	3.13E-02	9.41E+02	1.08E+03	1.19E-02	3.86E+02	3.99E+02	3.52E-03	1.33E+02	1.42E+02
NOR-D	3.40E-03	1.03E+02	1.10E+02	1.40E-03	4.04E+01	4.41E+01	4.59E-04	1.30E+01	1.39E+01
NOR-C	1.62E-03	9.02E+01	1.00E+02	7.13E-04	3.35E+01	3.56E+01	2.06E-04	1.16E+01	1.24E+01
PHI-D	8.45E-03	3.10E+02	3.32E+02	3.45E-03	1.15E+02	1.18E+02	1.00E-03	4.65E+01	5.03E+01
PHI-C	5.07E-03	2.86E+02	2.98E+02	2.03E-03	1.05E+02	1.08E+02	6.95E-04	4.13E+01	4.63E+01
POR-D	3.16E-03	1.09E+02	1.13E+02	1.18E-03	4.62E+01	4.90E+01	3.55E-04	1.40E+01	1.59E+01
POR-C	3.48E-03	1.01E+02	1.04E+02	1.35E-03	3.55E+01	4.37E+01	4.02E-04	1.19E+01	1.46E+01
SAV-D	5.26E-03	1.26E+02	1.28E+02	2.10E-03	5.56E+01	5.98E+01	6.05E-04	2.04E+01	2.16E+01
SAV-C	8.01E-04	4.37E+01	4.44E+01	3.33E-04	1.59E+01	1.72E+01	9.87E-05	5.65E+00	5.42E+00
SEA-C	8.69E-04	5.53E+01	5.99E+01	3.54E-04	2.10E+01	2.29E+01	1.12E-04	7.43E+00	8.11E+00
TAC-D	1.55E-03	8.36E+01	8.67E+01	7.01E-04	3.51E+01	3.60E+01	2.09E-04	1.19E+01	1.23E+01
TAC-C	1.87E-03	9.69E+01	1.01E+02	7.23E-04	3.65E+01	4.21E+01	2.20E-04	1.29E+01	1.52E+01
WIL-D	4.47E-03	7.09E+01	7.65E+01	1.79E-03	2.75E+01	2.98E+01	5.10E-04	9.33E+00	1.08E+01
WIL-C	1.03E-03	2.25E+01	2.79E+01	3.89E-04	8.70E+00	9.96E+00	1.18E-04	3.00E+00	3.11E+00
CHN-D	7.70E-04	3.69E+01	3.91E+01	3.04E-04	1.36E+01	1.42E+01	9.88E-05	5.22E+00	5.46E+00

Total Cancer Fatalities, 0-80 KM

	BR-2			RHF			TRIGA		
Site/Loc	EA4	EA5	EA6	EA4	EA5	EA6	EA4	EA5	EA6
CHA-D	4.33E-05	1.98E+00	2.24E+00	1.63E-05	7.81E-01	8.41E-01	5.50E-06	2.67E-01	2.89E-01
CHA-C	1.30E-04	3.96E+00	4.27E+00	7.14E-05	1.61E+00	1.69E+00	1.60E-05	4.94E-01	5.80E-01
CNC-D	1.43E-04	4.07E+00	4.38E+00	5.84E-05	1.28E+00	1.35E+00	1.60E-05	5.30E-01	5.55E-01
CNC-C	4.60E-04	6.20E+00	6.23E+00	1.80E-04	2.55E+00	2.59E+00	5.25E-05	8.80E-01	8.78E-01
GAL-D	2.07E-04	4.93E+00	5.12E+00	7.64E-05	1.96E+00	2.07E+00	2.18E-05	7.00E-01	7.31E-01
GAL-C	7.04E-05	3.88E+00	4.09E+00	2.89E-05	1.49E+00	1.54E+00	7.95E-06	5.73E-01	5.88E-01
JAC-D	5.80E-05	3.10E+00	3.21E+00	2.38E-05	1.12E+00	1.15E+00	6.67E-06	3.91E-01	4.34E-01
JAC-C	6.04E-05	2.71E+00	2.87E+00	2.29E-05	1.08E+00	1.14E+00	6.50E-06	3.53E-01	3.75E-01
LOS-D	NOT-FOUND	1.03E+01	1.05E+01	NOT-FOUND	4.49E+00	4.52E+00	NOT-FOUND	1.45E+00	1.58E+00
LOS-C	1.98E-04	9.81E+00	1.01E+01	7.39E-05	3.39E+00	3.90E+00	2.08E-05	1.18E+00	1.19E+00
MOT-D	2.32E-05	1.22E+00	1.33E+00	8.61E-06	4.08E-01	4.42E-01	2.67E-06	1.43E-01	1.47E-01
NEW-D	4.40E-04	2.46E+01	2.58E+01	1.72E-04	1.10E+01	1.15E+01	5.49E-05	3.48E+00	3.83E+00
NEW-C	1.29E-03	3.89E+01	4.36E+01	5.34E-04	1.47E+01	1.67E+01	1.40E-04	5.75E+00	6.28E+00
NOR-D	1.55E-04	4.23E+00	4.63E+00	6.51E-05	1.62E+00	1.81E+00	1.85E-05	5.99E-01	6.50E-01
NOR-C	7.23E-05	3.59E+00	3.97E+00	3.08E-05	1.39E+00	1.43E+00	8.46E-06	5.25E-01	5.47E-01
PHI-D	3.54E-04	1.18E+01	1.23E+01	1.29E-04	5.18E+00	5.55E+00	3.88E-05	1.90E+00	2.05E+00
PHI-C	2.03E-04	1.22E+01	1.12E+01	9.95E-05	4.74E+00	4.93E+00	2.85E-05	1.78E+00	1.85E+00
POR-D	1.47E-04	4.90E+00	5.16E+00	6.01E-05	1.96E+00	2.03E+00	1.61E-05	6.89E-01	7.13E-01
POR-C	1.48E-04	3.78E+00	4.71E+00	6.08E-05	1.56E+00	1.84E+00	1.63E-05	5.45E-01	6.19E-01
SAV-D	2.23E-04	5.68E+00	6.22E+00	1.01E-04	2.20E+00	2.45E+00	2.41E-05	7.91E-01	8.82E-01
SAV-C	3.52E-05	1.79E+00	1.93E+00	1.28E-05	6.84E-01	7.04E-01	3.71E-06	2.45E-01	2.62E-01
SEA-C	3.73E-05	2.41E+00	2.61E+00	1.40E-05	9.06E-01	9.68E-01	4.16E-06	3.17E-01	3.47E-01
TAC-D	7.55E-05	3.60E+00	3.74E+00	3.03E-05	1.32E+00	1.42E+00	8.41E-06	5.55E-01	5.74E-01
TAC-C	8.26E-05	3.94E+00	4.73E+00	3.19E-05	1.59E+00	1.87E+00	9.47E-06	5.25E-01	6.20E-01
WIL-D	1.99E-04	2.90E+00	3.25E+00	7.68E-05	1.17E+00	1.21E+00	2.05E-05	3.98E-01	4.27E-01
WIL-C	4.89E-05	1.04E+00	1.16E+00	1.96E-05	4.13E-01	4.66E-01	5.15E-06	1.45E-01	1.55E-01
CHN-D	3.33E-05	1.55E+00	1.70E+00	1.32E-05	6.28E-01	7.15E-01	3.67E-06	2.19E-01	2.32E-01

CHA = Charleston (Wando Terminal), SC; CNC = Concord, CA; GAL = Galveston, TX; JAC = Jacksonville, FL; LOS = Long Beach, CA; MOT = MOTSU, SC; NEW = Elizabeth, NJ; NOR = Norfolk, VA; PHI = Philadelphia, PA; POR = Portland, OR; SAV = Savannah, GA; SEA = Seattle, WA; TAC = Tacoma, WA; WIL = Wilmington, NC; CHN = NWS Charleston, SC

Table D-33 Peak Results, Variable Meteorology

EDE Whole Body Population Dose, 0-80 KM (SV)

		BR-2			RHF			TRIGA	
Site/Loc	EA4	EA5	EA6	EA4	EA5	EA6	EA4	EA5	EA6
CHA-D	2.82E-03	1.04E+02	1.10E+02	1.12E-03	4.07E+01	4.32E+01	3.41E-04	1.43E+01	1.51E+01
CHA-C	4.41E-03	2.12E+02	2.31E+02	1.76E-03	8.56E+01	9.34E+01	5.23E-04	3.00E+01	3.27E+01
CNC-D	3.35E-03	1.02E+02	1.11E+02	1.33E-03	4.03E+01	4.40E+01	4.00E-04	1.42E+01	1.55E+01
CNC-C	1.42E-02	6.71E+02	7.27E+02	5.70E-03	2.66E+02	2.88E+02	1.72E-03	9.34E+01	1.01E+02
GAL-D	5.60E-03	2.33E+02	2.54E+02	2.22E-03	9.59E+01	1.05E+02	6.69E-04	3.36E+01	3.66E+01
GAL-C	2.09E-03	1.85E+02	2.02E+02	8.28E-04	7.23E+01	7.89E+01	2.56E-04	2.53E+01	2.76E+01
JAC-D	2.15E-03	1.10E+02	1.20E+02	8.53E-04	4.28E+01	4.66E+01	2.61E-04	1.50E+01	1.63E+01
JAC-C	1.90E-03	1.12E+02	1.23E+02	7.52E-04	4.59E+01	5.01E+01	2.31E-04	1.61E+01	1.76E+01
LOS-D	1.30E-02	3.94E+02	4.29E+02	5.20E-03	1.56E+02	1.70E+02	1.54E-03	5.49E+01	5.98E+01
LOS-C	5.97E-03	3.47E+02	3.76E+02	2.39E-03	1.37E+02	1.49E+02	7.21E-04	4.83E+01	5.23E+01
MOT-D	7.72E-04	4.61E+01	5.03E+01	2.98E-04	1.71E+01	1.86E+01	9.74E-05	5.88E+00	6.42E+00
NEW-D	1.86E-02	1.13E+03	1.24E+03	7.44E-03	4.48E+02	4.89E+02	2.24E-03	1.58E+02	1.72E+02
NEW-C	3.41E-02	1.33E+03	1.45E+03	1.36E-02	5.25E+02	5.73E+02	4.01E-03	1.85E+02	2.02E+02
NOR-D	4.29E-03	1.66E+02	1.81E+02	1.71E-03	6.49E+01	7.06E+01	5.08E-04	2.27E+01	2.47E+01
NOR-C	2.78E-03	1.64E+02	1.78E+02	1.11E-03	6.44E+01	7.00E+01	3.36E-04	2.26E+01	2.45E+01
PHI-D	1.13E-02	7.15E+02	7.80E+02	4.52E-03	2.82E+02	3.08E+02	1.36E-03	9.91E+01	1.08E+02
PHI-C	8.77E-03	4.87E+02	5.31E+02	3.50E-03	1.92E+02	2.10E+02	1.06E-03	6.75E+01	7.36E+01
POR-D	3.85E-03	1.69E+02	1.85E+02	1.54E-03	6.69E+01	7.30E+01	4.64E-04	2.35E+01	2.57E+01
POR-C	3.94E-03	1.70E+02	1.85E+02	1.57E-03	6.66E+01	7.27E+01	4.67E-04	2.34E+01	2.55E+01
SAV-D	6.18E-03	2.39E+02	2.60E+02	2.46E-03	9.64E+01	1.05E+02	7.32E-04	3.38E+01	3.69E+01
SAV-C	1.43E-03	7.65E+01	8.00E+01	5.66E-04	2.94E+01	3.07E+01	1.75E-04	1.03E+01	1.07E+01
SEA-C	9.93E-04	5.62E+01	6.13E+01	3.93E-04	2.14E+01	2.33E+01	1.22E-04	7.44E+00	8.11E+00
TAC-D	2.67E-03	1.18E+02	1.29E+02	1.06E-03	4.66E+01	5.09E+01	3.23E-04	1.64E+01	1.79E+01
TAC-C	3.13E-03	1.70E+02	1.85E+02	1.25E-03	6.64E+01	7.25E+01	3.78E-04	2.33E+01	2.54E+01
WIL-D	5.50E-03	1.49E+02	1.63E+02	2.20E-03	5.91E+01	6.44E+01	6.51E-04	2.08E+01	2.27E+01
WIL-C	1.18E-03	3.28E+01	3.58E+01	4.71E-04	1.29E+01	1.41E+01	1.41E-04	4.57E+00	4.99E+00
CHN-D	1.76E-03	6.83E+01	7.43E+01	6.97E-04	2.64E+01	2.87E+01	2.14E-04	9.20E+00	1.00E+01

Total Cancer Fatalities, 0-80 KM

		BR-2			RHF			TRIGA	
Site/Loc	EA4	EA5	EA6	EA4	EA5	EA6	EA4	EA5	EA6
CHA-D	1.20E-04	4.41E+00	4.69E+00	4.80E-05	1.72E+00	1.83E+00	1.37E-05	6.02E-01	6.39E-01
CHA-C	1.95E-04	8.90E+00	9.71E+00	7.83E-05	3.60E+00	3.93E+00	2.17E-05	1.26E+00	1.38E+00
CNC-D	1.49E-04	4.31E+00	4.68E+00	5.96E-05	1.68E+00	1.83E+00	1.68E-05	5.90E-01	6.44E-01
CNC-C	6.01E-04	2.80E+01	3.03E+01	2.42E-04	1.11E+01	1.20E+01	6.84E-05	3.89E+00	4.22E+00
GAL-D	2.48E-04	9.97E+00	1.09E+01	9.90E-05	4.08E+00	4.45E+00	2.79E-05	1.43E+00	1.55E+00
GAL-C	9.02E-05	7.89E+00	8.61E+00	3.57E-05	3.07E+00	3.35E+00	1.05E-05	1.07E+00	1.17E+00
JAC-D	9.25E-05	4.71E+00	5.12E+00	3.68E-05	1.82E+00	1.98E+00	1.07E-05	6.37E-01	6.93E-01
JAC-C	8.20E-05	4.71E+00	5.13E+00	3.26E-05	1.93E+00	2.11E+00	9.47E-06	6.77E-01	7.38E-01
LOS-D	5.75E-04	1.64E+01	1.79E+01	2.31E-04	6.50E+00	7.08E+00	6.37E-05	2.29E+00	2.49E+00
LOS-C	2.52E-04	1.45E+01	1.57E+01	1.01E-04	5.73E+00	6.20E+00	2.87E-05	2.01E+00	2.18E+00
MOT-D	3.49E-05	2.10E+00	2.29E+00	1.34E-05	7.69E-01	8.39E-01	4.24E-06	2.65E-01	2.88E-01
NEW-D	7.88E-04	4.72E+01	5.16E+01	3.17E-04	1.87E+01	2.04E+01	8.94E-05	6.56E+00	7.16E+00
NEW-C	1.50E-03	5.53E+01	6.04E+01	6.06E-04	2.19E+01	2.39E+01	1.66E-04	7.69E+00	8.39E+00
NOR-D	1.89E-04	7.09E+00	7.71E+00	7.62E-05	2.75E+00	2.99E+00	2.10E-05	9.63E-01	1.05E+00
NOR-C	1.19E-04	6.92E+00	7.52E+00	4.75E-05	2.71E+00	2.94E+00	1.35E-05	9.50E-01	1.03E+00
PHI-D	4.79E-04	2.99E+01	3.26E+01	1.93E-04	1.18E+01	1.29E+01	5.44E-05	4.14E+00	4.52E+00
PHI-C	3.71E-04	2.04E+01	2.23E+01	1.49E-04	8.03E+00	8.77E+00	4.23E-05	2.82E+00	3.08E+00
POR-D	1.68E-04	7.05E+00	7.70E+00	6.74E-05	2.79E+00	3.04E+00	1.87E-05	9.80E-01	1.07E+00
POR-C	1.74E-04	7.18E+00	7.84E+00	7.00E-05	2.81E+00	3.06E+00	1.94E-05	9.84E-01	1.07E+00
SAV-D	2.74E-04	1.00E+01	1.09E+01	1.10E-04	4.07E+00	4.44E+00	3.04E-05	1.43E+00	1.55E+00
SAV-C	6.15E-05	3.32E+00	3.48E+00	2.44E-05	1.27E+00	1.33E+00	7.14E-06	4.42E-01	4.62E-01
SEA-C	4.27E-05	2.47E+00	2.69E+00	1.69E-05	9.33E-01	1.02E+00	4.99E-06	3.24E-01	3.53E-01
TAC-D	1.14E-04	5.03E+00	5.49E+00	4.54E-05	1.95E+00	2.12E+00	1.31E-05	6.83E-01	7.45E-01
TAC-C	1.33E-04	7.18E+00	7.84E+00	5.34E-05	2.80E+00	3.06E+00	1.51E-05	9.82E-01	1.07E+00
WIL-D	2.43E-04	6.24E+00	6.80E+00	9.80E-05	2.46E+00	2.69E+00	2.69E-05	8.70E-01	9.48E-01
WIL-C	5.22E-05	1.41E+00	1.54E+00	2.10E-05	5.42E-01	5.92E-01	5.94E-06	1.93E-01	2.10E-01
CHN-D	7.30E-05	2.95E+00	3.21E+00	2.90E-05	1.13E+00	1.23E+00	8.51E-06	3.95E-01	4.29E-01

CHA = Charleston (Wando Terminal), SC; CNC = Concord, CA; GAL = Galveston, TX; JAC = Jacksonville, FL; LOS = Long Beach, CA; MOT = MOTSU, SC; NEW = Elizabeth, NJ; NOR = Norfolk, VA; PHI = Philadelphia, PA; POR = Portland, OR; SAV = Savannah, GA; SEA = Seattle, WA; TAC = Tacoma, WA; WIL = Wilmington, NC; CHN = NWS Charleston, SC

Table D-33 Peak Results, Variable Meteorology (Continued)

Individual Center-line EDE Whole Body Dose, 0-1.6 KM (SV)

	BR-2			RHF			TRIGA		
Site/Loc	EA4	EA5	EA6	EA4	EA5	EA6	EA4	EA5	EA6
CHA-D	3.66E-06	5.85E-02	6.39E-02	1.46E-06	2.32E-02	2.53E-02	4.06E-07	8.15E-03	8.89E-03
CHA-C	3.66E-06	5.85E-02	6.39E-02	1.46E-06	2.32E-02	2.53E-02	4.06E-07	8.15E-03	8.89E-03
CNC-D	3.66E-06	2.51E-02	2.74E-02	1.46E-06	9.94E-03	1.08E-02	4.06E-07	3.50E-03	3.81E-03
CNC-C	3.66E-06	2.51E-02	2.74E-02	1.46E-06	9.94E-03	1.08E-02	4.06E-07	3.50E-03	3.81E-03
GAL-D	3.66E-06	5.34E-02	5.82E-02	1.46E-06	2.11E-02	2.31E-02	4.06E-07	7.43E-03	8.10E-03
GAL-C	3.66E-06	5.34E-02	5.82E-02	1.46E-06	2.11E-02	2.31E-02	4.06E-07	7.43E-03	8.10E-03
JAC-D	3.66E-06	5.85E-02	6.39E-02	1.46E-06	2.32E-02	2.53E-02	4.06E-07	8.15E-03	8.89E-03
JAC-C	3.66E-06	5.85E-02	6.39E-02	1.46E-06	2.32E-02	2.53E-02	4.06E-07	8.15E-03	8.89E-03
LOS-D	3.66E-06	2.51E-02	2.74E-02	1.46E-06	9.94E-03	1.08E-02	4.06E-07	3.50E-03	3.81E-03
LOS-C	3.66E-06	2.51E-02	2.74E-02	1.46E-06	9.94E-03	1.08E-02	4.06E-07	3.50E-03	3.81E-03
MOT-D	3.66E-06	5.96E-02	6.50E-02	1.46E-06	2.36E-02	2.57E-02	4.06E-07	8.29E-03	9.04E-03
NEW-D	3.66E-06	4.12E-02	4.50E-02	1.46E-06	1.63E-02	1.78E-02	4.06E-07	5.74E-03	6.26E-03
NEW-C	3.66E-06	4.12E-02	4.50E-02	1.46E-06	1.63E-02	1.78E-02	4.06E-07	5.74E-03	6.26E-03
NOR-D	3.66E-06	5.96E-02	6.50E-02	1.46E-06	2.36E-02	2.57E-02	4.06E-07	8.29E-03	9.04E-03
NOR-C	3.66E-06	5.96E-02	6.50E-02	1.46E-06	2.36E-02	2.57E-02	4.06E-07	8.29E-03	9.04E-03
PHI-D	3.66E-06	6.06E-02	6.61E-02	1.46E-06	2.40E-02	2.62E-02	4.06E-07	8.43E-03	9.20E-03
PHI-C	3.66E-06	6.06E-02	6.61E-02	1.46E-06	2.40E-02	2.62E-02	4.06E-07	8.43E-03	9.20E-03
POR-D	3.66E-06	5.64E-02	6.15E-02	1.46E-06	2.23E-02	2.43E-02	4.06E-07	7.85E-03	8.56E-03
POR-C	3.66E-06	5.64E-02	6.15E-02	1.46E-06	2.23E-02	2.43E-02	4.06E-07	7.85E-03	8.56E-03
SAV-D	3.66E-06	5.85E-02	6.39E-02	1.46E-06	2.32E-02	2.53E-02	4.06E-07	8.15E-03	8.89E-03
SAV-C	3.66E-06	5.85E-02	6.39E-02	1.46E-06	2.32E-02	2.53E-02	4.06E-07	8.15E-03	8.89E-03
SEA-C	3.66E-06	5.64E-02	6.15E-02	1.46E-06	2.23E-02	2.43E-02	4.06E-07	7.85E-03	8.56E-03
TAC-D	3.66E-06	5.64E-02	6.15E-02	1.46E-06	2.23E-02	2.43E-02	4.06E-07	7.85E-03	8.56E-03
TAC-C	3.66E-06	5.64E-02	6.15E-02	1.46E-06	2.23E-02	2.43E-02	4.06E-07	7.85E-03	8.56E-03
WIL-D	3.66E-06	5.96E-02	6.50E-02	1.46E-06	2.36E-02	2.57E-02	4.06E-07	8.29E-03	9.04E-03
WIL-C	3.66E-06	5.96E-02	6.50E-02	1.46E-06	2.36E-02	2.57E-02	4.06E-07	8.29E-03	9.04E-03
CHN-D	3.66E-06	5.85E-02	6.39E-02	1.46E-06	2.32E-02	2.53E-02	4.06E-07	8.15E-03	8.89E-03

Individual Center-line Cancer Risk, 0-1.6 KM

	BR-2			RHF			TRIGA		
Site/Loc	EA4	EA5	EA6	EA4	EA5	EA6	EA4	EA5	EA6
CHA-D	1.79E-07	2.44E-03	2.66E-03	7.29E-08	9.65E-04	1.05E-03	1.84E-08	3.39E-04	3.70E-04
CHA-C	1.79E-07	2.44E-03	2.66E-03	7.29E-08	9.65E-04	1.05E-03	1.84E-08	3.39E-04	3.70E-04
CNC-D	1.79E-07	1.05E-03	1.14E-03	7.29E-08	4.14E-04	4.52E-04	1.84E-08	1.46E-04	1.59E-04
CNC-C	1.79E-07	1.05E-03	1.14E-03	7.29E-08	4.14E-04	4.52E-04	1.84E-08	1.46E-04	1.59E-04
GAL-D	1.79E-07	2.23E-03	2.43E-03	7.29E-08	8.80E-04	9.60E-04	1.84E-08	3.09E-04	3.37E-04
GAL-C	1.79E-07	2.23E-03	2.43E-03	7.29E-08	8.80E-04	9.60E-04	1.84E-08	3.09E-04	3.37E-04
JAC-D	1.79E-07	2.44E-03	2.66E-03	7.29E-08	9.65E-04	1.05E-03	1.84E-08	3.39E-04	3.70E-04
JAC-C	1.79E-07	2.44E-03	2.66E-03	7.29E-08	9.65E-04	1.05E-03	1.84E-08	3.39E-04	3.70E-04
LOS-D	1.79E-07	1.05E-03	1.14E-03	7.29E-08	4.14E-04	4.52E-04	1.84E-08	1.46E-04	1.59E-04
LOS-C	1.79E-07	1.05E-03	1.14E-03	7.29E-08	4.14E-04	4.52E-04	1.84E-08	1.46E-04	1.59E-04
MOT-D	1.79E-07	2.48E-03	2.71E-03	7.29E-08	9.82E-04	1.07E-03	1.84E-08	3.45E-04	3.77E-04
NEW-D	1.79E-07	1.72E-03	1.88E-03	7.29E-08	6.80E-04	7.42E-04	1.84E-08	2.39E-04	2.61E-04
NEW-C	1.79E-07	1.72E-03	1.88E-03	7.29E-08	6.80E-04	7.42E-04	1.84E-08	2.39E-04	2.61E-04
NOR-D	1.79E-07	2.48E-03	2.71E-03	7.29E-08	9.82E-04	1.07E-03	1.84E-08	3.45E-04	3.77E-04
NOR-C	1.79E-07	2.48E-03	2.71E-03	7.29E-08	9.82E-04	1.07E-03	1.84E-08	3.45E-04	3.77E-04
PHI-D	1.79E-07	2.53E-03	2.76E-03	7.29E-08	9.98E-04	1.09E-03	1.84E-08	3.51E-04	3.83E-04
PHI-C	1.79E-07	2.53E-03	2.76E-03	7.29E-08	9.98E-04	1.09E-03	1.84E-08	3.51E-04	3.83E-04
POR-D	1.79E-07	2.35E-03	2.57E-03	7.29E-08	9.29E-04	1.01E-03	1.84E-08	3.27E-04	3.56E-04
POR-C	1.79E-07	2.35E-03	2.57E-03	7.29E-08	9.29E-04	1.01E-03	1.84E-08	3.27E-04	3.56E-04
SAV-D	1.79E-07	2.44E-03	2.66E-03	7.29E-08	9.65E-04	1.05E-03	1.84E-08	3.39E-04	3.70E-04
SAV-C	1.79E-07	2.44E-03	2.66E-03	7.29E-08	9.65E-04	1.05E-03	1.84E-08	3.39E-04	3.70E-04
SEA-C	1.79E-07	2.35E-03	2.57E-03	7.29E-08	9.29E-04	1.01E-03	1.84E-08	3.27E-04	3.56E-04
TAC-D	1.79E-07	2.35E-03	2.57E-03	7.29E-08	9.29E-04	1.01E-03	1.84E-08	3.27E-04	3.56E-04
TAC-C	1.79E-07	2.35E-03	2.57E-03	7.29E-08	9.29E-04	1.01E-03	1.84E-08	3.27E-04	3.56E-04
WIL-D	1.79E-07	2.48E-03	2.71E-03	7.29E-08	9.82E-04	1.07E-03	1.84E-08	3.45E-04	3.77E-04
WIL-C	1.79E-07	2.48E-03	2.71E-03	7.29E-08	9.82E-04	1.07E-03	1.84E-08	3.45E-04	3.77E-04
CHN-D	1.79E-07	2.44E-03	2.66E-03	7.29E-08	9.65E-04	1.05E-03	1.84E-08	3.39E-04	3.70E-04

CHA = Charleston (Wando Terminal), SC; CNC = Concord, CA; GAL = Galveston, TX; JAC = Jacksonville, FL; LOS = Long Beach, CA; MOT = MOTSU, SC; NEW = Elizabeth, NJ; NOR = Norfolk, VA; PHI = Philadelphia, PA; POR = Portland, OR; SAV = Savannah, GA; SEA = Seattle, WA; TAC = Tacoma, WA; WIL = Wilmington, NC; CHN = NWS Charleston, SC

Table D-34 Probability of Peak Results, Variable Meteorology

EDE Whole Body Population Dose, 0-80 KM (SV)

	BR-2			RHF			TRIGA		
Site/Loc	EA4	EA5	EA6	EA4	EA5	EA6	EA4	EA5	EA6
CHA-D	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05
CHA-C	7.77E-06	4.44E-06	4.44E-06	7.77E-06	4.44E-06	4.44E-06	7.77E-06	4.44E-06	4.44E-06
CNC-D	8.47E-04	1.18E-05	1.18E-05	8.47E-04	1.18E-05	1.18E-05	8.47E-04	1.18E-05	1.18E-05
CNC-C	7.58E-06	7.58E-06	7.58E-06	7.58E-06	7.58E-06	7.58E-06	7.58E-06	7.58E-06	7.58E-06
GAL-D	7.80E-06	9.75E-06	9.75E-06	7.80E-06	7.80E-06	7.80E-06	7.80E-06	7.80E-06	7.80E-06
GAL-C	7.80E-06	9.75E-06	9.75E-06	7.80E-06	9.75E-06	9.75E-06	7.80E-06	9.75E-06	9.75E-06
JAC-D	6.03E-06	6.03E-06	6.03E-06	6.03E-06	6.03E-06	6.03E-06	6.03E-06	6.03E-06	6.03E-06
JAC-C	6.08E-06	8.06E-06	8.06E-06	6.08E-06	8.06E-06	8.06E-06	6.08E-06	8.06E-06	8.06E-06
LOS-D	1.83E-03	3.42E-06	3.42E-06	1.83E-03	3.42E-06	3.42E-06	1.83E-03	3.42E-06	3.42E-06
LOS-C	4.91E-06	2.81E-06	2.81E-06	4.91E-06	2.81E-06	2.81E-06	4.91E-06	2.81E-06	2.81E-06
MOT-D	1.67E-05	2.76E-05	2.76E-05	1.67E-05	2.76E-05	2.76E-05	1.67E-05	2.76E-05	2.76E-05
NEW-D	2.03E-05	2.03E-05	2.03E-05	2.03E-05	2.03E-05	2.03E-05	2.03E-05	2.03E-05	2.03E-05
NEW-C	2.50E-04	7.65E-05	7.65E-05	2.50E-04	7.65E-05	7.65E-05	2.50E-04	7.65E-05	7.65E-05
NOR-D	3.51E-04	9.62E-06	9.62E-06	3.51E-04	9.62E-06	9.62E-06	3.51E-04	9.62E-06	9.62E-06
NOR-C	1.07E-05	1.61E-05	1.61E-05	1.07E-05	1.61E-05	1.61E-05	1.07E-05	1.61E-05	1.61E-05
PHI-D	3.17E-06	3.17E-06	3.17E-06	3.17E-06	3.17E-06	3.17E-06	3.17E-06	3.17E-06	3.17E-06
PHI-C	2.44E-05	2.44E-05	2.44E-05	2.44E-05	2.44E-05	2.44E-05	2.44E-05	2.44E-05	2.44E-05
POR-D	1.26E-05	1.09E-05	1.09E-05	1.26E-05	1.09E-05	1.09E-05	1.26E-05	1.09E-05	1.09E-05
POR-C	3.19E-04	1.09E-05	1.09E-05	3.19E-04	1.09E-05	1.09E-05	3.19E-04	1.09E-05	1.09E-05
SAV-D	1.13E-05	6.22E-06	6.22E-06	1.13E-05	6.22E-06	6.22E-06	1.13E-05	6.22E-06	6.22E-06
SAV-C	1.30E-05	1.14E-05	1.14E-05	1.30E-05	1.14E-05	1.14E-05	1.30E-05	1.14E-05	1.14E-05
SEA-C	1.36E-04	6.79E-04	6.79E-04	1.36E-04	6.79E-04	6.79E-04	1.36E-04	9.80E-04	9.80E-04
TAC-D	5.33E-06	1.14E-05	1.14E-05	5.33E-06	1.14E-05	1.14E-05	5.33E-06	1.14E-05	1.14E-05
TAC-C	1.08E-05	1.08E-05	1.08E-05	1.08E-05	1.08E-05	1.08E-05	1.08E-05	1.08E-05	1.08E-05
WIL-D	3.26E-04	1.16E-04	1.16E-04	3.26E-04	1.16E-04	1.16E-04	3.26E-04	1.16E-04	1.16E-04
WIL-C	3.04E-04	1.08E-04	1.08E-04	3.04E-04	1.08E-04	1.08E-04	3.04E-04	1.08E-04	1.08E-04
CHN-D	6.27E-06	3.89E-06	3.89E-06	6.27E-06	3.89E-06	3.89E-06	6.27E-06	3.89E-06	3.89E-06

Total Cancer Fatalities, 0-80 KM

	BR-2			RHF			TRIGA		
Site/Loc	EA4	EA5	EA6	EA4	EA5	EA6	EA4	EA5	EA6
CHA-D	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05
CHA-C	7.77E-06	4.44E-06	4.44E-06	7.77E-06	4.44E-06	4.44E-06	7.77E-06	4.44E-06	4.44E-06
CNC-D	8.47E-04	5.08E-04	5.08E-04	8.47E-04	1.18E-05	1.18E-05	8.47E-04	1.18E-05	1.18E-05
CNC-C	7.58E-06	7.58E-06	7.58E-06	7.58E-06	7.58E-06	7.58E-06	7.58E-06	7.58E-06	7.58E-06
GAL-D	7.80E-06	9.75E-06	9.75E-06	7.80E-06	7.80E-06	7.80E-06	7.80E-06	7.80E-06	7.80E-06
GAL-C	7.80E-06	9.75E-06	9.75E-06	7.80E-06	9.75E-06	9.75E-06	7.80E-06	9.75E-06	9.75E-06
JAC-D	6.03E-06	6.03E-06	6.03E-06	6.03E-06	6.03E-06	6.03E-06	6.03E-06	6.03E-06	6.03E-06
JAC-C	6.08E-06	8.06E-06	8.06E-06	6.08E-06	8.06E-06	8.06E-06	6.08E-06	8.06E-06	8.06E-06
LOS-D	1.83E-03	3.42E-06	3.42E-06	1.83E-03	3.42E-06	3.42E-06	1.83E-03	3.42E-06	3.42E-06
LOS-C	4.91E-06	2.81E-06	2.81E-06	4.91E-06	2.81E-06	2.81E-06	4.91E-06	2.81E-06	2.81E-06
MOT-D	1.67E-05	2.76E-05	2.76E-05	1.67E-05	2.76E-05	2.76E-05	1.67E-05	2.76E-05	2.76E-05
NEW-D	2.03E-05	2.03E-05	2.03E-05	2.03E-05	2.03E-05	2.03E-05	2.03E-05	2.03E-05	2.03E-05
NEW-C	2.50E-04	7.65E-05	7.65E-05	2.50E-04	7.65E-05	7.65E-05	2.50E-04	7.65E-05	7.65E-05
NOR-D	3.51E-04	9.62E-06	9.62E-06	3.51E-04	9.62E-06	9.62E-06	3.51E-04	9.62E-06	9.62E-06
NOR-C	1.07E-05	1.61E-05	1.61E-05	1.07E-05	1.61E-05	1.61E-05	1.07E-05	1.61E-05	1.61E-05
PHI-D	3.17E-06	3.17E-06	3.17E-06	3.17E-06	3.17E-06	3.17E-06	3.17E-06	3.17E-06	3.17E-06
PHI-C	2.44E-05	2.44E-05	2.44E-05	2.44E-05	2.44E-05	2.44E-05	2.44E-05	2.44E-05	2.44E-05
POR-D	2.98E-04	1.09E-05	1.09E-05	2.98E-04	1.09E-05	1.09E-05	2.98E-04	1.09E-05	1.09E-05
POR-C	3.19E-04	1.09E-05	1.09E-05	3.19E-04	1.09E-05	1.09E-05	3.19E-04	1.09E-05	1.09E-05
SAV-D	1.13E-05	6.22E-06	6.22E-06	1.13E-05	6.22E-06	6.22E-06	1.13E-05	6.22E-06	6.22E-06
SAV-C	1.30E-05	1.14E-05	1.14E-05	1.30E-05	1.14E-05	1.14E-05	1.30E-05	1.14E-05	1.14E-05
SEA-C	1.36E-04	6.79E-04	6.79E-04	1.36E-04	6.79E-04	6.79E-04	1.36E-04	6.79E-04	6.79E-04
TAC-D	5.33E-06	1.08E-05	1.08E-05	5.33E-06	1.08E-05	1.08E-05	5.33E-06	1.14E-05	1.14E-05
TAC-C	1.08E-05	1.08E-05	1.08E-05	1.08E-05	1.08E-05	1.08E-05	1.08E-05	1.08E-05	1.08E-05
WIL-D	3.26E-04	1.16E-04	1.16E-04	3.26E-04	1.16E-04	1.16E-04	3.26E-04	1.16E-04	1.16E-04
WIL-C	3.04E-04	1.27E-05	1.27E-05	3.04E-04	1.08E-04	1.08E-04	3.04E-04	1.08E-04	1.08E-04
CHN-D	6.27E-06	3.89E-06	3.89E-06	6.27E-06	3.89E-06	3.89E-06	6.27E-06	3.89E-06	3.89E-06

CHA = Charleston (Wando Terminal), SC; CNC = Concord, CA; GAL = Galveston, TX; JAC = Jacksonville, FL; LOS = Long Beach, CA; MOT = MOTSU, SC; NEW = Elizabeth, NJ; NOR = Norfolk, VA; PHI = Philadelphia, PA; POR = Portland, OR; SAV = Savannah, GA; SEA = Seattle, WA; TAC = Tacoma, WA; WIL = Wilmington, NC; CHN = NWS Charleston, SC

Table D-34 Probability of Peak Results, Variable Meteorology (Continued)

Individual Center-line EDE Whole Body Dose, 0-1.6 KM (SV)

	BR-2			RHF			TRIGA		
Site/Loc	EA4	EA5	EA6	EA4	EA5	EA6	EA4	EA5	EA6
CHA-D	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03
CHA-C	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03
CNC-D	1.22E-01	2.00E-04	2.00E-04	1.22E-01	2.00E-04	2.00E-04	1.22E-01	2.00E-04	2.00E-04
CNC-C	1.22E-01	2.00E-04	2.00E-04	1.22E-01	2.00E-04	2.00E-04	1.22E-01	2.00E-04	2.00E-04
GAL-D	3.73E-02	1.57E-03	1.57E-03	3.73E-02	1.57E-03	1.57E-03	3.73E-02	1.57E-03	1.57E-03
GAL-C	3.73E-02	1.57E-03	1.57E-03	3.73E-02	1.57E-03	1.57E-03	3.73E-02	1.57E-03	1.57E-03
JAC-D	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03
JAC-C	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03
LOS-D	1.22E-01	2.00E-04	2.00E-04	1.22E-01	2.00E-04	2.00E-04	1.22E-01	2.00E-04	2.00E-04
LOS-C	1.22E-01	2.00E-04	2.00E-04	1.22E-01	2.00E-04	2.00E-04	1.22E-01	2.00E-04	2.00E-04
MOT-D	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03
NEW-D	3.45E-03	1.06E-03	1.06E-03	3.45E-03	1.06E-03	1.06E-03	3.45E-03	1.06E-03	1.06E-03
NEW-C	3.45E-03	1.06E-03	1.06E-03	3.45E-03	1.06E-03	1.06E-03	3.45E-03	1.06E-03	1.06E-03
NOR-D	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03
NOR-C	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03
PHI-D	7.89E-02	5.14E-04	5.14E-04	7.89E-02	5.14E-04	5.14E-04	7.89E-02	5.14E-04	5.14E-04
PHI-C	7.89E-02	5.14E-04	5.14E-04	7.89E-02	5.14E-04	5.14E-04	7.89E-02	5.14E-04	5.14E-04
POR-D	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04
POR-C	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04
SAV-D	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03
SAV-C	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03
SEA-C	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04
TAC-D	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04
TAC-C	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04
WIL-D	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03
WIL-C	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03
CHN-D	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03

Individual Center-line Cancer Risk, 0-1.6 KM

	BR-2			RHF			TRIGA		
Site/Loc	EA4	EA5	EA6	EA4	EA5	EA6	EA4	EA5	EA6
CHA-D	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03
CHA-C	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03
CNC-D	1.22E-01	2.00E-04	2.00E-04	1.22E-01	2.00E-04	2.00E-04	1.22E-01	2.00E-04	2.00E-04
CNC-C	1.22E-01	2.00E-04	2.00E-04	1.22E-01	2.00E-04	2.00E-04	1.22E-01	2.00E-04	2.00E-04
GAL-D	3.73E-02	1.57E-03	1.57E-03	3.73E-02	1.57E-03	1.57E-03	3.73E-02	1.57E-03	1.57E-03
GAL-C	3.73E-02	1.57E-03	1.57E-03	3.73E-02	1.57E-03	1.57E-03	3.73E-02	1.57E-03	1.57E-03
JAC-D	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03
JAC-C	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03
LOS-D	1.22E-01	2.00E-04	2.00E-04	1.22E-01	2.00E-04	2.00E-04	1.22E-01	2.00E-04	2.00E-04
LOS-C	1.22E-01	2.00E-04	2.00E-04	1.22E-01	2.00E-04	2.00E-04	1.22E-01	2.00E-04	2.00E-04
MOT-D	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03
NEW-D	3.45E-03	1.06E-03	1.06E-03	3.45E-03	1.06E-03	1.06E-03	3.45E-03	1.06E-03	1.06E-03
NEW-C	3.45E-03	1.06E-03	1.06E-03	3.45E-03	1.06E-03	1.06E-03	3.45E-03	1.06E-03	1.06E-03
NOR-D	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03
NOR-C	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03
PHI-D	7.89E-02	5.14E-04	5.14E-04	7.89E-02	5.14E-04	5.14E-04	7.89E-02	5.14E-04	5.14E-04
PHI-C	7.89E-02	5.14E-04	5.14E-04	7.89E-02	5.14E-04	5.14E-04	7.89E-02	5.14E-04	5.14E-04
POR-D	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04
POR-C	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04
SAV-D	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03
SAV-C	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03
SEA-C	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04
TAC-D	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04
TAC-C	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04	2.91E-02	4.00E-04	4.00E-04
WIL-D	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03
WIL-C	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03	8.16E-03	1.46E-03	1.46E-03
CHN-D	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03	2.36E-02	1.66E-03	1.66E-03

CHA = Charleston (Wando Terminal), SC; CNC = Concord, CA; GAL = Galveston, TX; JAC = Jacksonville, FL; LOS = Long Beach, CA; MOT = MOTSU, SC; NEW = Elizabeth, NJ; NOR = Norfolk, VA; PHI = Philadelphia, PA; POR = Portland, OR; SAV = Savannah, GA; SEA = Seattle, WA; TAC = Tacoma, WA; WIL = Wilmington, NC; CHN = NWS Charleston, SC

population within 80.5 km (50 mi) of the Elizabeth channel accident location is about 16 million people and typical plumes are about two compass sectors wide, a typical accident plume might expose about two million people to radiation. Thus, for the largest mean result obtained, an average 50-year individual dose over the total exposed populations is about 6,900 person-rem/2,000,000 people = 0.0035 rem per person, which is 5,300 times smaller than the average dose (15 rem) people normally receive from natural, medical, and occupational exposures during the same period of time (BEIR, 1990).

Due to variable weather conditions, the calculated accident consequences vary over a range of values of approximately two orders of magnitude. Quantile values are one means used to indicate how much variation exists among the quantified consequences. The 99.9th quantile values presented in Table D-32 represent the accident consequences that are expected no more than 0.1 percent of the time, that is 99.9 percent of the time the accident consequences will be less than the values presented here. The 99.9th quantile values range from 0.00625 rem (at the MOTSU dock, TRIGA fuel, release category 4) to 108,000 rem (at the Elizabeth channel, BR-2 fuel, release category 6). These results are about three orders of magnitude less likely than the mean, but are less than two orders of magnitude higher than the mean results. (In some cases a 99.9th quantile value is listed as "NOT FOUND." In these instances the peak values, discussed in the following paragraph, occur with a probability of greater than 0.001).

Table D-33 shows that the largest value (peak result) calculated for population dose within 80.5 km (50 mi) of the accident location was 145,000 person-rem (1,450 person-Sv) and that this result was obtained for the Elizabeth channel calculation that used the BR-2 inventory, severity category 6 (EA6) release fractions, and New York City weather. Dividing by the two million people exposed by the accident gives an average 50-year individual dose over the exposed population of about 73 mrem, which is still 250 times smaller than a normal annual individual dose from background and medical exposure over the same period of time. In addition, Table D-34 shows that the probability of this result was 0.0000765 conditional on the accident having occurred. Since the probability of this accident occurring is about 6 x 10^{-10} per port call, the chance of having this result is much less than 1 x 10^{-10} per port call.

Table D-31 also shows that mean (expected) 50-year individual centerline doses at a distance of 0.8 km (0.5 mi) from the accident location [the midpoint of the 0-1.6 km or 0-1 mi computational interval] range from a low of 0.000006 rem (0.00000006 Sv) for the Norfolk and MOTSU calculations that used the TRIGA inventory, severity category 4 (EA4) release fractions, and Cape Hatteras weather to a high of 117 mrem (0.00117 Sv) for the Elizabeth calculations that used the BR-2 inventory, severity category 5 (EA5) release fractions, and New York City weather. Thus, the largest expected individual dose is 190 times smaller than a normal background medical and occupational individual dose during the same period (50 years), which suggests that the mean risk to a maximally exposed member of the general population is not of great concern. Note that the channel and dock values for centerline doses are the same for each port. This is because MACCS, in calculating centerline doses, develops the dose for a hypothetical person and so does not take into account population distribution. Therefore, the usually minor difference in position between the dock and channel does not result in different values. Table D-33 shows that the largest value (peak result) calculated for 50-year individual centerline dose for a person located 0.8 km (0.5 mi) from the accident location was 6.6 rem (0.066 Sv) and that this result was obtained for the Philadelphia calculations that used the BR-2 inventory, severity category 6 (EA6) release fractions, and Washington, DC, weather. This dose of 6.6 rem is less than half of the dose received due to background radiation over the same 50-year period. Table D-34 shows that the probability of this result is 0.00051 conditional on the accident having occurred. Thus, the chance per port call of the MEI receiving this 50-year dose is significantly less than 1 x 10^{-10}.

Table D-31 shows that the mean number of cancer deaths predicted to occur during the decades after the accident, among the populations located within 80.5 km (50 mi) of the accident site at the time of the accident, ranges from 0.00000041 for the MOTSU dock calculation that used the TRIGA inventory, severity category 4 (EA4) release fractions, and mean Cape Hatteras weather to 2.9 for the Elizabeth channel calculation that used the BR-2 inventory, severity category 5 (EA5) release fractions, and mean New York City weather. If all three of the cancer deaths predicted to occur as a result of the accident at the Elizabeth site should happen to occur in the same year, then the death rate among the two million people exposed to radiation by this accident would be 3/2,000,000 = 0.0000015 deaths per person year. Since the normal death rate due to all types of cancer is about 150 deaths per 100,000 people per year (World Almanac, 1992) or 0.0015 deaths per person year, the largest mean (expected) death rate for any base case calculation is 1,000 times smaller than the normal death rate due to cancer. Table D-33 shows that the largest number of cancer deaths obtained for any weather trial in any base case calculation was 60 and that this result was obtained for the Elizabeth channel calculation that used the BR-2 inventory, severity category 6 (EA6) release fractions, and New York City weather. Again, if all of these deaths were to occur in the same year in the future (a very improbable outcome), the death rate during that year among the population exposed to radiation by the accident would be 0.00003 or 50 times lower than the normal death rate due to cancer among this population. Table D-34 shows that the probability of this result is 0.000077 conditional on the occurrence of the accident or less than 1×10^{-10} per port call. Thus, even the worst case number of cancer deaths would be wholly undetectable in the exposed population by the best of epidemiological studies.

Figures D-56 and D-57 present Complementary Cumulative Distribution Functions for population dose and cancer fatalities among the population located within 80.5 km (50 mi) of the accident site for seven of the thirteen ports studied. Only seven were plotted to simplify the figure; these seven provide the full range of results. The figures display the range and probability (conditional on the occurrence of the accident) of these two consequence measures. Figure D-56 shows that any large accident (severity category 5 with the BR-2 inventory is a severe ship collision and fire accident) will lead to a population dose of 10 person-rem, that the values of the 99th quantile (probability of 0.01) range from about 2,000 person-rem to about 40,000 person-rem, and that the largest (peak) result calculated ranges from about 4,600 rem (MOTSU) to about 110,000 rem (Elizabeth). Figure D-57 shows that a large accident has about one chance in 10 (range of 0.002 to 0.6) of causing at least one cancer death among the exposed population in future years, that the values of the 99.9th quantile range from 1 cancer fatality to about 25 cancer deaths, and that the largest (peak) result calculated ranges from 2.1 to 47 deaths due to cancer during the years after the accident.

Figure D-58 presents an example of Complementary Cumulative Distribution Functions for population dose and cancer fatalities for the distance range 0 to 80.5 km (0 to 50 mi) for both the dock and channel locations at Charleston. This figure shows that the dock and channel Complementary Cumulative Distribution Functions for both population dose and cancer fatalities are quite similar, which is typical for all of the ports examined. This suggests that moving the coordinates of the origin of a population distribution a small distance (a few kilometers) has little effect on population dose or cancer fatalities among population located within 80.5 km (50 mi) of the accident location for severe accidents (Table D-28 lists the coordinates of the origins of the polar coordinate population distributions used in these calculations).

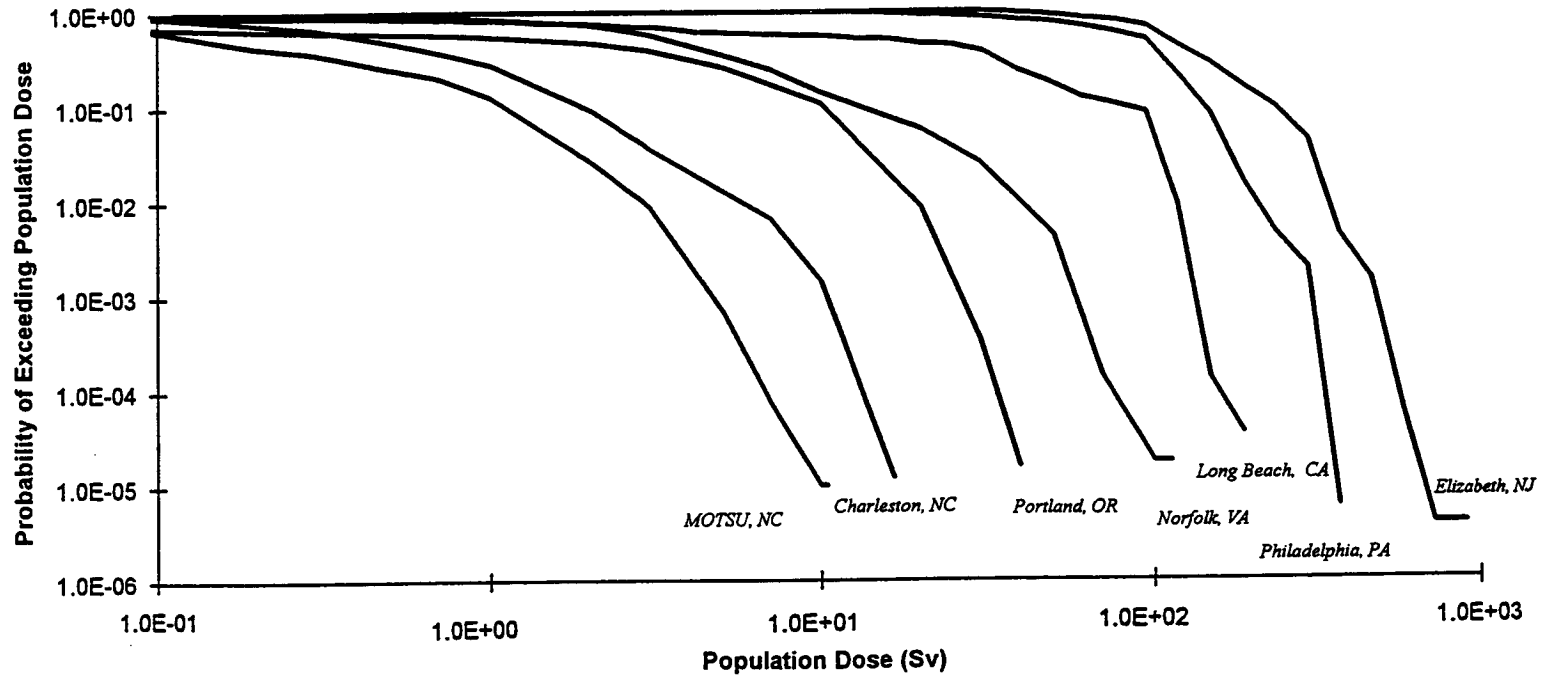


Figure D-56 Effective Dose Equivalent Whole Body Population Dose, 0-80 km (0-50 mi), Select Ports (at the Dock), Variable Meteorology, BR-2 Inventory, Severity Category 5 Releases

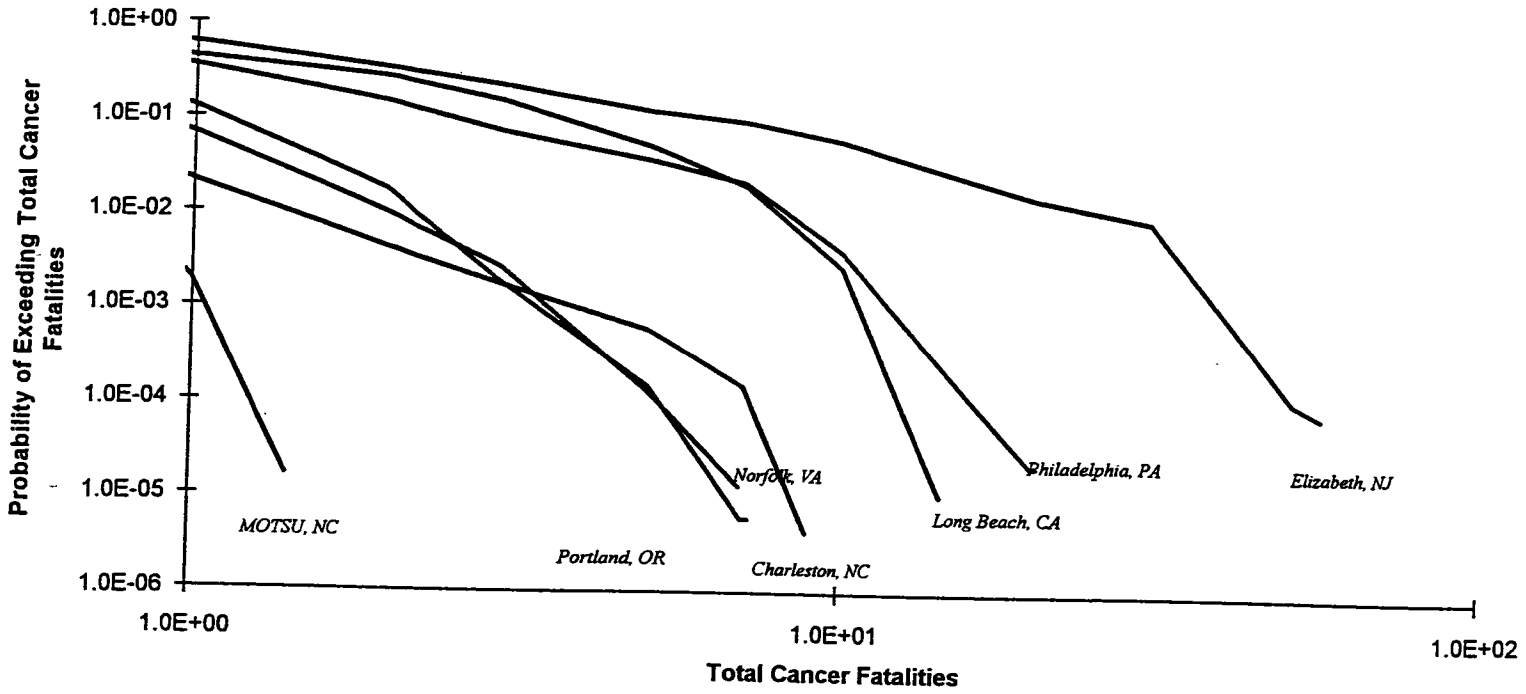


Figure D-57 Total Latent Cancer Fatalities, 0-80 km (0-50 mi), Select Ports (in the Channel), Variable Meteorology, BR-2 Inventory, Severity Category 5 Release

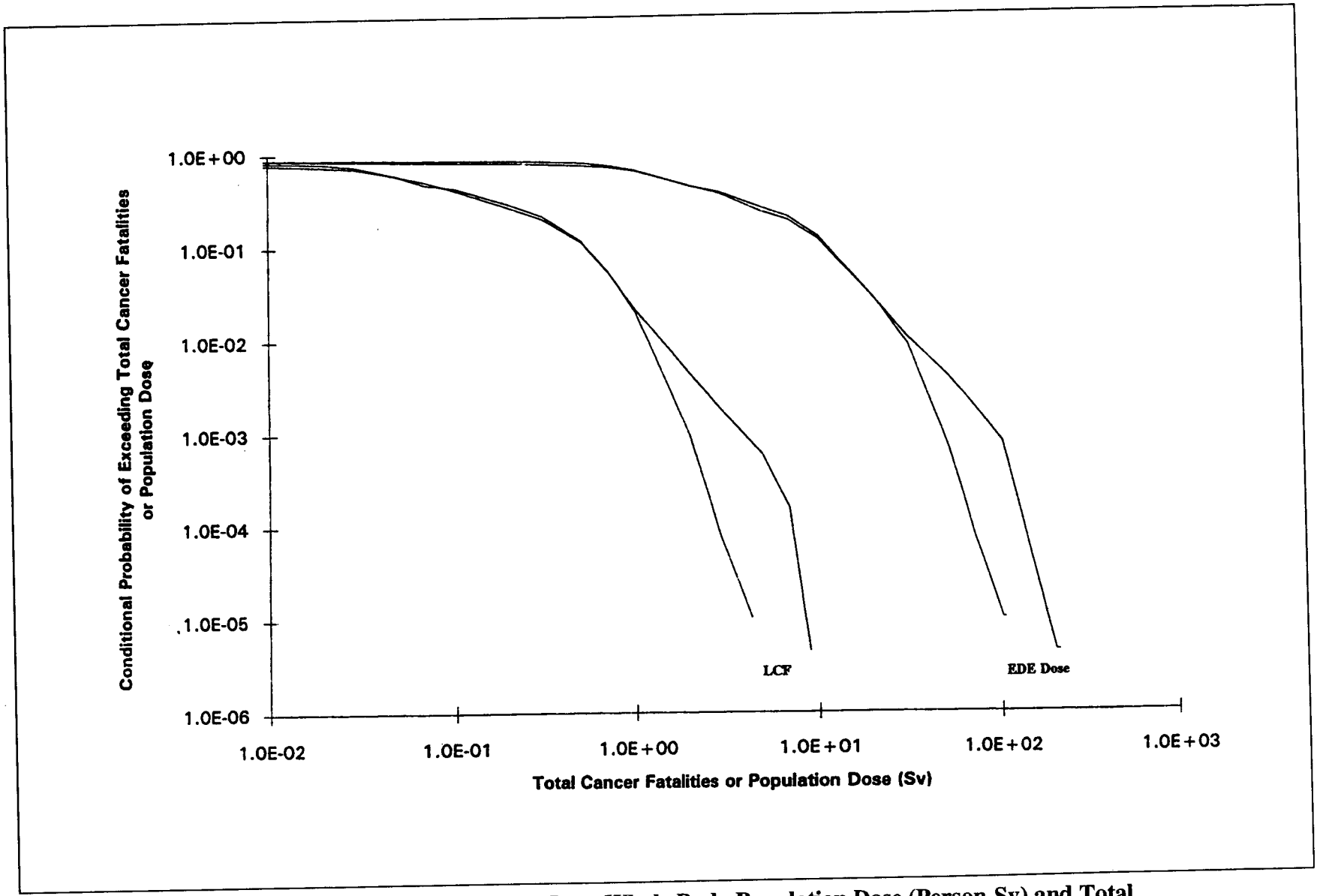


Figure D-58 Effective Equivalent Dose Whole Body Population Dose (Person-Sv) and Total Latent Cancer Fatalities, 0-80 km (0-50 mi), Charleston Dock and Channel Locations, Variable Meteorology, BR-2 Inventory, Severity Category 5 Release

D.5.4.3 Sensitivity Calculations

Two principal sensitivity calculations were performed to determine the sensitivity of the results to key parameters. First, the effect of using local less detailed meteorological data versus meteorological data recorded at a National Weather Service station located some distance from the port was evaluated. Second, the results of exceptionally high spent nuclear fuel temperatures were examined. Additionally, the sensitivity of changes in plume buoyancy, the size of the nuclide set, modal study release fractions, corrosion products release, and work force population were examined. The meteorological sensitivity calculations compared results obtained using variable meteorology recorded at a National Weather Service station away from the port to results obtained using constant meteorology recorded at the port. All other sensitivity calculations except the work force calculations were performed by modifying the Elizabeth base case channel calculation as was appropriate in order to examine the parameter of interest. The work force calculations were based on the Elizabeth dock site. All of the sensitivity calculations used the BR-2 inventory and all, except those that examined release fractions, used severity category 5 release fractions.

D.5.4.3.1 Variable vs. Constant Meteorology

Variable meteorology, which takes into account hourly changes of wind direction and speed, was used in the calculations that led to the results presented in this EIS. However, the detailed weather data required to support these calculations are not available in most ports, so detailed data from the most appropriate National Weather Service Station location possible were used. A sensitivity study was performed to better understand the effect of using detailed but not local weather data versus using local less-detailed port weather data. The local weather is called constant meteorology, to reflect the fact that the weather remains constant during the course of the accident, not varying on an hourly basis.

This study performed, for each port, a large number of constant meteorology calculations for each port, using the conditions and probabilities specified in the joint frequency distributions that were available for each port. Since joint frequency distributions specify for each compass sector the probability of occurrence of each of the six Pasquil-Gifford atmospheric stability classes with each of six windspeed ranges, 16 x 6 x 6 = 576 constant meteorology calculations could be performed, once assuming that it was raining and once assuming that it was not. Then, by cumulating the results of each set of approximately 1,150 constant meteorology single weather trial calculations (rain does not occur for all of the sets of conditions in the joint frequency distribution), a Complementary Cumulative Distribution Function could be constructed to compare with the complementary cumulative distribution function obtained using variable meteorology recorded at the nearest National Weather Service Station.

Table D-35 presents a sample joint frequency table for one of the ports examined during this EIS (Charleston). Tables D-36 and D-37 present the port wind rose and a probability of rain by stability class respectively for selected ports.

Constant meteorology calculations were performed as follows. For each port examined, two sets of constant meteorology calculations were performed. Both used the joint frequency distribution of windspeed (6 windspeed ranges) and stability class (6 stability classes) by wind direction (16 compass sectors) for the port being analyzed as the meteorological input data for MACCS. Each calculation was run two times, once for no rain and once assuming that it was raining throughout the entire simulation. Therefore, each MACCS constant meteorology calculation consisted of 6 x 6 x 16 x 2 = 1,152 constant meteorology trials. From these 1,152 trials, a complementary cumulative Distribution Function and a mean (expected result) was constructed for each consequence measure calculated.

Table D-35 1988-92 Summary Joint Frequency Table for Charleston, SC Port

A Stability

Wind Speed	Wind Directions (Blowing Toward)															
(mph)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1- 3	.0003	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0003	.0003	.0002	.0003	.0001	.0002	.0001	.0001
4- 7	.0005	.0003	.0005	.0004	.0004	.0006	.0003	.0003	.0006	.0004	.0004	.0002	.0002	.0001	.0002	.0003
8-12	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
13-18	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
19-24	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
>24	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

B Stability

Wind Speed	Wind Directions (Blowing Toward)															
(mph)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1- 3	.0008	.0003	.0006	.0007	.0005	.0007	.0008	.0005	.0011	.0006	.0010	.0007	.0007	.0006	.0004	.0005
4- 7	.0018	.0013	.0017	.0019	.0023	.0020	.0017	.0013	.0031	.0016	.0023	.0017	.0018	.0011	.0013	.0007
8-12	.0021	.0013	.0021	.0025	.0025	.0014	.0013	.0008	.0016	.0013	.0013	.0010	.0013	.0012	.0016	.0012
13-18	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
19-24	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
>24	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

C Stability

Wind Speed	Wind Directions (Blowing Toward)															
(mph)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1- 3	.0002	.0002	.0003	.0003	.0003	.0003	.0003	.0003	.0004	.0003	.0005	.0005	.0003	.0002	.0001	.0001
4- 7	.0015	.0014	.0016	.0022	.0026	.0021	.0019	.0020	.0026	.0021	.0035	.0021	.0014	.0010	.0014	.0012
8-12	.0081	.0038	.0061	.0072	.0090	.0049	.0037	.0031	.0057	.0051	.0062	.0042	.0034	.0043	.0042	.0049
13-18	.0017	.0012	.0021	.0020	.0021	.0014	.0006	.0005	.0006	.0005	.0005	.0004	.0008	.0005	.0008	.0007
19-24	.0000	.0000	.0000	.0001	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
>24	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

D Stability

Wind Speed	Wind Directions (Blowing Toward)															
(mph)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1- 3	.0009	.0005	.0005	.0007	.0006	.0005	.0004	.0008	.0013	.0012	.0013	.0012	.0007	.0007	.0004	.0004
4- 7	.0045	.0030	.0037	.0027	.0028	.0026	.0022	.0044	.0094	.0079	.0093	.0056	.0042	.0039	.0026	.0022
8-12	.0196	.0151	.0165	.0112	.0108	.0070	.0047	.0061	.0168	.0216	.0201	.0124	.0108	.0075	.0066	.0083
13-18	.0140	.0179	.0145	.0082	.0133	.0096	.0058	.0058	.0084	.0080	.0057	.0047	.0051	.0035	.0034	.0036
19-24	.0009	.0019	.0020	.0007	.0020	.0023	.0010	.0004	.0003	.0000	.0000	.0001	.0001	.0001	.0001	.0000
>24	.0002	.0005	.0002	.0001	.0003	.0003	.0001	.0000	.0000	.0001	.0000	.0000	.0000	.0000	.0000	.0000

E Stability

Wind Speed	Wind Directions (Blowing Toward)															
(mph)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1- 3	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
4- 7	.0127	.0071	.0088	.0047	.0033	.0023	.0021	.0025	.0050	.0061	.0094	.0066	.0052	.0049	.0036	.0051
8-12	.0063	.0072	.0085	.0059	.0067	.0058	.0032	.0030	.0038	.0066	.0043	.0021	.0019	.0013	.0011	.0016
13-18	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
19-24	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
>24	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

F Stability

Wind Speed	Wind Directions (Blowing Toward)															
(mph)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
1- 3	.0090	.0076	.0081	.0059	.0052	.0039	.0035	.0057	.0086	.0076	.0101	.0054	.0054	.0036	.0032	.0035
4- 7	.0122	.0088	.0112	.0074	.0063	.0051	.0044	.0059	.0095	.0104	.0122	.0057	.0044	.0044	.0029	.0039
8-12	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
13-18	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
19-24	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
>24	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

Table D-36 Wind Rose Table for Select Ports

1988-92 Summary Wind Rose Table For Charleston, SC Port
Wind Directions (Blowing Toward)

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
.0974	.0796	.0892	.0650	.0712	.0530	.0380	.0436	.0790	.0817	.0882	.0549	.0479	.0389	.0341	.0385

1988-92 Summary Wind Rose Table For Long Beach, CA Port
Wind Directions (Blowing Toward)

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
.0246	.0171	.0602	.3093	.1804	.0157	.0177	.0229	.0331	.0227	.0271	.0475	.1115	.0601	.0348	.0154

1988-92 Summary Wind Rose Table For Newark, NJ Port
Wind Directions (Blowing Toward)

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
.0784	.0725	.1015	.0871	.0854	.0639	.0788	.0559	.0832	.0786	.0442	.0273	.0231	.0304	.0452	.0447

1988-92 Summary Wind Rose Table For Norfolk, VA Port
Wind Directions (Blowing Toward)

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
.1078	.0963	.1021	.0647	.0562	.0456	.0344	.0285	.0940	.0665	.0860	.0573	.0470	.0321	.0358	.0458

1988-92 Summary Wind Rose Table For Philadelphia, PA Port
Wind Directions (Blowing Toward)

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
.0682	.0440	.0950	.1118	.1281	.0913	.0715	.0568	.0669	.0266	.0275	.0639	.0545	.0284	.0278	.0378

1988-92 Summary Wind Rose Table For Portland, OR Port
Wind Directions (Blowing Toward)

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
.0936	.0551	.0337	.0315	.0756	.0956	.1163	.1054	.0704	.0187	.0171	.0225	.0638	.1126	.0576	.0304

1988-92 Summary Wind Rose Table For Wilmington, NC Port
Wind Directions (Blowing Toward)

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
.0744	.0804	.0994	.0798	.0747	.0378	.0417	.0435	.0955	.0780	.0699	.0488	.0549	.0351	.0411	.0451

Table D-37 Rainfall Data, Select Ports

Rainfall Data for the Charleston, SC Port 1988-1992 Data

Stab Class	Avg Rate (in/hr)	Fraction Time
A	0.05000	0.00264
B	0.22400	0.00371
C	0.16322	0.00771
D	0.13860	0.11099
E	0.14740	0.01099
F	0.07941	0.00125

Rainfall Data for the Long Beach, CA Port 1988-1992 Data

Stab Class	Avg Rate (in/hr)	Fraction Time
A	0.00000	0.00000
B	0.00000	0.00000
C	0.14375	0.00233
D	0.07837	0.03648
E	0.06596	0.00809
F	0.07083	0.00115

Rainfall Data for the Newark, NJ Port 1988-1992 Data

Stab Class	Avg Rate (in/hr)	Fraction Time
A	0.00000	0.00000
B	0.05000	0.00059
C	0.08571	0.00648
D	0.08577	0.12139
E	0.08968	0.00971
F	0.05000	0.00153

Rainfall Data for the Norfolk, VA Port 1988-1992 Data

Stab Class	Avg Rate (in/hr)	Fraction Time
A	0.00000	0.00000
B	0.09167	0.00371
C	0.10921	0.00771
D	0.47136	0.11099
E	0.12574	0.01099
F	0.05000	0.00125

Rainfall Data for the Philadelphia, PA Port 1988-1992 Data

Stab Class	Avg Rate (in/hr)	Fraction Time
A	0.00000	0.00000
B	0.17500	0.00089
C	0.11250	0.00431
D	0.07520	0.12101
E	0.10682	0.00649
F	0.17500	0.00035

Rainfall Data for the Portland, OR Port 1988-1992 Data

Stab Class	Avg Rate (in/hr)	Fraction Time
A	0.00000	0.00000
B	0.11250	0.00139
C	0.08125	0.01245
D	0.06172	0.15220
E	0.06493	0.01428
F	0.05000	0.00087

Rainfall Data for the Wilmington, NC Port 1988-1992 Data

Stab Class	Avg Rate (in/hr)	Fraction Time
A	0.00000	0.00000
B	0.18235	0.00718
C	0.17500	0.01937
D	0.15048	0.12490
E	0.16295	0.02310
F	0.08571	0.00244

Table D-38 Comparison of Population Dose and Selected Ports Using Variable vs. Constant Meteorology for Category Accident of a BR-2 Fuel Cask

Site/Loc	EDE Whole Body Population Dose, 0-80 KM (Sv)				Total Cancer Fatalities, 0-80 KM			
	Mean		99.9th Quantile		Mean		99.9th Quantile	
	Var	Const	Var	Const	Var	Const	Var	Const
CHA-D	4.15E+00	3.06E+00	4.63E+01	2.13E+01	1.89E-01	1.29E-01	1.98E+00	8.43E-01
CHA-C	4.18E+00	3.41E+00	9.03E+01	3.71E+01	1.90E-01	1.43E-01	3.96E+00	2.01E+00
LOS-D	4.71E+01	3.44E+01	2.67E+02	1.19E+02	1.99E+00	1.44E+00	1.03E+01	5.35E+00
LOS-C	4.26E+01	3.31E+01	2.19E+02	8.16E+01	1.80E+00	1.38E+00	9.81E+00	3.43E+00
NEW-D	6.55E+01	5.47E+01	5.87E+02	2.32E+02	2.75E+00	2.28E+00	2.46E+01	9.54E+00
NEW-C	6.93E+01	5.89E+01	9.41E+02	NOT-FOUND	2.90E+00	2.46E+00	3.89E+01	NOT-FOUND
NOR-D	8.54E+00	8.88E+00	1.03E+02	7.26E+01	3.77E-01	3.72E-01	4.23E+00	3.07E+00
NOR-C	6.65E+00	6.76E+00	9.02E+01	3.51E+01	2.96E-01	2.83E-01	3.59E+00	1.34E+00
PHI-D	2.81E+01	2.53E+01	3.10E+02	NOT-FOUND	1.20E+00	1.06E+00	1.18E+01	1.34E+00
PHI-C	2.74E+01	2.01E+01	2.86E+02	5.91E+01	1.17E+00	8.40E-01	1.22E+01	2.45E+00
POR-D	1.17E+01	1.08E+01	1.09E+02	7.76E+01	5.18E-01	4.54E-01	4.90E+00	3.29E+00
POR-C	1.12E+01	8.76E+00	1.01E+02	3.88E+01	4.97E-01	3.68E-01	3.78E+00	1.51E+00
MOT-D	2.08E+00	1.02E+00	2.46E+01	NOT-FOUND	9.94E-02	4.37E-02	1.22E+00	1.51E+00
WIL-C	2.07E+00	1.05E+00	2.25E+01	5.47E+00	9.76E-02	4.49E-02	1.04E+00	2.22E-01

Table D-38 compares for seven ports the expected (mean) and 99.9th quantile values of population dose and cancer fatalities for the distance range 0 to 80.5 km (0-50 mi) obtained using variable meteorology to the values obtained using constant meteorology. Inspection of the table shows that the mean values for constant meteorology are quite similar to mean values for variable meteorology. For example, for population dose, the ratio of the variable meteorology result to the constant meteorology result has an average value and standard deviation of 1.31±0.31 for population dose and 1.34±0.41 for cancer fatalities. The MOTSU dock calculation yielded the largest values for these ratios, 2.04 for mean population dose and 2.27 for cancer fatalities. Thus, the use of meteorological data recorded at a nearby National Weather Service station yields expected (mean) values for population dose and cancer fatalities that are on average about 30 to 40 percent larger than the values obtained using constant meteorological conditions for each of the six Pasquil-Gifford atmospheric stability classes that were derived from data recorded at the harbor.

The 99.9th quantile values of population dose and cancer fatalities among the population that resides within 80.5 km (50 mi) of the harbor results agree less well for constant and variable meteorology. For several ports, the 99.9th quantile population dose is missing, ("not found"), for the constant meteorology calculation. This means that the probability of the largest result obtained for any of the 1,152 trials run during each constant meteorology calculation was larger than 0.001 for that particular calculation. For the locations that yielded a 99.9th quantile value for both the variable and constant meteorology calculation, the ratio of the 99.9th quantile variable meteorology result to the 99.9th quantile constant meteorology result has a value of 2.64±0.98 for population dose and 3.00±2.02 for cancer fatalities. The fact that the 99.9th quantile values obtained using variable meteorology are on average 2.5 to 3.0 times larger than the 99.9th quantile values obtained using constant meteorology suggests that the importance sampling scheme, used by MACCS to select weather sequences from a year of variable meteorological data, is able to find weather sequences that lead to adverse results that are not represented in the sets of constant meteorological conditions found in the joint frequency distributions of windspeed and atmospheric stability by wind direction that were recorded at the harbors. This is so because the occurrence of rain is usually the cause of peak results at some later time when the plume is passing over some downwind highly populated region. Thus, because rain at some downwind location was not modeled by the constant meteorology calculations, these results should differ significantly from those obtained using variable meteorology, especially for the higher quantiles of result distributions.

Figure D-59 presents, as an example, complementary cumulative distribution functions for Long Beach of the 50-year population dose and lifetime LCFs over the distance range from 0 to 80.5 km (0 to 50 mi) obtained using both variable and constant meteorology. All four calculations used the BR-2 inventory and severity category 5 release fractions. The dose calculation was performed for the dock location at Long Beach; and the LCF calculation was performed for the channel location. Inspection of the figures shows that the constant and variable meteorology complementary cumulative distribution functions are quite similar until the 90th quantile of the distributions are reached, and diverge increasingly as higher quantiles are passed, with the constant meteorology complementary cumulative distribution function generally falling off faster than the variable meteorology complementary cumulative distribution function (smaller consequence value at any consequence probability). Thus, the figures confirm the conclusion reached by inspection of Table D-38, that variable and constant meteorology yield quite similar estimates for mean results and that adverse meteorological conditions are more likely to be modeled if weather sequences are selected by importance sampling from a year of variable data than if constant meteorological conditions are used.

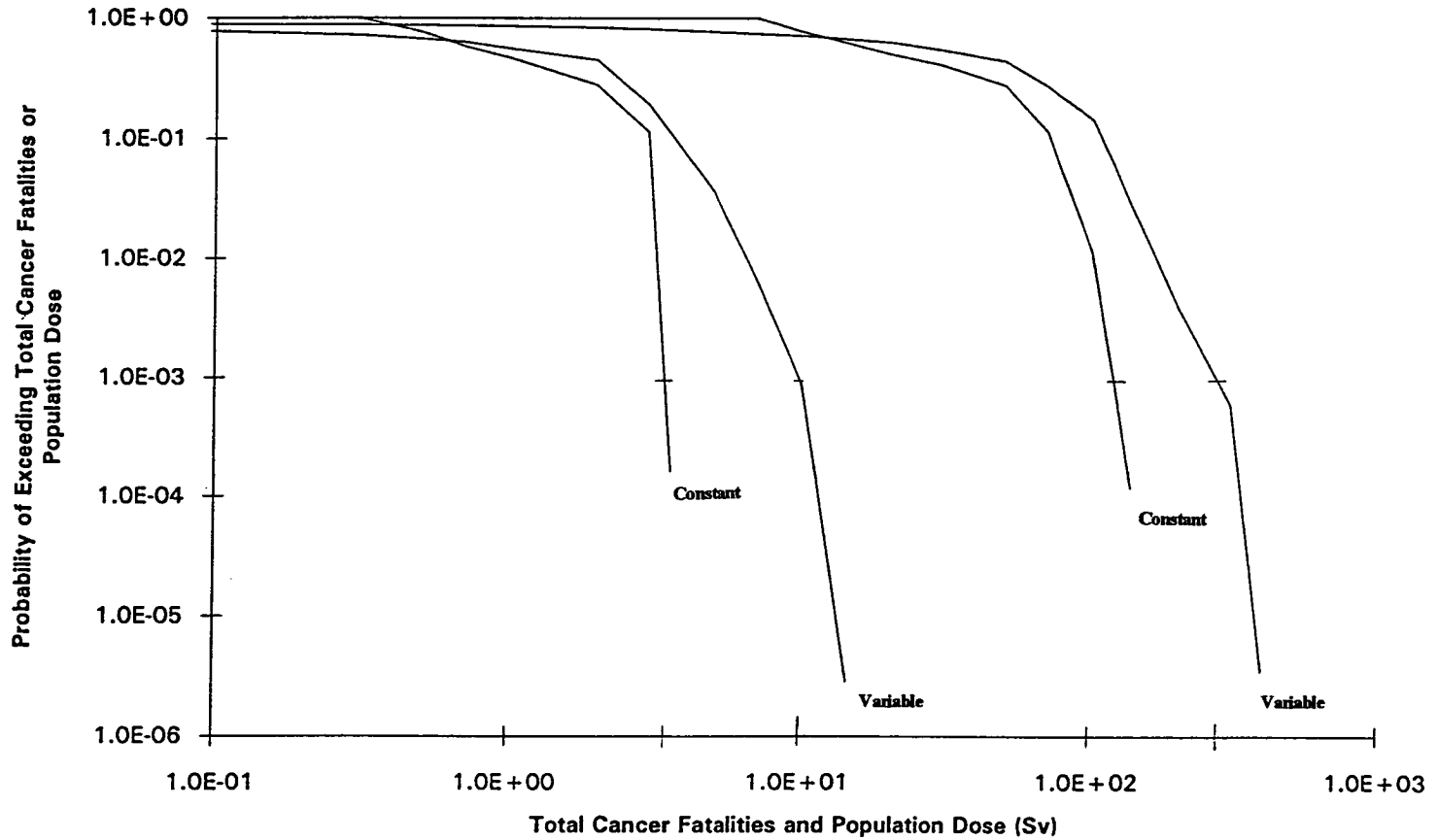


Figure D-59 Effective Dose Equivalent Whole Body Population Dose (Sv) (Dock) and Total Cancer Fatalities (Channel), 0-80 km (0-50 mi), Long Beach, Variable and Constant Meteorology, BR-2 Inventory, Severity Category 5 Releases

D.5.4.3.2 High-Temperature Sensitivity Calculations

As previously discussed, releases of radioactive material from spent nuclear fuel transportation casks are categorized by severity. Severity category 6, which results in the largest release, is assumed for the marine transportation portion of this EIS to be caused by a severe ship collision that results in damage to the transportation cask and a severe fire that engulfs the cask. Only around one in five severe ship fires reach temperatures above approximately 700°K or 800°F (see Attachment D5, Section 4). As discussed below, extremely high temperatures, above 900°K (1,160°F), result in phenomena that could significantly alter the release fraction for aluminum-based and TRIGA fuel (previous studies have not specifically addressed the impact of these phenomena). Therefore, the release fractions assumed for severity category 6 (Table D-21) are for temperatures of the spent nuclear fuel above 700°K (800°F) but below 900°K (1,160°F).

Section D.5.3.1 of this appendix developed probabilities of the more severe marine accidents. Table D-24 stated that the probability of a severity category 6 accident is 6×10^{-10}, or less than one chance in a billion per cask shipment. This very low probability is made even lower if the probability of the severe fire causing the spent nuclear fuel temperature to exceed 900°K (1,160°F) is considered. Appendix D Attachment D5 concludes that the probability of a severe ship fire exceeding spent nuclear fuel temperatures of 900°K (1,160°F) is 0.1. Multiplying the probability of a severity category 6 accident (6×10^{-10}) by the probability of a severe fire on the ship (0.1) results in the probability of a severity category 6 accident that includes a severe ship fire, 6×10^{-11}. This exceedingly small probability indicates that the occurrence of this condition is not a creditable accident. However, for completeness, an evaluation of the consequences of such an accident is presented below as a sensitivity calculation.

The review of the behavior of aluminum-uranium (Al-U) alloy and TRIGA fuels at temperatures above 900°K (1,160°F), presented in Attachment D5, found that at these temperatures Al-U fuels melt, and if exposed to air, TRIGA fuel burns. Table D5-2 (in Attachment D5) compares the release fractions estimated for these high-temperature scenarios to those used in the base case calculations. These data show the high-temperature events (the category 5B and 6B events) increase release from these fuels significantly.

Since both processes (melting and burning) are expected to produce fission product release fractions that are significantly larger than those used during base case calculations for severity category 6 accidents, sensitivity calculations were performed so that the consequences and risks associated with these larger releases could be compared to the consequences and risks of the base case results. Again the Elizabeth channel location was used to perform the sensitivity calculations. Three calculations were performed, two BR-2 aluminum-uranium alloy fuel calculations and one TRIGA fuel calculation. All of these calculations used the release fractions specified in Table D-39 for high-temperature scenarios. The first aluminum-uranium alloy fuel sensitivity calculation used severity category 5B and the second category 6B release fractions. The single TRIGA sensitivity calculation used category 6B release fractions. Calculations were not performed with any of the other sets of release fractions presented in Table D-39, because each of the other sets is smaller than the set used in the base case calculations that it would replace; and would thus yield smaller consequences and risks.

Table D-39 presents the results of these high-temperature sensitivity calculations and compares them to the base case results obtained using the same inventories but using the severity category 5 or 6 release fractions given in Table D-21. Table D-39 shows that, as expected, the larger severity category 5B and severity category 6B release fractions lead to consequences significantly larger than those obtained for the base case calculations that used severity category 5 and severity category 6 release fractions. Inspection of the table shows that the larger release fractions increase consequence estimates by factors of ten to 100.

Table D-39 High-Temperature Sensitivity Calculation Results

	BR-2				TRIGA	
Accident Severity Category	5	5B	6	6B	6	6B
Accident Probability	5×10^{-9}	5×10^{-10}	6×10^{-10}	6×10^{-11}	6×10^{-10}	6×10^{-11}
Peak Probability [0-1.6 km [0-1 mi)]	8.41×10^{-5}	7.65×10^{-5}	8.41×10^{-5}	7.03×10^{-5}	8.41×10^{-5}	2.17×10^{-4}
Peak Probability [0.80.5 km (0-50 mi)]	8.41×10^{-5}	1.16×10^{-5}	8.41×10^{-5}	1.45×10^{-5}	8.41×10^{-5}	1.45×10^{-5}
EDE Whole Body Population Dose (person-rem)						
0-1.6 km (0-1 mi)						
Mean	236	1,490	192	3,810	26.8	3,980
Peak	42,100	203,000	45,900	271,000	6,390	297,000
0-80.5 km (0-50 mi)						
Mean	6,930	68,400	6,770	639,000	937	298,000
Peak	133,000	1,450,000	145,000	14,400,000	20,200	6,390,000
Total Cancer Fatalities						
0-1.6 km (0-1 mi)						
Mean	0.098	0.622	0.0802	1.59	0.0112	1.66
Peak	17.5	84.5	19.1	113	2.66	123
0-80.5 km (0-50 mi)						
Mean	2.90	28.7	2.84	268	0.392	125
Peak	55.3	603	60.4	6,000	8.39	2,660
Impact Distances (km)						
Decontamination						
Mean	0.0	0.0156	0.0	0.302	0.0	0.0993
Peak	0.0	1.61	0.0	8.05	0.0	6.44
Cond. Peak Prob.	---	0.00969	---	0.00116	---	7.53×10^{-5}
Interdiction						
Mean	0.0	0.0156	0.0	0.302	0.0	0.0993
Peak	0.0	1.61	0.0	8.05	0.0	6.44
Cond. Peak Prob.	---	0.00969	---	0.00116	---	7.53×10^{-5}
Condemnation						
Mean	0.0	0.0	0.0	0.0292	0.0	0.00263
Peak	0.0	0.0	0.0	3.22	0.0	1.61
Cond. Peak Prob.	---	---	---	0.000648	---	0.00163
Population Dose Risk						
0-1.6 km (0-1 mi)						
Mean	1.2×10^{-6}	7.5×10^{-7}	1.2×10^{-7}	2.3×10^{-7}	1.6×10^{-8}	2.4×10^{-7}
Peak	1.8×10^{-8}	7.8×10^{-9}	2.3×10^{-9}	1.1×10^{-9}	3.2×10^{-10}	3.9×10^{-9}
0-80.5 km (0-50 mi)						
Mean	3.5×10^{-5}	3.4×10^{-6}	4.1×10^{-6}	3.8×10^{-5}	5.6×10^{-7}	1.8×10^{-5}
Peak	5.6×10^{-8}	8.4×10^{-9}	7.3×10^{-9}	1.3×10^{-8}	1.0×10^{-9}	5.5×10^{-9}
Cancer Fatality Risk						
0-1.6 km						
Mean	4.9×10^{-10}	4.4×10^{-10}	4.8×10^{-11}	9.5×10^{-11}	6.7×10^{-12}	1.0×10^{-10}
Peak	7.4×10^{-12}	3.2×10^{-12}	9.6×10^{-13}	4.8×10^{-13}	1.3×10^{-13}	1.6×10^{-12}
0-80.5 km						
Mean	1.5×10^{-7}	1.6×10^{-7}	1.7×10^{-9}	1.6×10^{-8}	2.4×10^{-10}	7.5×10^{-9}
Peak	2.3×10^{-11}	3.5×10^{-12}	3.0×10^{-12}	5.2×10^{-12}	4.2×10^{-13}	2.3×10^{-12}

However, because the probabilities of occurrence of these high-temperature release fractions (see Attachment D-5) for BR-2 aluminum uranium alloy fuel inventories are generally ten times smaller than those associated with the severity category 5 and severity category 6 accident categories, the risks associated with these larger releases are comparable to or smaller than those predicted for base case BR-2 calculations. For TRIGA fuel, severity category 6B release fractions are much larger than the severity category 6 release fractions. The probability of the severity category 6B release fractions is only ten times smaller than that of the severity category 6 release fractions. Therefore, the risks associated with a TRIGA fuel category 6B release are significantly larger than those obtained for the base case accident severity category 6 calculation. But, because the TRIGA inventory is substantially smaller than the BR-2 inventory, the TRIGA severity category 6B risks are still smaller than the risks obtained for base case calculations using the BR-2 inventory and the severity category 5 set of release fractions.

Other environmental impacts in addition to the public health consequences are presented in Table D-39. These impacts were determined as part of the MACCS calculations. MACCS calculated land impacts based on a habitability dose criterion and cost effectiveness of mitigative actions such as evacuation, temporary relocation, and land decontamination and interdiction. The habitability criterion is based on the need to take action to ensure that the dose to a person remains below 4 rem[1] over a 5-year period. MACCS code determines the mitigative actions in a predetermined sequence in order to select the least stringent action which will allow the habitability dose criterion to be satisfied. The order of actions is: 1) decontamination alone (minimum decontamination process, three levels of decontamination process can be specified), 2) maximum level of decontamination followed by an interdiction period, and 3) permanent interdiction (condemnation) of the land. The decontamination distance is that distance from the accident location that requires post-accident clean-up to ensure this dose level is not achieved. The land is usable, that is, people may live and work in the area, within a relatively short period after the accident. The interdiction distance is that distance from the accident that even after decontamination would require some time, typically seven years, before the land area would be useable. The condemnation distance characterizes the land area that even after decontamination would remain unusable for at least 30 years.

MACCS code calculates both the affected population in the urban areas and the affected farmlands in the rural areas. The affected distances, (i.e., decontamination, interdiction, and condemnation distances), in the rural areas are generally larger than those of the urban area. Since one of the principal uses of rural land is agricultural, the consumption of contaminated food produced in these areas would result in larger doses to some members of the public.

Table D-39 provides the land impact distances for an accident that occurs in the Port of Elizabeth for the most severe accident severity categories of both the base case calculations (category 5 and 6 for the BR-2 fuel and category 6 for the TRIGA fuel) and for the most severe of the high temperature accident scenarios (categories 5B and 6B for BR-2 fuel and category 6B for the TRIGA fuel). Since the ports are located primarily in urban areas, the impact distances presented are those based on the urban (population) impact calculations. For the base case accident scenarios, MACCS predicted no impact on the usability of the land. However, when temperatures reaching the melting point of the aluminum based fuel and the combustion temperature of the TRIGA fuel are realized, some land-use impacts are calculated. All mean impact distances are well under 1 km (0.6 mi), with the largest distance being approximately 300 m

1 *This arises from 2 rem in first year and 0.5 rem per year for the years 2 to 5. This criterion is consistent with the Environmental Protection Agency's long-term objectives of the Protective Action Guide, (Section 4.2.1 of "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," EPA 1991).*

(1000 ft). The peak values quoted in Table D-39 represent the worst possible consequences, driven by meteorological conditions that create the maximum potential damage. The occurrences of these meteorological conditions are of low probabilities which are ranging from approximately one-in-one hundred to less than one-in-ten thousand.

In addition to the Port of Elizabeth, the land impact analysis was performed for several of the candidate ports, including Concord NWS, CA; Galveston, TX; MOTSU, NC; and Tacoma, WA. For these four ports, the mean values for the land impacts resulting from the category 6B accidents, the most severe of all accident categories, were of the same order of magnitude as, and slightly smaller than, the results presented in Table D-39 for the Port of Elizabeth.

D.5.4.3.3 Other Sensitivity Calculations

In addition to the two sensitivity calculations discussed above, sensitivity calculations were also performed that examined the effect on consequences of (1) plume buoyancy, (2) the size of the set of nuclides used to specify inventories, (3) Modal Study release fractions, (4) corrosion deposits release, and (5) work force population. Table D-40 summarizes the calculations performed. For all of these calculations, the reference calculation was the base case Elizabeth dock or channel calculation that used the BR-2 inventory, severity category 5 release fractions, and variable meteorology recorded at the New York City National Weather Service station. Work force sensitivity calculations used the Elizabeth dock population distribution. All of the other sensitivity calculations used the Elizabeth channel population distribution. Table D-41 presents mean and peak population doses and cancer fatalities for two distance ranges, 0-1.6 km and 0-80.5 km, (0-1 and 0-50 mi) for all of the "other" sensitivity calculations, and also for the reference Elizabeth base case calculations to which sensitivity calculation results should be compared.

D.5.4.3.3.1 Plume Buoyancy

As Table D-21 showed, a severity category 5 release scenario results from a collision and a severe fire. Thus, the first sensitivity calculation performed examined the effect of plume buoyancy (i.e, of plume rise) on accident consequences. This was done by repeating the Elizabeth channel reference calculation setting the sensible heat content of the release to zero. This change produces a cold plume that is not subject to plume rise and thus is not lofted over the population located close to the release point (the accident location). The results of this sensitivity calculation are presented in Table D-41.

Table D-41 shows that changing the reference Elizabeth channel calculation to a cold release not subject to plume rise causes mean and peak population doses and cancer fatalities to increase somewhat for the 0-80.5 km (0-50 mi) distance range and substantially for the 0-1.6 km (0-1 mi) distance range. For the 0-80.5 km (0-50 mi) distance range, mean population dose and cancer fatalities both increase by a factor of 2.4, and peak population dose and cancer fatalities increase by a factor of 1.1. For the 0-1.6 km (0-1 mi) distance range, mean population dose and cancer fatalities both increase by a factor of 17, and peak population dose and cancer fatalities both increase by a factor of 2.7. Thus, if engulfing fires increase release magnitudes, consequence magnitudes will not increase proportionately because the fire will produce a hot plume that will be lofted over nearby populations decreasing radiation exposures and thus health effects among those populations. It should be mentioned that the releases assumed here (category 5) are not considered possible *without* the fire. This calculation was done to show the sensitivity of the results to the presence of a fire.

Table D-40 Other Sensitivity Calculations

Run No.	Meteorology[a]		Nuclides[b]		Release Fractions[c]			Heat[d]		Shielding[e]	
	Variable	Constant	MACCS	EIS	5	MS/nM5	MS/M5	H	C	N	C
BC	x			x	x			x		x	
Buoyancy Calculations											
1a.	x			x	x				x	x	
Nuclide Sensitivity Calculations											
2a.	x		x		x			x			x
2b.	x		x		x				x		x
Modal Study Release Fraction Calculations											
3a.	x			x		x		x		x	
3b.	x			x			x	x		x	
Corrosion Products Calculations											
4a.[f]	x			x	EA3				x	x	
4b.[g]	x			x	x			x		x	
Work Force Calculations											
5a.	x			x	x			x		x	
5b.	x			x	x				x	x	
5c.	x			x	x				x		x
5d.[h]	x			x	x				x	x	
5e.[h]	x			x	x				x		x
5f.[i]	x			x	x				x	x	

[a] *Meteorology: Variable = hourly National Weather Service data, Constant = Joint Frequency Data.*

[b] *Nuclides: MACCS = 22 MACCS nuclides, EIS = 34 EIS nuclides.*

[c] *Release Fractions: 5 = severity category 5 release fractions; MS/nM5 = release fractions for nonmetallic (TRIGA) spent nuclear fuel for Modal study cask response region roughly corresponding to severity category 5; MS/M5 = release fraction for metallic (aluminum-based) spent nuclear fuel for Modal study cask response regions roughly corresponding to severity category 5.*

[d] *Heat: H = hot plume, C = cold plume.*

[e] *Shielding: N = normal shielding factors; C = sheltering shielding factors from 0-8 km (0-5 mi) for one day and normal shielding factors at all other times and distances.*

[f] *Only Corrosion Products released*

[g] *With Corrosion Products release added to the reference release.*

[h] *With puff and tail*

[i] *With puff and tail, and evacuation from 0-1.6 km (0-1 mi.)*

D.5.4.3.3.2 Size of Nuclide Set

Table D-25 presented the three inventories used in the base case analyses. Each inventory contains 34 radionuclides. The default set of radionuclides used by MACCS does not contain dose conversion factors for 13 of these 34 radionuclides. These 13 radionuclides are hydrogen-3, tin-123, antimony-125, tellurium-125m, promethium-147, promethium-148m, europium-154, europium-155m, uranium-234, uranium-235, uranium-238, americium-242m, and americium-243. *Chronic* health effect dose conversion factors for all 13 of these radionuclides were available (DOE, 1988a; DOE, 1988b) and were added to the MACCS dose conversion factor library for this study. However, because generally accepted *acute* health effect dose conversion factors were not available, all calculations performed for this study were run not including acute health effects for these 13 radionuclides.

Table D-41 Sensitivity Study Results, Elizabeth Dock and Channel, Inventory BR-2, Severity Category 5

Run	EDE Whole Body Population Dose (person-rem)				Total Cancer Fatalities			
	0-1.6 km (0-1 mi)		0-80.5 km (0-50 mi)		0-1.6 km (0-1 mi)		0-80.5 km (0-50 mi)	
	Mean	Peak	Mean	Peak	Mean	Peak	Mean	Peak
Base Case (Channel)	236	42,100	6,930	133,000	0.099	17.5	2.90	55.3
Buoyancy								
1	4,200	114,000	16,900	151,000	1.75	47.6	7.07	62.9
Nuclide Sensitivity								
2a	236	42,100	6,930	133,000	0.0985	17.5	2.90	55.3
2b	4,200	114,000	16,900	151,000	1.75	47.6	7.07	62.9
Modal Study Release Fraction								
3a	53.7	9,540	1,570	30,100	0.0224	3.98	0.661	12.6
3b	0.3	47.7	7.9	151	0.000112	0.0199	0.00331	0.0628
Corrosion Products Calculations								
4a	739	20,100	2,950	26,600	0.319	8.70	1.27	11.5
4b	278	49,400	8,120	156,000	0.116	20.7	3.42	65.4
Base Case (Dock)	71.3	13,300	6,550	113,000	0.0298	5.56	2.75	47.2
Work Force								
5a	105	14,400	6,600	113,000	0.0438	6.02	2.77	47.2
5b	1,870	40,400	11,200	84,600	0.780	16.8	4.69	35.3
5c	1,860	40,300	11,200	84,500	0.778	16.8	4.68	35.3
5d	1,940	40,400	11,600	72,500	0.810	16.9	4.84	30.2
5e	1,940	40,400	11,500	72,500	0.808	16.8	4.83	30.2
5f	1,940	40,300	11,500	72,500	0.808	16.8	4.83	30.2

The effect of not including acute impacts for 13 of the radionuclides in the inventories was examined by two sensitivity calculations. For these calculations, the reference Elizabeth channel calculation was performed with and without the chronic effects of the 13 radionuclides for two situations, once assuming a hot release, and once assuming a cold release. Table D-41 shows that removing these 13 radionuclides from the BR-2 inventory had no significant impact on either mean or peak values of population dose or cancer fatalities over the distance ranges 0-1.6 km (0-1 mi) and 0-80.5 km (0-50 mi) for either calculation. The cold release results and the hot release peak results are identical to those obtained using all 34 radionuclides in the full BR-2 inventory. The hot release mean values obtained with the 13 radionuclides removed differ by no more than 5 percent from the results obtained using 34 radionuclides. Thus, the 13 radionuclides for which acute dose conversion factors were not available do not contribute significantly to chronic dose or health effects, which suggests that none should have a significant impact on acute health effects.

The relative contributions to radiation exposures of the nuclides in an inventory can be estimated by normalizing the ratio of each nuclide's curie amount and the run 2a value by the sum of those ratios. A run 2a value is the curie amount of the radionuclide that produces significant radiation doses (IAEA, 1961; IAEA, 1990). The RADSEL code was used to perform this calculation for the set of 34 nuclides in the inventories used in this study. The RADSEL calculation showed that only one radionuclide, promethium-147, in the set of 13 nuclides for which acute health effect dose conversion factors were lacking, contributes significantly to dose at the 99.9 percent level. More importantly, the calculation also showed that promethium-147 accounts for only 0.5 percent of the total dose produced by the full set of 34 radionuclides. Thus, the 21 nuclides in the inventories for which acute health effect conversion factors were available account for all significant contributions to dose. Therefore, not including acute health effects for 13 of the 34 radionuclides in the inventories used in this study is not believed to have had a

significant impact on the estimation of acute health effects, especially since none of these nuclides contributes significantly to chronic dose or health effects and since no acute effects were observed at any level including peak results for any calculation performed during this study.

D.5.4.3.3.3 Modal Study Cask Response Regions Release Fractions

The Modal Study (Fischer et al., 1987) developed release fractions for truck and rail accidents involving transportation cask containing commercial spent nuclear fuel. DOE as part of the preparation of the Programmatic SNF&INEL EIS, developed representative release fractions for metallic (aluminum-based) and nonmetallic (TRIGA) fuel for each of the Modal Study's cask response regions (DOE, 1995). Although there is not a direct relationship between the accident classification used in this EIS for ship accidents and that developed in the Modal Study, attempts were made to establish a meaningful comparison based on the definition of accidents and their consequences. Based on the accident definitions, one can approximate the severity category 5 ship accidents to the Modal Study's cask response region resulting from a medium impact mechanical force with a medium intensity thermal load. Table D-42 provides the values of release fractions used in this EIS for severity category 5 accident and that used for metallic and nonmetallic fuel in the Programmatic SNF&INEL EIS for a similar accident category. For ease of comparison, the EIS release fractions that were used in all of the base case calculations performed for this study are repeated in this table.

Table D-42 Programmatic SNF&INEL EIS Release Fractions

Element Group	*Release Fraction*		
		Programmatic SNF&INEL EIS	
	EIS (Base Case Category 5)	*Metallic*	*Nonmetallic*
Krypton	0.1	0.39	0.39
Cesium	9.0×10^{-4}	1.0×10^{-6}	0.00020
Ruthenium	1.0×10^{-6}	2.4×10^{-7}	0.000048
Particulate	5.0×10^{-8}	1.0×10^{-8}	0.0000020

Source: DOE, 1995

Inspection of the table shows that, except for the krypton element group, the base case EIS release fraction values for severity category 5 are somewhat larger than the values for nonmetallic fuel and are quite a bit larger than the values for metallic fuel. Thus, as would be expected, Table D-41 shows that mean and peak population doses and cancer fatalities for the distance ranges 0-1.6 and 0-80.5 km (0-1 and 0-50 mi) obtained using EIS release fractions are about five times larger than those obtained using nonmetallic fuel release fractions, which in turn are about 200 times larger than those obtained using metallic fuel release fractions. Therefore, since severity category 5 largely determines risk, use of EIS release fractions is conservative even if metallic and nonmetallic release fractions better represent releases during ship collisions.

D.5.4.3.3.4 Corrosion Products Release

During the operation of power reactors, radioactive cobalt is formed by neutron activation of chemical deposits on the outer surfaces of fuel rods. Thus, during transportation accidents, release of these radioactive deposits, usually referred to as corrosion products, can be a significant contributor to the size of the accident source term.

Because corrosion products formation is usually not a problem for research reactors, radioactive cobalt is not present in the inventories used in this study, and the sets of source terms input to MACCS do not contain fractions for corrosion products release. The potential impact of corrosion products release on foreign research reactor spent nuclear fuel accident source terms was examined by performing two sensitivity calculations. For these calculations, after scaling to match the size of the BR-2 inventory used in this study, the cobalt-60 content of the spent nuclear fuel inventory for a DOE test reactor (DOE, 1995) was added to the BR-2 inventory that was used in these sensitivity calculations (cobalt-58 was ignored as it should largely have decayed away before the fuel is shipped). Then, two sensitivity calculations were performed. Both calculations added 360 Ci of cobalt-60 to the BR-2 inventory and both used a value of 0.012 for the release fraction for the corrosion products chemical element group, as had been done in earlier studies. The first calculation examined the consequences of an accident that releases only corrosion products. Because corrosion products are not volatile, this release was assumed to be cold, that is driven by mechanical forces generated by the ship collision. The second calculation added the corrosion products release to the severity category 5 release used in the reference calculation. Because this release postulates a severe engulfing fire, the second calculation assumed that the release was hot.

Table D-41 shows that the first calculation, the cold release that contained only corrosion products (run 4a), leads to consequences that differ from those produced by the reference calculation as follows: for the 0-1.6 km (0-1 mi) distance range, mean values of population dose and cancer fatalities are about three times larger and peak values about two times smaller; for the 0-80.5 km (0-50 mi) distance range, mean and peak values for these two consequences are both smaller than the reference calculation results by factors of about 2.5 and 5 respectively. Mean and peak results for the 0-80.5 km (0-50 mi) distance range and peak results for the 0-1.6 km (0-1 mi) range are smaller because the curie content of the corrosion products release is smaller than the total curie content of the release used in the reference calculation (the release produced by severity category 5 release fractions and the BR-2 inventory). Mean results for the 0-1.6 km (0-1 mi) distance range are larger because the release is cold and therefore not lofted over nearby populations. Table D-41 also shows that adding the corrosion products release to the reference calculation (run 4b) increases consequence predictions only slightly (by about 20 percent), as would be expected given the small curie content of the corrosion products release compared to the reference release.

D.5.4.3.3.5 Work Force Population

Approximately 7,000 people work in Port Elizabeth in Newark, NJ. Thus, at least for accidents that occur during the workweek, these workers could be exposed to radiation as a result of a ship collision that involves a ship carrying foreign research reactor spent nuclear fuel. Inspection of maps showed that these workers should be added to the residential populations in the first distance intervals of the north sector of the Newark dock population distribution. Since the division of workers between these two distance intervals was not known, 3,500 workers were added to each interval for these sensitivity calculations.

Work force sensitivity calculations were performed first assuming, as was done for the reference calculation, a hot release, the BR-2 inventory, and severity category 5 release fractions. Then, this calculation was repeated two times assuming a cold release. The first of these two cold release calculations used the same shielding factors that had been used in the reference calculation. For the second cold release calculation, larger shielding factors were used during the first 24 hours after the accident over the distance range 0-8 km (0-5 mi) because the commercial buildings near the port are likely to provide better shielding than is provided by the mix of buildings located within 80.5 km (50 mi) of the port. Next, these two cold release calculations were repeated assuming that the release consists of a puff caused by the collision impact and a tail caused by the ensuing fire. Severity category 4 release fractions were used for the puff, and the release fractions for the tail were obtained by subtracting the severity

category 4 release fractions from the severity category 5 release fractions. The puff was released when the collision occurred and lasted for 10 minutes; the tail was released one hour later and had a one hour release duration. Finally, the puff and tail calculation that did not use increased shielding factor values was repeated assuming that an evacuation would be called for should a severe accident lead to a fire that engulfed a radioactive material transportation cask, that the evacuation would begin about one hour after the accident took place (i.e., at about the time the tail release begins), and that the average evacuation speed would be slow because of city congestion.

Inspection of Table D-41 shows that, when a hot release is assumed (run 5a), adding a work force population increases mean population dose and cancer fatalities by less than a factor of 2 in the 0-1.6 km (0-1 mi) distance range, but has little effect on peak values in this distance range or on either mean or peak values in the 0-80.5 km (0-50 mi) distance range. When the release is cold (run 5b), 0-1.6 km (0-1 mi) mean population doses and cancer fatalities are increased by factors of about 26 and 2 respectively, and peak doses and cancer fatalities are increased by factors of about 3. For the 0-80.5 km (0-50 mi) distance range mean results are increased by factors of about 2 and peak results actually decrease by a factor of about 0.7. Moreover, these results are little changed by using increased shielding factors for commercial buildings, by assuming a puff and tail release, or by assuming a slow delayed evacuation.

The insensitivity to short-term shielding factor values, to release timing, and to evacuation is easy to understand when one remembers that population dose and cancer fatalities in these calculations are determined almost entirely by long-term groundshine exposures, which are of course little influenced by variation of any of these three short-term effects. Thus, as was shown above, elimination of lofting by assuming a cold release increases consequences, especially those that occur at short distances, but little else has much effect because only recovery actions (decontamination, temporary interdiction, condemnation) not examined by these sensitivity calculations can significantly affect long-term groundshine dose.

D.5.5 Port Accident Risk

The port accident risk analysis combines the results of the analysis of the frequency of ship accidents in the port area with the results of the consequence analysis of each of these accidents. Each of the accident severity categories contributes to the overall risk of accidents in the port. The total risk is the sum of the risk for each severity category. The specific methodology used to evaluate port accident risks and the results of that analysis are presented in this section.

The port accident risk analysis was performed based on 721 individual shipments of foreign research reactor spent nuclear fuel. Unlike the incident-free analyses, where the shipment of two or more casks on the same vessel results in an increase in the worker risk, the number of casks shipped on a single vessel does not affect the results of the analysis. The larger the number of casks on a single vessel, the fewer the number of shipments required to ship all 721 casks. Accident data is generated on a per transit basis. Assuming a single cask per shipment maximizes the number of shipments and maximizes the probability of an accident involving a ship carrying foreign research reactor spent nuclear fuel. If it is assumed that an accident that results in damage to a foreign research reactor spent nuclear fuel cask results in damage to all of the casks on a single vessel, the risks from the shipment of multiple casks on a single vessel would be identical to the risks associated with the shipment of the same number of casks individually. From the analysis performed in Appendix D Attachment D4, it is apparent that the probability of damage to all casks given that one is damaged in an accident is less than one. Therefore, performing the port accident risk analysis assuming that one cask is shipped per voyage results in an estimate of risk that is maximized for number of transportation casks shipped per voyage.

The accident risks have been evaluated for 13 ports: Elizabeth, NJ; the Hampton Roads, VA, ports of Portsmouth, Norfolk, and Newport News (using Portsmouth as the representative port); MOTSU, NC; Charleston, SC; Philadelphia. PA; Long Beach, CA; Savannah, GA; Galveston, TX; Concord NWS, CA; Tacoma, WA; Wilmington, NC; Jacksonville, FL; and Portland, OR. Although high population density ports do not meet the port selection screening criteria, the three high population ports of Elizabeth, Long Beach, and Philadelphia were included in the analysis for two purposes. First, it is possible that the shipments of foreign research reactor spent nuclear fuel could be made on vessels that make intermediate port calls, which could include these high population ports. Additionally, by evaluating these high population ports as ports of entry it was possible to estimate the maximum port accident risks resulting from the shipment of foreign research reactor spent nuclear fuel into the United States.

As discussed in the port accident consequence analysis (Section D.5.4), the accident analysis has evaluated the impact of accidents at two locations within each of the ports considered in the risk analysis. The two locations represent the possibility of: (1) an accident involving the ship transporting the foreign research reactor spent nuclear fuel while at the dock and (2) an accident at some point in the approach to the dock. Two locations were selected to address the possibility that the terminal (pier at which the cargo vessel is docked) may not be the location within the port that would yield the highest consequences for an accident. The key consideration is that in approaching the terminal, at some ports, the cargo vessel would pass through areas with a higher nearby population than the area around the terminal. To ensure that the accident consequence analysis did not underestimate the potential consequences, this second accident location was selected. It was selected by identifying the point in the approach to the terminal which had characteristics most likely to result in consequences representative of the largest consequences associated with an accident within the port facility. This generally meant a location near a population center. Accident locations were identified earlier in Table D-28.

Because two locations were selected for the accident analysis in each port, the total risk associated with a port call at the port of entry is the sum of the risks at these two locations. Accidents may occur either at the terminal (dock) or in the channel as the vessel approaches the dock This risk can be expressed as:

$$R_{PE} = \sum (M_D P_D + M_C P_C)$$

where:

R_{PE}=Risks from accidents in the port of entry,

M_D=Magnitude of the consequences for a severity category 4, 5, 6 accident at the dock,

P_D=Probability of an accident of severity category 4, 5, 6 at the dock,

M_C=Magnitude of the consequences for an accident in the approach to the dock (in the channel), and

P_C=Probability of an accident of severity category 4, 5, 6 in the approach to the dock (in the channel).

One of the assumptions made in the port risk analysis is that the vessel carrying the foreign research reactor spent nuclear fuel may make intermediate port calls at up to two different ports before arriving at the port of entry. In the event that these intermediate port calls are made, the risks associated with each of these port calls can be expressed as follows:

$$R_{IP} = \sum (M_D P_D + 2 M_C P_C)$$

where R_{IP} is the risk from an accident in one of the intermediate ports of call. All other parameters have the same definitions as in the equation defining R_{PE}. The risks associated with accidents in the channel of the port is considered twice for the intermediate ports because the vessel must enter the harbor and approach the dock and, with the foreign research reactor spent nuclear fuel still on board, must depart the harbor. The accident frequency data is derived as a per transit frequency. For this risk analysis the approach to the dock has been considered to be part of one transit, the departure as part of a second transit.

From Section D.5.3.1.7, the probabilities per transit for the three accident severity categories evaluated are provided in Table D-43. These accident frequencies were used to develop the per transit probabilities for the accidents at the dock and in the channel for each of the intermediate ports and the ports of entry for the foreign research reactor spent nuclear fuel. The port accident data collected was not detailed enough to determine the percentage of accidents that occurred at the dock versus the percentage that occurred in the channel. For the purposes of this analysis, it was assumed that the accidents were evenly distributed between the dock and the approach to the dock. Table D-43 presents the per transit probabilities used in the port accident analysis for accidents at the dock and in the channel.

Table D-43 Port Accident Probabilities

Accident Severity Category	P	P_B	P_C
4	0.000006	0.000003	0.000003
5	0.000000005	0.0000000027	0.0000000027
6	0.0000000006	0.0000000003	0.0000000003

Accident consequences (mean results) for each of the accident severity categories are reproduced in Tables D-44 and D-45, in terms of total population dose and LCF, respectively. The consequences vary depending on the type of fuel involved in the accident, the port at which the accident occurs, the severity category, and the location of the accident within the port environs. The largest differences are between the different release categories and is the result of the smaller release fractions for a severity category 4 accident than for the severity category 5 and 6 accidents. Between the different ports assessed in the analysis, the consequences vary by a factor of approximately 30 [i.e., the consequences of an accident in Elizabeth (the location of the highest consequences) are approximately 30 times greater than the consequences of the same accident at MOTSU (the location with the lowest consequences)].

Using the equations presented previously in this section, the probability and consequence data were combined to generate the risk data presented in Table D-46. This table presents data on a per shipment basis and for the shipment of all 721 foreign research reactor spent nuclear fuel casks. Data is presented for shipments that are made with no intermediate port stops (identified as direct shipments in the table) and for shipments that are made with intermediate port stops. The direct shipments are quantified using the relationship developed for R_{PE}. For example, the risks in terms of person-rem associated with a single direct shipment consisting of a single cask of BR-2 fuel into the port of Elizabeth are the sum of the severity category 4 risks, severity category 5 risks, and severity category 6 risks associated with accidents at the Elizabeth dock (0.00000069, 0.000018, 0.0000020) and in the approach to the port of Elizabeth (0.0000011, 0.000019, 0.0000020), which is 0.000042 as shown in the table.

In developing the risk estimates for shipments that pass through intermediate ports, several combinations of intermediate ports were considered for each ultimate port of entry. The ports selected for use in this analysis represent the range of populations found in ports around the United States. As stated previously; Elizabeth, Philadelphia, and Long Beach are considered high population ports; Portland, Jacksonville, Tacoma, Concord NWS, and the Hampton Roads ports are considered to be intermediate population ports; and Charleston, Savannah, Wilmington, Galveston, and MOTSU are considered low population ports. Each possible combination of populations was considered for the intermediate ports. The risks associated

Table D-44 Port Accident Analysis—Total Effective Dose Equivalent Population Dose (Person-Rem)

Location	BR-2 Spent Nuclear Fuel Severity Category			RHF Spent Nuclear Fuel Severity Category			TRIGA Spent Nuclear Fuel Severity Category		
	4	5	6	4	5	6	4	5	6
Elizabeth (D)[1]	0.23	6600	6500	0.093	2600	2600	0.028	910	900
Elizabeth (C)[2]	0.38	6900	6800	0.15	2700	2700	0.045	960	940
Long Beach (D)[1]	0.21	4700	4800	0.085	1900	1900	0.025	650	660
Long Beach (C)[2]	0.081	4300	4400	0.032	1700	1700	0.0097	590	610
Philadelphia (D)[1]	0.18	2800	2800	0.071	1100	1100	0.021	380	380
Philadelphia (C)[2]	0.085	2700	2800	0.034	1100	1100	0.010	370	380
Portland (D)[1]	0.077	1200	1200	0.031	450	450	0.0093	160	160
Portland (C)[2]	0.053	1100	1200	0.021	430	440	0.0065	150	150
Norfolk (D)[1]	0.055	850	830	0.022	330	320	0.0067	110	110
Norfolk (C)[2]	0.030	670	660	0.012	250	250	0.0037	87	87
Charleston Wando Terminal (D)[1]	0.024	420	410	0.0096	150	150	0.003	53	53
Charleston NWS (D)[1]	0.016	480	480	0.0066	180	180	0.0021	61	61
Charleston (C)[2]	0.038	420	420	0.015	160	160	0.0046	54	54
Tacoma (D)[1]	0.056	1,700	1,800	0.022	670	700	0.0068	230	250
Tacoma (C)[2]	0.039	1,400	1,500	0.016	550	570	0.0048	190	200
Concord NWS (D)[1]	0.044	2,100	2,200	0.018	800	850	0.0054	280	300
Concord NWS (C)[2]	0.094	3,300	3,400	0.038	1,300	1,300	0.011	450	460
Jacksonville (D)[1]	0.028	680	680	0.011	260	250	0.0035	88	87
Jacksonville (C)[2]	0.026	530	550	0.010	200	200	0.0032	69	70
Savannah (D)[1]	0.056	490	500	0.022	180	180	0.0068	62	63
Savannah (C)[2]	0.013	380	390	0.005	140	140	0.0018	47	49
Wilmington (D)[1]	0.038	480	500	0.015	180	190	0.0047	62	64
Wilmington (C)[2]	0.0097	210	220	0.0038	75	80	0.0012	26	27
Galveston (D)[1]	0.073	1,400	1,600	0.029	550	600	0.0089	190	210
Galveston (C)[2]	0.032	1,400	1,600	0.013	540	590	0.0041	190	200
MOTSU (D)[1]	0.0073	210	220	0.0029	75	80	0.0010	25	27
MOTSU (C)[2]	0.0097	210	220	0.0038	75	80	0.0012	26	27

[1] *Accident is at the Dock*

[2] *Accident is in the Channel, the approach to the dock*

with a shipment that passed through two U.S. ports before arriving at the port of entry for the foreign research reactor spent nuclear fuel were calculated using the relationships for R_{PE} and R_{IP}. The risks were calculated for each intermediate port stop and added to the risks associated with operations within the port of entry, i.e., the risks associated with a direct shipment.

The per shipment data was used to calculate the risks associated with the basic implementation of Management Alternative 1 of proposed action. The values shown in the two rightmost columns of Table D-46 represent the risks associated with the shipment of all of the foreign research reactor spent nuclear fuel through a single port of entry via the same intermediate ports. Using the shipments through Elizabeth as an example, the value given for the program risks for the shipment of the foreign research reactor spent nuclear fuel through one intermediate and one low population port (0.027 person-rem or 0.000011 LCF) assumes that all 721 foreign research reactor spent nuclear fuel casks are shipped through these same three ports. The number of shipments of each type of fuel (473 BR-2, 86 RHF, and 162 TRIGA) were incorporated into the development of the risks.

Table D-45 Port Accident Analysis—Accident Consequences (LCF)

Location	BR-2 Spent Nuclear Fuel Severity Category			RHF Spent Nuclear Fuel Severity Category			TRIGA Spent Nuclear Fuel Severity Category		
	4	5	6	4	5	6	4	5	6
Elizabeth (D)[1]	0.00010	2.8	2.7	0.000041	1.1	1.1	0.000011	0.38	0.38
Elizabeth (C)[2]	0.00016	2.9	2.8	0.000066	1.1	1.1	0.000018	0.40	0.39
Long Beach (D)[1]	0.000093	2.0	2.0	0.000038	0.78	0.80	0.000010	0.27	0.28
Long Beach (C)[2]	0.000035	1.8	1.9	0.000014	0.71	0.73	0.0000040	0.25	0.26
Philadelphia (D)[1]	0.000078	1.2	1.2	0.000031	0.47	0.46	0.0000087	0.16	0.16
Philadelphia (C)[2]	0.000037	1.2	1.2	0.000015	0.45	0.47	0.0000042	0.16	0.16
Portland (D)[1]	0.000034	0.52	0.53	0.000014	0.20	0.20	0.0000039	0.068	0.069
Portland (C)[2]	0.000023	0.50	0.51	0.0000093	0.19	0.19	0.0000027	0.065	0.067
Norfolk (D)[1]	0.000024	0.38	0.37	0.0000097	0.14	0.14	0.0000028	0.049	0.048
Norfolk (C)[2]	0.000013	0.30	0.30	0.0000053	0.11	0.11	0.0000015	0.039	0.039
Charleston Wando Terminal (D)[1]	0.000011	0.19	0.19	0.0000042	0.070	0.070	0.0000012	0.024	0.024
Charleston NWS (D)[1]	0.0000068	0.22	0.22	0.0000027	0.080	0.080	0.00000084	0.028	0.028
Charleston(C)[2]	0.000017	0.19	0.19	0.0000067	0.070	0.071	0.0000019	0.024	0.024
Tacoma (D)[1]	0.000024	0.75	0.80	0.0000097	0.29	0.30	0.0000028	0.10	0.11
Tacoma (C)[2]	0.000017	0.63	0.66	0.0000068	0.24	0.25	0.0000020	0.083	0.087
Concord NWS (D)[1]	0.000019	0.90	0.96	0.0000076	0.34	0.37	0.0000022	0.12	0.13
Concord NWS (C)[2]	0.000041	1.4	1.5	0.000017	0.55	0.56	0.0000046	0.19	0.20
Jacksonville (D)[1]	0.000012	0.31	0.31	0.0000049	0.11	0.11	0.0000015	0.039	0.039
Jacksonville (C)[2]	0.000011	0.24	0.25	0.0000045	0.090	0.092	0.0000013	0.031	0.032
Savannah (D)[1]	0.000025	0.23	0.23	0.0000099	0.083	0.085	0.0000028	0.028	0.029
Savannah (C)[2]	0.0000059	0.18	0.19	0.0000023	0.065	0.067	0.00000074	0.022	0.023
Wilmington (D)[1]	0.000017	0.22	0.23	0.0000067	0.081	0.084	0.0000019	0.028	0.029
Wilmington (C)[2]	0.0000042	0.098	0.10	0.0000017	0.035	0.037	0.0000005	0.012	0.013
Galveston (D)[1]	0.000032	0.64	0.70	0.000013	0.24	0.27	0.0000037	0.084	0.092
Galveston (C)[2]	0.000014	0.63	0.69	0.0000056	0.24	0.26	0.0000017	0.082	0.090
MOTSU (D)[1]	0.0000032	0.099	0.11	0.0000013	0.035	0.038	0.00000041	0.012	0.013
MOTSU (C)[2]	0.0000042	0.098	0.10	0.0000017	0.035	0.037	0.00000052	0.012	0.013

[1] *Accident is at the Dock*

[2] *Accident is in the Channel, the approach to the dock*

Table D-46 Summary of Latent Cancer Fatalities and Population Exposure Risk—Per Shipment and for the Entire Program (Basic Implementation)

Port	Risks per Shipment						Program Risks	
	Population Exposure per Shipment (person-rem)			Risk per Shipment (LCF)			Expos. (person-rem)	Risk (LCF)
	BR-2	RHF	TRIGA	BR-2	RHF	TRIGA		
Elizabeth via:								
Two High Population Ports	0.00013	0.000052	0.000018	0.000000056	0.000000022	0.0000000075	0.070	0.000029
One High and One Intermediate Population Port	0.00011	0.000044	0.000016	0.000000048	0.000000019	0.0000000065	0.060	0.000025
One High and One Low Population Port	0.00011	0.000043	0.000015	0.000000045	0.000000018	0.0000000062	0.057	0.000024

Port	Risks per Shipment						Program Risks	
	Population Exposure per Shipment (person-rem)			Risk per Shipment (LCF)			Expos. (person-rem)	Risk (LCF)
	BR-2	RHF	TRIGA	BR-2	RHF	TRIGA		
Two Intermediate Population Ports	0.000056	0.000022	0.0000076	0.000000024	0.0000000093	0.0000000032	0.030	0.000013
One Intermediate and One Low Population Port	0.000051	0.000020	0.0000070	0.000000022	0.0000000085	0.0000000029	0.027	0.000011
Two Low Population Ports	0.000046	0.000018	0.0000063	0.000000020	0.0000000077	0.0000000026	0.024	0.000010
Direct	0.000042	0.000017	0.0000058	0.000000018	0.0000000070	0.0000000024	0.022	0.0000094
Long Beach via:								
Two High Population Ports	0.000011	0.000044	0.000015	0.000000047	0.000000018	0.0000000064	0.058	0.000025
One High and One Intermediate Population Port	0.000080	0.000032	0.0000011	0.000000034	0.000000013	0.0000000043	0.042	0.000018
One High and One Low Population Port	0.000071	0.000028	0.0000097	0.000000030	0.0000000012	0.0000000041	0.038	0.000016
Two Intermediate Population Ports	0.000050	0.000019	0.0000067	0.000000021	0.0000000083	0.0000000022	0.026	0.000011
One Intermediate and One Low Population Port	0.000041	0.000016	0.0000055	0.000000018	0.0000000068	0.0000000020	0.022	0.0000092
Two Low Population Ports	0.000032	0.0000013	0.0000043	0.000000014	0.0000000053	0.0000000018	0.017	0.0000072
Direct	0.000028	0.0000011	0.0000038	0.000000012	0.0000000046	0.0000000016	0.015	0.0000062
Philadelphia via:								
Two High Population Ports	0.00011	0.000042	0.000015	0.000000045	0.000000018	0.0000000061	0.057	0.000024
One High and One Intermediate Population Port	0.000088	0.000035	0.000012	0.000000037	0.000000015	0.0000000050	0.047	0.000020
One High and One Low Population Port	0.000083	0.000033	0.000011	0.000000035	0.000000014	0.0000000048	0.044	0.000019
Two Intermediate Population Ports	0.000031	0.000012	0.0000041	0.000000014	0.0000000052	0.0000000018	0.016	0.0000072

Port	Risks per Shipment						Program Risks	
	Population Exposure per Shipment (person-rem)			Risk per Shipment (LCF)			Expos. (person-rem)	Risk (LCF)
	BR-2	RHF	TRIGA	BR-2	RHF	TRIGA		
One Intermediate and One Low Population Port	0.000026	0.000010	0.0000035	0.000000011	0.0000000044	0.0000000015	0.014	0.0000061
Two Low Population Ports	0.000021	0.0000083	0.0000028	0.0000000093	0.0000000036	0.0000000012	0.011	0.0000049
Direct	0.000017	0.0000069	0.0000023	0.0000000075	0.0000000029	0.0000000099	0.0092	0.0000040
Portland via:								
Two High Population Ports	0.000090	0.000035	0.000012	0.000000038	0.000000015	0.0000000050	0.047	0.000020
One High and One Intermediate Population Port	0.000059	0.000023	0.0000080	0.000000025	0.0000000099	0.0000000029	0.031	0.000013
One High and One Low Population Port	0.000050	0.000020	0.0000068	0.000000022	0.0000000084	0.0000000027	0.027	0.000011
Two Intermediate Population Ports	0.000029	0.000011	0.0000039	0.000000013	0.0000000049	0.00000000088	0.015	0.0000066
One Intermediate and One Low Population Port	0.000020	0.0000077	0.0000027	0.0000000090	0.0000000034	0.00000000068	0.011	0.0000048
Two Low Population Ports	0.000011	0.0000042	0.0000015	0.0000000051	0.0000000019	0.00000000049	0.0059	0.0000026
Direct	0.0000073	0.0000028	0.00000098	0.0000000032	0.0000000012	0.00000000026	0.0039	0.0000017
Norfolk via:								
Two High Population Ports	0.000095	0.000037	0.000013	0.000000040	0.000000016	0.0000000054	0.050	0.000021
One High and One Intermediate Population Port	0.000076	0.000030	0.000010	0.000000032	0.000000013	0.0000000043	0.040	0.000017
One High and One Low Population Port	0.000071	0.000028	0.0000097	0.000000030	0.000000012	0.0000000040	0.037	0.000016
Two Intermediate Population Ports	0.000019	0.0000071	0.0000024	0.0000000083	0.0000000031	0.0000000011	0.0098	0.0000044
One Intermediate and One Low Population Port	0.000014	0.0000052	0.0000018	0.0000000061	0.0000000023	0.00000000078	0.0072	0.0000032
Two Low Population Ports	0.0000088	0.0000033	0.0000011	0.0000000040	0.0000000015	0.00000000050	0.0046	0.0000021

Port	Risks per Shipment						Program Risks	
	Population Exposure per Shipment (person-rem)			Risk per Shipment (LCF)			Expos. (person-rem)	Risk (LCF)
	BR-2	RHF	TRIGA	BR-2	RHF	TRIGA		
Direct	0.0000048	0.0000018	0.00000062	0.0000000021	0.0000000081	0.00000000028	0.0025	0.0000011
Charleston (Wando Terminal) via:								
Two High Population Ports	0.000092	0.000036	0.000013	0.000000039	0.000000015	0.0000000053	0.049	0.000021
One High and One Intermediate Population Port	0.000074	0.000029	0.000010	0.000000031	0.000000012	0.0000000042	0.039	0.000016
One High and One Low Population Port	0.000069	0.000027	0.0000094	0.000000029	0.000000011	0.0000000039	0.036	0.000015
Two Intermediate Population Ports	0.000016	0.0000063	0.0000021	0.0000000074	0.0000000028	0.00000000095	0.0087	0.0000039
One Intermediate and One Low Population Port	0.000012	0.0000043	0.0000015	0.0000000052	0.0000000019	0.00000000066	0.0061	0.0000027
Two Low Population Ports	0.0000066	0.0000024	0.00000082	0.0000000031	0.0000000011	0.00000000038	0.0035	0.0000016
Direct	0.0000027	0.000001	0.00000034	0.0000000012	0.00000000045	0.00000000015	0.0014	0.00000064
Charleston NWS via:								
Two High Population Ports	0.000093	0.000033	0.000013	0.000000039	0.000000015	0.0000000053	0.049	0.000021
One High and One Intermediate Population Port	0.000074	0.000029	0.000010	0.000000031	0.000000012	0.0000000042	0.039	0.000016
One High and One Low Population Port	0.000069	0.000027	0.0000094	0.000000029	0.000000011	0.0000000039	0.036	0.000015
Two Intermediate Population Ports	0.000017	0.0000063	0.0000022	0.0000000075	0.0000000028	0.00000000096	0.0084	0.0000039
One Intermediate and One Low Population Port	0.000012	0.0000044	0.0000015	0.0000000053	0.0000000020	0.00000000067	0.0058	0.0000028
Two Low Population Ports	0.0000068	0.0000025	0.00000084	0.0000000032	0.0000000011	0.00000000039	0.0032	0.0000017
Direct	0.0000028	0.0000011	0.00000036	0.0000000013	0.00000000048	0.00000000016	0.0011	0.00000068
MOTSU via:								
Two High Population Ports	0.000091	0.000036	0.000012	0.000000039	0.000000015	0.0000000052	0.048	0.000020

Port	Risks per Shipment: Population Exposure per Shipment (person-rem)			Risks per Shipment: Risk per Shipment (LCF)			Program Risks: Expos. (person-rem)	Program Risks: Risk (LCF)
	BR-2	RHF	TRIGA	BR-2	RHF	TRIGA		
One High and One Intermediate Population Port	0.000072	0.000028	0.0000099	0.000000031	0.000000012	0.0000000041	0.038	0.000016
One High and One Low Population Port	0.000067	0.000026	0.0000092	0.0000000028	0.0000000011	0.0000000038	0.036	0.000015
Two Intermediate Population Ports	0.000015	0.0000057	0.0000019	0.0000000068	0.0000000025	0.00000000087	0.0080	0.0000036
One Intermediate and One Low Population Port	0.000010	0.0000038	0.0000013	0.0000000046	0.0000000017	0.00000000058	0.0054	0.0000024
Two Low Population Ports	0.0000053	0.0000019	0.00000064	0.0000000025	0.00000000088	0.0000000003	0.0028	0.0000013
Direct	0.0000013	0.00000047	0.00000016	0.00000000062	0.00000000022	0.000000000075	0.00069	0.00000032
Galveston via:								
Two High Population Ports	0.000099	0.000039	0.000013	0.000000042	0.000000016	0.0000000056	0.052	0.000022
One High and One Intermediate Population Port	0.000080	0.000031	0.000011	0.000000034	0.000000013	0.0000000046	0.042	0.000018
One High and One Low Population Port	0.000075	0.000029	0.0000010	0.000000032	0.0000000012	0.0000000043	0.040	0.000017
Two Intermediate Population Ports	0.000023	0.0000087	0.0000030	0.000000010	0.0000000038	0.0000000013	0.012	0.0000053
One Intermediate and One Low Population Port	0.000018	0.0000067	0.0000023	0.0000000080	0.000000003	0.000000001	0.0094	0.0000042
Two Low Population Ports	0.000013	0.0000048	0.0000017	0.0000000058	0.0000000022	0.00000000074	0.0068	0.0000031
Direct	0.0000090	0.0000034	0.0000012	0.0000000040	0.0000000015	0.00000000052	0.0047	0.0000021
Jacksonville via:								
Two High Population Ports	0.000094	0.000037	0.000013	0.000000040	0.000000016	0.0000000053	0.050	0.000021
One High and One Intermediate Population Port	0.000075	0.000029	0.00001	0.000000032	0.000000012	0.0000000043	0.040	0.000017

Port	Risks per Shipment						Program Risks	
	Population Exposure per Shipment (person-rem)			Risk per Shipment (LCF)			Expos. (person-rem)	Risk (LCF)
	BR-2	RHF	TRIGA	BR-2	RHF	TRIGA		
One High and One Low Population Port	0.000070	0.000027	0.0000096	0.000000029	0.000000012	0.0000000040	0.037	0.000016
Two Intermediate Population Ports	0.000018	0.0000067	0.0000023	0.0000000079	0.0000000030	0.0000000010	0.0093	0.0000041
One Intermediate and One Low Population Port	0.000013	0.0000048	0.0000016	0.0000000057	0.0000000021	0.00000000073	0.0067	0.000003
Two Low Population Ports	0.0000078	0.0000028	0.00000097	0.0000000036	0.0000000013	0.00000000045	0.0041	0.0000019
Direct	0.0000038	0.0000014	0.00000049	0.0000000017	0.00000000064	0.00000000022	0.0020	0.00000090
Savannah via:								
Two High Population Ports	0.000093	0.000037	0.000013	0.000000039	0.000000015	0.0000000053	0.049	0.000021
One High and One Intermediate Population Port	0.000074	0.000029	0.00001	0.000000031	0.000000012	0.0000000042	0.039	0.000016
One High and One Low Population Port	0.000069	0.000027	0.0000094	0.000000029	0.000000011	0.0000000039	0.036	0.000015
Two Intermediate Population Ports	0.000017	0.0000063	0.0000021	0.0000000075	0.0000000028	0.00000000095	0.0088	0.0000039
One Intermediate and One Low Population Port	0.000012	0.0000044	0.0000015	0.0000000053	0.000000002	0.00000000067	0.0062	0.0000028
Two Low Population Ports	0.0000068	0.0000025	0.00000083	0.0000000032	0.0000000011	0.00000000039	0.0036	0.0000017
Direct	0.0000028	0.000001	0.00000035	0.0000000013	0.00000000048	0.00000000016	0.0015	0.00000069
Wilmington via:								
Two High Population Ports	0.000092	0.000036	0.000013	0.000000039	0.000000015	0.0000000053	0.049	0.000021
One High and One Intermediate Population Port	0.000073	0.000029	0.00001	0.000000031	0.000000012	0.0000000042	0.039	0.000016
One High and One Low Population Port	0.000068	0.000027	0.0000094	0.000000029	0.000000011	0.0000000039	0.036	0.000015
Two Intermediate Population Ports	0.000016	0.0000061	0.0000021	0.0000000072	0.0000000027	0.00000000092	0.0084	0.0000038

Port	Risks per Shipment						Program Risks	
	Population Exposure per Shipment (person-rem)			Risk per Shipment (LCF)			Expos. (person-rem)	Risk (LCF)
	BR-2	RHF	TRIGA	BR-2	RHF	TRIGA		
One Intermediate and One Low Population Port	0.000011	0.0000042	0.0000014	0.0000000050	0.0000000019	0.00000000064	0.0058	0.0000026
Two Low Population Ports	0.0000062	0.0000022	0.00000076	0.0000000029	0.0000000010	0.00000000035	0.0032	0.0000015
Direct	0.0000022	0.00000082	0.00000028	0.0000000010	0.00000000037	0.00000000013	0.0012	0.00000053
Tacoma via:								
Two High Population Ports	0.000092	0.000036	0.0000013	0.000000039	0.000000015	0.0000000053	0.049	0.000021
One High and One Intermediate Population Port	0.000062	0.000024	0.0000084	0.000000026	0.000000010	0.0000000032	0.033	0.000014
One High and One Low Population Port	0.000053	0.000021	0.0000072	0.000000023	0.0000000088	0.0000000031	0.028	0.000012
Two Intermediate Population Ports	0.000031	0.000012	0.0000042	0.000000014	0.0000000053	0.0000000012	0.017	0.0000072
One Intermediate and One Low Population Port	0.000023	0.0000086	0.0000030	0.000000010	0.0000000038	0.00000000099	0.012	0.0000053
Two Low Population Ports	0.000014	0.0000052	0.0000018	0.0000000061	0.0000000023	0.00000000079	0.0072	0.0000032
Direct	0.0000097	0.0000038	0.0000013	0.0000000043	0.0000000016	0.00000000057	0.0051	0.0000023
Concord NWS via:								
Two High Population Ports	0.000099	0.000039	0.000013	0.000000042	0.000000016	0.0000000057	0.052	0.000022
One High and One Intermediate Population Port	0.000069	0.000027	0.0000093	0.000000029	0.000000011	0.0000000036	0.036	0.000015
One High and One Low Population Port	0.000060	0.000024	0.0000081	0.000000025	0.0000000099	0.0000000034	0.032	0.000013
Two Intermediate Population Ports	0.000038	0.000015	0.0000051	0.000000017	0.0000000064	0.0000000016	0.020	0.0000087
One Intermediate and One Low Population Port	0.000029	0.000011	0.0000039	0.000000013	0.0000000049	0.0000000014	0.016	0.0000067

Port	Risks per Shipment						Program Risks	
	Population Exposure per Shipment (person-rem)			Risk per Shipment (LCF)			Expos. (person-rem)	Risk (LCF)
	BR-2	RHF	TRIGA	BR-2	RHF	TRIGA		
Two Low Population Ports	0.000021	0.0000079	0.0000027	0.0000000090	0.0000000034	0.0000000012	0.011	0.0000047
Direct	0.000017	0.0000065	0.0000022	0.0000000071	0.0000000028	0.00000000096	0.0088	0.0000038

These risk estimates provide an estimate of the range of the port accident risks that would result from the basic implementation of Management Alternative 1 via the use of a wide range of ports. The ports of Elizabeth, Philadelphia, and Long Beach were included in the analysis as ports of entry even though they did not survive the port screening criteria. However, because of the high populations around these ports, their use provides an estimate of the highest risks associated with the shipment of foreign research reactor spent nuclear fuel into the United States. These risks can be contrasted with the risks associated with the shipment of the foreign research reactor spent nuclear fuel through MOTSU, which has an extremely low population around the port.

The port accident risks associated with the entire program range from a high of 0.070 person-rem and 0.000029 LCF, which assumes that all shipments would be made through two high population intermediate ports into Elizabeth, to a low of 0.0007 person-rem and 0.00000032 LCF, which assumes that the shipments are made directly into MOTSU. In the worst case analyzed the mean risks associated with port accidents results in an approximately one-in-a-thousand chance of a single LCF. The highest risks associated with a port that did meet the port selection criteria (assuming no restrictions on the selection of intermediate ports) is 0.000022 LCF. If, in addition, all intermediate port calls are restricted to port cities of similar size to those that meet the selection criteria, the highest calculated risk is reduced to 0.000009 LCF, approximately a one-in-a-hundred thousand chance of a single LCF.

D.5.6 Port Accident Impacts for Implementation Alternatives

Two implementation alternatives to Management Alternative 1 were identified that could impact the results of the port accident risk analysis that was developed for the basic implementation case. They are: 1a, Accepting Fuel from Developing Countries Only, and 2a, Accepting Fuel for Only Five Years. Developing countries are countries other than high income economies. Both of the implementation alternatives change the number of transportation casks containing foreign research reactor spent nuclear fuel that would be shipped to the United States.

The difference in the number of shipments does not affect the per-transit probability of an accident. The conditional probabilities of a severity category 4, 5, or 6 accident also do not change. On a per-shipment basis, the probability an accident of each of these severity categories is identical to the estimates used in the analysis of the basic implementation.

The consequences associated with each of the three accident severity categories also do not change just due to the change in the number of shipments. Since neither the probability nor the consequences of the accidents change, the per-shipment risks are identical to those of the basic implementation.

These alternatives are discussed in the following paragraphs.

Acceptance of Foreign Research Reactor Spent Nuclear Fuel from Developing Countries Only: Developing countries are defined as countries other than high-income economies. Under this alternative 168 transportation casks of foreign research reactor spent nuclear fuel would be shipped to the United States (see Appendix C.4.2 for details). All of these shipments would be shipped by ocean vessel and, therefore, would enter the United States through ports.

In addition to a reduced number of shipments associated with this alternative, the mix of fuel types changes. In the basic implementation of Management Alternative 1, most of the foreign research reactor spent nuclear fuel shipments would be BR-2 type fuel. Only about 20 percent of the shipments would be of the TRIGA fuel type. From the information provided in Appendix B, most of the shipments from countries other than high-income economies would be TRIGA fuel. Of the 168 shipments under this implementation alternative, 109 are TRIGA shipments. The remaining 59 shipments are BR-2 fuel shipments.

The risks of the basic implementation of Management Alternative 1, provided in Table D-46, have been recalculated to incorporate the change in the number and makeup of the shipments associated with this implementation alternative. These results are presented in Table D-47. The highest calculated port accident risks are associated with the shipment of all of the foreign research reactor spent nuclear fuel through the port of Elizabeth via two high population intermediate ports. The port accident risks for this implementation alternative for this route are 0.0098 person-rem and 0.000004 LCF. The lowest calculated impacts are for the shipment of all of the material directly into MOTSU (no intermediate port calls) which results in port accident risks of 0.000095 person-rem and 0.000000045 LCF.

Table D-47 Summary of Risk and Population Exposure—For the Implementation Alternative of Acceptance of Foreign Research Reactor Spent Nuclear Fuel Only From Countries Other than High-Income Economies

Port	*Exposure (person-rem)*	*Risk (LCF)*
Elizabeth via:		
Two High Population Ports	0.0098	0.0000041
One High and One Intermediate Population Port	0.0084	0.0000035
One High and One Low Population Port	0.0080	0.0000034
Two Intermediate Population Ports	0.0041	0.0000018
One Intermediate and One Low Population Port	0.0038	0.0000016
Two Low Population Ports	0.0034	0.0000014
Direct	0.0031	0.0000013
Long Beach via:		
Two High Population Ports	0.0081	0.0000034
One High and One Intermediate Population Port	0.0059	0.0000025
One High and One Low Population Port	0.0052	0.0000022
Two Intermediate Population Ports	0.0037	0.0000015
One Intermediate and One Low Population Port	0.0030	0.0000013
Two Low Population Ports	0.0023	0.0000010
Direct	0.0021	0.00000087
Philadelphia via:		
Two High Population Ports	0.0079	0.0000033
One High and One Intermediate Population Port	0.0065	0.0000028
One High and One Low Population Port	0.0062	0.0000026
Two Intermediate Population Ports	0.0023	0.00000010
One Intermediate and One Low Population Port	0.0019	0.00000084

Port	Exposure (person-rem)	Risk (LCF)
Two Low Population Ports	0.0016	0.00000068
Direct	0.0013	0.00000055
Portland via:		
Two High Population Ports	0.0066	0.0000028
One High and One Intermediate Population Port	0.0044	0.0000018
One High and One Low Population Port	0.0037	0.0000016
Two Intermediate Population Ports	0.0021	0.00000085
One Intermediate and One Low Population Port	0.0015	0.00000060
Two Low Population Ports	0.00082	0.00000035
Direct	0.00054	0.00000022
Norfolk via:		
Two High Population Ports	0.0070	0.0000030
One High and One Intermediate Population Port	0.0056	0.0000024
One High and One Low Population Port	0.0052	0.0000022
Two Intermediate Population Ports	0.0014	0.00000061
One Intermediate and One Low Population Port	0.0010	0.00000045
Two Low Population Ports	0.00064	0.00000029
Direct	0.00035	0.00000016
Charleston (Wando Terminal) via:		
Two High Population Ports	0.0069	0.0000029
One High and One Intermediate Population Port	0.0054	0.0000023
One High and One Low Population Port	0.0051	0.0000021
Two Intermediate Population Ports	0.0012	0.00000054
One Intermediate and One Low Population Port	0.00084	0.00000038
Two Low Population Ports	0.00048	0.00000022
Direct	0.00020	0.000000089
Charleston NWS via:		
Two High Population Ports	0.0068	0.0000029
One High and One Intermediate Population Port	0.0054	0.0000023
One High and One Low Population Port	0.0051	0.0000021
Two Intermediate Population Ports	0.0012	0.00000054
One Intermediate and One Low Population Port	0.00084	0.00000038
Two Low Population Ports	0.00048	0.00000022
Direct	0.00020	0.000000089
MOTSU via:		
Two High Population Ports	0.0067	0.0000028
One High and One Intermediate Population Port	0.0053	0.0000022
One High and One Low Population Port	0.0050	0.0000021
Two Intermediate Population Ports	0.0011	0.00000049
One Intermediate and One Low Population Port	0.00074	0.00000034
Two Low Population Ports	0.00038	0.00000018
Direct	0.000095	0.000000045
Galveston via:		
Two High Population Ports	0.0073	0.0000031
One High and One Intermediate Population Port	0.0059	0.0000025
One High and One Low Population Port	0.0055	0.0000023
Two Intermediate Population Ports	0.0017	0.00000074
One Intermediate and One Low Population Port	0.0013	0.00000058
Two Low Population Ports	0.00094	0.00000043
Direct	0.00066	0.00000029
Jacksonville via:		
Two High Population Ports	0.0069	0.0000029

Port	Exposure (person-rem)	Risk (LCF)
One High and One Intermediate Population Port	0.0055	0.0000023
One High and One Low Population Port	0.0052	0.00000022
Two Intermediate Population Ports	0.0013	0.00000057
One Intermediate and One Low Population Port	0.00093	0.00000042
Two Low Population Ports	0.00056	0.00000026
Direct	0.00028	0.00000013
Savannah via:		
Two High Population Ports	0.0068	0.0000029
One High and One Intermediate Population Port	0.0055	0.0000023
One High and One Low Population Port	0.0051	0.0000021
Two Intermediate Population Ports	0.0012	0.00000054
One Intermediate and One Low Population Port	0.00085	0.00000039
Two Low Population Ports	0.00049	0.00000023
Direct	0.00021	0.000000095
Wilmington via:		
Two High Population Ports	0.0068	0.0000029
One High and One Intermediate Population Port	0.0054	0.0000023
One High and One Low Population Port	0.0050	0.0000021
Two Intermediate Population Ports	0.0012	0.00000052
One Intermediate and One Low Population Port	0.00081	0.00000037
Two Low Population Ports	0.00045	0.00000021
Direct	0.00016	0.000000074
Tacoma via:		
Two High Population Ports	0.0068	0.0000029
One High and One Intermediate Population Port	0.0045	0.0000019
One High and One Low Population Port	0.0039	0.0000017
Two Intermediate Population Ports	0.0023	0.00000095
One Intermediate and One Low Population Port	0.0017	0.00000070
Two Low Population Ports	0.00010	0.00000045
Direct	0.00072	0.00000032
Concord NWS via:		
Two High Population Ports	0.0073	0.0000031
One High and One Intermediate Population Port	0.0051	0.0000021
One High and One Low Population Port	0.0044	0.0000019
Two Intermediate Population Ports	0.0028	0.0000012
One Intermediate and One Low Population Port	0.0022	0.00000091
Two Low Population Ports	0.0015	0.00000066
Direct	0.0012	0.00000053

Acceptance of Foreign Research Reactor Spent Nuclear Fuel for 5 Years Only: Under this implementation alternative, 586 transportation casks of foreign research reactor spent nuclear fuel would be shipped to the United States. All of these shipments would be shipped by ocean vessel and would enter the United States through ports.

In addition to a reduced number of shipments associated with this implementation alternative, the mix of fuel types changes slightly. From the information provided in Appendix B, 376 of the 586 shipments in this alternative are BR-2 spent fuel shipments, 56 are RHF, and 154 are TRIGA.

The risks of the basic implementation of Management Alternative 1, provided in Table D-46, have been recalculated to incorporate the change in the number and makeup of the shipments associated with this implementation alternative. These results are presented in Table D-48. The highest calculated port accident risks are associated with the shipment of all of the foreign research reactor spent nuclear fuel

through the port of Elizabeth via two high population intermediate ports. The port accident risks for the implementation alternative for this route are 0.055 person-rem and 0.000023 LCF. The lowest calculated impacts are for the shipment of all of the material directly into MOTSU (no intermediate port calls) which results in port accident risks of 0.00055 person-rem and 0.00000026 LCF.

Table D-48 Summary of Risk and Population Exposure—For the Implementation Alternative of a 5-Year Acceptance Duration

Port	*Exposure (person-rem)*	*Risk (LCF)*
Elizabeth via:		
Two High Population Ports	0.055	0.000023
One High and One Intermediate Population Port	0.047	0.000020
One High and One Low Population Port	0.045	0.000019
Two Intermediate Population Ports	0.023	0.000010
One Intermediate and One Low Population Port	0.021	0.0000091
Two Low Population Ports	0.019	0.0000082
Direct	0.018	0.0000074
Long Beach via:		
Two High Population Ports	0.046	0.000019
One High and One Intermediate Population Port	0.033	0.000014
One High and One Low Population Port	0.030	0.000013
Two Intermediate Population Ports	0.021	0.0000089
One Intermediate and One Low Population Port	0.017	0.0000073
Two Low Population Ports	0.013	0.0000057
Direct	0.012	0.0000049
Philadelphia via:		
Two High Population Ports	0.045	0.000019
One High and One Intermediate Population Port	0.037	0.000016
One High and One Low Population Port	0.035	0.000015
Two Intermediate Population Ports	0.013	0.0000057
One Intermediate and One Low Population Port	0.011	0.0000048
Two Low Population Ports	0.0089	0.0000039
Direct	0.0073	0.0000031
Portland via:		
Two High Population Ports	0.038	0.000016
One High and One Intermediate Population Port	0.025	0.000011
One High and One Low Population Port	0.021	0.0000090
Two Intermediate Population Ports	0.012	0.0000052
One Intermediate and One Low Population Port	0.0084	0.0000037
Two Low Population Ports	0.0047	0.0000021
Direct	0.0031	0.0000013
Norfolk via:		
Two High Population Ports	0.040	0.000017
One High and One Intermediate Population Port	0.032	0.000013
One High and One Low Population Port	0.030	0.000013
Two Intermediate Population Ports	0.0078	0.0000035
One Intermediate and One Low Population Port	0.0057	0.0000026
Two Low Population Ports	0.0036	0.0000017
Direct	0.0020	0.00000089
Charleston (Wando Terminal) via:		
Two High Population Ports	0.039	0.000016
One High and One Intermediate Population Port	0.031	0.000013
One High and One Low Population Port	0.029	0.000012
Two Intermediate Population Ports	0.0069	0.0000031

Port	Exposure (person-rem)	Risk (LCF)
One Intermediate and One Low Population Port	0.0048	0.0000022
Two Low Population Ports	0.0028	0.0000013
Direct	0.0011	0.00000051
Charleston NWS via:		
Two High Population Ports	0.039	0.000016
One High and One Intermediate Population Port	0.031	0.000013
One High and One Low Population Port	0.029	0.000012
Two Intermediate Population Ports	0.0066	0.0000031
One Intermediate and One Low Population Port	0.0048	0.0000022
Two Low Population Ports	0.0025	0.0000013
Direct	0.00087	0.00000054
MOTSU via:		
Two High Population Ports	0.038	0.000016
One High and One Intermediate Population Port	0.030	0.000013
One High and One Low Population Port	0.028	0.000012
Two Intermediate Population Ports	0.0063	0.0000028
One Intermediate and One Low Population Port	0.0042	0.0000019
Two Low Population Ports	0.0022	0.0000010
Direct	0.00055	0.00000028
Galveston via:		
Two High Population Ports	0.041	0.000018
One High and One Intermediate Population Port	0.033	0.000014
One High and One Low Population Port	0.031	0.000013
Two Intermediate Population Ports	0.0095	0.0000042
One Intermediate and One Low Population Port	0.0074	0.0000033
Two Low Population Ports	0.0054	0.0000024
Direct	0.0037	0.0000017
Jacksonville via:		
Two High Population Ports	0.039	0.000017
One High and One Intermediate Population Port	0.031	0.000013
One High and One Low Population Port	0.029	0.000012
Two Intermediate Population Ports	0.0073	0.0000033
One Intermediate and One Low Population Port	0.0053	0.0000024
Two Low Population Ports	0.0032	0.0000015
Direct	0.0016	0.00000072
Savannah via:		
Two High Population Ports	0.039	0.000016
One High and One Intermediate Population Port	0.031	0.000013
One High and One Low Population Port	0.029	0.000012
Two Intermediate Population Ports	0.0069	0.0000031
One Intermediate and One Low Population Port	0.0049	0.0000022
Two Low Population Ports	0.0028	0.0000013
Direct	0.0012	0.00000055
Wilmington via:		
Two High Population Ports	0.039	0.000016
One High and One Intermediate Population Port	0.031	0.000013
One High and One Low Population Port	0.029	0.000012
Two Intermediate Population Ports	0.0067	0.0000030
One Intermediate and One Low Population Port	0.0046	0.0000021
Two Low Population Ports	0.0026	0.0000012
Direct	0.00093	0.00000042

Port	Exposure (person-rem)	Risk (LCF)
Tacoma via:		
Two High Population Ports	0.039	0.000016
One High and One Intermediate Population Port	0.026	0.0000011
One High and One Low Population Port	0.022	0.0000094
Two Intermediate Population Ports	0.013	0.0000057
One Intermediate and One Low Population Port	0.0094	0.0000041
Two Low Population Ports	0.0057	0.0000026
Direct	0.0041	0.0000018
Concord NWS via:		
Two High Population Ports	0.041	0.000017
One High and One Intermediate Population Port	0.029	0.000012
One High and One Low Population Port	0.025	0.000011
Two Intermediate Population Ports	0.016	0.0000070
One Intermediate and One Low Population Port	0.012	0.0000054
Two Low Population Ports	0.0086	0.0000037
Direct	0.0070	0.0000030

D.5.7 Port Accident Impacts Associated with Management Alternative 2

Of the two subalternatives under Management Alternative 2, only subalternative 1b requires assessment of the impacts of accidents in port. This subalternative involves overseas reprocessing of foreign research reactor spent nuclear fuel. Under this subalternative, which is explained in detail in Chapter 2, up to eight transportation casks of vitrified high-level waste might pass through U.S. ports on their way to storage sites in the United States. The port accident impacts associated with this subalternative are evaluated below.

Foreign Reprocessing with Shipment of Vitrified Waste to a U.S. Storage Facility: In this subalternative to Management Alternative 2, all of the foreign research reactor spent nuclear fuel (including that generated in Canada) would be sent to either Great Britain or France for reprocessing and part or all of the vitrified high-level waste generated in the process could be shipped to the United States. Based on the reprocessing of approximately 23 metric tons of spent nuclear fuel (all of the fuel considered by the basic implementation of Management Alternative 1), enough vitrified high-level waste would be generated to require the transportation of up to eight transportation casks carrying logs of vitrified high-level waste to the United States.

The consequences of an accident in port involving a cask of vitrified high-level waste could not be derived from the analysis of the port accidents for the foreign research reactor spent nuclear fuel. Two significant differences in the contents of the cask carrying vitrified high-level waste and the casks carrying foreign research reactor spent nuclear fuel dictate that revised source terms be calculated for the vitrified high-level waste case. The release fractions associated with the accident severity categories are different for the vitrified high-level waste than they are for the foreign research reactor spent nuclear fuel. Based on previous DOE efforts (DOE, 1994b) the release fractions for vitrified high-level waste are the same for all three release categories (categories 4, 5, and 6). Vitrified waste release fractions are relatively insensitive to the affects of the fires that differentiate the category 5 and 6 accidents from the category 4 accidents. The release fractions used in this analysis are a factor of 0.05 higher than those used in the referenced analysis because the use of the MACCS code eliminates the need to describe a respirable fraction of the release. In the referenced analysis, the release fraction was determined and then modified by the respirable fraction (0.05) to use the value of 0.00000005 (5.0E-08) used in that analysis. Without the respirable fraction modification the release fraction is 0.000001 (1.0E-06). This is the release fraction used in the analysis of the vitrified high-level waste shipment port accident analysis.

These release fractions apply to all material in the vitrified high-level waste. Each isotope contained in the glassified waste has been assigned the same release fraction.

All of the wastes generated in reprocessing the foreign research reactor spent nuclear fuel would be transported in no more than eight casks, compared to the 837 marine and overland shipments of spent nuclear fuel required under the basic implementation of Management Alternative 1. This means that the curie content of the vitrified high-level waste could be approximately 100 times the content of a single transportation cask of foreign research reactor spent nuclear fuel.

In this analysis no credit has been taken for the reduction in the curie content of the vitrified high-level waste due to the natural decay that would result during the temporary storage of the vitrified high-level waste at the reprocessing facility. One of the options considered for this subalternative includes the storage of this material at the reprocessing facility until a permanent U.S. facility is ready to receive it for storage. Even if the material is not held until a permanent facility is available, some temporary storage at the reprocessing facility would probably be necessary. In either case, the reduction in the curie content of the waste logs has conservatively not been incorporated into this analysis. The risks associated with the shipment of aged vitrified high-level waste would be less, proportional to the reduction in the curie content, than the risks associated with the shipment of recently reprocessed material of the same volume. Therefore, while the risks calculated in this analysis are more appropriate for the shipment of recently reprocessed waste, the analysis bounds the risks associated with both options.

The isotopic content of the material shipped in one transportation cask of vitrified high-level waste is presented in Table D-49. This estimate was developed by combining the isotopic inventory of every assembly being shipped in the basic implementation of Management Alternative 1 and equally dividing these inventories into eight shipments. This inventory of material was developed from an earlier estimate of the number of foreign research reactor spent nuclear fuel shipments than that analyzed as the basic implementation of Management Alternative 1. The isotopic content of the earlier estimate of the number of shipments is slightly higher than results from the shipments in the basic implementation of Management Alternative 1, for every isotope found in the vitrified high-level waste. Therefore, the estimate used to generate the data in Table D-49 is slightly conservative.

The consequence analysis was performed using the MACCS code utilizing the inventory and release fraction data presented above. Since it is anticipated that the vitrified high-level waste would be stored, temporarily, at the Savannah River Site and the shipments are originating in Europe, only selected East Coast sites were analyzed. Port accident risks were analyzed for the ports of Philadelphia, Charleston, and MOTSU. Also, it has been assumed that the vitrified high-level waste shipments would be made on vessels that would not make intermediate port calls, i.e., on a chartered vessel. The results of these consequences analyses are presented in Table D-50. The highest mean value for an exposure to the MEI is 740 mrem for a 50-year dose to that individual. This corresponds to a LCF consequence of 0.00035.

The probability of an accident in port has been modeled using the data generated for the analysis of the basic implementation of Management Alternative 1. Although the use of a chartered (especially a purpose-built) ship could result in somewhat lower accident frequencies for each of the severity categories, these differences were judged to be minor and were not incorporated into the analysis. The port accident risks associated with the shipment of a single cask and of all eight casks containing the entire inventory of vitrified high-level waste generated in the reprocessing of all of the foreign research reactor spent nuclear fuel considered in the basic implementation of Management Alternative 1 are presented in Table D-51.

Table D-49 Radionuclide Inventory for Each of Eight Vitrified High-Level Waste Shipments

Radionuclide	Vitrified High-Level Waste Inventory (Ci)	Radionuclide	Vitrified High-Level Waste Inventory (Ci)
Hydrogen-3	7,302	Cerium-141	559,300
Krypton-85	207,000	Cerium-144 Promethium-144	24,890,000
Strontium-89	3,072,000	Promethium-147	3,703,000
Strontium-90 Yttrium-90	1,743,000	Promethium-148m	7,133
Yttrium-91	5,477,000	Europium-154	62,390
Zirconium-95	8,079,000	Europium-155	12,900
Niobium-95	16,540,000	Plutonium-238	8,484
Ruthenium-103 Rh-103m	716,000	Plutonium-239	405
Ruthenium-106 Rh-106m	1,882,000	Plutonium-240	326
Tin-123	33,340	Plutonium-241	78,440
Antimony-125	75,700	Americium-241	98
Tellurium-125m	18,060	Americium-242m	0.67
Tellurium-127M	69,720	Americium-243	1.4
Tellurium-129M	15,870	Curium-244	122
Cesium-134	1,413,000	Curium-242	990
Cesium-137	1,743,000		

Table D-50 Port Accident Consequences for Vitrified High-Level Waste

Location	Mean Accident Consequences		99th Percentile Consequences	
	Population Exposure (person-rem)	LCF	Population Exposure (person-rem)	LCF
MOTSU at the Dock	93.1	0.04	572	0.25
MOTSU in the Channel	66.1	0.029	332	0.13
Charleston at the Dock	202	0.088	747	0.32
Charleston in the Channel	293	0.13	2450	1.02
Philadelphia at the Dock	1250	0.54	5110	2.12
Philadelphia in the Channel	733	0.32	2990	1.21

The port accident risks associated with the implementation of this subalternative to Management Alternative 2 results in a negligible risk to the public. The highest mean port accident risk results in a less than one-in-ten thousand chance of a single LCF.

D.5.8 Port Accident Impacts Associated with a Combination of Returning Foreign Research Reactor Spent Nuclear Fuel and Overseas Management

In addition to evaluating the port accident impacts for the various alternatives associated with bringing all of the foreign research reactor spent nuclear fuel to the United States (Management Alternative 1) and managing all of the spent nuclear fuel overseas (Management Alternative 2), a hybrid scenario was analyzed. In this scenario, those countries that have the capability to store high-level waste would be encouraged to process aluminum-based foreign research reactor spent nuclear fuel and to accept the resulting high-level waste. For this scenario, those countries are assumed to be Belgium, France, Germany, Italy, Spain, Switzerland, and the United Kingdom. The United States would accept the foreign

Table D-51 Port Accident Risks for the Acceptance of Vitrified High-Level Waste

Port	Risk per Shipment of One Cask of Waste		Risk of the Entire Waste Acceptance Option	
	Population Dose (person-rem)	LCF	Population Dose (person-rem)	LCF
Philadelphia	0.006	0.000003	0.05	0.00002
Charleston	0.001	0.0000007	0.01	0.000005
MOTSU	0.0005	0.0000002	0.004	0.000002

research reactor spent nuclear fuel from those countries deemed not to have the high-level waste storage capability. In this option, this includes all of the countries identified in Table C-1, except for those listed above. Under the hybrid scenario, 452 shipments of spent nuclear fuel are assumed to be sent to the United States through U.S. ports, excluding shipments of Canadian origin, which are assumed to be transported overland. Of these, 290 are of the BR-2 fuel type and 162 are of the TRIGA type.

In analyzing the exposure and risk associated with this scenario, much of the information that was developed for Management Alternative 1 can be used. Both the per-transit probability of an accident and the conditional probabilities of severity category 4, 5, and 6 accidents are valid for this hybrid scenario. The consequences associated with each of the three accident severity categories also do not change, because the only thing that is changing is the number of shipments. Since neither the probability nor the consequences of the accidents change, the per-shipment risks are identical to those of the basic implementation of Management Alternative 1.

The risks associated with the basic implementation of Management Alternative 1 (Table D-46) have been recalculated to incorporate the change in the number and makeup of the shipments associated with the hybrid scenario. These results are presented in Table D-52. The highest calculated port accident risks are associated with the shipment of all of the foreign research reactor spent nuclear fuel through the port of Elizabeth via two high population intermediate ports. The port accident risks for the Management Alternative for this route are 0.041 person-rem and 0.000017 LCF. The lowest calculated impacts are for the shipment of all the material directly into MOTSU (no intermediate port calls), which results in port accident risk of 0.0004 person-rem and 1.9×10^{-7} LCF.

Table D-52 Summary of Risk and Population Exposure—For the Hybrid Scenario

Port	Exposure (person-rem)	Risk (LCF)
Elizabeth via:		
Two High Population Ports	0.041	1.7×10^{-5}
One High and One Intermediate Population Port	0.035	1.5×10^{-5}
One High and One Low Population Port	0.034	1.4×10^{-5}
Two Intermediate Population Ports	0.017	7.5×10^{-6}
One Intermediate and One Low Population Port	0.016	6.8×10^{-6}
Two Low Population Ports	0.014	6.1×10^{-6}
Direct	0.013	5.5×10^{-6}
Long Beach via:		
Two High Population Ports	0.034	1.5×10^{-5}
One High and One Intermediate Population Port	0.025	1.1×10^{-5}
One High and One Low Population Port	0.022	9.4 x 10-6
Two Intermediate Population Ports	0.015	6.6 x 10-6
One Intermediate and One Low Population Port	0.013	5.4 x 10-6
Two Low Population Ports	0.0099	4.3×10^{-6}
Direct	0.0087	3.7×10^{-6}
Philadelphia via:		
Two High Population Ports	0.033	1.4×10^{-5}

Port	Exposure (person-rem)	Risk (LCF)
Two High Population Ports	0.033	1.4×10^{-5}
One High and One Intermediate Population Port	0.028	1.2×10^{-5}
One High and One Low Population Port	0.026	1.1×10^{-5}
Two Intermediate Population Ports	0.0097	4.2×10^{-6}
One Intermediate and One Low Population Port	0.0082	3.6×10^{-6}
Two Low Population Ports	0.0066	2.9×10^{-6}
Direct	0.0054	2.3×10^{-6}
Portland via:		
Two High Population Ports	0.028	1.2×10^{-5}
One High and One Intermediate Population Port	0.018	7.8×10^{-6}
One High and One Low Population Port	0.016	6.7×10^{-6}
Two Intermediate Population Ports	0.0090	3.9×10^{-6}
One Intermediate and One Low Population Port	0.0063	2.7×10^{-6}
Two Low Population Ports	0.0035	1.6×10^{-6}
Direct	0.0023	9.8×10^{-7}
Norfolk via:		
Two High Population Ports	0.030	1.2×10^{-5}
One High and One Intermediate Population Port	0.024	1.0×10^{-5}
One High and One Low Population Port	0.022	9.3×10^{-6}
Two Intermediate Population Ports	0.0058	2.6×10^{-6}
One Intermediate and One Low Population Port	0.0043	1.9×10^{-6}
Two Low Population Ports	0.0027	1.2×10^{-6}
Direct	0.0015	6.7×10^{-7}
Charleston (Wando Terminal) via:		
Two High Population Ports	0.029	1.2×10^{-5}
One High and One Intermediate Population Port	0.023	9.7×10^{-6}
One High and One Low Population Port	0.021	9.0×10^{-6}
Two Intermediate Population Ports	0.0051	2.3×10^{-6}
One Intermediate and One Low Population Port	0.0036	1.6×10^{-6}
Two Low Population Ports	0.0021	9.5×10^{-7}
Direct	0.00083	3.8×10^{-7}
Charleston NWS via:		
Two High Population Ports	0.029	1.2×10^{-5}
One High and One Intermediate Population Port	0.023	9.7×10^{-6}
One High and One Low Population Port	0.021	9.1×10^{-6}
Two Intermediate Population Ports	0.0049	2.3×10^{-6}
One Intermediate and One Low Population Port	0.0034	1.6×10^{-6}
Two Low Population Ports	0.0019	9.8×10^{-7}
Direct	0.00041	4.0×10^{-7}
MOTSU via:		
Two High Population Ports	0.028	1.2×10^{-5}
One High and One Intermediate Population Port	0.023	9.5×10^{-6}
One High and One Low Population Port	0.0021	8.8×10^{-6}
Two Intermediate Population Ports	0.0047	2.1×10^{-6}
One Intermediate and One Low Population Port	0.0032	1.4×10^{-6}
Two Low Population Ports	0.0016	7.6×10^{-7}
Direct	0.00041	1.9×10^{-7}
Galveston via:		
Two High Population Ports	0.031	1.3×10^{-5}
One High and One Intermediate Population Port	0.025	1.1×10^{-5}
One High and One Low Population Port	0.023	9.9×10^{-6}
Two Intermediate Population Ports	0.0071	3.2×10^{-6}

Port	Exposure (person-rem)	Risk (LCF)
One Intermediate and One Low Population Port	0.0056	2.5×10^{-6}
Two Low Population Ports	0.0040	1.8×10^{-6}
Direct	0.0028	1.2×10^{-6}
Jacksonville via:		
Two High Population Ports	0.029	1.2×10^{-5}
One High and One Intermediate Population Port	0.023	9.9×10^{-6}
One High and One Low Population Port	0.022	9.2×10^{-6}
Two Intermediate Population Ports	0.0055	2.4×10^{-6}
One Intermediate and One Low Population Port	0.0039	1.8×10^{-6}
Two Low Population Ports	0.0024	1.1×10^{-6}
Direct	0.0012	5.3×10^{-7}
Savannah via:		
Two High Population Ports	0.029	1.2×10^{-5}
One High and One Intermediate Population Port	0.023	9.7×10^{-6}
One High and One Low Population Port	0.022	9.1×10^{-6}
Two Intermediate Population Ports	0.0052	2.3×10^{-6}
One Intermediate and One Low Population Port	0.0036	1.7×10^{-6}
Two Low Population Ports	0.0021	9.8×10^{-7}
Direct	0.00088	4.1×10^{-7}
Wilmington via:		
Two High Population Ports	0.029	1.2×10^{-5}
One High and One Intermediate Population Port	0.023	9.6×10^{-6}
One High and One Low Population Port	0.021	9.0×10^{-6}
Two Intermediate Population Ports	0.0050	2.2×10^{-6}
One Intermediate and One Low Population Port	0.0035	1.6×10^{-6}
Two Low Population Ports	0.0019	8.9×10^{-7}
Direct	0.00069	3.2×10^{-7}
Tacoma via:		
Two High Population Ports	0.029	1.2×10^{-5}
One High and One Intermediate Population Port	0.019	8.2×10^{-6}
One High and One Low Population Port	0.016	7.0×10^{-6}
Two Intermediate Population Ports	0.0098	4.2×10^{-6}
One Intermediate and One Low Population Port	0.0070	3.1×10^{-6}
Two Low Population Ports	0.0043	1.9×10^{-6}
Direct	0.0030	1.3×10^{-6}
Concord NWS via:		
Two High Population Ports	0.031	1.3×10^{-5}
One High and One Intermediate Population Port	0.021	9.1×10^{-6}
One High and One Low Population Port	0.019	7.9×10^{-6}
Two Intermediate Population Ports	0.012	5.1×10^{-6}
One Intermediate and One Low Population Port	0.0092	4.0×10^{-6}
Two Low Population Ports	0.0064	2.8×10^{-6}
Direct	0.0052	2.2×10^{-6}

D.5.9 Consequences of Sabotage or Terrorist Attack

This section provides an evaluation of impacts that could potentially result from a malicious act on a shipment of foreign research reactor spent nuclear fuel. In no instance, even in severe cases such as those discussed below, could a nuclear explosion or permanent contamination of the environment leading to condemnation of land occur. Furthermore, DOE considers that, due to the security measures that would be in place for any spent nuclear fuel shipments, such attacks would be unlikely to occur. At a minimum, the extent or effects of any such attacks, would be mitigated by the security measures.

Since it is impossible to determine with certainty the probability of a deliberate act of sabotage or terrorist attack, this section presents an analysis of potential consequences of sabotage or terrorist attack on a spent nuclear fuel shipping cask, and does not attempt to estimate the risk of such an activity. Although judged very unlikely to actually occur, a malicious attack on a foreign research reactor spent nuclear fuel shipping cask has been postulated to occur at a U.S. port or during transportation from the port to the management site, for purposes of illustrating the effects that might result from such an event.

The spectrum of attacks that can be postulated is broad, falling into three categories or scenarios: (1) exploding a bomb near a shipping cask, (2) attacking a cask with a shaped charge, or an armor-piercing weapon (i.e., an anti-tank weapon), and (3) hijacking (stealing) a shipping cask. None of the scenarios considered would lead to a criticality accident.

D.5.9.1 Exploding a Bomb Near a Shipping Cask

This sabotage/terrorist attack scenario assumes that a large bomb, similar to that detonated in Oklahoma City in April of 1995, is detonated in the immediate vicinity of a spent nuclear fuel shipping cask. The primary threats to the cask integrity would arise from: (1) direct blast forces (shock wave) from the bomb, (2) impact forces from fragments (e.g., motor vehicle parts) generated by the bomb, and (3) other dynamic forces such as a roll-over of the cask transport vehicle in response to the blast forces. The casks are rugged structures that would be expected to survive the effects of a nearby bomb explosion with no significant loss of integrity. At worst, the blast might produce a crack in the wall of the cask. In any case, all spent nuclear fuel elements would remain inside the cask. Blast-related damage might, however, reduce the effectiveness of cask shielding and/or cause locally higher dose rates outside the cask (e.g., from damaged shielding areas and radiation streaming through a crack in the cask wall).

Although no mechanism has been postulated that could cause such an event, an analysis of a total loss of cask shielding has been performed for the purposes of demonstrating limiting case effects of an attack on a spent nuclear fuel shipping cask, such as that discussed above. The analysis scenario assumes that the cask was full of a highly irradiated foreign research reactor spent nuclear fuel, and that the spent nuclear fuel elements were spread on the ground producing the highest possible direct dose rate. For the calculation of direct dose, no credit was taken for self-shielding of the spent fuel, and it was assumed that no other obstacle would exist between the spent nuclear fuel and individual members of the public. Since the spent nuclear fuel would be a solid metal structure, this analysis assumes that no spent nuclear fuel damage occurs, therefore, no radioactive materials would be dispersed. The results of this unrealistically conservative analysis are shown in Figure D-60. This figure provides a conservative estimate of the direct dose rate (rem per hour) to an individual member of the public versus distance from a spent nuclear fuel pile consisting of 30 highly irradiated fuel elements. Based on the results of this hypothetical, conservative analysis, an evacuation distance of about 900 meters (3000 ft) would be sufficient to maintain a dose rate of less than 10 mrem per hour, (or 0.01 rem per hour). This is a very conservative evacuation distance, but it would provide a good measure for consideration by an emergency response team. This scenario would result in minimal or no contamination of the area where it occurred and once the spent nuclear fuel was shielded, the evacuation zone would be greatly reduced. Once the spent nuclear fuel was removed from the site, the area would be decontaminated, if necessary, before it returned to normal.

D.5.9.2 Attacking a Cask with a Shaped Charge or Armor-Piercing Weapon

If a cask were attacked by an armor-piercing weapon or a shaped charge, the cask would be penetrated and spent nuclear fuel elements inside the cask could be damaged. An analysis of a hypothetical attack on a spent nuclear fuel shipping cask using a shaped charge was performed using the MACCS code. The

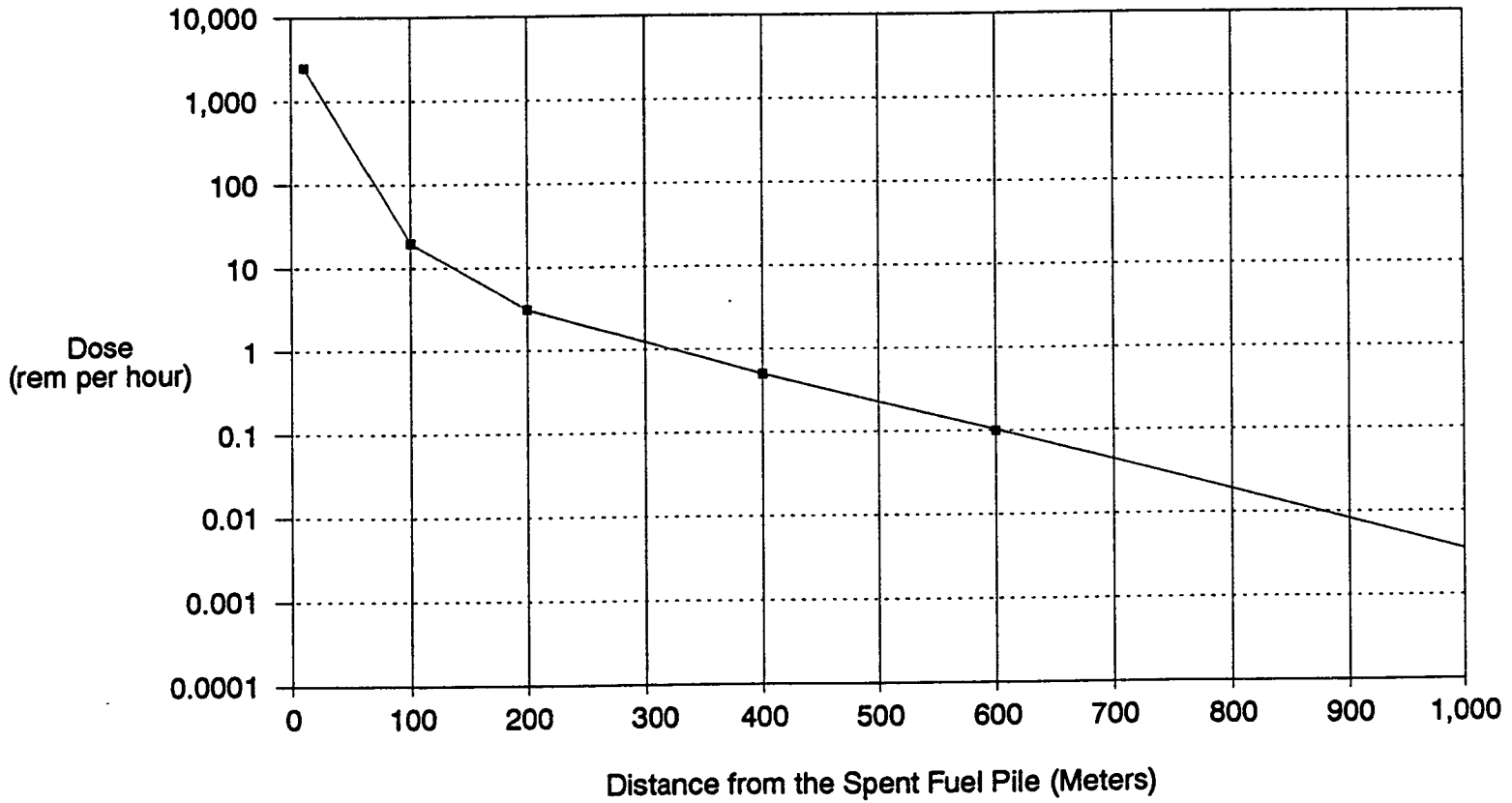


Figure D-60 Direct Dose vs Distance to an Individual Member of the Public

accident was assumed to occur on a city street in a highly populated area near the harbor where the spent nuclear fuel cask was transferred to a truck after trans oceanic shipment from overseas. The analysis assumed that the cask contained the highest radionuclide inventory, and the blast released all of the noble gases and one percent of the bulk of the spent nuclear fuel as airborne aerosols. The one percent of bulk spent nuclear fuel release assumption was based on measurements of aerosols released during tests where spent nuclear fuel was explosively disrupted. These tests yielded spent nuclear fuel release mass fractions that ranged from 0.05 to 2.5 percent (Sanders, et al., 1992). The blast energy would be quickly dissipated and the released fission products and gases and aerosols were assumed to be relatively cool; thus no plume rise was assumed to occur. These assumptions are very conservative and the results provide an enveloping estimate of consequences on the environmental and health effects. The MACCS calculations estimated a population dose of 208,000 person-rem with no acute fatalities or short-term adverse health effects among the exposed population. The MACCS results estimated that 91 latent cancer fatalities could occur among the 16 million persons living within 80 kilometers (50 miles) of the attack. The average individual lifetime radiation dose among the one to two million people who would be exposed is estimated to be about 200 mrem. This is less than one percent of a person's lifetime natural background radiation dose. This evaluation did not consider any evacuation and/or sheltering activities after the attack. MACCS also estimated a contamination distance of about 1 kilometer (0.6 miles) down wind from the attack. This distance, though conservative, could be used by an emergency response team for evacuation purposes. Of course, any actual evacuation distance would be determined on a case-by-case basis, if such an event were ever to occur. Mitigation activities in the aftermath of such an explosion, as required by law (EPA), would reduce the size of the contaminated area drastically and the area could become rehabitable in a short period of time. It is important to bear in mind that the explosion itself would be likely to produce fatalities, injuries and property damage that far exceed that caused by any release of radioactive material from the spent nuclear fuel.

In a terrorist attack using an anti-tank weapon, any cask damage and resulting consequences would be less severe than the accidents analyzed elsewhere in the EIS. This is because (1) there would be no explosive material inside the cask so the cask would not explode. Therefore, no additional radioactivity, other than that released directly by the projectile, would be forced out of the cask, and (2) there would be no fire to disperse the radioactivity that would be released when the cask was breached. At worst, the consequences of a terrorist attack on a spent nuclear fuel shipping cask with an anti-tank weapon would be similar to that analyzed above for a hypothetical terrorist attack on a cask with a high explosive shaped charge.

D.5.9.3 Hijacking a Shipping Cask

The discret theft of a spent nuclear fuel transportation cask is considered to be very unlikely, due to security measures that would be in place during transportation activities, especially the guarding of the cask, and communication and tracking systems (see Section 2.8 and Appendix H). In addition, the large size and weight of these casks (20 to 30 metric tons) and the inherent radioactivity of the spent nuclear fuel (which could kill a person upon contact) would deter most would-be hijackers. In the event of a hijack attempt, required communications systems would ensure timely notification of authorities who would mobilize response forces. The installed tracking system would allow the location of the cask to be determined in real time, thereby aiding timely interception of hijackers by response forces.

No release of radioactive material or increase in radiation level would be expected during a hijack scenario unless the hijacker could blow up the cask using explosive material (e.g., a shaped charge), or open the cask. In case of a cask explosion using a shaped charge, the consequences would be the same as, or smaller than (depending on the location of the accident), the case described in Section D.5.9.2. If the cask were opened (a lengthy process requiring special tooling), shielding would be decreased and the radiation

level in the immediate vicinity of the cask would increase. The cask opening could only be accomplished at great personal risk to hijackers due to large (possibly immediately lethal) radiation exposures that they would receive while handling the unshielded fuel elements.

Should such an attempt be made, the hijackers would not be able to alter the fuel configuration inside the cask to make it critical. Criticality analyses that have been performed in support of the cask certification process consider various fuel and moderation configurations. These analyses are performed to ensure that none of potential configurations that could occur during loading and transport of the cask would lead to a criticality condition. Changing moderating material to achieve criticality, would require special materials that are not readily available (safeguard materials). Based on the time available to the hijackers, and tooling and materials that are needed, DOE considers that the potential for achieving criticality in a hijacked spent nuclear fuel cask is beyond credibility. If the hijackers were to dump the unshielded spent nuclear fuel, the resulting consequences to the public from the bare spent nuclear fuel radiation exposure would be less severe than those already analyzed for other hypothetical scenarios in this appendix.

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Attachment D1
Capital Improvement Plans and Other Significant Port Developments Anticipated During the Period of the Proposed Action

Port	*Improvements and Other Significant Developments*
Baltimore, MD	The Board of Public Works approved the purchase of a new $7.4 million container crane to be installed at the Dundalk Marine Terminal, a 231 ha (570 acre) terminal complex with 13 deepwater berths and 9 container cranes. The new crane is expected to be operational by early 1995 (Governors Press Office, State of Maryland, May 18, 1994). Governor William Schaefer announced Board of Public Works approval of a contract to modernize and improve (up-grade to post-Panamax capacity) three container cranes located at the Dundalk Marine Terminal (Ibid, June 22, 1994).
Boston, MA	Officials of the Massachusetts Port Authority (Massport) have submitted a draft environmental impact report to Federal and State officials that calls for dredging the harbor and access channels to 12.2 m (40 ft) from 9.75-10.97 m (32-36 ft) (*American Shipper*, "Boston Seeks Direct Calls From Asia," October 1994, Pg. 94). Ralph Cox, Marine Director, and other port officials claim that the deeper water is critical to the Port's viability. Massport is also seeking support of the State Legislature for road and rail clearances to permit double-stack train service to the City of Boston and its marine terminals. A $50 million expansion and modernization of Boston's Conley Terminal is approximately 80 percent complete. When completed, Conley Terminal will have 40.5 ha (100 acres) of container storage and handling area, 4 post-Panamax container cranes, 304.8 m (1,000 ft) of berth, and a new gate complex. Reportedly, container tonnage is up for 1994 over 1993 tonnage when Boston handled 152,240 twenty-foot equivalent units for the year.
Charleston, SC	As of late 1993, the $90 million Wando terminal expansion project was nearing completion. When completed, the project will add an additional 418.5 m (1,373 ft) of berthing space, 26.3 ha (65 acres) of container storage area, and two $5.4 million post-Panamax container cranes. The entire project is scheduled for completion by Fall 1994. Planning is progressing for development of the approximately 323.8 ha (800-plus acre) Daniel Island terminal site in Charleston Harbor. The container terminal is being designed to meet demand at the port well into the 21st century. The massive project is expected to take 15 to 20 years to complete and will ultimately consist of 323.8 ha (800 acres) of paved container storage and 2,438 m (8,000 lineal ft) of berthing space (*American Shipper* - Southern Ports, January 1994). At NWS Charleston, the U.S. Army is planning to expand Wharf Alpha and upgrade the railroad in support of the Army Strategic Mobility Logistics Base. This upgrade is scheduled for completion in 1998.

Concord NWS, CA	Currently authorized improvements expected to be completed by 1997 include an upgrade of Pier 3 to withstand greater loadings, and will also include two new 36 metric ton (40 ton) container cranes, container storage pads, and support facilities and equipment. These improvements are projected to permit average load rates of about 20 containers per hour. The improvements will also permit increasing the channel depth and depth alongside to 12.7 m (42 ft) in the future if necessary. The facility will be the designated West Coast container facility for military shipments (personal communications from Karl Yocum, Concord NWS Office of Business Development, September 1, 1994, and 1994 Fact Sheets received during port visit).
Eddystone, PA	No immediate improvements identified.
Fernandina Beach, FL	U.S. Army Corps of Engineers is expected to award a contract in October 1994 for deepening of the harbor channel to 11 m (36 ft), and to construct a 366 m (1,200 ft) turning basin (Personal communication from Mr. Stubbs, Port of Fernandina, September, 1994).
Gulfport, MS	A consulting firm has recommended a 15-year, $160 million terminal expansion for the Port of Gulfport to a projected tripling of port business by 2010. The proposed expansion would add 34 ha (84 acres) of land to West Pier at a cost of $81 million, replace or reconfigure existing warehouses ($13 million), and include the purchase of $11 million in additional container handling equipment (but not necessarily a container gantry crane) (*American Shipper*, September 1994, p. 102; *Containerization International*, September 1994, p. 11). A $41 million dredging project that deepened the harbor from 9.14 m to 10.97 m (30-36 ft) was completed in April 1994. In August 1993, the Port Authority issued $15 million in bonds to pay for three development projects that included expansion of East Pier warehouse facilities and the addition of 11.7 ha (29 acres) of land—through diking and pumping sand, at West Pier. The latter to be used for a new container terminal (*American Shipper* - Southern Ports, January 1994).
Jacksonville, FL	In anticipation of continued strong growth in cargo demand over the next 20 years, JAXPORT adopted a 20-year, $934 million development plan designed to prepare its facilities for 2010. In addition to recommendations for immediate construction of a third container terminal at Dames Point, consultants recommended expansion and reconfiguration of the Authority's Blount Island and Talleyrand Terminals, projected to cost about $274 million over 7 years. A $1 million feasibility cost sharing agreement was signed this year with the Corps of Engineers to develop a dredging study to deepen the harbor from 11.6 m (38 ft) to 12.8 m (42 ft). Design of a second roll-on/roll-off dock plus 2 ha (5 acres) more container storage and a 450 m (1,500 ft) extension of marginal wharf is scheduled for Blount Island in fiscal 1995 [The Jacksonville Port Authority (JAXPORT), Marketing Department, October 3, 1994].

The Port Authority anticipated breaking ground in 1994 for a new 203 ha (500 acre) container and general cargo terminal complex at Dames Point, immediately adjacent and upstream of its existing Blount Island terminal. The new facility is expected to cost $160 million when completed in the future. Other improvements scheduled include a $2.5 million investment in increased intermodal rail capacity at Blount Island and Talleyrand Terminals, and widening of Hecksher Drive to four lanes from the entrance to Blount Island to State Road 9A, which connects with I-95. I-295 is also being widened to four lanes (American Shipper - Southern Ports, January 1994).

Long Beach, CA

The Long Beach Port Commission and City Council have approved a 1994-95 budget of $417 million, which includes $236.5 million for port construction, land acquisition, and environmental mitigation. Last year's budget included $405 million to purchase land owned by Union Pacific Resources Company in the north harbor, which the Port plans to convert to a marine cargo terminal. The property is comprised of 117 ha (289 acres) north of the Cerritos Channel, 143 ha (354 acres) south of the Channel, and 33 ha (82 acres) within the Channel. The new budget provides allocations of $60 million for street overpasses to cross rail lines in the port area, $22 million for other street and road improvements, $78 million for continuing container terminal improvements at Pier J, $25 million for other construction projects, and $40 million for land acquisitions and environmental mitigation. These land acquisitions will increase the Port's operating area by 35 percent (American Shipper, September 1994, p. 94; "Long Beach to Spend $417 million").

Los Angeles, CA

Los Angeles' "2020 Program" represents the Port's comprehensive long-term development plan, which is designed to accommodate a doubling of cargo throughput through the next decade and a forecast California population of 20 million people. The major components of the 2020 Program include:

a. Construction of Pier 300 on landfill completed in 1983. When completed, Pier 300 will include the American President Lines container terminal, an intermodal container/rail/truck transfer facility and a coal export terminal;

b. Landfill and construction of Pier 400, with three container terminals, an intermodal container transfer facility, and liquid bulk terminals;

c. The Alameda Corridor, a road and rail improvement program linking the Port to rail facilities in downtown Los Angeles with a fully grade-separated trackage (Port of Los Angeles, Property Management Division, October 3, 1994).

Implementation of the 2020 Program is well underway and will involve expenditures of approximately $600 million over the next three years. Work has begun on the new 91.5 ha (226 acres) American President Lines Container Terminal on Pier 300 which, when completed in 1997, will be the largest container terminal in the United States. Costing about $270 million, the terminal will have 1,219 m (4,000 ft) of wharf capable of handling four of American President Lines' largest ships at one time, and an adjacent 19 ha

(47 acre) intermodal rail yard that will also serve the coal export yard being constructed next to the facility. The American President Lines complex will be equipped with six to eight new-generation container cranes. The Port has also embarked on a mammoth $148.6 million dredging project that will create 4.8 km (3 mi) of new channels 13.6 m to 19.1 m (45-63 ft) deep, providing access to Pier 300, a turning basin, and 1,520 m (5,000 ft) of berthing space south of Pier 300. Dredge spoil will be used to create about 91 ha (225 acres) of new land to be called Pier 400, which will be located south (seaward) of the new American President Lines Terminal. Plans for Pier 400, call for the construction of three container terminals on the north side of the terminal, each with two berths and five container gantry cranes, and a large bulk liquid/petroleum terminal complex on the south (ocean) side. Other on-going improvement projects include replacement of the Badger Avenue Bridge providing rail and road access to Pier 300 and Terminal Island, construction of a $200 million coal export terminal on Pier 300 and a $20 million rail yard to serve Terminal Island container terminals [*Long Beach Press Telegram* (Business), "Port Builds for Future," September 26, 1994].

Miami, FL

Phase I of Miami's $100 million port deepening project (begun in April 1991), was completed July 1993 and included deepening of the harbor channel to 12.8 m (42 ft) from the sea buoy to the Lummus Island Container Terminal. Phase II (now underway) extends the 12.8 m (42 ft) channel from container berths on Lummus Island to a new south channel turning basin between Dodge and Lummus Islands. Completion of dredging is expected by mid-1995. The dredging project has already added 24.3 ha (60 acres) of land to Lummus Island and current dredging is expected to add another 16.2 ha (40 acres) for additional container and roll-on/roll-off ship berths. The Port also plans to add two 49 metric ton (54 ton) post-Panamax size container cranes to the existing three 49 mt and three 39.2 metric ton (43 ton) gantry cranes already installed (American Shipper-Southern Ports, January 1994).

Mobile, AL

The Port has just completed about $80 million in improvements through 1993. No new immediate improvements have been identified (Alabama State Docks System, "Port of Mobile Handbook," 1993).

New Orleans, LA

The newest terminal to be added to the Port of New Orleans is the Nashville "B" multi-purpose facility, which marked the completion of the first phase in the ongoing $200 million capital improvements program which, as part of the Mississippi River Terminal Complex, will take New Orleans into the 21st century. When complete, it will feature two miles of continuous modern wharves and state-of-the-art facilities. A full array of multipurpose and ocean-going container ships will be able to discharge cargo quickly, take on new cargo and sail for the next port without delay. A newly paved marshalling yard will eliminate trucking congestion and tie-ups, and an increased shedded area will allow stevedores to operate more efficiently. Flood protection barriers are being raised to eliminate the possibility of flooding. Two ship berths have been added and three more are scheduled to open by the end of 1995. The Napoleon Avenue Wharf C apron width will be replaced to increase the load capacity to 36 kg sm (850 psf), along with other

	improvements. The Tchoupitoulas Corridor Project will provide a new, high-speed dedicated roadway from the port through the city (Annual Directory, Port of New Orleans, 1993-1994; Board of Commissioners of the Port of New Orleans, "Mississippi River Terminal Complex," 1993).
Newport News, VA	No immediate improvements identified.
Norfolk, VA	In 1991, the Virginia Ports Authority began a $40 million expansion of the Norfolk International Terminal that will double the size and cargo handling capacity of the terminal. When completed in 2004, improvements include adding 1,300 m (4,300 ft) of new berthing space and 120 ha (300 acres) of backup cargo handling area, creating a massive (819 acre) intermodal terminal with 27,000 m (89,000 ft) of onsite rail, connecting the terminal with Norfolk Southern's bullet train and providing double stack service to major U.S. markets (Virginia Port Authority, "Promises, Results," 1993; Financial World, "The Ports of Virginia: Destiny Controlled," p. 63, New York, NY, July 20, 1993).
Oakland, CA	The $50 million reconstruction of Oakland's 22.7 ha (56 acre) Seventh Street Terminal is nearing completion. Severely damaged in the 1989 Loma Prieta earthquake, three new post-Panamax cranes have been added and the entire wharf structure and upland areas have been rebuilt. The final phase of the redevelopment program is a $5 million gate relocation and construction project providing six entry and four exit lanes. Truck queues outside the terminal will be avoided by the addition of 46 inbound and 44 outbound queue spaces plus six "trouble" lanes for trucker paperwork problems within the gate area. The gate complex will use computer and video technology to speed container movements through the Port (American Shipper, August 1994, "Rebirth for Oakland Terminal," p. 77).
Philadelphia, PA	A new bi-state agency, *The Port of Philadelphia and Camden, Inc.*, has been created to assume responsibility for regional port operations previously directed by the Philadelphia Regional Port Authority (ports of Philadelphia), the South Jersey Port Corporation (terminals in Camden), and the World Trade Division of the Delaware River Port Authority—a regional economic development agency. The new agency will begin operation in 1995 (WWS/World Wide Shipping, June 1994, p. 35).
Port Everglades, FL	Completion of the Port Everglades Authority's new $100 million, 62.7 ha (155-acre) container complex at Southport, and the development of 6.7 ha (15 acres) of expanded container storage area at Midport, both scheduled for 1994, culminates years of planning and construction by Port Everglades. Southport is equipped with three 39.2 metric ton (43 ton) low-profile, post-Panamax container cranes designed to avoid interference with nearby airport operations. Design planning studies are underway for lift-on/lift-off support facilities at the new 26 ha (63 acre) lift-on/lift-off container yard located immediately adjacent to Southport's cranes. These include a container freight station, electrical outlets for reefer containers, gatehouse with scales, inspection shed, automated facilities, and a feasibility study for developing an intermodal container transfer facility nearer to the Southport complex. The

Fiscal 1993-94 budget provides $9.6 million for a tenth cruise line terminal and enhancements to the two facilities described above (FS, 1992; Southern Ports, January 1994, Pg. 33).

Port of New York, NY

The Port Authority of New York/New Jersey's 1993 capital spending budget totaled $57 million, largely for terminal improvements such as wharf rehabilitation, berth deepening, paving, etc.

Port of Elizabeth, NJ

Funds were also included for deepening Federal channels in the Kill Van Kull and into Newark Bay to the Elizabeth Marine Terminal. The total project, scheduled for completion in 1995, will provide a 12.2 m (40 ft) channel from Upper New York Bay through the Kill Van Kull into Newark Bay. The lack of adequate channel depths has resulted in the diversion of ships to other ports. Three and a half years of wrangling over permits for maintenance dredging and ocean spoil disposal have reportedly increased the cost of dredging from $1 million to $15 million, in part due to court-ordered dredging requirements. The Port Authority has previously announced that it will construct a new $8.5 million on-dock rail terminal at its Port Elizabeth container facilities, which is scheduled for completion in the first quarter of 1995. Initial capacity of the facility will be 100,000 containers annually (WWS/World Wide Shipping, June 1994, p. 33).

Red Hook Container Terminal - Brooklyn, Howland Hook Container Terminal - Staten Island, NY. Red Hook terminal is the only marine cargo terminal still operating on the East side of the Harbor. It was reactivated in January 1994 under the management of American Stevedoring Ltd. The NY/NJ Port Authority is in the process of dredging the approach channel to its project depth of 11.6 m (38 ft). American Stevedoring anticipates handling 20,000 twenty-foot equivalent units in 1994 and as many as 70,000 twenty-foot equivalent units by 1995. The terminal also benefits from a Port Authority subsidized container-on-barge service connecting Red Hook with New Jersey railheads. Terminal facilities include 920 m (3,030 ft) of berthing, containers, roll-on/roll-off and breakbulk cargoes, rail service, four 36.3 metric ton (40 tons) container cranes, and one 63.7 metric ton (70 tons) container crane. While seeking an operator to revitalize the 58.7 ha (145 acre) Howland Hook container terminal—the former base of U.S. Lines idled since 1991, the Port Authority is completing a $25 million renovation of the terminal. Work includes replacement of electrical and distribution systems and resurfacing of a 762 m (2,500 ft) wharf. The Port Authority is also seeking a dredging permit to increase the depth of the berths from the original 10.1 m (33 ft) to the authorized depth of 12.2 m (40 ft). The terminal has a capacity of more than 300,000 containers a year. Its facilities include 762 m (2,500 ft) of lineal berthing space, four 36.3 metric ton (40 ton) and two 45.5 metric ton (50 ton) container cranes, and rail service (American Shipper, August 1994, Pages 73-74).

The City of New York – owner of the Terminal (Howland Hook), and the State of New Jersey are negotiating for the purchase of the Staten Island Railroad tracks between the Terminal and Cranford, NJ, where the short line

connects with Conrail. CSX owns the Staten Island line, but was granted approval in 1991 to abandon the route, so a new owner is needed to reactivate the rail line. City officials and the prospective operator of the Howland Hook facility predicted that the future of this terminal as a viable facility may hinge on the acquisition of the trackage and the installation of on-dock rail service (American Shipper, August 1994, p. 84).

Portland, OR

The Port Commission has approved a $60 million container terminal upgrade program for Terminal 6 to increase throughput capacity to 510,000 twenty-foot equivalent units over the next 10 years, nearly double its present capacity. The Terminal currently handles 314,500 twenty-foot equivalent units a year. Improvement plans include a new $16 million post-Panamax size container crane scheduled to come on stream by late 1995. The Port Commission has also hired an engineering consulting firm to recommend a development strategy and 20-year development program for a new marine terminal complex on West Hayden Island (*American Shipper*, October 1994, "Port of Portland Builds for the Future")

In July, the Port Of Portland Commission contracted with IBM and Stevedoring Services of America to provide the hardware and software for a new $1.0 million computerized terminal management system for its Terminal 6 container facility. The Port presently handles 600 trucks a day with a cargo inventory system developed in 1980. Portland is the fastest growing port on the West Coast (Containerization International, September 1994, "Portland Buys SSA System").

Portsmouth, VA

No immediate improvements identified.

San Francisco, CA

San Francisco's future as a leading West Coast container port is in jeopardy following the decision of Evergreen line to leave the port when its lease expires in June 1995. Evergreen's move follows the departure of Cosco, National Shipping Co. of the Philippines, Nedlloyd Line, Blue Star Lines, and South Seas Steamship. The anticipated reduction in revenues caused by these defections to the Port of Oakland may effect San Francisco's Port capital expenditure programs, including the $10 million rail tunnel improvement project designed to accommodate double-stack train services south of the City. Delays in executing this project are cited as the reason for the loss of these lines. The Port's North Container Terminal is presently dormant and the South Terminal is significantly under-utilized. As reported in WWS/World Wide Shipping, July/August 1994, Pg. 41: The Mayor of San Francisco announced a plan for a New Age entertainment center, incorporating a ballpark and a sports area to be built in space formerly used for cargo handling and Southern Pacific trackage—underscoring the trend to convert prime commercial waterfront land into resort and entertainment areas—an industry-wide problem (Containerization International, "San Franciscos Latest Setback," September 1994, p. 27).

Savannah, GA

Completion of a new 12.8 m (42 ft) shipping channel was completed this Spring. The 1.22 m (4 ft) deepening of the channel makes the Savannah terminals accessible to 98 percent of ships currently in the trade. 1994 is the

third year of Savannah's $319 million development program called *Focus 222*, which is designed to provide the facilities and infrastructure needed to maintain growth into the year 2000. Remaining elements of the Program include steps to help restore the freshwater habitat in the Savannah National Wildlife Refuge, completion of upgrading the 1,680 m (5,500 ft) of contiguous berth at Garden City's Container Berth 6, the addition of 12 ha (30 acres) of container storage and delivery of four new post-Panamax container cranes, two of which were scheduled to arrive late in 1994, and upgrading of existing container cranes, making a total of 13 container cranes at the Garden City port complex (WWS/World Wide Shipping, May 1994, p. 27).

Seattle, WA

The ports of Seattle and Tacoma use the findings of a 1990 econometric study sponsored by the Washington Public Ports Association as an integral part of their planning strategies. In the case of Seattle, this means being capable of handling 2.1-2.5 million twenty-foot equivalent units annually, 15 years hence. The port's Container Terminal Development Plan, adopted by the Seattle Port Commission in May 1991, called for another 97 ha (240 acres) of land to be developed by the end of the century. A further 41 ha (100 acres) has been scheduled for possible acquisition by the year 2010. Seattle currently has about 140 ha (350 acres) of land that is dedicated to container handling activities. The initial phase of the Program involves adding parking space, extending certain piers and upgrading shipside cargo handling gear. Additionally, the Container Terminal Development Plan calls for expansion of existing, and construction of new on-dock rail yards, and improving overall access to/from the port area. A summary of Seattle's current expansion/development programs includes:

a. Expansion of Terminal 5, operated by an affiliate of American President Lines, from 33.6 has to 64 ha (83 to 158 acres) and a 122 m (400 ft) extension of the berth. Work is scheduled for completion in 2 to 3 years;

b. An on-dock intermodal rail facility at Terminal 5 capable of handling two full-length double-stack rail cars simultaneously plus capacity for storing two more, and an overpass to segregate rail and truck traffic;

c. A 36.4 ha (90 acre) expansion to the 44.5 ha (110 acre) Terminal 18 located on the eastern side of Harbour Island. The expansion will permit doubling of the existing intermodal on-dock rail yard from 28 to 56 double-stack rail cars. The new south intermodal rail yard will have separate rail access to avoid conflict with Terminal 5 rail traffic. Container aprons will be upgraded, and the terminal's seven container cranes will be upgraded, and/or replaced by post-Panamax capacity gantry cranes. Additional plans call for an addition of 4 ha (10 acres) to the northernmost extremity of the Terminal, increasing its size to 18.2 ha (45 acres) and the lengthening of the ship berth by 122 m (400 ft). Terminal 18 is the Port's largest common-user facility, and will be able to handle two post-Panamax vessels at the same time (Containerization International, July 1994, pages 87-90).

Tacoma, WA

Tacoma's 20-year, $450 million 2010 Blair Waterway terminal expansion program is equally ambitious, but its implementation will be geared to customer demand. Major elements of the 2010 Blair Waterway program, which is designed to enable the waterway to handle the largest containerships afloat include:

a. The addition of approximately 125 ha (309 acres) of new container terminal area, 11 berths, and 30 ha (75 acres) of new intermodal rail facilities at the Port;

b. Dredging of the main access channel to a depth of 13.7 m (45 ft), and construction of a new city bypass road with subsequent dismantling of the Blair Road Bridge. The bridge is slated to be removed by the end of 1995 and the entire West Blair terminal project is to be completed by the end of 1996;

Additional planned port improvements include the construction of two new container terminals on the north side of the Blair waterway and the new terminals have two berths and 20.2 ha (50 acres) of land. The second new terminal will be built at the existing Terminal 7 and will consist of a one-berth 20.2 ha (50 acre) facility. Spoil from dredging work is being used to fill in the Milwaukee Channel and increase the Sea Land terminal by 9.7 ha (24 acres). According to the econometric study cited above, Tacoma will need to be able to handle between 2.5 and 2.8 million twenty-foot equivalent units in the year 2010 (Containerization International, July 1994, pages 87-90).

Wilmington, DE

No immediate improvements identified.

Wilmington, NC

Long term development plans by the North Carolina State Ports Authority include studies for the deepening of the outer bar channel to 14 m (46 ft), the river and harbor channel to 13.4 m (44 ft), and development of a new marine terminal upstream of the existing port complex. Dredging was expected to begin in early summer 1994 and site development work for the new terminal is slated for fiscal year 1996 provided funding is available. Similar planning for a new marine terminal on Radio Island, adjacent to existing port facilities at Morehead City, is underway. The recently completed channel and harbor dredging to 13.7 m (45 ft) makes Morehead City one of the deepest ports on the East Coast (WWS/World Wide Shipping, May 1994, p. 26).

Attachment D2
Port Population Growth Factors (1990 - 2010)

U.S. Ports	Counties	1990	2010	Growth Factor
	East Coast			
Boston, Massachusetts	Suffolk	663,906	792,200	
	Norfolk	616,087	631,300	
		1,279,993	1,423,500	1.11
Elizabeth, New Jersey	Essex	778,206	757,200	
	Kings, NY	2,369,966	2,364,992	
	Hudson	553,099	566,600	
	Richmond, NY	385,224	463,529	
	Union	493,819	502,300	
		4,580,314	4,654,621	1.02
Philadelphia, Pennsylvania	Philadelphia	1,585,577	1,513,674	
	Camden	502,824	550,500	
	Gloucester	230,082	269,300	
		2,318,483	2,333,474	1.01
Eddystone, Pennsylvania	Delaware	547,651	508,557	
	Philadelphia	1,585,577	1,434,694	
		2,133,228	1,943,251	0.91
Wilmington, Delaware	New Castle	441,946	513,750	
		441,946	513,750	1.16
Baltimore, Maryland	Baltimore	692,134	728,898	
	Anne Arundel	427,239	499,204	
	Howard	187,328	288,701	
		1,306,701	1,516,803	1.16
Newport News, Virginia	Isle of Wight	25,053	34,283	
	Norfolk City	261,229	253,809	
	Hampton City	133,793	146,648	
	York	42,422	56,000	
		462,497	490,740	1.06
Norfolk, Virginia	Isle of Wight	25,053	34,283	
	Norfolk City	261,229	253,809	
	Portsmouth City	103,907	101,965	
	Hampton City	133,793	146,648	
	York	42,422	56,000	
		566,404	592,705	1.05
Portsmouth, Virginia	Isle of Wight	25,053	34,283	
	Portsmouth City	103,907	101,965	
	Norfolk City	261,229	253,809	
		390,189	390,057	1.00
Wilmington, North Carolina	New Hanover	120,284	150,936	
	Brunswick	50,985	79,644	
		171,269	230,580	1.35
Charleston, South Carolina	Charleston	295,039	339,400	
	Berkeley	128,776	252,800	
		423,815	592,200	1.40
Savannah, Georgia	Chatham	216,935	273,391	
	Byran	15,438	23,610	
		232,373	297,001	1.28

U.S. Ports	Counties	1990	2010	Growth Factor
Fernandina Beach, Florida	Nassau	43,941	79,800	
		43,941	79,800	1.82
Jacksonville, Florida	Nassau	43,941	79,800	
	Duval	672,971	1,014,100	
		716,912	1,093,900	1.53
Port Everglades, Florida	Broward	1,255,488	1,980,900	
		1,255,488	1,980,900	1.58
Miami, Florida	Dade	1,937,094	2,809,700	
		1,937,094	2,809,700	1.45
Gulf Coast				
Mobile, Alabama	Mobile	378,643	408,600	
	Baldwin	98,280	110,300	
		476,923	518,900	1.09
Gulfport, Mississippi	Harrison	165,365	175,291	
		165,365	175,291	1.06
Galveston, Texas	Galveston	217,399	245,820	
	Brazoria	191,707	249,644	
	Chambers	20,088	21,200	
		429,194	516,663	1.20
New Orleans, Louisiana	Jefferson	448,306	513,980	
	Orleans	496,938	514,740	
	St. Bernard	66,631	79,950	
	Plaquemines	25,575	29,820	
		1,037,450	1,138,490	1.10
West Coast				
Seattle, Washington	King	1,507,319	1,833,133	
	Kitsap	189,731	261,970	
		1,697,050	2,095,103	1.23
Tacoma, Washington	Pierce	586,203	792,179	
		586,203	792,179	1.35
San Francisco, California	Marin	231,200	245,500	
	San Mateo	652,100	787,300	
	San Francisco	723,900	781,700	
		1,607,200	1,814,500	1.13
Concord Naval Weapons, California	Contra Costa	810,300	1,096,300	
	Solano	345,700	557,400	
		1,156,000	1,653,700	1.43
Oakland, California	Alameda	1,279,182	1,561,900	
	San Francisco	723,959	781,700	
		2,003,141	2,343,600	1.17
Los Angeles, California	Orange	2,424,100	3,104,100	
	Los Angeles	8,897,500	11,441,900	
		11,321,600	14,546,000	1.28
Long Beach, California	Orange	2,424,100	3,104,100	
	Los Angeles	8,897,500	11,441,900	
		11,321,600	14,546,000	1.28

+1990 Census taken from Rand McNally/The New Cosmopolitan World Atlas Census/Environmental Edition, 1992.

Alabama	Alabama Population Projections 1990-2015, Alabama State Data Center Center for Business and Economic Research, University of Alabama, Tuscaloosa, AL, January 1994.
California	Population Projections by Race/Ethnicity for California and its Counties, Report 93 P-1, Demographic Research Unit, Sacramento, CA, (916) 322-4651, April 1993.
Delaware	Census info and projection numbers through Evelyn Pearson, Delaware Development Office, Business Research Section, Dover, DE, Consortium Series, (302) 739-4271, June 30, 1994.
Florida	Projected from Florida Population Studies (by county) by Stanley K. Smith, Director, Bureau of Economic and Business Research, University of Florida, Volume 27/Number 2/Bulletin No. 108, February, 1994.
Georgia	Census info and projection numbers through Marty Sik, Governor's Office of Planning and Budget, Atlanta, GA, (404) 656-0911.
Louisiana	Census info and projections provided by Division of Administration, Baton Rouge, LA, Department of Budget, ATTN: ARL, (504) 342-7410.
Maryland	Department of State Planning, Office of State Planning Data, Office of Michael Lettre, , Baltimore, MD, (410) 225-4452, September 29, 1994.
Massachusetts	Ms. Alice Rarig, Massachusetts Inst. for Social & Econ Research (MISER), University of Mass., Amherst, MA, (413) 545-6660, September 30, 1994. **Calculations are only preliminary numbers. Final reports will be made available by end of October 1994.
Mississippi	Projections given by phone through the Office of Dr. Barbara Logue (EPA) on 9/29/94 from Center Policy Research & Planning, MS Institute of Higher Learning, Jackson, MS, (601) 982-6576, September 29, 1994.
New Jersey	Census info and projection numbers provided by Sen-Juan Wu, New Jersey Dept of Labor, Labor Market & Demographic Rsr, Trenton, NJ, (609) 292-0076.
New York	Census info and projections provided by New York State Bureau of Economic and Demographic Info, Albany, NY, (518) 474-6005.
North Carolina	Census info and projection numbers through Bill Tillman, Office of State Planning, Raleigh, NC, (919) 733-4131, Prepared April 1994.
Pennsylvania	Projections given by David Gordner, Bureau of Water Management, Department of Environmental Resources, Harrisburg, PA, (717) 772-4048, September 30, 1994.
South Carolina	Census info and projection numbers through Diana Tester, South Carolina Budget and Control Board, Office of Research & Statistical Services, Columbia, SC, (803) 734-3619, Published October 29, 1993.
Texas	Census info and projection numbers obtained through Texas State Data Center, Texas A & M University System, College Station, TX, 77843-2125, (409) 845-5115. Contact: Hazel Dolar.

Virginia	Projection given by Jeanne Brown, Center for Public Service University of Virginia, Charlottesville, VA, (804) 982-5580, September 28, 1994.
Washington	Census info and projections from Washington State County Population Projections, Office of Financial Management, Forecasting Division, Olympia, WA, January 31, 1992.

Attachment D3
Background Discussion of Alternative Analytical Models for Evaluation of Potentially Impacted Port Populations

In the Fall of 1993, the Department of Energy (DOE) began to collect and analyze information required for the list of port criteria included in the Notice of Intent (DOE, 1993) for this environmental impact statement (EIS). DOE recognized that there would be public concern associated with consideration of potential ports of entry for the foreign research reactor spent nuclear fuel. Therefore, DOE decided to develop a sound technical basis for the identification of potential ports of entry.

As a result (concurrently with the independent evolution of the Urgent Relief Environmental Assessment), a list of 28 potential commercial ports was established based on the recommendations of independent maritime consultants. The database included information in the following categories:

1. *Geophysical Factors,* harbor and channel water depths [a port would fail if it had less than 7 m (23 ft) of water, but receive the maximum score if it had more than the 12 m (40 ft) of water required for all but the largest cellular container vessels]; the nautical distance from the open ocean to the port [ports greater than 40 km (25 mi) from open ocean received no points, but were not disqualified from further consideration]; and navigational factors that might increase public risks (narrow, winding channels with currents or other factors seriously affecting safe navigation were given no points, but a weighting factor was applied to channels with good characteristics to account for the relatively greater importance of this factor for maritime safety).

2. *Port facilities,* which included the capabilities of cargo terminals for handling containerized foreign research reactor spent nuclear fuel, wharves and depths alongside, crane capacities, terminal access (truck and rail), terminal security, and the liner services available.

3. *Factors related to spent nuclear fuel handling and transport,* including past experience with spent nuclear fuel or other hazardous cargoes, whether there were local restrictions on the receipt of foreign research reactor spent nuclear fuel, emergency response capabilities, hazardous material handling training, locations of terminals relative to nearby populations with a doubleweighted score for ports that were remote from urban populations (e.g., heart of a city), 1990 census statistics for port city populations and population densities, environmental factors (whether the immediate port vicinity had sensitive populations of animals), and distance from the port to Savannah River Site and Idaho National Engineering Laboratory (at that time these were the preferred storage sites due to historical experience and facilities; the other three sites were added later as the result of the Programmatic Spent Fuel Draft EIS decision to consider them).

Using the database developed, a semi-quantitative analysis of the port criteria was prepared that summed the "score" assigned to each port attribute by the maritime experts, and the ports were ranked from best to the least acceptable (this list of ports is, for the most part, a subset of the set of over 40 ports that were subsequently analyzed in detail in Section D.2 of this appendix).

DOE determined that a semi-quantitative analysis of all ports for all of the noticed criteria was unacceptably subjective, especially concerning the assignment and weighting of the numerical scores. Furthermore, it did not differentiate well between ports, and when weighting factors were applied to better discriminate between criteria that were very important to safety versus those that were "desirable attributes," the methodology became very difficult to justify.

Attachment D4
Derivation of Ship Collision Damage Probabilities

Derivation of the accident severity category probabilities requires that a probability of damage to the transportation cask, given a collision between two vessels, be calculated. In Appendix D, this probability has been characterized by two values, P_{Impact} and P_{Crush}. The first is a probability that the cask is damaged due to impact forces associated with the collision. The second represents the probability that crush forces result in damage to the cask. This attachment describes how these probabilities were derived.

D4.1 Kinetic Energy

V.U. Minorsky developed a method for analyzing the collision of ships that provides a correlation between resistance to penetration and the energy absorbed in the collision (Minorsky, 1959). The absorbed energy was determined for actual collisions by assuming the impact was nearly transverse, the hydrodynamic forces due to water entrained by the hull of the struck ship could be treated as a virtual increase in mass, and the collision was perfectly inelastic. The resistance to penetration was quantified through a resistance factor, R_t, which was computed from accident and ship design information. He found, for higher energy incidents, that there is a linear correlation between R_t and the absorbed energy.

ORI Inc., in a draft report on accident severities associated with water transport of radioactive materials, extended Minorsky's method to develop correlations between penetration depth and the energy absorbed in ship collisions (ORI, 1981b). By considering empirical probability distributions for displacement of the striking ship, its speed, and the angle of impact, bounding case curves were developed for the probability of occurrence of force levels at selected penetration depths. The force value referred to is the collision force acting between the two ships.

Only a fraction the collision force would be seen by a spent fuel transportation cask on board the struck ship. ORI gave a qualitative discussion of this aspect of the collision, together with some limiting case values based on assumptions about stowage and the presence and type of other cargo.

The present analysis depends, to a large extent, on the Minorsky and ORI analyses. It does add an approximate treatment of accelerations experienced by the spent fuel package and includes the effects due to cargo in determining the maximum penetration depth in collision events. The dynamics of inelastic collisions are treated through conservation laws for momentum and energy. Following Minorsky, the transverse hydrodynamic forces on the hull of the struck ship are accounted for by a virtual increase in mass, hence kinetic energy. This is a conventional method used by naval architects, but has limitations when applied to collisions. M.J. Petersen pointed out that experiments and calculations by Motora et al., have shown that the added mass treatment is not always a good approximation (Petersen, 1982; Motora, 1971). Here we accept the limitations imposed by the added mass method, because a more rigorous treatment of the collision is not warranted due to other uncertainties in the analysis, particularly in the modeling of cargo effects.

It should be noted that the ORI/Minorsky method of calculating hull penetration probably does not take account of the massive keel structures in the struck transport ships. Therefore, they most likely significantly overestimate the probability of penetration further than one-fifth of the beam of the struck ship, since penetration to this distance would mean that the keel structures had been encountered. Note that historic experience (rule-of-thumb experience) indicates that few ship collisions lead to penetration more than one-fifth of the beam of the struck ship.

Parameters and Assumptions

The target ship in the following calculations is assumed to have a beam of 24.99 m (82 ft) and a displacement, 'm', of 25,310 metric tons (27,841 tons). The virtual mass, 'dm', due to hydrodynamic forces is 0.4 m = 10,120 metric tons (11,132 tons). Eight cases are considered for the displacement, 'm', of the striking ship: 5,600; 16,800; 28,000; 39,200; 50,400; 61,600; 72,800; and 84,000 metric tons (6,160; 18,480; 30,800; 43,120; 55,440; 67,760; 80,080; and 92,400 tons. The normal component of the striking speed at impact ranges from 1 to 10 meters per second (1.9 to 19 knots or 2.2 to 22 statute miles per hour).

A full distribution of sailing speeds (0-22 knots) was used in the penetration calculations even though speeds in port channels are likely to be no greater than 10-15 knots and speeds at dockside only a few knots (minimum required to maintain steerage). In addition, large ships (e.g., tankers) are likely to be pushed/towed by tugs near docks.

The models for energy absorption by the ship and its cargo follow the methods of ORI. The work, 'W', due to cargo compression is the product of the crush strength of the cargo, the cross sectional area of the blunted bow of the striking ship, and the difference between the penetration distance and the cargo closeup distance. ORI gave examples of this calculation, which are reproduced in the formula

$$W_{cargo} = 19.44 f \sigma (x - f(\,beam\,))$$

where f is the fraction of open space on the hold floor, σ is the crush strength of the cargo in MPa (mega pascals), 'x' is the penetration depth and beam is the width of the struck ship, both in meters. This formula follows ORI in assuming the vertical size of the damage zone is 7.62 m (25 ft), and one third of the blunted bow is the effective area.

Prior to the initiation of cargo compression, energy is absorbed solely by deformation of the ship structure; this effect is modeled using the Minorsky value of 32 'mj' (mega joules) for the energy to penetrate the hull, together with the semi-empirical curves in Figure 6.2 of the ORI report. Table D4-1 gives coefficients for a quadratic fit used to represent the ORI curves below 15 m (49.2 ft) penetration, while a second fit for greater penetration distances is given in Table D4-2.

Table D4-1 Quadratic Coefficients for Energy Absorbed Due to Ship Structures <15m

$$W_{ship} = a + bx + cx^2 \quad (x < 15m)$$

Metric ton	a (mj)	b (mj/m)	c (mj/m^2)
5,600	9.551	0.6836	0.0405
16,800	8.709	0.8118	0.2984
28,000	8.056	1.2030	0.4558
39,200	8.121	1.0850	0.5296
50,400	9.234	0.6555	0.6217
61,600	8.956	0.8639	0.6698
72,800	8.574	1.1790	0.6906
84,000	8.204	1.5290	0.7154

Table D4-2 Quadratic Coefficients for Energy Absorbed due to Ship Structures >15m

$W_{ship} = a + bx + cx^2$ (x >15m)

Metric ton	a (mi)	b (mi/m)	c (mi/m^2)
5,600	58.13	-4.837	0.1919
16,800	14.72	-0.057	0.3337
28,000	15.76	-0.304	0.5179
39,200	64.87	-5.622	0.7306
50,400	189.5	-19.21	1.162
61,600	264.4	-29.02	1.531
72,800	303.8	-36.36	1.878
84,000	412.2	-50.50	2.393

Distribution of Ship Displacements, Speeds and Angles

Analysis of two years of shipping accident data allowed ORI to develop probability distributions for 'M' (mass of the striking ship), 'V' (transverse speed of the striking ship), and θ (angle of incidence), which are presented here in Table D4-3 through D4-5. The ORI tables originally contained eleven intervals for displacement of the striking ship. Four cargo loadings were examined in the analysis: no cargo, light cargo, medium cargo, and heavy cargo (light, medium, and heavy refer to the amount of cargo on board). For the present work, the two lowest intervals were combined as were the three highest, yielding eight intervals to match the eight ORI curves for 'W'. There were also 11 values of 'V' in the ORI tables, with speeds ranging up to 11.3 meters per second (21.5 knots or 24.9 statute miles per hour), and 9 values of the collision angle. Thus 968 different combinations of these values are treated in determining transportation cask failure.

Table D4-3 Probabilities for Striking Ship Displacement

Displacement (metric ton)	Probability of Occurrence
0 - 10,160	0.15
10,161 - 20,321	0.25
20,322 - 30,481	0.25
30,482 - 40,642	0.05
40,643 - 50,802	0.05
50,803 - 60,963	0.05
60,964 - 71,123	0.10
71,124 - 152,407+	0.10

Table D4-4 Probabilities of Striking Ship Speeds

Speed (meters/second)[a]	Probability of Occurrence
0.0 - 1.028	0.0448
1.028 - 2.058	0.2538
2.058 - 3.087	0.1045
3.087 - 4.115	0.1343
4.115 - 5.144	0.1343
5.144 - 6.173	0.0896
6.173 - 7.202	0.0746
7.202 - 8.231	0.0597
8.231 - 9.260	0.0746
9.260 - 10.29	0.0149
10.29 - 11.32	0.0149

[a] *1 meters per second = 1.9 knots = 2.2 miles per hour*

Table D4-5 Probabilities of Striking Ship Angles of Incidence

Angle From the Normal (degrees)	*Probability of Occurrence*
0 - 10	0.2754
10 - 20	0.1305
20 - 30	0.0725
30 - 40	0.1305
40 - 50	0.1015
50 - 60	0.0724
60 - 70	0.1303
70 - 80	0.0435
80 - 90	0.0434

Speed During a Collision

In the following, 'M' and 'V' are the mass and transverse speed of the striking ship, while 'm' and 'v' denote the mass and transverse speed of the struck ship. Theta (θ) is the angle of impact, measured from the normal to the direction of the struck ship (this is the angle used by ORI, Minorsky and Petersen use its complement). The amount of virtual mass attributed to the struck ship to account for transverse hydrodynamic forces is 'dm'. W(x) denotes the work done in deforming the ships and compressing the cargo during a penetration to a depth 'x', and E_0 is the initial kinetic energy in the motion of the striking ship transverse to the struck ship.

The total energy in the transverse motion of the striking ship is:

$$E = MV^2 \cos^2(\theta)/2$$

Because energy is conserved during the collision, and neglecting turning effects,

$$E = \frac{MV^2}{2} + \frac{(m+dm)\,v^2}{2} + W(x)$$

Because momentum is conserved,

$$MV\cos(\theta) = MV + (m+dm)\,v$$

Together these equations yield a quadratic expression of the velocity of the struck ship:

$$\frac{Av^2}{2} - V\cos(\theta)\,v + \frac{W(x)}{m+dm} = 0$$

where A = (1+(m+dm)/M).

The value of the struck ship's transverse speed during the collision is, therefore,

$$v = \frac{V\cos(\theta)}{A} - \frac{1}{A}\sqrt{V^2\cos^2(\theta) - \frac{2AW(x)}{m+dm}}$$

The second term in this equation decreases to zero during the collision, yielding a terminal speed of $V\cos(\theta)/A$. This is also the terminal speed component of the striking ship in the same direction. The change in kinetic energy is (1-1/A)E = (m+dm)/(M+m+dm)E, in agreement with Minorsky.

Maximum Penetration Distance

The maximum penetration of the bow of the striking ship into the target ship was computed by finding, using Newton's method, the position at which the ships reached their terminal speed. From the conservation laws for energy and momentum, the condition for this to occur is:

$$0.5\,\mu\,V^2\cos^2(\theta) = W(x)$$

where $\mu = M(m+dm)/(M+m+dm)$, and $V\cos(\theta)$ is the initial normal speed of the striking ship. For the no cargo case, it was found that for each of the striking ship displacements considered, initial normal speeds of 8 meters per second (15.2 knots or 17.6 statute miles per hour) and 10 meters per second (19.0 knots or 22.0 statute miles per hour) were sufficient to cut completely through the struck ship, resulting in a probable sinking; refer to Figure D4-1. On the other hand, at 2 meters per second (3.8 knots or 4.4 statute miles per hour) only the four heavier ships would even penetrate the hull of the struck ship, and at or below 1 meters per second (1.9 knots or 2.2 statute miles per hour) the hull was not punctured for striking ships of any displacement.

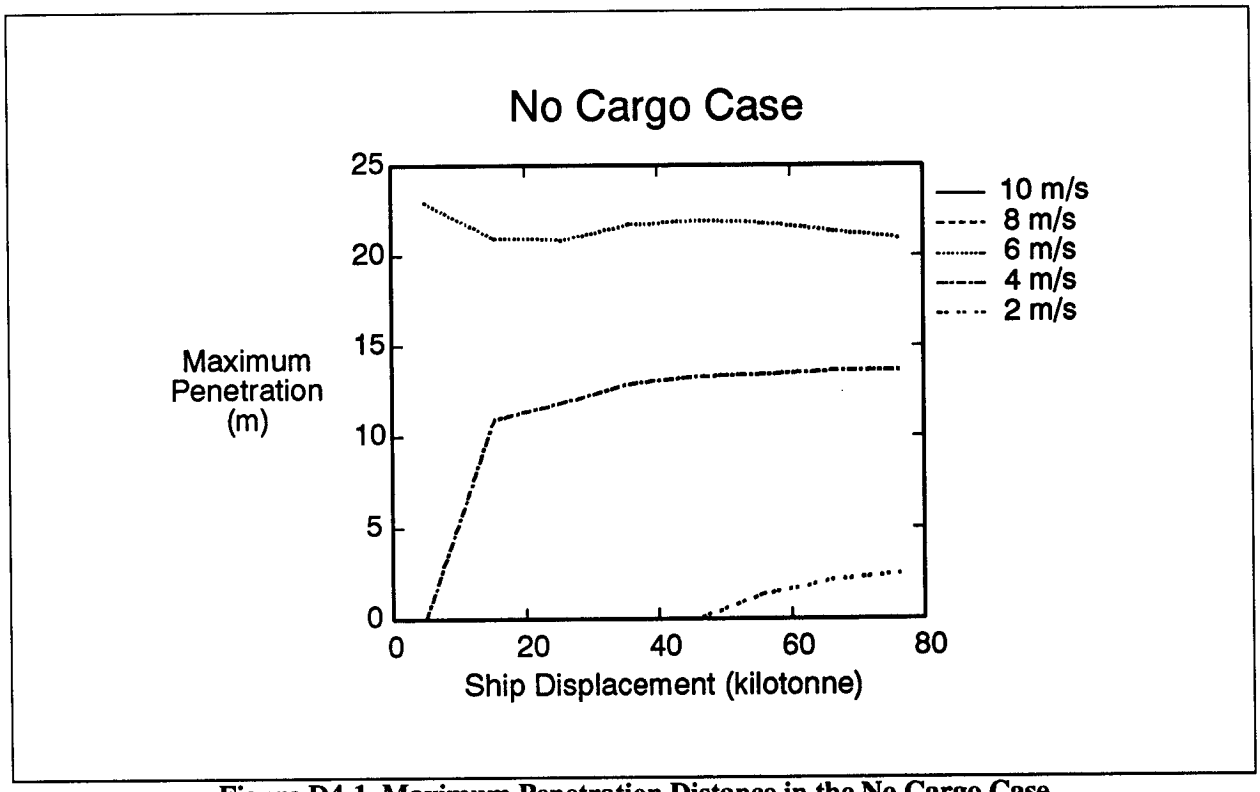

Figure D4-1 Maximum Penetration Distance in the No Cargo Case

Figure D4-2 shows the corresponding information for the light cargo case. Because of the packing fraction for this case, 0.6, the cargo effect does not begin until penetration has reached 15 m (49.2 ft). The figure shows the results as a function of the displacement of the striking ship, for normal impact speeds from 2 meters per second (3.8 knots or 4.4 statute miles per hour) to 10 meters per second (19.0 knots or 22.0 statute miles per hour). There were no cases where the struck ship would be completely cut through. At the two lower speeds, the cargo did not close up, hence was not a factor in absorbing the impact energy. There was no penetration at 1 meter per second (1.9 knots or 2.2 statute miles per hour) for any of the eight striking ship displacements considered.

The medium and heavy cargo results are shown in Figures D4-3 and D4-4, respectively. Figure D4-3 shows the cargo effect beginning at 5 m of penetration, and is important down to impact speeds of 4 meters per second (7.6 knots or 8.8 statute miles per hour). The cargo did not close up at smaller speeds, so was not a factor in determining the penetration depths. A similar result was obtained for heavy cargo; in both cases there was a strong influence by the cargo on the maximum penetration depth.

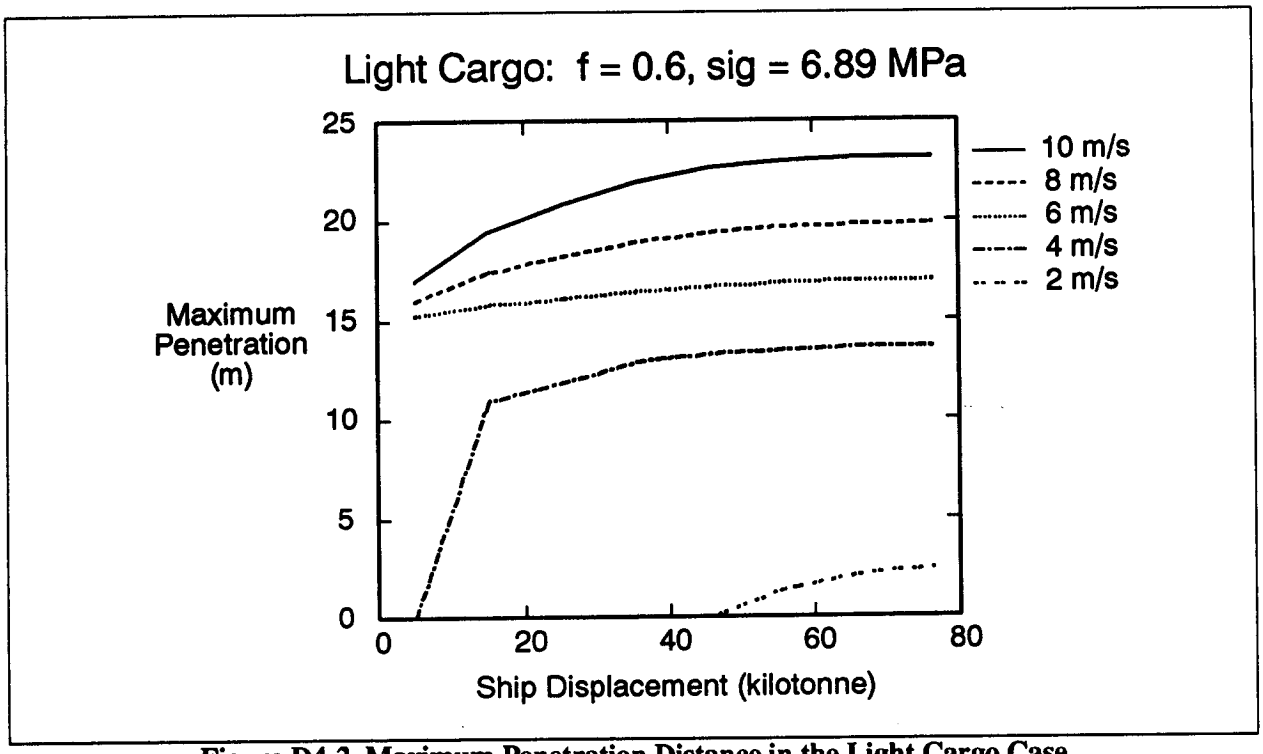

Figure D4-2 Maximum Penetration Distance in the Light Cargo Case

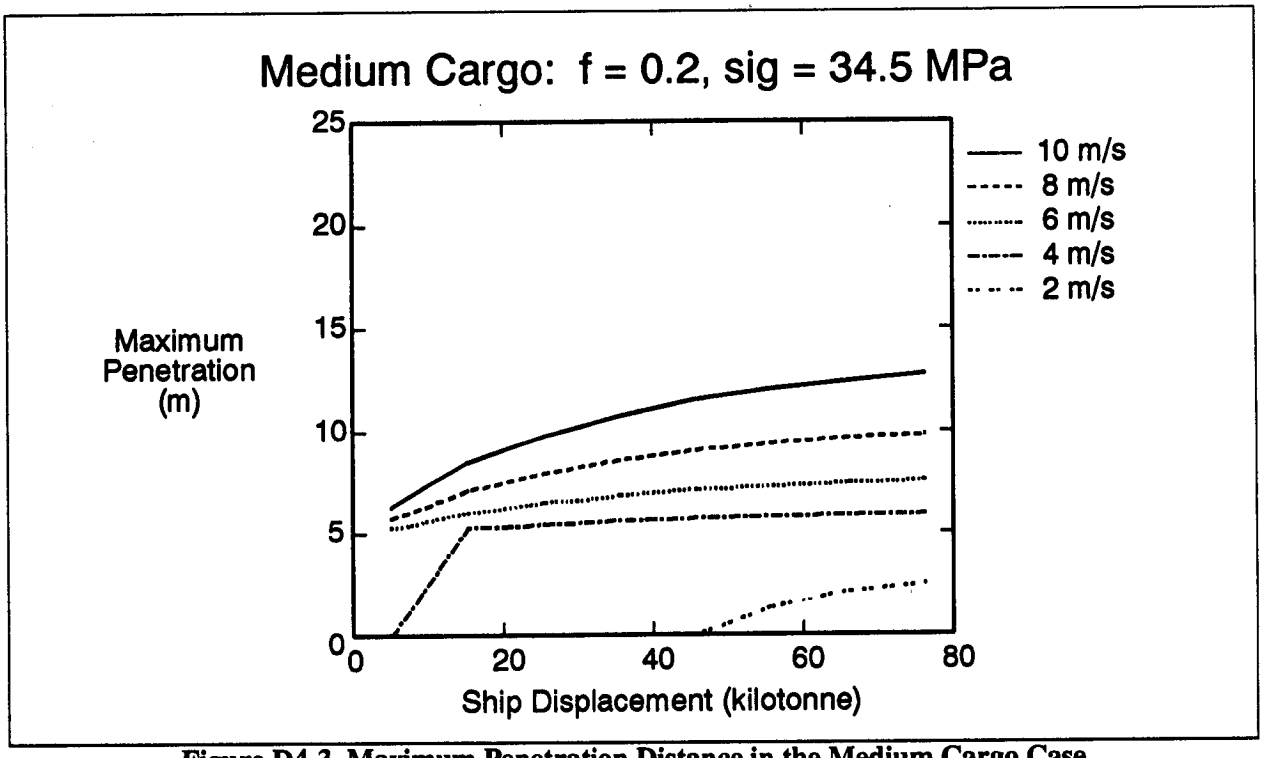

Figure D4-3 Maximum Penetration Distance in the Medium Cargo Case

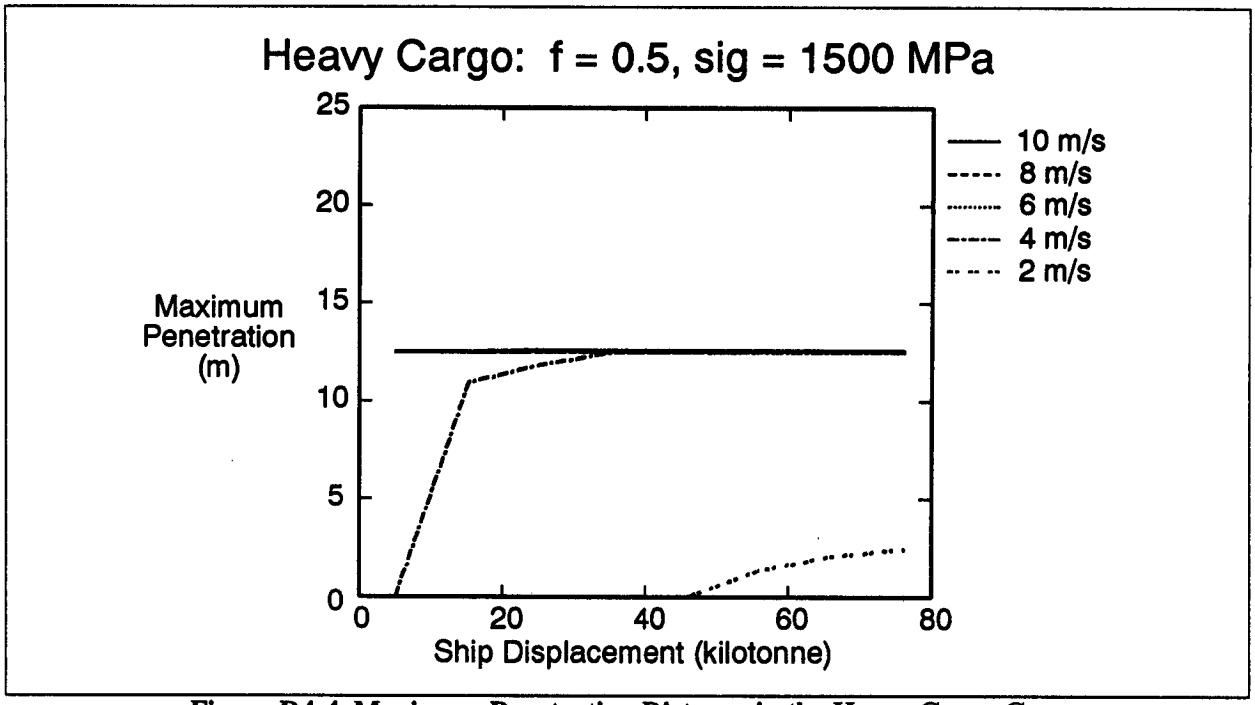

Figure D4-4 Maximum Penetration Distance in the Heavy Cargo Case

D4.2 Impact Forces During the Collision

Fuel elements experience impact forces if during a strong acceleration event they are driven against the inside of the cask or basket, or come into hard element to element contact. It is shown in Sanders et al., (Sanders, 1992) that accelerations of 100 g can be produced in the hypothetical accident conditions defined by NRC, which involve 9-m (29.5-ft) drops onto unyielding targets (NRC, 1990). They also showed there is a resulting cladding breach probability that for some power fuel types can be up to 0.0002 per rod in such events. We show here that the average acceleration experienced in ship collisions is very much smaller, usually below 1g, and conclude that inertial effects on the fuel are not significant for ship collisions.

The acceleration as a result of a ship collision is the time derivative of the transverse speed of the struck ship:

$$a = \frac{dv}{dt} = \frac{dv}{dx}\frac{dx}{dt} = v\frac{dv}{dx}$$

Performing the derivatives yields:

$$a = \frac{v(x)\,F(x)\,/(m+dm)}{\sqrt{V^2\cos^2(\theta) - \frac{2A\,W(x)}{m+dm}}}$$

where F(x) = dW(x)/dx. Notice that the acceleration peaks at the end of the collision, because the argument of the square root goes to zero there. The acceleration has a vertical asymptote at the maximum distance of penetration; the average acceleration, however, remains small.

The average acceleration during the collision is:

$$\langle a \rangle = \frac{\int_o^d a(x)dx}{d} = \frac{V^2 \cos^2(\theta)}{2dA^2}$$

where d is the maximum penetration depth. This is an improper integral since a (x) has a singularity at 'd'. However, the integrand increases sufficiently slowly in the neighborhood of 'd', like $(x-d)^{-1/2}$, for the integral to converge.

When there is no other cargo in the hold with the spent fuel cask, the average acceleration is only a fraction of 1g (9.8 meters per second^2) in all cases, with the average acceleration always less than 5 meters per second^2. Similar results hold for the light and medium cargo cases. Even in the extreme case of heavy cargo, the average accelerations found were less than 2.5g. The highest acceleration, corresponding to a 75,000 metric tons (82,500 ton) ship striking with a normal speed of 10 meters per second (19.0 knots or 22.0 statute miles per hour), was about 0.2g (2 meters per second^2).

Because of these low average accelerations, generally on the order 1 percent relative to the accelerations expected in the NRC regulatory accident conditions, impact of fuel elements inside the cask is not expected to do any damage to the fuel as a result of collisions either in port or on the high seas. We conclude $P_{impact} = 0.0$.

D4.3 Crush Loads on the Fuel Package During the Collision

The spent fuel package of interest is the Pegase transportation cask, a cask of french design. It is a lead shielded cask, with a mass of 18.9 metric tons (20.8 ton), a diameter of 1.875 m (6.2 ft), and a height of 2.239 m (7.3 ft). It has a body composed of two stainless steel shells built around a lead shield. It is designed to carry fuel or other radioactive material in baskets of differing design which fit into the cylindrical cavity of the cask. A detailed analysis of the mechanical response of the Pegase transportation cask to crush forces is not available, however it is similar in construction to the lead shielded cask analyzed in the study of Fischer et al., (1987).

Fischer et al., developed a curve for the static force versus deflection for sidewise loading of a cask which was 4.9 m (16.1 ft) high, with a lead shield 0.133 m (0.4 ft) thick enclosed by an outer layer of stainless steel 0.0318 m 1.25 in) thick and an inner layer 0.0127 m (0.5 in) thick. Because a Pegase transportation cask is much shorter, but of similar construction, it will be at least as resistant to sidewise loading as Fisher's generic lead shielded cask. Fisher's results show that it requires a load of about 8.9 million newtons to produce a deflection of the cask body of 0.0254 m (1 in). A deflection of 0.0254 m (1 in) is judged to be a conservative deflection that could occur without damage to the fuel. Said another way, sidewise cask loading on a Pegase transportation cask in excess of 8.9 million newtons would probably result in some disruption of the fuel. Now the questions is, can crush forces on the cask as high as 8.9 million newtons be produced in a ship collision? To the extent that the homogeneous cargo models are applicable, the answer is "yes." The force applied by the cargo in these models, after closeup, is a constant equal to:

$$F_{cargo} = \sigma\, hd$$

where σ is the cargo crush strength, and 'hd' is the cross sectional area of the cask; for the Pegase transportation cask, 'hd' is 4.198 m^2 (45.2ft^2). Thus, the force in the light cargo case is 56.0 million newtons, and for the medium and heavy cargo cases it is many times larger. These values so far exceed the damage threshold at 8.9 million Newtons that major damage to the fuel and cask can be expected.

But if the cargo does not close up because the penetration is shallow or there is no other cargo in the hold, the cask does not see this force. Then, unless it is within the penetration region, it will not be significantly affected.

Inside the penetration region the cask can be crushed without the cargo going solid, or even if there is no other cargo in the struck hold. Cask tiedowns are designed, under U.S. regulatory practice, to withstand about 5 million newtons of transverse force (NRC, 1990). The difference between this value and the 8.9 million newtons required to produce a 0.025 m (1.0 in) deflection in the cask wall of the generic cask is not considered significant; moreover in ORI's opinion "the RAM [Radioactive Material] package could conceivably be restrained from sliding, even in an empty hold, after the fittings failed. A buckled deck for example could do this and in effect act as an infinitely strong fitting" (ORI, 1981a).

Thus there are two cases to consider for failure due to crush forces. In the first the penetration depth exceeds the cargo close-up distance, while in the second it exceeds the cask stowage location. We assume fuel damage and closure failure in both types of events.

Cask Failure Probability

This section evaluates the probability that a cask will fail when the ship carrying it is struck in a collision with another ship. Since there are two different scenarios, the total probability of cask failure is the sum of two terms, one of cargo going solid, the other for the ship over-running the cask location, or

$$P_{\text{crush}} = P_{\text{solid}} + P_{\text{contact}}.$$

P_{solid} and P_{contact} were evaluated by comparing the maximum penetration distance against the closeup distance and the stowage position, assumed to be on the centerline of the hull, for all combinations of striking ship displacement, speed, and angle given in Tables D4-3 to D4-5. Each individual case was counted as either resulting in cask failure (meaning the fuel is damaged and the cask seal is broken) or not, and the probability of the case was assigned according to the probability values in the referenced tables. The sum $P_{\text{solid}} + P_{\text{contact}}$ of the probabilities of all failure cases is P_{crush}.

The results are shown in Figure D4-5. The successive columns refer to the four models considered, for no cargo, and light, medium and heavy cargo. For other than the medium cargo model, the total crush probability is about 0.29, although the fraction due to the cargo going solid varies from 0 for the no cargo case to 1 for the heavy cargo case. The medium case, which as the smallest fraction of open hold space at 0.2, also has the highest failure rate, about 0.45. Of the four cases considered, this is the only case where the cargo goes solid well before the midline of the ship is reached, thus permitting a greater proportion of all the collisions to be significant from a cask damage point of view. Since this case shows the greatest probability, it is conservative to take $P_{\text{crush}} = 0.45$.

Alternate Case

Because the top speed in a harbor is controlled, the ORI distribution was adjusted to a top speed of 8.23 meters per second (15.6 knots or 18.1 statute miles per hour). This reduced the number of speed intervals to eight, and eliminated the three highest speed categories in Table D4-4. The total number of combinations of striking ship displacement, speed, and angle was therefore reduced from 968 to 704. Figure D4-6 shows the revised cask failure probabilities for the four cases. The highest failure probability is still from the medium cargo case, probably because this case has the earliest cargo closeup distance and fails most often from collisions which do not penetrate far into the target ship. The failure probability goes down more in the other cases because they involve penetrations going past the midline of the ship. Such events are sensitive to the high end of the speed distribution. The cask crush probability for this alternative is set equal to the largest result, $P_{\text{crush}} = 0.40$.

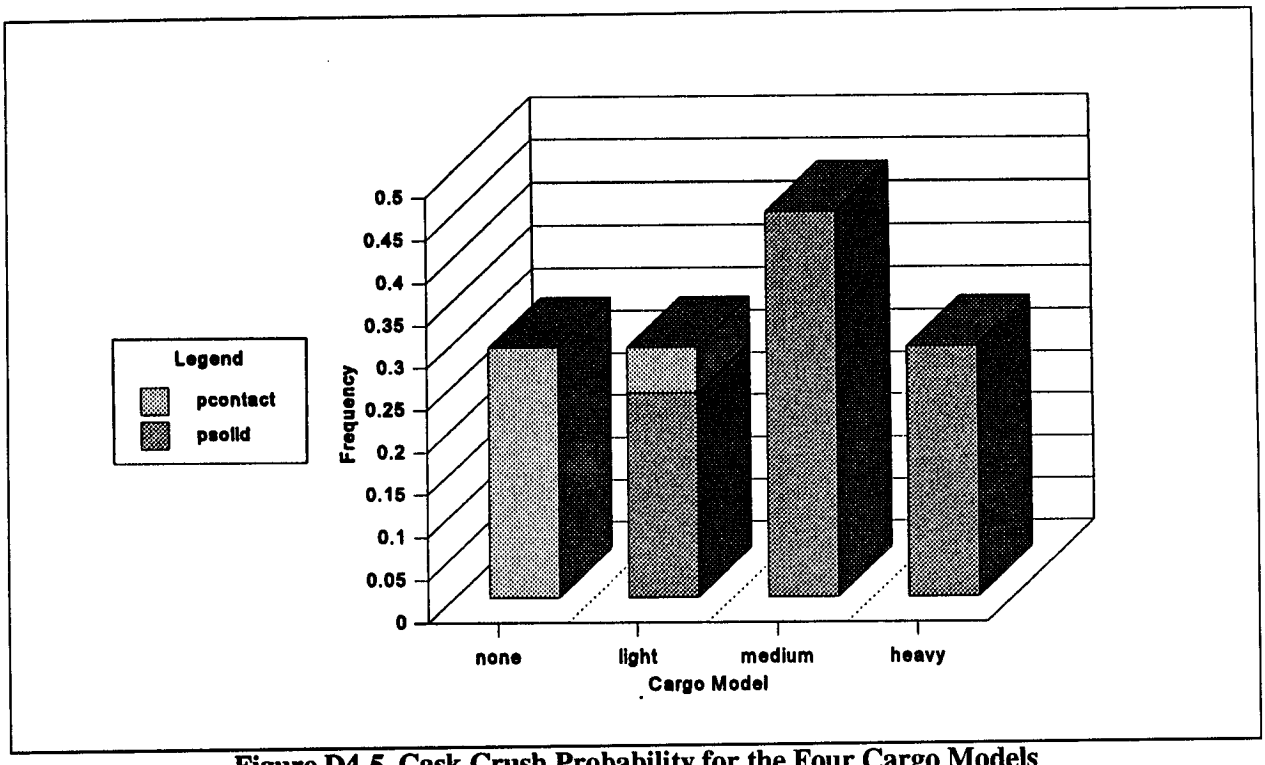

Figure D4-5 Cask Crush Probability for the Four Cargo Models

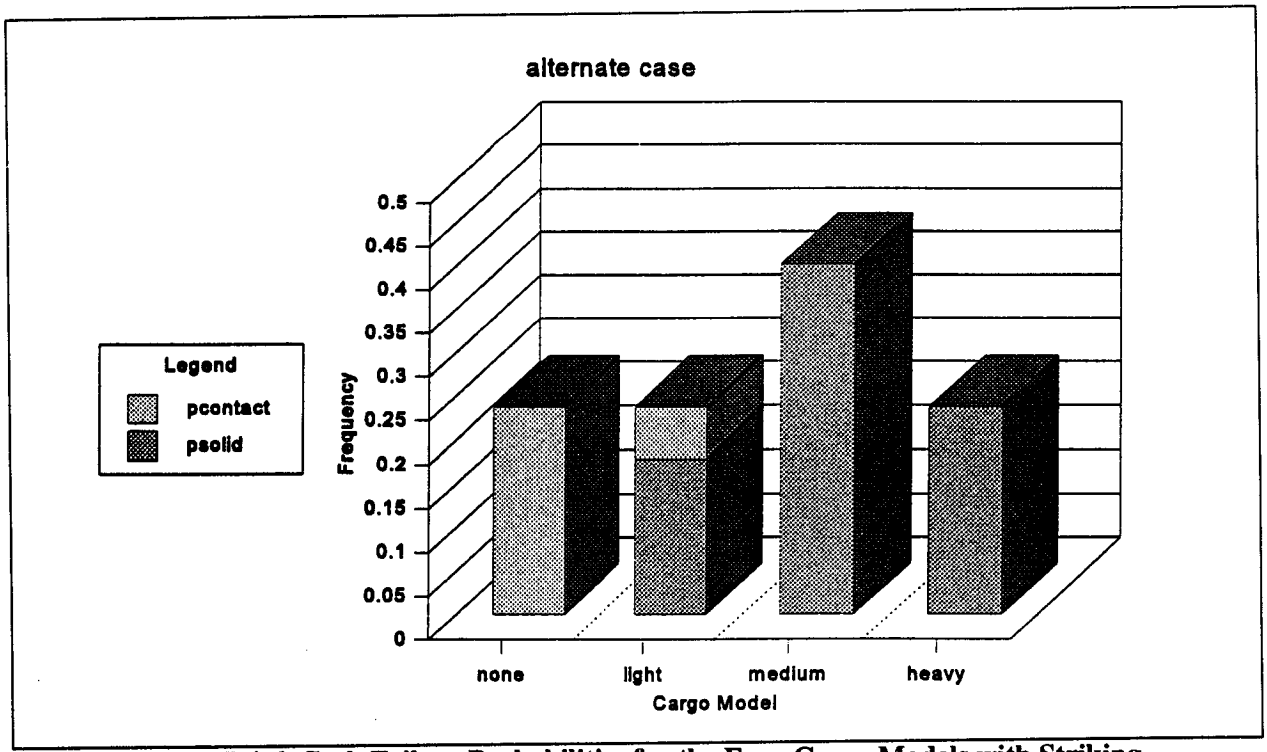

Figure D4-6 Cask Failure Probabilities for the Four Cargo Models with Striking Ship Speeds Truncated at 8.23 m/s

Attachment D5
High Temperature Effects on Research Reactor Fuel Release Fractions

D5.1 Introduction

Previous assessments of the accident risks associated with the transport of research reactor fuel did not specifically address certain high temperature (somewhat above 900°K or 1160°F) effects on the fuel. In this temperature range, aluminum based fuels (the aluminum-uranium alloys used in research reactor fuels) are susceptible to melting. Additionally, TRIGA fuel is spontaneously combustible in this same temperature range, if sufficient oxygen is available. The melting point for the uranium dioxide fuels that had been used as the basis for the development of estimates of the release fractions for earlier assessments is considerably higher than for the aluminum based fuels. These earlier assessments were the basis for the release fractions used in the base case analysis of this study. This attachment provides an assessment of the impact of these high temperature effects on the release fractions, and the probabilities of the accident severity categories, used in the base case study. This assessment forms the basis for the sensitivity study provided in Section 5.4.3.2 of Appendix D.

D5.2 Fission Product Release At High Temperatures

Table D-21 shows that accident severity category 4 accidents are caused by a ship collision that fails the seal of the spent fuel transport cask; that category 5 accidents add a severe engulfing fire to the conditions that characterize category 4 accidents; and that category 6 accidents assume an engulfing fire and a more severe cask failure (one medium sized hole or two or more small holes), one that allows the severe fire to induce substantial convective flow of air through the failed cask. Table D-21 also shows that the principal difference between severity category 5 and severity category 4 release fractions is a five order-of-magnitude increase (from 1.0×10^{-8} to 9.0×10^{-4}) in the release fraction for cesium; and that the principal difference between severity category 6 and severity category 5 release fractions is a 42-fold increase (from 1.0×10^{-6} to 4.2×10^{-5}) in the release fraction for ruthenium.

Much increased cesium volatility at the elevated temperatures to which the spent fuel is heated by the severe fire is the cause of the five order-of-magnitude increase in cesium release assumed for category 5 accidents. Conversion of elemental ruthenium to volatile ruthenium oxide (RuO_4) by oxygen, due to convective air flow through the failed cask, is the cause of the 40 fold increase of ruthenium release assumed for category 6 accidents.

The release fractions listed in Table D-21 and used in the base case analysis were constructed from release estimates developed (Wilmot, 1981; Wilmot et al., 1981) for power reactor fuel (uranium dioxide pellets clad in zircaloy). The fuels used in research reactors are not uranium dioxide pellets clad in zircaloy. TRIGA reactors use large pellets formed from a mixture of uranium, zirconium, and zirconium hydride (ZrH_2) that are clad in stainless steel. All of the other reactors considered in this assessment (BR-2 and RHF) use aluminum-clad metallic fuels where the metal is an alloy of aluminum and uranium (Al-U). At elevated temperatures (above 900°K or 1,160°F) these fuels melt and, if exposed to air, TRIGA fuel burns. Therefore, if a ship collision leads to a fire that heats these fuels to temperatures much above 900°K (1,160°F), fission product releases from these fuels will differ markedly from that predicted for uranium dioxide power reactor fuels. Therefore, the properties of metallic aluminum-uranium alloy fuels and of TRIGA fuel were reviewed to identify any significant differences between releases from these fuels and releases from power reactor fuel when these fuels are heated to elevated temperatures.

The BR-2, and RHF fuels considered by this study are fabricated as stacks of aluminum-uranium alloy plates or cylinders that are contained in aluminum-cladding. Release of fission products from aluminum-uranium alloy fuels has been reviewed (Ellison, 1993). Fission product release is minor below about 923°K (1,202°F), the melting point of the aluminum-uranium alloy from which these fuels are fabricated. Once the aluminum-uranium alloy has melted, fission products volatile at melt temperatures are rapidly released to the gas space above the molten alloy. Although molten aluminum can dissolve both the stainless steel spacers that support individual fuel bundles and the alloy fuel plates, melting of the aluminum-cladding that surrounds these alloy fuels does not significantly affect release because the melting temperature of the clad, 933°K (1,220°F), is slightly higher than the melting temperature of the alloy fuel.

The effects of air ingression on the release of fission products from commercial reactor fuel have been reviewed (Powers, 1994). That review indicates that ruthenium release fractions from uranium dioxide fuel will equal or exceed 4.2×10^{-5}, the release fraction for ruthenium used in the base case analysis for category 6 accidents, if the fuel is exposed to air for 15 to 30 minutes while heated to 700°K (800°F). The review also indicates that release increases rapidly as temperature rises or exposure times lengthen, and that for temperatures less than 1,200°K (1,700°F), ruthenium is released principally as ruthenium-oxide.

TRIGA fuel is a uranium-zirconium-hydrogen alloy that burns spontaneously in air at temperatures above 925°K or 1,205°F (Benedict, 1981). Because this combustion process is highly exothermic, if a severe fire heats a failed cask containing TRIGA spent nuclear fuel to temperatures above 925°K (1,205°F), air ingression due to convection or contraction of cask gases upon cask cooling would be expected to initiate spontaneous combustion of the fuel alloy, which should lead to substantially increased release from the fuel to the cask interior of krypton, cesium (most likely as cesium hydroxide, CsOH), and ruthenium [by conversion to volatile ruthenium oxide (RuO_4)].

Theoretical (NRC, 1988; SNL, 1989; GNS, 1993; Shaffer, 1994) and experimental (Babrauskas, 1986b; Nelsen, 1986; Gregory, 1987; Gregory, 1989; Schneider, 1989; Keltner, 1994) estimates of the thermal loads on casks produced by engulfing fires indicate that only engulfing fires with durations of an hour or more caused by the combustion of high-grade fuels (gasoline, jet fuel, diesel fuel) with an ample oxygen supply can raise the spent fuel contained in the casks to temperatures that approach 1,000°K (1,340°F). These studies also indicate that cask temperatures this high are not attained for fires of similar duration caused by poorer fuels (e.g., crude oil, wood). Thus, short duration fires involving low-grade fuels or mixtures of low and high-grade fuels are unlikely to raise cask temperatures high enough to significantly increase cesium vaporization or to cause substantial conversion of ruthenium to volatile ruthenium oxide. Fires involving high-grade fuels that are oxygen-starved because hold covers are closed or suppressed by the operation of fire fighting systems are also unlikely to result in elevated release fractions. Conversely, engulfing fires of about one hour duration that involve high-grade fuels could, for some accidents, be able to heat cask interiors to temperatures where (1) aluminum-uranium alloy fuels melt, (2) krypton, cesium, and ruthenium are easily vaporized, both from TRIGA fuel pellets and from melted aluminum-uranium alloy fuels, and (3) conversion of ruthenium to ruthenium oxide is substantial, if either fuel is exposed to air. The impact of these high temperature affects on the accident severity category 5 and 6 release fractions are discussed in the following paragraphs.

Accident Severity Category 5

When fuel temperatures remain below 900°K (1,160°F), that is, below the ignition point of TRIGA fuel in air and the melting point of aluminum-uranium alloy fuels, the release fractions from TRIGA fuel should be similar to that from uranium dioxide fuels. Also, the releases from aluminum-uranium alloy fuels should be very small, perhaps negligible, since diffusion in the metal plates from which the fuel is fabricated will be too slow to cause significant release to the cask, much less to the environment.

When research reactor fuels are heated significantly above 900°K (1,160°F) the release to the cask from TRIGA fuel pellets and from melted aluminum-uranium alloy fuels of krypton, volatile cesium, and ruthenium should be substantial (Cubicoitti, 1984; Cordfunke, 1990). Once released to the cask interior, transport of these fission products from the cask to the environment (past the failed cask seal) will only be efficient when the gases in the cask expand significantly due to heating of the cask to temperatures well above 900°K (1,160°F). For example, if melting of an aluminum-uranium alloy fuel at 923°K (1,202°F) causes essentially all of the krypton trapped in the fuel to be released to the cask interior, then further heating of cask gases to 1,023°K (1,382°F) by the fire will cause approximately 10 percent of the gases in the cask, including the krypton that escaped from the fuel to the cask interior, to be lost to the environment by expansion past the failed cask seal.

After the fire dies out, cooling of the hot cask will cause air to be drawn into the cask as the gases in the cask cool and contract. Thus, almost any hot fire of substantial duration will lead to substantial air ingression into a failed cask. Enhanced ruthenium release will then occur only if large amounts of fuel are exposed to the air, if this exposure occurs when the fuel is still hot enough to allow ruthenium to be oxidized to a volatile species, and if there is a transport process operating that causes the volatile ruthenium species to be released from the failed cask.

Because aluminum-uranium alloy fuels are molten at temperatures above 923°K (1,202°F), after air is drawn into the cask by cooling, if still molten, substantial exposure of fuel to air will occur, and therefore oxidation of ruthenium to ruthenium oxide will occur. However, after release to the cask interior, release of ruthenium to the environment can only occur by an inefficient transport mechanism, diffusion against the inflow of air since the cask is now cooling down. Thus, category 5 accident conditions, even those that reach unusually high temperatures, are not expected to significantly increase ruthenium release from aluminum-uranium alloy fuels, unless after dying down and drawing air into the cask, the fire flares up anew and again heats the cask to elevated temperatures whereupon gas expansion would transport some of the oxidized ruthenium vapors from the cask to the environment.

Because TRIGA fuel burns spontaneously and exothermically at temperatures above 900°K (1,160°F), if cask cooling draws air into a cask that contains TRIGA fuel while the fuel is still at such elevated temperatures, fuel burning will convert ruthenium to ruthenium oxide, and heating of the fuel and the cask gases by the highly exothermic oxidation of the hydride fuel will cause the oxidized ruthenium to vaporize, the cask gases to expand, and some of the vapors to be transported from the cask to the environment.

Accident Severity Category 6

During category 6 accidents, release from fuel to the cask interior of krypton, cesium, and ruthenium (after conversion to ruthenium oxide by exposure to air), occurs by the same processes that were just discussed for category 5 accidents. Gas convection through the failed cask is, by definition, substantial during category 6 accidents. Exposure of hot fuel to air causes substantial conversion of ruthenium to ruthenium oxide. Additionally, all vapors released from the fuel to the cask are transported from the cask to the environment by the convective flow of gases.

D5.3 Release Fractions for High-Temperature Events

The discussion presented in Section D5.2 indicates that, at elevated temperatures, release fractions for aluminum-uranium alloy and TRIGA fuels will differ substantially from those assumed in earlier studies of research reactor fuel transportation accidents for category 6 events and also for category 5 events that reach unusually high temperatures. To allow the consequences of such high-temperature events to be examined, the severity category strategy used in the base case analysis was modified by dividing both categories 5 and 6 into a low temperature and a high temperature category. Release fractions were then estimated for all of the categories in the modified strategy (categories 4, 5A and 5B, and 6A and 6B) and sensitivity calculations were performed to estimate the effects of the new release fractions on accident consequences.

Fire events that do not heat cask contents above 900°K (1,160°F) are placed in categories 5A and 6A. Fire events that heat cask contents above 900°K (1,160°F) are placed in categories 5B and 6B. Events that lead to seal failure are placed in category 4 and 5. Events that lead to cask failures (one medium hole, two or more small holes) that allow significant convective flow of gases through the failed cask are placed in category 6. Thus, transport of fission products released from fuel to the cask interior for category 5 events must be driven by expansion of cask gases due to heating of the cask by the fire, while for category 6 events, transport from the cask to the environments is efficiently driven by convective flow of gases through the cask. Table D5-1 summarizes the attributes of the modified severity categories.

Table D5-1 Category Attributes for the Modified Release Category Strategy

Category	*Cask Failure Mode*	*Transport from Cask*	*Temperature of Cask Contents*
5A	Seal Failure	Gas Expansion	T< 900°K
5B	Seal Failure	Gas Expansion	T> 900°K
6A	One medium hole, two small holes	Convection	T< 900°K
6B	One medium hole, two small holes	Convection	T> 900°K

Table D5-2 presents the release fractions developed for this modified strategy. Summarized in the footnotes of Table D5-2 are the basis for these release fractions. This table also compares the revised release fractions to the release fractions that were used in all of the base case calculations performed in this study. The sensitivity calculations that were performed using these new release fraction are described in Appendix D Section 5.4.3.2.

Table D5-2 Modified Release Fractions for Severity Categories 4, 5, and 6

Severity Category	*Study*	*Fuel*	*Chemical Element Group*			
			Krypton	*Cesium*	*Ruthenium*	*Particulate*
4	Base Case	Both	0.01	1.0x10-8	$1.0x10^{-8}$	$1.0x10^{-8}$
	Sensitivity Case	TRIGA	0.1	1.0x10-7	$1.0x10^{-7}$	$1.0x10^{-7}$
		Aluminum-uranium	$1.0x10^{-8}$	$1.0x10^{-8}$	$1.0x10^{-8}$	$1.0x10^{-8}$
5	Base Case	Both	0.1	$9.0x10^{-4}$	$1.0x10^{-6}$	$5.0x10^{-8}$
5A	Sensitivity Case	TRIGA	0.26	$1.0x10^{-3}$	$2.3x10^{-6}$	$1.3x10^{-6}$
		Aluminum-uranium	$1.3x10^{-7}$	$1.3x10^{-7}$	$1.3x10^{-7}$	$1.3x10^{-7}$
5B	Sensitivity Case	TRIGA	0.31	$1.1x10^{-2}$	$9.8x10^{-3}$	$3.3x10^{-4}$
		Aluminum-uranium	0.098	$9.8x10^{-3}$	$1.7x10^{-6}$	$3.0x10^{-7}$
6	Base Case	Both	0.11	$9.8x10^{-4}$	$4.2x10^{-5}$	$5.0x10^{-8}$
6A	Sensitivity Case	TRIGA	0.35	$1.6x10^{-3}$	$3.6x10^{-6}$	$2.0x10^{-6}$
		Aluminum-uranium	2.0x10-7	$2.0x10^{-7}$	$2.0x10^{-7}$	$2.0x10^{-7}$
6B	Sensitivity Case	TRIGA	1.0	0.3	0.3	0.01
		Aluminum-uranium	1.0	0.1	$1.6x10^{-5}$	$1.6x10^{-6}$

In order to develop release fraction values for the sensitivity study accident categories, several parameters need to be defined. These parameters are defined in Table D5-3.

Table D5-3 Definitions of Parameters used in the Sensitivity Study Accident Categories

F_{B1}	Fraction of fuel elements failed by the ships collision
F_{C1}	Release fraction for fission products from the fuel to the cask cavity due to the mechanical effects of the ship collision
F_{CE1}	Fraction of the fission products released to the cask cavity that escape from the cask in the absence of a fire
F_{FC2}	Fraction of fission products released from the fuel to cask cavity due to heating of the fuel from ambient temperature (T_a)to some elevated temperatures (T_f) less than 900°K
F_{B2}	Fraction of the fuel elements failed by burst rupture due to heating from T_a to T_f
F_{CE2}	1 - (T_a/T_f) where $T_a/T_f = V_a/V_f$ = the fraction of the gases in the cask at ambient temperature that remain in the cask after heating to Tf
F_{FC3}	Fraction of fission products released from the fuel to the cask cavity after the fuel has been heated to T_{FC3}(=temperature where aluminum-uranium fuel melts and TRIGA fuel burns if exposed to air
F_{B3}	The fraction of fuel elements failed by burst rupture due to heating from T_{FC3} to T_f
F_{CE3}	1 - (T_{FC3}/T_f) where $T_{FC3}/T_f = V_{TC3}/V_f$ = the fraction of the gases in the cask after heating to T_{FC3} that remain in the cask after further heating to T_f

Then, the release fraction (F_{R4}) for Category 4 events is given by

$$F_{R4} = F_{B1}F_{FC1}F_{CE1} \quad (1)$$

If the collision leads to a fire that heats the cask to elevated temperatures that do not exceed 900°K (1160°F) heating of the fuel may cause more fission products to be released from the fuel to the 900° cask cavity, and expansion of cask gases due to heating by the fire will cause a substantial fraction of the gas borne fission products to be transported from the cask interior through the failed cask seal to the environment. Thus, the release fraction (F_{R5A}) for Category 5A events is given by

$$F_{R5A} = F_{R4} + F_{B1}F_{FC1}(1 - F_{CE1})F_{CE2} + F_{B2}F_{FC2}F_{CE2} \quad (2)$$

If the collision has led to cask failures (a single medium hole or two smaller holes) that allow substantial convective flow through the cask, then all fission products released to the cask interior will be transported from the cask to the environment. Thus, the release fraction (F_{R6A}) for Category 6A events is given by

$$F_{R6A} = F_{R4} + F_{B1}F_{FC1}(1 - F_{CE1}) + F_{B2}F_{FC2} \quad (3)$$

as by definition $F_{CE2} = 1.0$ for Category 6 events.

The release fraction (F_{R58}) for fire events that heat the cask to temperatures above 900°K (1160°F), i.e. Category 5B events where Al-U alloy fuels melt and TRIGA fuel burns if exposed to oxygen is given by

$$F_{R5B} = F_{R5A} + F_{B3}F_{FC3}F_{CE3} \quad (4)$$

where

Again, if a Category 6 event has occurred, the release fraction (F_{R6B}) will be

$$F_{R6B} = F_{R6A} + F_{B3}F_{FC3} \quad (5)$$

since by definition $F_{CE3} = 1.0$ for Category 6 events.

The release fractions used in the base case assessment are the same as those (Wilmot 1981) developed for air-cooled casks for release of fission products from spent commercial UO_2 fuel for three processes: impact, burst, and oxidation. Base case Category 4 release fractions are the same as those developed by Wilmot for impact events involving air-cooled casks. Except for cesium, Category 5 release fractions are equal to the sum of Wilmot's release fractions for impact and burst, and Category 6 release fractions are equal to the sum of Wilmot's release fractions for impact, burst, and oxidation. For cesium, the base case uses release fractions that have been adjusted somewhat to reflect the effect of metallic fuel properties on cesium release. This information is used as the basis to derive several of the values for the parameters identified in Table D5-3.

For impact events, Wilmot uses $F_{B1} = 0.1$, $F_{FC1} = 0.2$ and $F_{CE1} = 0.5$ for krypton; and $F_{FC1} = 2x10^{-6}$ and $F_{CE1} = 0.05$ for cesium, ruthenium and particulates for release of fuel fines and thus the fission products trapped in the fines. For burst events, Wilmot assumes that $F_{B2} = 0.9$. Table D5-2 shows that the base case used values of 0.1, $9x10^{-4}$, $1x10^{-6}$, and $5x10^{-8}$, respectively, for the release fractions for krypton, cesuim, ruthenium, and particulates for Category 5 events. If Equation 2 is solved for F_{FC2} using the base case values for Category 5 events for F_{R5A} and Wilmot's values for F_{B1}, F_{B2}, F_{FC1}, and F_{CE1}, then the following values are obtained for F_{CE2}: 0.15 for krypton, $1.6x10^{-3}$ for cesium, $1.6x10^{-6}$ for ruthenium, and 0 for particulates.

The analysis presented in Attachment D4 of cask damage caused by impact and crush concludes that damage will not result from the impacts forces experienced by cask during ship collisions, and that if the cask is subjected to crush forces, they will always be large enough to fail all of the fuel elements contained in the cask. Therefore, $F_{B1} = F_{B2} = F_{B3} = 1.0$.

To facilitate comparison of the new release fractions developed here to the release fractions used in the base case, the release fractions for the cesium, ruthenium, and particulate chemical element groups for Category 4 events were forced to be the same as the value used in the base case. Although aluminum-uranium alloy fuels should have very little, if any, fuel fines associated with the metal plates from which the fuel bundles are fabricated, to achieve this equivalence, it was assumed that aluminum-uranium alloy fuels have amounts of fuel fines one-tenth of those assumed by Wilmot for uranium dioxide fuels. Thus, for aluminum-uranium alloy fuels, $F_{FC1} = 2x10^{-7}$ and therefore, because $F_{B1} = 1.0$, $F_{R4} = 2x10^{-8}$, which is the value that the base case used for the realease fraction for cesium, ruthenium, and particulate for Category 4 events.

Reasonable choices for F_{FC3} for aluminum-uranium alloy fuels, that is, for release to the cask cavity upon melting for the alloy fuel, are 1.0 for krypton, 0.1 for cesium, $1.6x10^{-5}$ for ruthenium, and $1.6x10^{-6}$ for particulate, where ruthenium release from metallic fuel upon melting has been assumed to be ten times the ruthenium release from commercial uranium dioxide fuel estimated for Category 5A events (the value of F_{FC2} for ruthenium release from uranium dioxide fuel for Category 5A events. Particulate release has been assumed to be about the same as ruthenium release from uranium dioxide fuel for Category 5A events and about ten times larger than particulate releases from aluminum-uranium alloy fuels for Category 4 events (the value of F_{FC1} for particulate release from aluminum-uranium alloy fuels for Category 4 events), as the melting of aluminum uranium alloy fuels due to heating of the cask by a fire is not likely to be violent.

Reasonable choices for F_{FC3} for TRIGA fuel are 1.0 for krypton; 0.3 for cesium; 0.3 for ruthenium, since burning of the fuel means that ruthenium will be converted to a volatile oxide by exposure to air; and 0.01 for particulate, on the assumption that the high exothermicity of the combusion process will cause one percent of the fuel mass to be aerosolized. For Category 5B, these values were decreased by a factor of 3, because air can only enter the cask due to cooling, which will not lead to fuel burning if the fuel cools

below 900°K, (1160°F). Even if burning does occur, efficient transport of fission products released by the burning from the cask to the environment can occur only by gas expansion caused by the heat released by fuel burning. Thus, the cask atmosphere must breath (pass through several cooling/burning cycles), if significant quantities of fission products are to be released by fuel burning, when there is no convective flow of air through the cask.

Table D5-4 lists the parameters used in Equations 1 through 5, and presents the values used for each parameter to calculate values for the release fractions F_{R4}, F_{R5A}, F_{R6A}, F_{R5B}, and F_{R6B}. For the four EA5 results for UO_2 fuel, the result calculated is the F_{FC2} value, not the F_{R5} value, which is an input and is set equal to the value used in the EA for the indicated element group.

Table D5-4 Parameters Used to Generate High Temperatures Fire Sensitivity Study Release Fractions

Accident Category	*Fuel*	*Element*	*Parameter*[1]									
			F_{B1}	F_{C1}	F_{CB1}	F_{B2}	F_{FC2}	T_a	T_{FC3}	T_f	F_{FC3}	F_R
Base Case 4		krypton	0.1	0.2	0.5							0.01
		all others	0.1	$2x10^{-6}$	0.05							$1x10^{-8}$
Base Case 5		krypton	0.1	0.2	0.5	0.9	0.15	300		800		0.1
		cesium	0.1	$2x10^{-6}$	0.05	0.9	$1.6x10^{-3}$	300		800		$9x10^{-4}$
		ruthenium	0.1	$2x10^{-6}$	0.05	0.9	$1.6x10^{-6}$	300		800		$1x10^{-6}$
		particulates	0.1	$2x10^{-6}$	0.05	0.9	0.0	300		800		$5x10^{-8}$
Sensitivity Study 4	Al-U	all	1.0	$2x10^{-7}$	0.05							$1x10^{-8}$
	TRIGA	krypton	1.0	0.2	0.5							0.1
	TRIGA	all others	1.0	$2x10^{-6}$	0.05							$1x10^{-7}$
Sensitivity Study 5A	TRIGA	krypton	1.0	0.2	0.05	1.0	0.15	300		800		0.26
	TRIGA	cesium	1.0	$2x10^{-6}$	0.05	1.0	$1.6x10^{-3}$	300		800		0.001
	TRIGA	ruthenium	1.0	$2x10^{-6}$	0.05	1.0	$1.6x10^{-6}$	300		800		$2.3x10^{-6}$
	TRIGA	particulates	1.0	$2x10^{-6}$	0.05	1.0	0.0	300		800		$1.3x10^{-6}$
	Al-U	all	1.0	$2x10^{-7}$	0.05	1.0	0.0	300		800		$1.3x10^{-7}$
Sensitivity Study 5B	TRIGA	krypton	1.0	0.2	0.5	1.0	0.15	300	923	1023	0.33	0.31
	TRIGA	cesium	1.0	$2x10^{-6}$	0.05	1.0	$1.6x10^{-3}$	300	923	1023	0.1	0.011
	TRIGA	ruthenium	1.0	$2x10^{-6}$	0.05	1.0	$1.6x10^{-6}$	300	923	1023	0.1	0.0098
	TRIGA	particulates	1.0	$2x10^{-6}$	0.05	1.0	0.0	300	923	1023	0.0033	$3.3x10^{-4}$
	Al-U	krypton	1.0	$2x10^{-7}$	0.05	1.0	0.0	300	923	1023	1.0	0.098
	Al-U	cesium	1.0	$2x10^{-7}$	0.05	1.0	0.0	300	923	1023	0.1	0.0098
	Al-U	ruthenium	1.0	$2x10^{-7}$	0.05	1.0	0.0	300	923	1023	$1.6x10^{-5}$	$1.7x10^{-6}$
	Al-U	particulates	1.0	$2x10^{-7}$	0.05	1.0	0.0	300	923	1023	1.6x10-6	$3.0x10^{-7}$
Sensitivity Study 6A	TRIGA	krypton	1.0	0.2	0.5	1.0	0.15	300		800		0.35
	TRIGA	cesium	1.0	$2x10^{-6}$	0.05	1.0	$1.6x10^{-3}$	300		800		0.0016
	TRIGA	ruthenium	1.0	$2x10^{-6}$	0.05	1.0	$1.6x10^{-6}$	300		800		$3.6x10^{-6}$
	TRIGA	particulates	1.0	$2x10^{-6}$	0.05	1.0	0.0	300		800		$2.0x10^{-6}$
	Al-U	all	1.0	$2x10^{-7}$	0.05	1.0	0.0	300		800		$2.0x10^{-7}$
Sensitivity Study 6B	TRIGA	krypton	1.0	0.2	0.5	1.0	0.15	300	923	1023	1.0	1.0
	TRIGA	cesium	1.0	$2x10^{-6}$	0.05	1.0	$1.6x10^{-3}$	300	923	1023	0.3	0.3
	TRIGA	ruthenium	1.0	$2x10^{-6}$	0.05	1.0	$1.6x10^{-6}$	300	923	1023	0.3	0.3
	TRIGA	particulates	1.0	$2x10^{-6}$	0.05	1.0	0.0	300	923	1023	0.01	0.01
	Al-U	krypton	1.0	$2x10^{-7}$	0.05	1.0	0.0	300	923	1023	1.0	1.0
	Al-U	cesium	1.0	$2x10^{-7}$	0.05	1.0	0.0	300	923	1023	0.1	0.1
	Al-U	ruthenium	1.0	$2x10^{-7}$	0.05	1.0	0.0	300	923	1023	$1.6x10^{-5}$	$1.6x10^{-5}$
	Al-U	particulates	1.0	$2x10^{-7}$	0.05	1.0	0.0	300	923	1023	$1.6x10^{-6}$	$1.8x10^{-6}$

Inspection of Table D5-2 allows the size of the new release fractions developed for aluminum-uranium alloy and TRIGa fuels to be conpared to the release fractions used in the base case calculations. Table D5-5 summarizes these comparisons.

Table D5-5 Relative Size of the Sensitivity Study Release Fractions Compared to the Base Case Release Fractions Used to Perform the Base Case Calculations

Fuel	*Severity Category*		*Size of New Sensitivity Study Release Fractions Compared to Base Case Release Fractions*
	Sensitivity Study	*Base Case*	
Aluminum-Uranium Alloy	4	4	About the same (krypton much smaller)
	5A	5	Smaller (cesium 10,000 times smaller)
	5B	5	Cesium 10 times larger
	6A	6	Cesium 5000 times smaller
	6B	6	Cesium 100 times larger
TRIGA	4	4	10 times larger
	5A	5	About the same
	5B	5	Cesium 10 times larger
	6A	6	About the same
	6B	6	Cesium 300 times larger

D5.4 Probability of High-Temperature Events

Data on the temperatures of real ship fires is nearly non-existent. Only one of the five severe fires identified by searching the Lloyd's of London data (Lloyd's, 1991) attained temperatures where steel beams buckled due to thermal stress. Carbon steels begin to soften at about 475°K (395°F) and have lost 90 percent of their strength at about 925°K (1,205°F). Thus, buckling of ship structures due to thermal stress might be expected to occur at about 700°K (800°F), the midpoint of this temperature range, which suggests that one severe fire in five attains temperatures at about 700°K (800°F) and also that P_{T900K} is less than 0.2. Due to the lack of ship board fire temperature data the an attempt has been made to estimate the likelihood of a fire that exceeds 900°K (1160°F).

A shipboard fire can heat the contents of a transportation cask to temperatures above 900°K (1,160°F) only if three conditions are met: (1) the fire must consume a high quality fuel such as gasoline or jet fuel, (2) enough fuel must be available to cause the fire to burn for an hour or more, and (3) the fire cannot be smothered by lack of air or the operation of fire suppression systems. Most severe ships fires involve the burning of the ship's own fuel (bunker or diesel fuel) or of crude oil, when the collision that leads to the fire involves an oil tanker. Thus, P_{T900K}, the chance that a ship fire can heat the contents of a transportation cask to temperatures above 900°K (1,160°F), can be estimated as follows:

$$P_{T>900K} = P_{\text{good fuel}} \times P_{\text{enough fuel}} \times P_{\text{enough oxygen}}$$

Diesel fuel, bunker fuel, and crude oil all have peak flame temperatures that exceed 900°K or 1,160°F (Mudan, 1988), and most polymeric materials (e.g., plastics, wood) have peak flame temperatures of about 1,200°K or 1,700°F (Babrauskas, 1986a). Since fires in cargo holds should behave like enclosure fires, hold fires that burn wood could attain peak temperatures of about 1200°K (1,700°F), if post flashover conditions are attained (Babrauskas, 1986a). So, the fuels and solid materials that are likely to be involved in shipboard fires in cargo holds should be able to heat cask contents to temperatures significantly above

900°K (1,160°F), provided the fire burns long enough and isn't suppressed by lack of oxygen or the operation of fire suppression systems. Thus, $P_{good\ fuel}$, the chance that a long burning hold fire is supported by the burning of a good fuel, is not likely to be small and is here assumed to be 0.9.

The review of ship fires prepared by the French Bureau Veritas for the International Maritime Organization (IMO, 1992) contains data on ship fire durations. Most ship fires (70 to 80 percent) do not burn for an hour. However, most severe ship fires (95 percent) burn for more than an hour. Therefore, the chance that a severe fire involves enough fuel to burn for an hour or more, $P_{enough\ fuel}$, is assumed to be 0.95.

Figure D5-1 presents an event tree for oxygen availability during fires in cargo holds, and is used to estimate $P_{enough\ oxygen}$. The tree shows that most cargo hold fires will be partially starved for oxygen for two reasons, because hold covers will be closed when the fire starts, or will be deliberately closed after it starts in order to smother the fire; or because CO_2 fire suppression systems are installed in the hold and operate successfully. To quantify the event tree provided in Figure D5-1, it was necessary to derive the probability of these two events. The probability that a cargo hold is closed during a collision can be estimated using the following relationship.

$$P_{closed} = 1 - P_{open}$$

where

$$P_{open} = P_{all\ not\ closed} P_{worked} P_{location} \sum (N_i P_{deck}).$$

The derivation of each of the terms in this relationship is described in the following paragraphs.

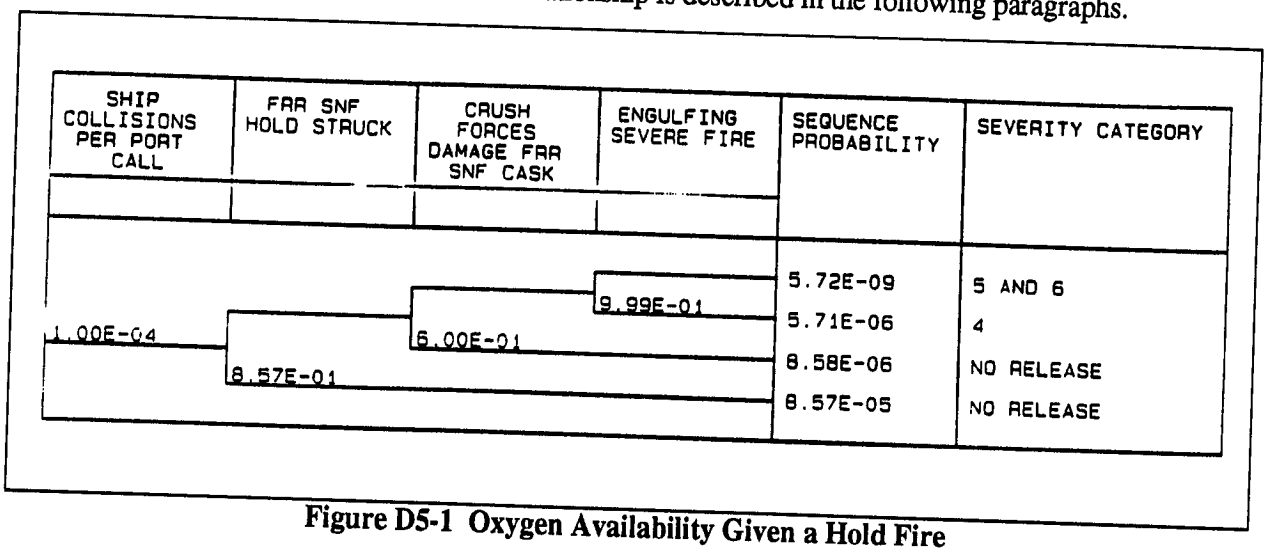

Figure D5-1 Oxygen Availability Given a Hold Fire

Cargo hold covers are normally closed except during loading of unloading of cargo. Thus, if a typical port call takes approximately three days (half a day entering the port and docking, two days anchored at the dock with two-thirds of that time, (two eight-hour shifts per day) spent loading and unloading cargo, and one-half day leaving the port) then all holds will be closed about half of the time while a ship is in port. Conversely, about half of the time at least one hold will be open. Thus $P_{all\ not\ closed} = \frac{1}{2}$ or 0.5.

When a break-bulk freighter like the seven-hold ship used in these analyses is being loaded or unloaded, usually three or four holds are being worked at any given time. Thus, when the ship is being loaded or unloaded, P_{worked}, the probability that a given hold is being worked is ½ or 0.5.

The break-bulk freighter used in these analyses has seven holds. Five of these holds contain three cargo decks, one contains four cargo decks, and one contains only two cargo decks. Thus, there are 21 possible deck locations for a spent fuel cask in this typical ship. Accordingly, $P_{location}$, the chance that a spent nuclear fuel cask has been loaded onto a given deck in one of the seven holds is 0.048.

All hold openings have covers, not just the opening in the main deck through which the hold is loaded and unloaded, but also the openings in the cargo decks within each hold. When a deck in a cargo hold is being loaded or unloaded, all openings above that deck must be open and the opening in the deck and all openings in lower decks are normally closed. Thus, while a hold is being worked, upper decks in that hold will be open to outside air more often than lower decks. For example, for a three-deck hold, while the hold is being worked, the upper deck will always be open to the outside air, the second deck will be open about two-thirds of the time, and the lowest deck will be open about one-third of the time. Thus, if N is the number of holds with two, three, or four decks, and P_{deck} is the probability that deck i in a hold is open to outside air while that hold is being worked, then P_{closed}, the chance that an engulfing fire is partially starved for oxygen because there is a cargo deck or main deck hold cover in place between the fire and the outside air will be:

$$P_{closed} = 1 - \{(0.5)(0.5)(0.048)([5(1 + \tfrac{2}{3} + \tfrac{1}{3})] + [1(1 + \tfrac{3}{4} + \tfrac{1}{2} + \tfrac{1}{4})] + [1(1 + \tfrac{1}{2})])\}$$

$$= 0.833$$

The ORI study (ORI, 1981a) found that over half (60 percent) of all cargo ships are equipped with fire detectors and CO_2 fire suppression systems. Because CO_2 fire suppression systems are not complicated, they should operate reliably on demand most of the time. To be conservative, failed operation during one of five fire events is assumed.

Using this data, the event tree in Figure D5-1 can be quantified to determine the probability of the event $P_{enough\ oxygen}$. Two branches of the oxygen availability tree lead to the outcome "enough air." The probabilities of these two branches sum to 0.087. Thus, 0.09 is a reasonable estimate for $P_{enough\ oxygen}$, the chance that a fire has adequate oxygen available to burn freely and generate maximum heat loads.

Combining the probability estimates for $P_{good\ fuel}$, $P_{enough\ fuel}$, and $P_{enough\ oxygen}$ allows $P_{T900\ K}$ to be estimated as follows:

$$P_{T900\ K} = P_{good\ fuel} \times P_{enough\ fuel} \times P_{enough\ oxygen}$$

$$= 0.9 \times 0.95 \times 0.09 = 0.077$$

Rounding to the next order of magnitude yields a conservative estimate of 0.1 for the chance that a severe engulfing fire with a duration of at least an hour will heat the contents of a transportation cask engulfed by the fire to temperatures significantly higher than 900°K (1,160°F).

D5.5 Probability of Convective Flow through the Failed Cask

Non-uniform heating of the cask during engulfing fires is expected to produce substantial flow of gases through the cask if two or more small holes or one medium hole have been produced in the cask by the ship collision. Because transportation casks bottoms and lid seats are welded to the cylindrical shell of the cask using full-penetration welds that are as strong or stronger than the parent material, when the cask shell is subjected to a severe stress (e.g, high impact or crush forces), the cask shell should yield before the welds fail. In fact, extra-regulatory 60 mph drop tests produced large plastic strains in the cylindrical shell of the test cask without failing its welds (Ludwigsen and Ammerman, 1995). Thus, during a ship collision, crush forces should collapse the cask walls inward without producing catastrophic failure of the lid, its seat, or the welds that attach the seat or the bottom of the cask to the cask walls. Therefore, an unusual configuration of cargo and/or deformed ship structures must be produced during the ship collision in order to subject the cask to forces that will produce failures substantially worse than failure of the lid seal. Either the lid seat must be bent significantly, or at least two penetrations must break, or the cask walls must be sheared or punctured. Although data for such failures is lacking, because casks normally do not fail by these mechanisms, the probability that a failure substantially worse than seal failure occurs is assumed to be no larger than 0.1.

D5.6 Severity Category Event Trees

Figures D5-2 and D5-3 present event trees that represent the sequence of events that lead to category 4, 5A, 5B, 6A, and 6B releases from transportation casks due to ship collisions. After rounding to the nearest integer, Figure D5-3 shows that these categories have the probabilities per port call provided in Table D5-4.

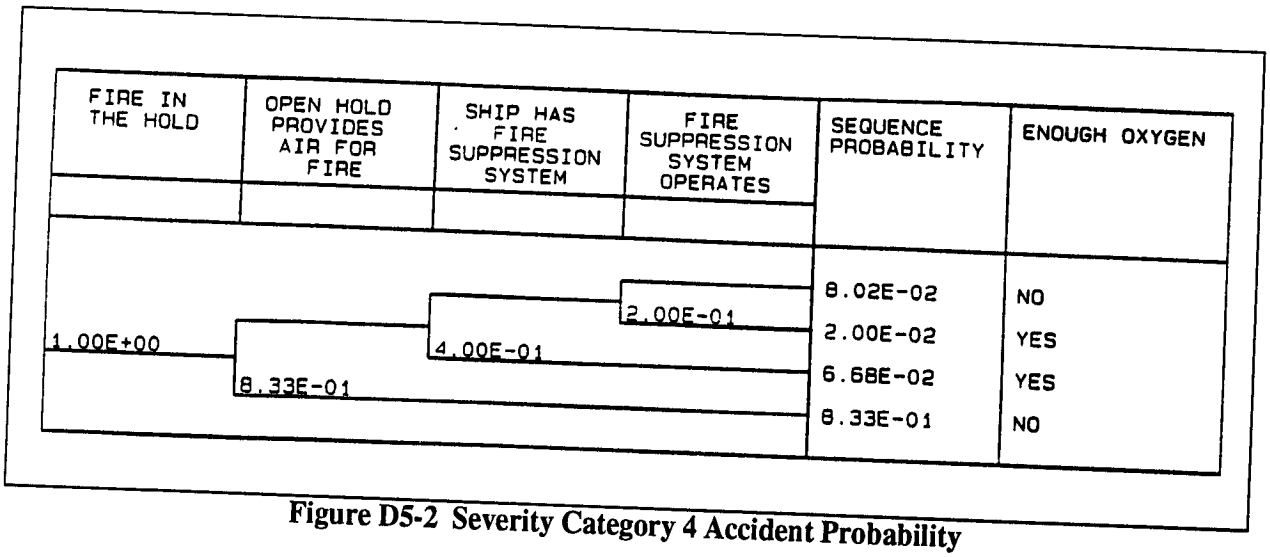

Figure D5-2 Severity Category 4 Accident Probability

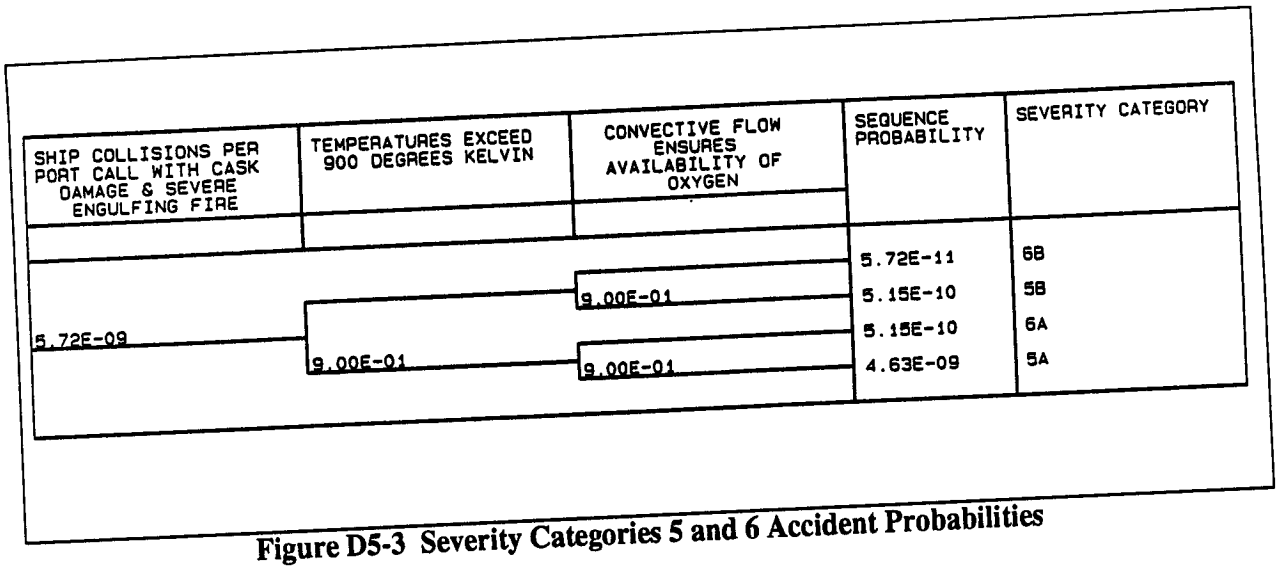

Figure D5-3 Severity Categories 5 and 6 Accident Probabilities

Table D5-4 Sensitivity Study Accident Severity Category Probabilities

Severity Category	*Probability Per Port Call*
4	6×10^{-6}
5A	5×10^{-9}
5B	5×10^{-10}
6A	5×10^{-10}
6B	6×10^{-11}

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Volume 2

FINAL ENVIRONMENTAL IMPACT STATEMENT

on a

Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Appendix E
Evaluation of Human Health Effects of Overland Transportation

United States Department of Energy
Assistant Secretary for Environmental Management
Washington, DC 20585

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Appendix E
Evaluation of Human Health Effects of Overland Transportation

E.1 Introduction

The overland transportation of any commodity involves a risk to both transportation crew members and members of the public. This risk results directly from transportation-related accidents and indirectly from the increased levels of pollution from vehicle emissions, regardless of the cargo. The transportation of certain materials, such as hazardous or radioactive waste, can pose an additional risk due to the unique nature of the material itself. In order to permit a complete appraisal of the environmental impacts of the proposed action and alternatives, the human health risks associated with the overland transportation of foreign research reactor spent nuclear fuel have been assessed.

This appendix provides an overview of the approach used to assess the human health risks that may result from the overland transportation of foreign research reactor spent nuclear fuel. The appendix includes discussion of the scope of the assessment, analytical methods used for the risk assessment (i.e., computer models), important assessment assumptions, determination of potential transportation routes, and presents the results of the assessment. In addition, to aid in the understanding and interpretation of the results, specific areas of uncertainty are described, with an emphasis on how the uncertainties may affect comparisons of the alternatives.

The approach used in this appendix is modeled after that used in the Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Final Environmental Impact Statement (SNF&INEL Final EIS) (DOE, 1995). The SNF&INEL Final EIS did not perform as detailed an analysis on the specific actions taken for foreign research reactor spent nuclear fuel because of the breadth necessary to analyze the entire spent fuel management program. However, the fundamental assumptions used in this analysis are consistent with those used in the SNF&INEL Final EIS (DOE, 1995), and the same computer codes and generic release and accident data are used.

The risk assessment results are presented in this appendix in terms of "per-shipment" risk factors, as well as for the total risks associated with each alternative. Per-shipment risk factors provide an estimate of the risk from a single spent nuclear fuel shipment between a specific origin and destination. They are calculated for all possible origin and destination pairs for each spent nuclear fuel type. The total risks for a given alternative are found by multiplying the expected number of shipments by the appropriate per-shipment risk factors. This approach provides maximum flexibility for determining the risks for a large number of potential alternatives.

E.2 Scope of Assessment

The scope of the overland transportation human health risk assessment, including the alternatives and options, transportation activities, potential radiological and nonradiological impacts, and transportation modes considered, is described below. Additional details of the assessment are provided in the remaining sections of the appendix.

Proposed Action and Alternatives: The transportation risk assessment conducted for this EIS estimates the human health risks associated with the transportation of spent nuclear fuel for a number of management and implementation alternatives. The alternatives differ primarily in the number and location of possible ports of entry and Phase 1 management sites (storage sites that would be used until a repository was ready). The alternatives considered are described in detail in Chapter 2 of this EIS.

For transportation assessment purposes, each option is defined as an individual or pair of U.S. Department of Energy (DOE) sites used for initial management and an individual or pair of DOE sites used for final interim management. The transportation risk assessment determines risks by considering the total amount of spent nuclear fuel shipped over each representative route. The assessment takes into account differences in the physical and radiological properties of spent nuclear fuel types and characteristics of the potential routes to and between sites.

A large number of potentially applicable marine ports of entry and Canadian border crossings, including commercial and military ports on the Atlantic, Pacific, and Gulf of Mexico coasts are considered in this risk analysis. The port selection process is described in Appendix D. The Canadian border crossing points are representative points based on a qualitative judgment of previously used shipment routes (NRC, 1993). The alternatives in this EIS define the acceptance of the fuel, while the SNF&INEL Final EIS (DOE, 1995) alternative selected defines the DOE site or sites that would receive foreign research reactor spent nuclear fuel; and the options identified in this EIS define the various ways in which the foreign research reactor spent nuclear fuel could be handled to meet the SNF&INEL Final EIS selected alternative.

Transportation-Related Activities: The transportation risk assessment is limited to estimating the human health risks incurred during the overland transportation of spent nuclear fuel for each alternative. The risks to workers or to the public during spent nuclear fuel loading, unloading, and handling prior to or after shipment are not included in the overland transportation assessment, they are addressed in Appendices C and D. Similarly, the transportation risk assessment does not address possible impacts from increased transportation levels on local traffic flow, noise levels, or infrastructure.

Radiological Impacts: For each alternative, radiological risks (i.e., those risks that result from the radioactive nature of the spent nuclear fuel) are assessed for both incident-free (i.e., normal) and accident transportation conditions. The radiological risk associated with incident-free transportation conditions would result from the potential exposure of people to external radiation in the vicinity of a loaded shipment. The radiological risk from transportation accidents would come from the potential release and dispersal of radioactive material into the environment during an accident and the subsequent exposure of people through multiple exposure pathways (i.e., exposure to contaminated ground or air, or ingestion of contaminated food).

All radiological-related impacts are calculated in terms of committed dose and associated health effects in the exposed populations. The radiation dose calculated is the total effective dose equivalent (10 CFR Part 20), which is the sum of the effective dose equivalent (EDE) from external radiation exposure and the 50-yr committed effective dose equivalent from internal radiation exposure. Radiation doses are presented in units of person-rem for collective populations and rem for individuals. The impacts are further expressed as health risks in terms of latent cancer fatalities (LCF) and cancer incidence in exposed populations. The health risk conversion factors (expected health effects per dose absorbed) were derived from International Commission on Radiological Protection Publication 60 (ICRP, 1991).

Nonradiological Impacts: In addition to the radiological risks posed by overland transportation activities, vehicle-related risks are also assessed for nonradiological causes (i.e., related to the transport vehicles and not the radioactive cargo) for the same transportation routes. The nonradiological transportation risks are

independent of the radioactive nature of the cargo and would be incurred for similar shipments of any commodity. The nonradiological risks are assessed for both incident-free and accident conditions. Nonradiological risks during incident-free transportation conditions would be caused by potential exposure to increased vehicle exhaust emissions. The nonradiological accident risk refers to the potential occurrence of transportation accidents that directly result in fatalities unrelated to the shipment cargo. State-specific transportation fatality rates are used in the assessment. Nonradiological risks are presented in terms of estimated fatalities.

Transportation Modes: All spent nuclear fuel shipments have been assumed to take place either by truck or rail transportation modes. Per-shipment risk factors are presented separately for truck and rail modes. For the alternatives, risks have been calculated separately for all truck and all rail options, although the actual transportation operation for a selected alternative may involve a combination of the two modes.

Barge transport has certain disadvantages. First, barge transport limits site and port selection for both the SNF&INEL Final EIS and this EIS to Savannah River Site (available both phases) and Hanford Site (available in Phase 2 only). These sites are only served by the ports of Savannah, GA and Portland, OR, respectively. Additionally, barge transportation would require additional intermodal transfers at the port and at the site. At the port, the cask would be removed from the ocean-going vessel and moved by truck to the barge terminal for loading onto a barge. When the barge arrives at the DOE site, the cask would have to be moved to a truck for transport across the site to the receiving basin. Other reasons for not using barge transportation include DOE's lack of extensive experience in shipping casks via barge, the lack of alternative routes, and low speeds. DOE, however, has performed a scoping analysis of barge transportation to assess its relative impacts.

Receptors: Transportation-related risks are calculated and presented separately for workers and members of the general public. The workers considered are truck and rail crew members involved in the actual overland transportation of spent nuclear fuel. The general public includes all persons who could be exposed to a shipment while it is moving or stopped en route. Potential risks are estimated for the collective populations of exposed people, as well as for the hypothetical maximally exposed individual (MEI). The collective population risk is a measure of the radiological risk posed to society as a whole by the alternative being considered. As such, the collective population risk is used as the primary means of comparing various alternatives.

Cumulative Impacts: The cumulative impacts of the transportation of foreign research reactor spent nuclear fuel are calculated and presented as a relative proportion of those described in the SNF&INEL Final EIS (DOE, 1995). The collective dose to the general population and workers is the measure used to quantify cumulative transportation impacts.

E.3 Spent Nuclear Fuel Packaging and Representative Shipment Configurations

Regulations that govern the transportation of radioactive materials are designed to protect the public from the potential loss or dispersal of radioactive materials as well as from routine radiation doses during transit. The primary regulatory approach to ensure safety is through the specification of standards for the packaging of radioactive materials. Because packaging represents the primary barrier between the radioactive material being transported and radiation exposure to the public and the environment, packaging requirements are an important consideration for the transportation risk assessment. Regulatory packaging requirements are discussed briefly below and in Chapter 5. In addition, the representative packaging and shipment configurations assumed for this EIS are described.

E.3.1 Packaging Overview

Although several Federal and State organizations are involved in the regulation of radioactive waste transportation, primary regulatory responsibility resides with the U.S. Department of Transportation and the U.S. Nuclear Regulatory Commission (NRC). All transportation activities must take place in accordance with the applicable regulations of these agencies specified in 49 Code of Federal Regulations (CFR) Part 173 and 10 CFR Part 71.

Transportation packaging for radioactive materials must be designed, constructed, and maintained to ensure that the packages will contain and shield their contents during normal transport conditions. For more highly radioactive material, such as spent nuclear fuel, they must contain and shield their contents in the event of severe accident conditions. The type of packaging used is determined by the total radioactive hazard presented by the material within the packaging. The basic types of packaging required by the applicable regulations are designated as Type A, Type B, or "strong and tight".

"Strong and tight" packages are designed such that no radioactive material will leak or be released during transportation. They can only be used for low-specific-activity material. Type A packaging must withstand the conditions of incident-free transportation without the loss or dispersal of the radioactive contents. Incident-free transportation refers to all conditions of transportation except those that result from accidents or sabotage. Approval of Type A packaging is achieved by demonstrating that the packaging can withstand specified test conditions which are intended to simulate incident-free transportation conditions. Type A packaging, typically a 55-gallon (gal) drum or standard waste box, is commonly used to transport wastes having low activities of radioactive material.

The transportation of spent nuclear fuel requires the use of Type B packaging. In addition to meeting the standards for Type A packaging, Type B packaging must provide a high degree of assurance that even in severe accidents the integrity of the package will be maintained with essentially no loss of the radioactive contents or serious impairment of the shielding capability. Type B packaging must satisfy stringent testing criteria specified in 10 CFR Part 71. The testing criteria were developed to simulate severe hypothetical accident conditions, including impact, puncture, fire, and water immersion. The massive casks used to transport spent nuclear fuel represent the most widely recognized Type B packaging.

For risk assessment purposes, it is important to note that all packaging of a given type is designed to meet the same performance criteria. Therefore, two spent nuclear fuel casks of different designs would be expected to perform similarly during incident-free and accident transportation conditions. The specific cask selected, however, will determine the total number of shipments necessary to transport a given quantity of spent nuclear fuel.

External radiation allowed to escape from a package must be below specified limits that minimize the exposure of the handling personnel and general public. The foreign research reactor spent nuclear fuel shipments would be handled only by the shipper and the receiver, an arrangement referred to as an "exclusive-use" shipment. For these types of shipments, the external radiation dose rate during normal transportation conditions must be maintained below the following limits of 49 CFR Part 173:

- 10 mrem per hr at any point 2 meters (m) (6.6 ft) from the vertical planes projected by the outer lateral surfaces of the transport vehicle (referred to as the regulatory limit throughout this document), and
- 2 mrem per hr in any normally occupied position in the transport vehicle.

Although additional restrictions apply to package surface radiation levels, these restrictions are not important for the transportation radiological risk assessment.

The NRC recently issued revised regulations, 10 CFR Part 71, governing the transportation of radioactive materials. These regulations become effective on April 1, 1996 (NRC, 1995). The revised regulations conform with those of the International Atomic Energy Agency and current legislative requirements. The revised regulations affecting "Type B" casks require that a spent nuclear fuel transportation cask with activity greater than one million curies (Ci) be designed and 290 psi, or immersion in 200 m (656 ft) of water, for a period of not less than one hour without collapse, buckling, or allowing water to leak into the cask.

E.3.2 Packaging and Representative Shipment Configurations for Foreign Research Reactor Spent Nuclear Fuel

To conduct the overland transportation risk assessment, assumptions must be made concerning the types of packaging, transport vehicles, and shipment capacities that could be used for future spent nuclear fuel shipments. In all cases, it is assumed that spent nuclear fuel would be characterized, treated, packaged, and labeled in accordance with applicable regulations prior to shipment.

The transportation of all foreign research reactor spent nuclear fuel would take place in casks certified by foreign competent authorities and revalidated by Department of Transportation in accordance with 49 CFR 173. In addition, it is assumed that only exclusive-use vehicles would be used. Highway transportation is assumed to take place by legal weight heavy-haul combination (tractor-trailer) trucks. Rail transportation is assumed to take place by regular freight train service.

E.3.3 Description of Transportation Activities

The proposed action could involve transporting foreign research reactor spent nuclear fuel from the ports of entry (both marine ports and Canadian border crossings) to DOE sites, and could involve transporting foreign research reactor spent nuclear fuel between DOE sites. The interim management site or sites for the foreign research reactor spent nuclear fuel in the United States have been determined on the basis of the SNF&INEL Final EIS (DOE, 1995).

In this section, the assumptions and logic used to model the transportation requirements for the basic implementation of Management Alternative 1 of the proposed action are described. In general, the same assumptions are used to analyze the management and implementation alternatives. Therefore, the transportation requirements for management and implementation alternatives will be described in relation to the basic implementation.

Certain assumptions are required in order to simply and consistently describe the manner in which foreign research reactor spent nuclear fuel would be transported to the sites. The shipments were divided into east coast and west coast shipments, depending on the country of origin. Spent nuclear fuel shipments from Europe, Africa, the Middle East and parts of South and Central America were designated as east coast shipments, and all others were designated as west coast shipments. Shipments from Canada were assumed to enter the United States from either an eastern or western point of entry, depending on the Canadian point of origin. Under these assumptions, the east coast would receive approximately 535 cask shipments and the west coast approximately 186 cask shipments. Approximately 116 shipments from Canada would arrive in the eastern United States.

Regarding foreign research reactor spent nuclear fuel transportation, the SNF&INEL Final EIS (DOE, 1995) analyzes the use of any one of five candidate sites and seven distinct combinations of sites. Eight of the alternatives involve sites that could not be ready to accept spent nuclear fuel at the onset of the foreign research reactor spent nuclear fuel program. Therefore, a two-phased approach is assumed using one or both of the sites that are ready to accept spent nuclear fuel (Savannah River Site and Idaho National Engineering Laboratory) as a near-term management location. Phase 1 is defined, for the purposes of analyzing transportation, as the period of time in which shipments of foreign research reactor spent nuclear fuel are transported to a near-term management site. For analytical purposes, Phase 1 is assumed to last from the beginning of 1996 to the beginning of 2006.

The amount of fuel that would arrive in Phase 1 versus Phase 2 cannot be precisely determined at this time. In order to proceed with the risk analysis, it is necessary to make assumptions based on the available information. The total number of casks that would be required to transport the 22,700 spent fuel elements is estimated to be 837, per Appendix B. The split between Phase 1 and Phase 2 depends on the rate at which casks are received and the time the Phase 2 site(s) is ready to receive fuel. For calculational purposes, the casks are assumed to arrive at a uniform rate, and the Phase 2 site(s) is assumed to be ready 10 years after the implementation of the policy.

The disposition of foreign research reactor spent nuclear fuel during Phase 1 is analyzed in this EIS. Logically, Phase 1 could entail any one of four options: A) splitting foreign research reactor spent nuclear fuel by fuel type [TRIGA (which stands for Training, Research, and Isotope reactors built by General Atomic) to Idaho National Engineering Laboratory and Aluminum-based to Savannah River Site], B) splitting the spent nuclear fuel geographically by port of entry, C) transporting all spent nuclear fuel to Idaho National Engineering Laboratory, or D) transporting all spent nuclear fuel to Savannah River Site. Not all Phase 1 strategies are consistent with all Phase 2 strategies.

Phase 2 begins when Oak Ridge Reservation, Hanford Site, or Nevada Test Site would be ready to receive fuel from ports and, when applicable, from a DOE site being used for near-term management. In all cases, Phase 2 is dependent on decisions based on the SNF&INEL Final EIS (DOE, 1995). During Phase 2, all foreign research reactor spent nuclear fuel arriving at ports of entry would be transported to the appropriate site. Additionally, intersite shipments from the near-term management site could also be arriving at the SNF&INEL Final EIS selected site(s).

The following is a description of the shipping program, organized by SNF&INEL Final EIS (DOE, 1995) alternatives:

No Action - DOE cannot accept foreign research reactor spent nuclear fuel under this alternative.

Decentralization - Foreign research reactor spent nuclear fuel arriving on the east coast would be transported to Savannah River Site, and foreign research reactor spent nuclear fuel arriving on the west coast would be transported to Idaho National Engineering Laboratory. Since both Idaho National Engineering Laboratory and Savannah River Site are capable of receiving fuel in late 1995, there is no need for a two-phase program or intersite shipments. The total number of shipments for this alternative would be approximately 837. Savannah River Site would receive 651 casks from the east, and Idaho National Engineering Laboratory would receive 186 casks from the west. The transportation under this alternative is illustrated in Figure E-1. No intersite shipment would be anticipated under this single-phased alternative.

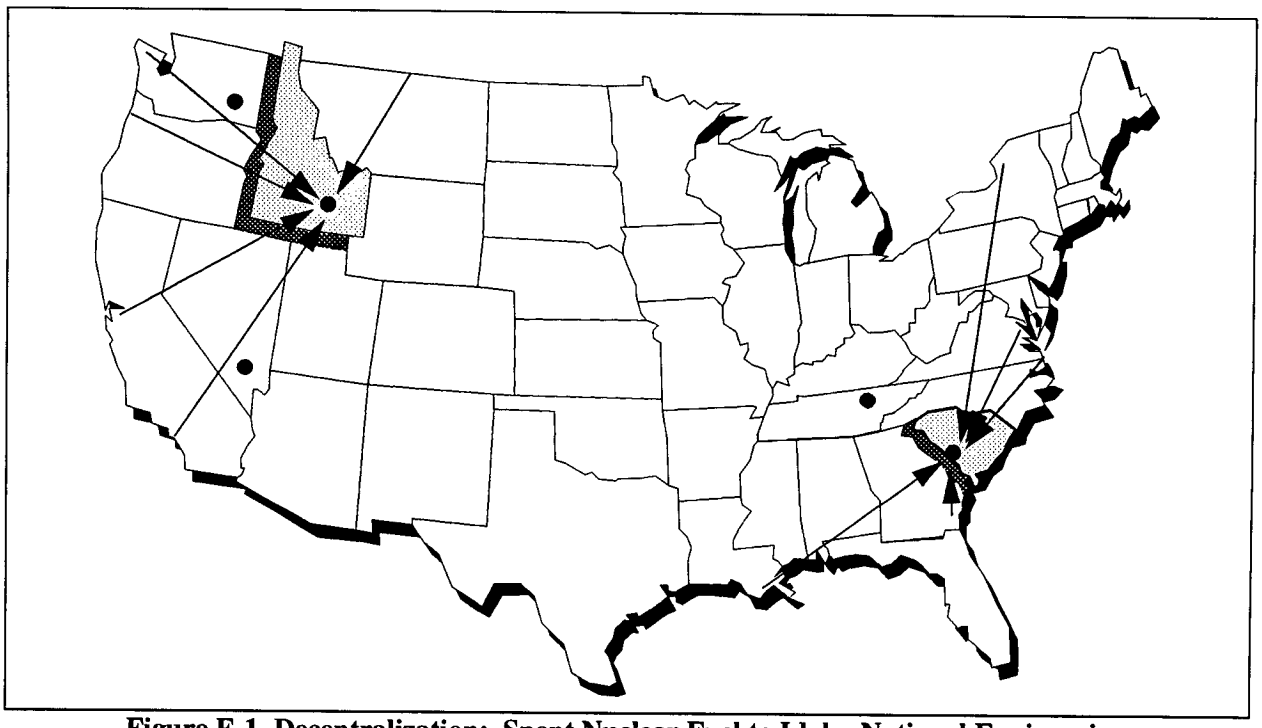

Figure E-1 Decentralization: Spent Nuclear Fuel to Idaho National Engineering Laboratory and Savannah River Site

1992-1993 Planning Basis - The SNF&INEL Final EIS (DOE, 1995) provides no specific guidance for foreign research reactor spent nuclear fuel. The transportation analysis in the SNF&INEL Final EIS assumed that half the foreign research reactor spent nuclear fuel would be transported to Idaho National Engineering Laboratory and half to Savannah River Site. The disposition of foreign research reactor spent nuclear fuel could correspond to Decentralization (described above), Regionalization (described below), Centralization to Idaho National Engineering Laboratory or Savannah River Site (described below), or an arbitrary split as described in the SNF&INEL Final EIS (DOE, 1995).

Regionalization - There are two distinct subalternatives under Regionalization: Regionalization by Fuel Type, and Regionalization by Geography. These subalternatives are described below.

Regionalization Subalternative A - Under Regionalization by Fuel Type, the foreign research reactor spent nuclear fuel would be split by fuel type, regardless of the port of entry. The TRIGA fuel would be shipped to Idaho National Engineering Laboratory and the aluminum-based Material Test Reactor (MTR) fuel would be shipped to Savannah River Site. Savannah River Site would receive 675 casks of fuel: 544 from the east and 131 from the west. Idaho National Engineering Laboratory would receive 162 casks of fuel: 107 from the east and 55 from the west. The transportation under this alternative is illustrated in Figure E-2. No intersite shipment would be anticipated under this single-phased alternative.

Regionalization Subalternative B - Under Regionalization by Geography, foreign research reactor spent nuclear fuel would be distributed between an Eastern Regional Site (Oak Ridge Reservation or Savannah River Site) and a Western Regional Site (either Hanford Site, Idaho National Engineering Laboratory, or Nevada Test Site). The foreign research reactor spent nuclear fuel arriving at an eastern port would go to the Eastern Regional Site, and the foreign research reactor spent nuclear fuel arriving at a western port would go to the Western Regional Site. If the chosen sites were Savannah River Site and Idaho National

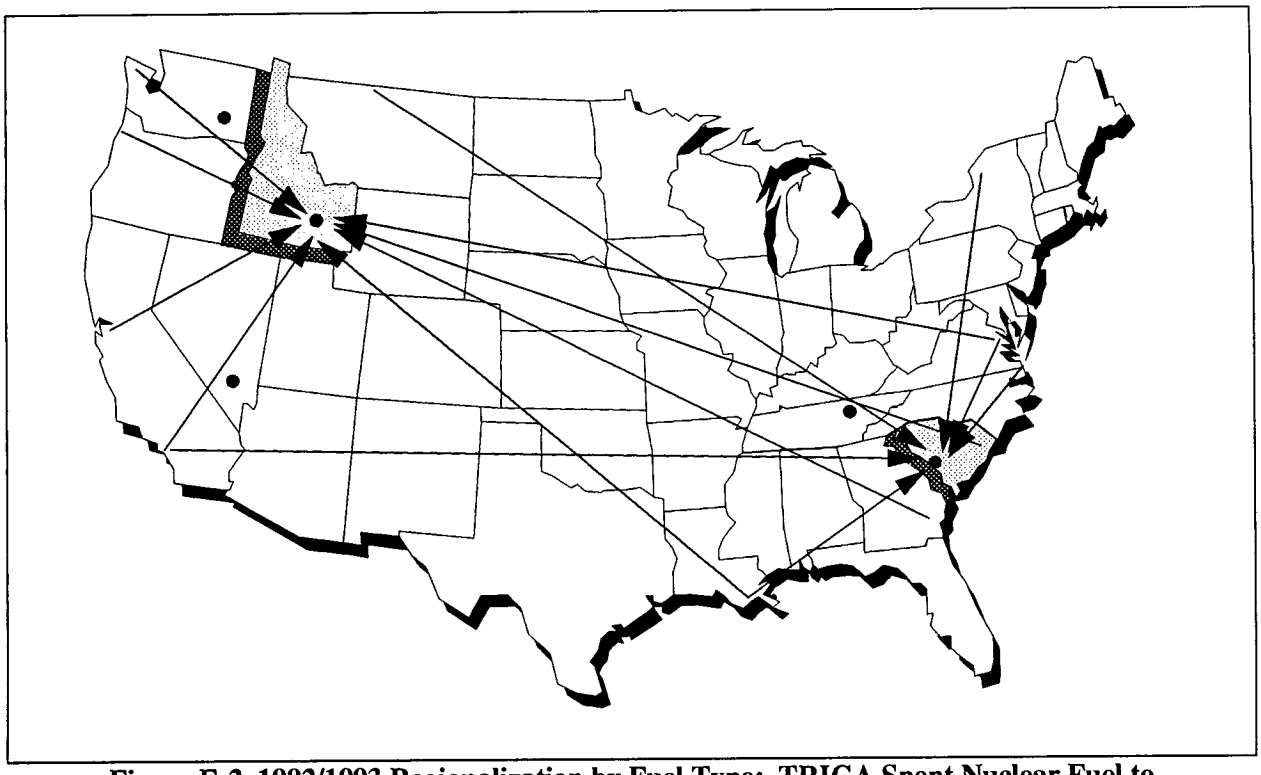

Figure E-2 1992/1993 Regionalization by Fuel Type: TRIGA Spent Nuclear Fuel to Idaho National Engineering Laboratory and MTR Spent Nuclear Fuel to Savannah River Site

Engineering Laboratory, the transportation would be the same as that described in the Decentralization Alternative and Figure E-2. No intersite shipment would be anticipated under this single-phased alternative.

A two-phased program would be required if a site other than Idaho National Engineering Laboratory or Savannah River Site were selected as a regional site under this programmatic alternative. The remaining possible site pairs for Regionalization are Idaho National Engineering Laboratory/Oak Ridge Reservation, Nevada Test Site/Savannah River Site, Nevada Test Site/Oak Ridge Reservation, Hanford Site/Savannah River Site, and Hanford Site/Oak Ridge Reservation. Splitting fuel by both geography and fuel type was considered as a logical Phase 1 approach for each site pair, but transporting all fuel to Savannah River Site or Idaho National Engineering Laboratory for near-term management was not considered for the following reasons:

- If Idaho National Engineering Laboratory were selected as the Western Regional Site, and Savannah River Site were not selected as the Eastern Regional Site, it would not be reasonable to ship all foreign research reactor spent nuclear fuel to Savannah River Site during Phase 1. Since Idaho National Engineering Laboratory is currently capable of receiving fuel and is much closer to west coast ports, it would be unreasonable to ship all fuel across the country to Savannah River Site only to move the fuel again. However, the option to ship all MTR fuel to Savannah River Site, for onsite logistical reasons, is a logical Phase 1 option even if Savannah River Site is not an ultimate interim management location. Thus, shipment of all fuel to SRS during Phase 1 was not considered reasonable if Idaho National Engineering Laboratory were to be chosen as the Western Regional Site.

- Conversely, if Savannah River Site were selected as the Eastern Regional Site, and Idaho National Engineering Laboratory were not selected as the Western Regional Site, it would not be reasonable to ship all foreign research reactor spent nuclear fuel to Idaho National Engineering Laboratory during Phase 1. Since Savannah River Site is currently capable of receiving fuel and is much closer to east coast ports, it would be unreasonable to ship all fuel across the country to Idaho National Engineering Laboratory only to move the fuel again. However, the option to ship all TRIGA fuel to Idaho National Engineering Laboratory, for onsite logistical reasons, is a logical Phase 1 option, even if Idaho National Engineering Laboratory is not an ultimate interim management location. Thus, shipment of all fuel to Idaho Engineering National Laboratory during Phase 1 was not considered reasonable if Savannah River Site were to be chosen as the Eastern Regional Site.

Figures E-3 through E-7 show the transportation schemes for site pairs Idaho National Engineering Laboratory/Oak Ridge Reservation, Nevada Test Site/Savannah River Site, Nevada Test Site/Oak Ridge Reservation, Hanford Site/Savannah River Site, and Hanford Site/Oak Ridge Reservation, respectively. The origins of the arrows representing shipments on the figures are selected for illustrative purposes, not to show specifically selected ports. Shipments would be expected to arrive at eastern, western, and Gulf Coast ports, and from eastern and western Canada. Because of their relative proximity to eastern sites, Gulf Coast ports are assigned the same transportation schemes as east coast ports. Note that there is no TRIGA fuel in Canada, so there is no planned route from Canada to Idaho National Engineering Laboratory for the Regionalization by Fuel Type alternative.

The number of shipments in the basic implementation for each site pair is described in Table E-1. The number of intersite shipments is based on the assumption that spent nuclear fuel arriving from foreign countries in small casks would be rearranged such that intersite shipments could be made in larger casks. The fuel assemblies would be cut to more efficient shapes, the fuel would be older and, thus, less radioactive and would produce less heat. For analysis purposes, it is assumed that the amount of foreign research reactor spent nuclear fuel originally shipped in four of the casks used for importing fuel could be shipped in one intersite truck cask. Rail shipment allows the use of even larger casks; and, thus, it is assumed that 10 cask loads of foreign research reactor spent nuclear fuel could be intersite shipped in 1 rail cask. Since the potential shipments would be scheduled to occur at least 10 years in the future, it is difficult to predict what casks would be used. Appendix B describes a variety of candidate casks. DOE would use fewer but larger shipments when shipping from site-to-site.

Centralization - Any one of the five DOE sites could be chosen by the SNF&INEL Final EIS (DOE, 1995) for receipt of all foreign research reactor spent nuclear fuel. If that site were Idaho National Engineering Laboratory or Savannah River Site, a two-phased approach would not be necessary. From the beginning of the program, all fuel could be accepted at either of these sites. Figures E-8 and E-9 describe the single-phase centralization options to Idaho National Engineering Laboratory and Savannah River Site, respectively.

However, a two-phase program would be required if the site selected were Hanford Site, Oak Ridge Reservation, or Nevada Test Site, none of which would be ready to receive foreign research reactor spent nuclear fuel at the beginning of the program. The option for execution of Phase 1 shipments is assumed to be independent from Phase 2 and the chosen SNF&INEL Final EIS (DOE, 1995) alternative. As with the Regionalization options, during Phase 1, DOE could choose to divide the fuel by either geography or fuel type between the two initially-capable DOE sites (Idaho National Engineering Laboratory and Savannah River Site). Alternatively, all fuel could be initially shipped to Idaho National Engineering Laboratory or Savannah River Site. Figures E-8 through E-12 show the transportation schemes for all five sites. The

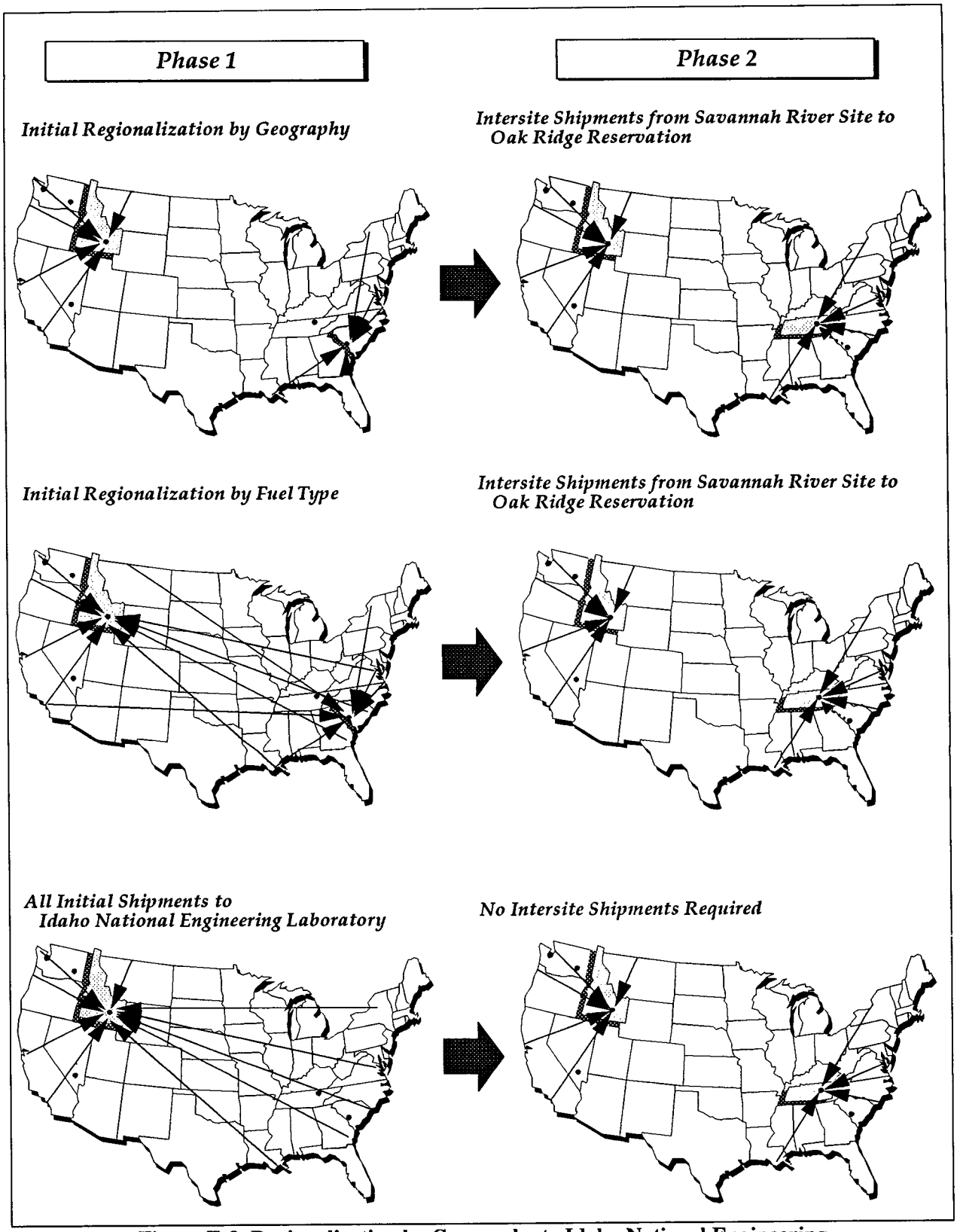

Figure E-3 Regionalization by Geography to Idaho National Engineering Laboratory and Oak Ridge Reservation

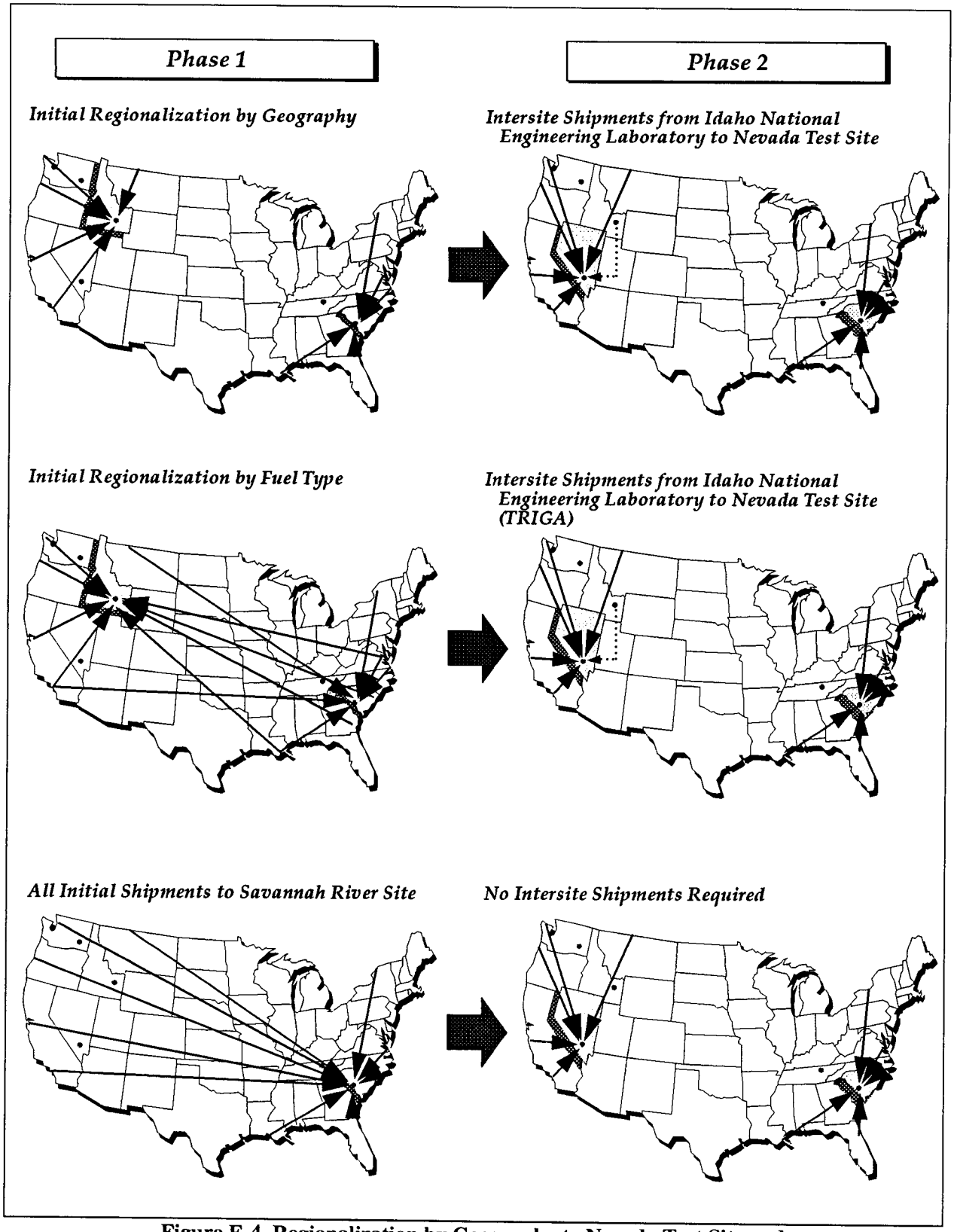

Figure E-4 Regionalization by Geography to Nevada Test Site and Savannah River Site

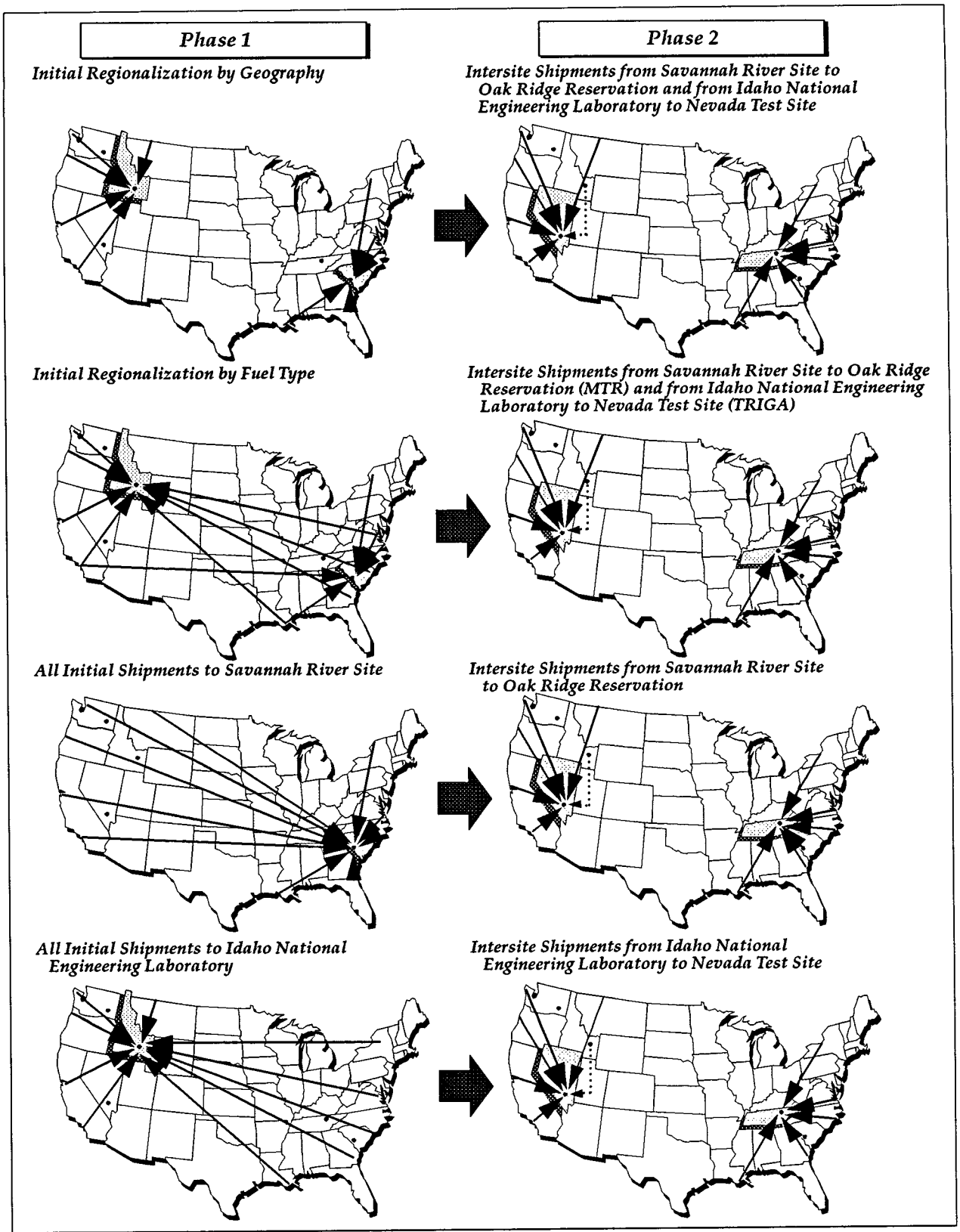

Figure E-5 Regionalization by Geography to Nevada Test Site and Oak Ridge Reservation

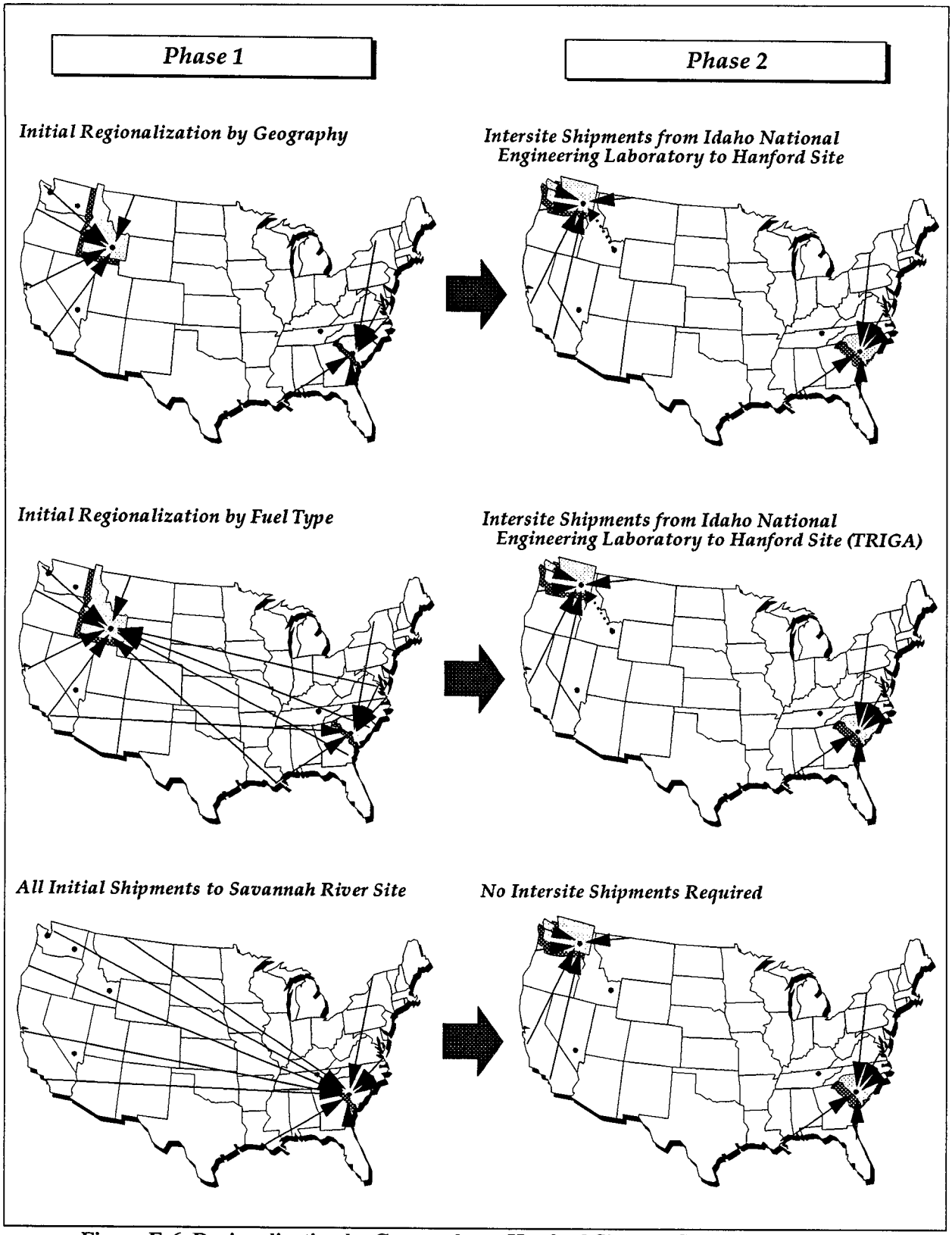

Figure E-6 Regionalization by Geography to Hanford Site and Savannah River Site

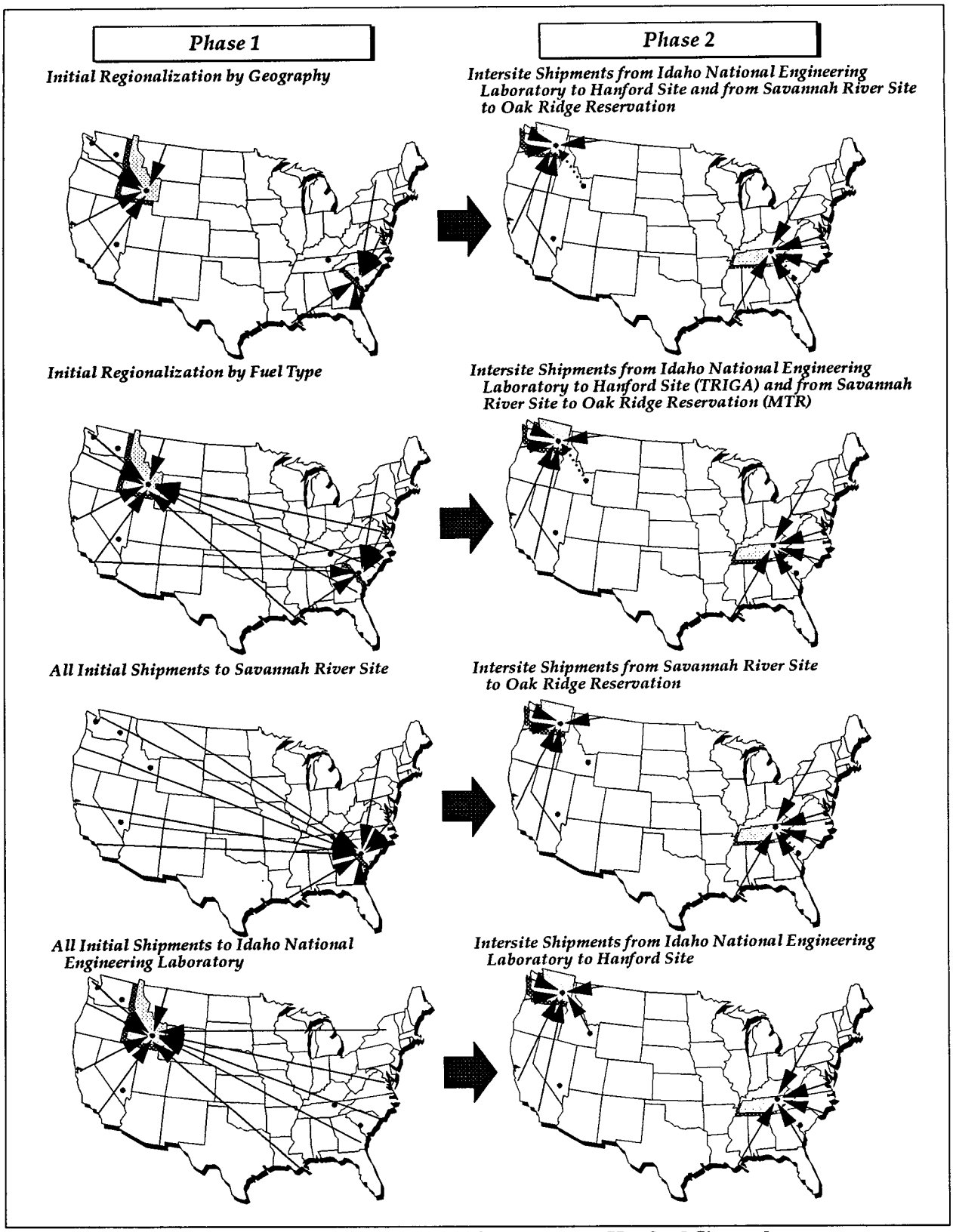

Figure E-7 Regionalization by Geography to Hanford Site and Oak Ridge Reservation

Table E-1 Shipment Summary for Regionalization Alternatives

Spent Nuclear Fuel Site Option	*Phase 1 Approach*	*Phase 1 Port-to-Site Shipments*	*Site-to-Site Shipments*[a]	*Phase 2 or Port-to-Final Site Shipments*	*Total Number of Shipments*
INEL/ORR	Geographic	East to SRS: 501 West to INEL: 143	SRS to ORR: 126/51	East to ORR: 150 West to INEL: 43	963/888
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	SRS to ORR: 130/52	East to ORR: 150 West to INEL: 43	967/889
	All to INEL	644	None	East to ORR: 150 West to INEL: 43	837
NTS/SRS	Geographic	East to SRS: 501 West to INEL: 143	INEL to NTS: 36/15	East to SRS: 150 West to NTS: 43	873/852
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	INEL to NTS: 31/13	East to SRS: 150 West to NTS: 43	868/850
	All to SRS	644	None	East to SRS: 150 West to NTS: 43	837
NTS/ORR	Geographic	East to SRS: 501 West to INEL: 143	SRS to ORR: 126/51 INEL to NTS: 36/15	East to ORR: 150 West to NTS: 43	999/903
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	SRS to ORR: 130/52 INEL to NTS: 31/13	East to ORR: 150 West to NTS: 43	998/902
	All to SRS	644	SRS to ORR: 161/65	East to ORR: 150 West to NTS: 43	998/902
	All to INEL	644	INEL to NTS: 161/65	East to ORR: 150 West to NTS: 43	998/902
HS/SRS	Geographic	East to SRS: 501 West to INEL: 143	INEL to HS: 36/15	East to SRS: 150 West to HS: 43	873/852
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	INEL to HS: 31/13	East to SRS: 150 West to HS: 43	868/850
	All to SRS	644	None	East to SRS: 150 West to HS: 43	837
HS/ORR	Geographic	East to SRS: 501 West to INEL: 143	SRS to ORR: 126/51 INEL to HS: 36/15	East to ORR: 150 West to HS: 43	999/903
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	SRS to ORR: 130/52 INEL to HS: 31/13	East to ORR: 150 West to HS: 43	998/902
	All to SRS	644	SRS to ORR: 161/65	East to ORR: 150 West to HS: 43	998/902
	All to INEL	644	INEL to HS: 161/65	East to ORR: 150 West to HS: 43	998/902

[a] *Truck/Rail shipments, assuming that the truck casks used for intersite shipments are capable due to consolidation of carrying 4 times as much fuel, and rail casks 10 times as much fuel as the shipping cask received from the foreign research reactor.*

INEL = Idaho National Engineering Laboratory; ORR = Oak Ridge Reservation; SRS = Savannah River Site; NTS = Nevada Test Site; HS = Hanford Site

number of shipments for each site pair is shown in Table E-2. The number of intersite shipments is based on a 4-cask-to-1 conversion if trucks were used, and a 10-cask-to-1 conversion if trains were used, as explained in the previous section.

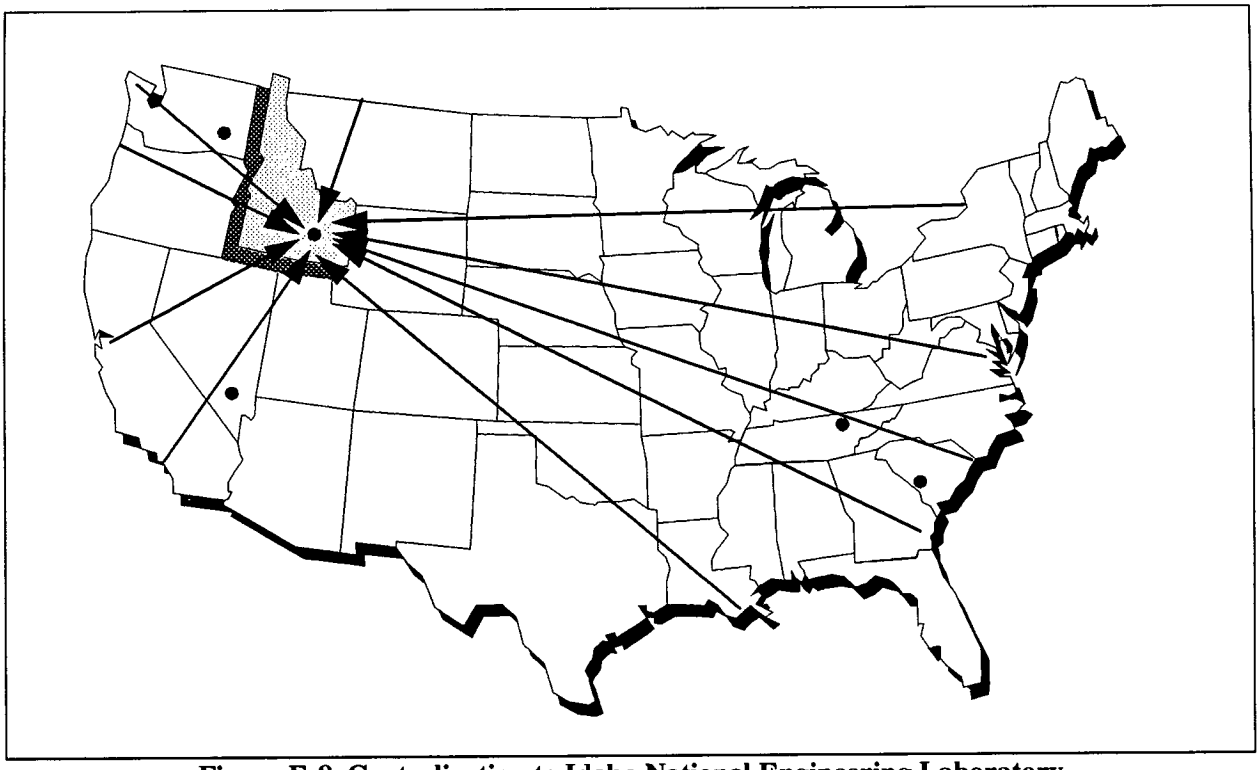

Figure E-8 Centralization to Idaho National Engineering Laboratory

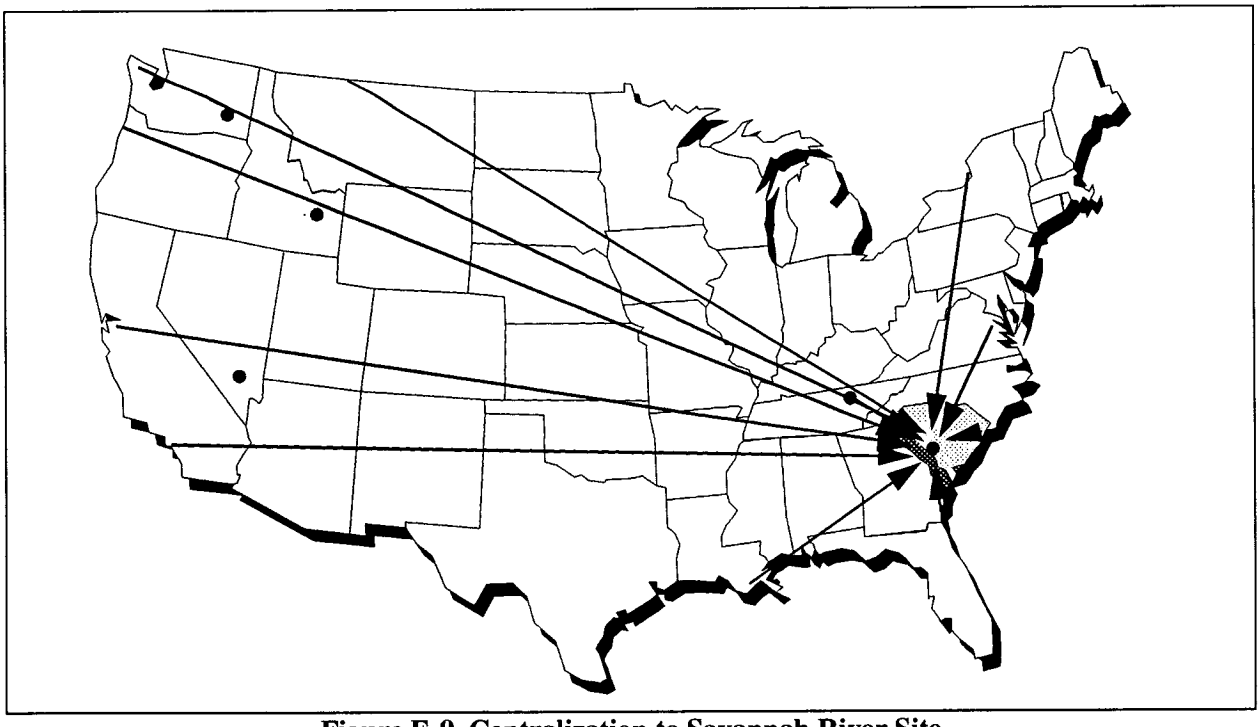

Figure E-9 Centralization to Savannah River Site

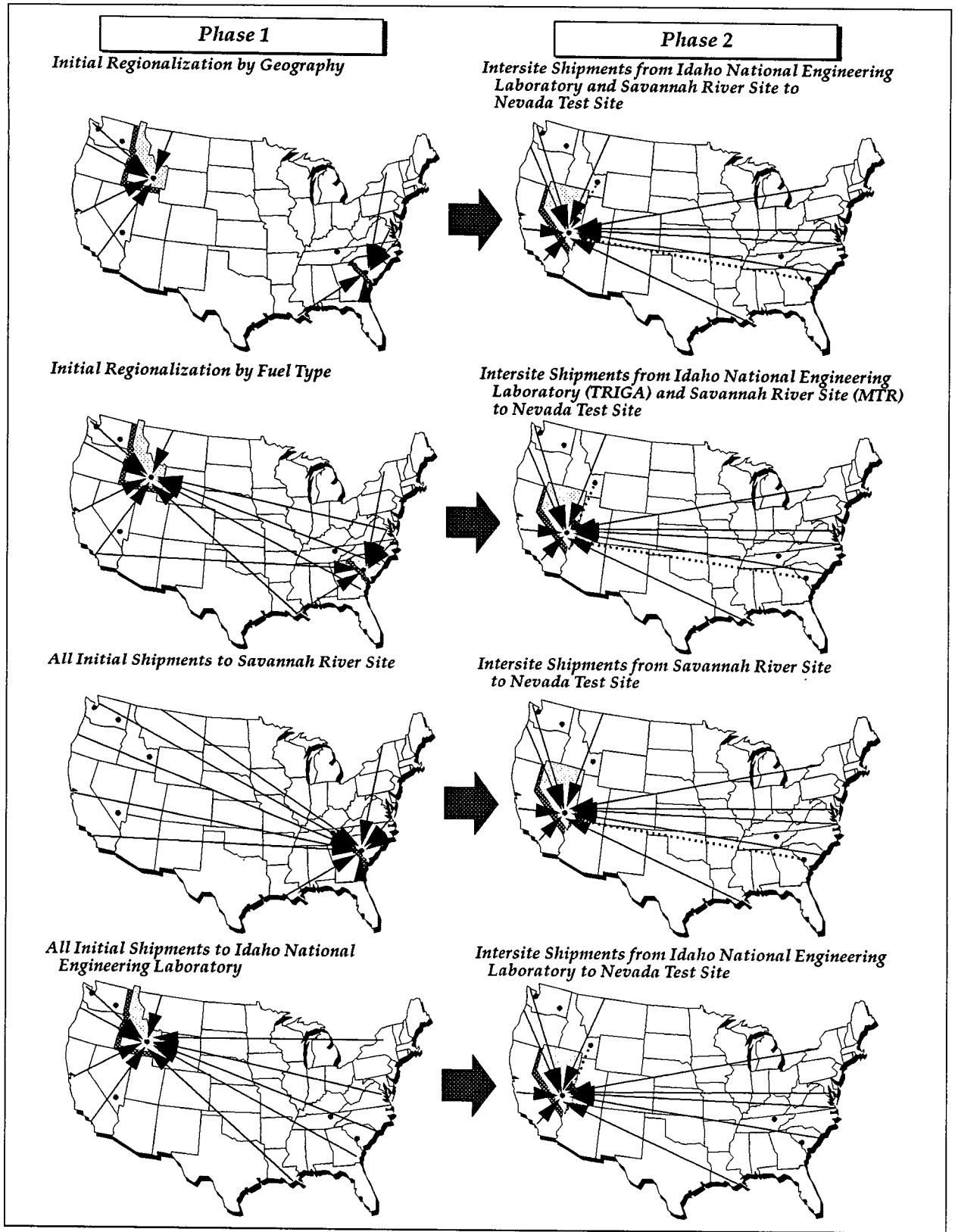

Figure E-10 Centralization to Nevada Test Site

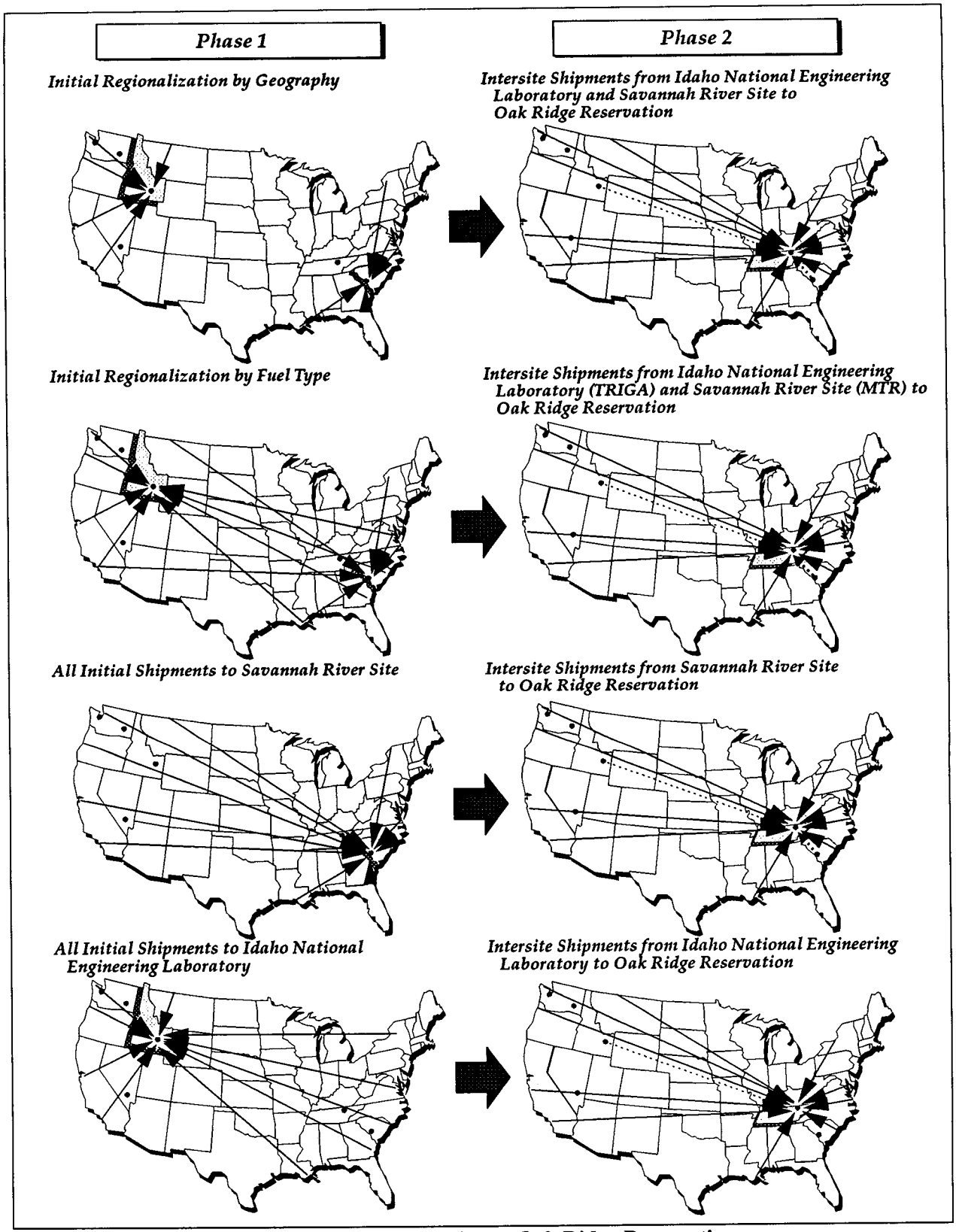

Figure E-11 Centralization to Oak Ridge Reservation

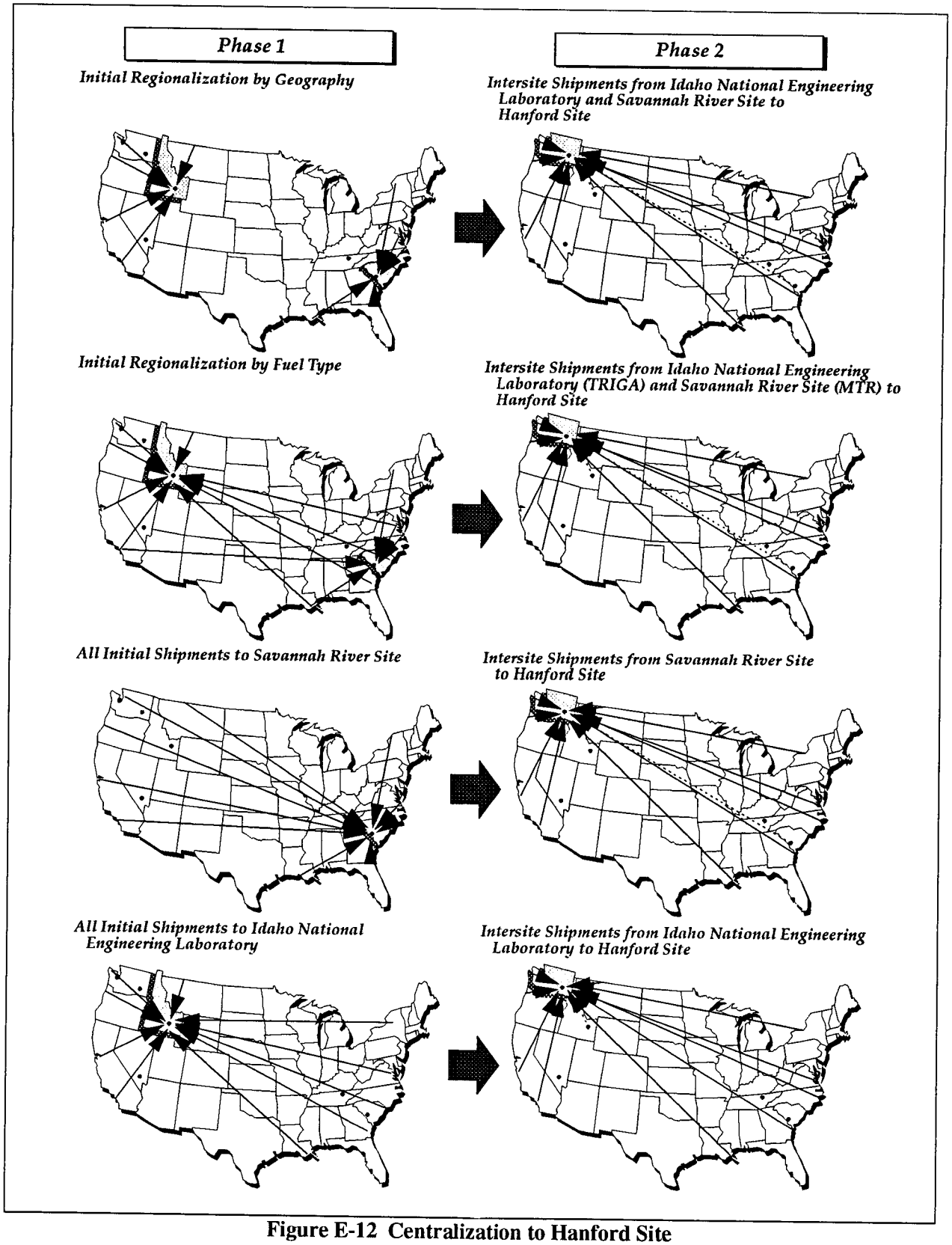

Figure E-12 Centralization to Hanford Site

Table E-2 Shipment Summary for Centralization Alternatives

Spent Nuclear Fuel Site Option	*Phase 1 Approach*	*Phase 1 Port-to-Site Shipments*	*Site-to-Site Shipments*[a]	*Phase 2 or Port-to-Final Site Shipments*	*Total Number of Shipments*
INEL	N/A - Single phase program			837	837
SRS	N/A - Single phase program			837	837
NTS	Geographic	East to SRS: 501 West to INEL: 143	From SRS: 126/51 From INEL: 36/15	From East: 150 From West: 43	999/903
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	From SRS: 130/52 From INEL: 31/13	From East: 150 From West: 43	998/902
	All SRS	644	161/65	From East: 150 From West: 43	998/902
	All INEL	644	161/65	From East: 150 From West: 43	998/902
ORR	Geographic	East to SRS: 501 West to INEL: 143	From SRS: 126/51 From INEL: 36/15	From East: 150 From West: 43	998/903
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	From SRS: 130/52 From INEL: 31/13	From East: 150 From West: 43	998/902
	All SRS	644	161/65	From East: 150 From West: 43	998/902
	All INEL	644	161/65	From East: 150 From West: 43	998/902
Hanford Site	Geographic	East to SRS: 501 West to INEL: 143	From SRS: 126/51 From INEL: 36/15	From East: 150 From West: 43	999/903
	By Fuel	MTR to SRS: 520 TRIGA to INEL: 124	From SRS: 130/52 From INEL: 31/13	From East: 150 From West: 43	998/902
	All SRS	644	161/65	From East: 150 From West: 43	998/902
	All INEL	644	161/65	From East: 150 From West: 43	998/902

[a] *Truck/Rail shipments assuming that the truck casks used for intersite shipments are capable of carrying 4 times as much fuel and rail casks 10 times as much fuel as the shipping cask received from the foreign research reactor due to consolidation.*

INEL = Idaho National Engineering Laboratory; ORR = Oak Ridge Reservation; SRS = Savannah River Site; NTS = Nevada Test Site; HS = Hanford Site

E.4 Truck and Rail Routing Analysis

Both rail and highway shipping capabilities are available at all potential ports of entry, and each of the five DOE sites is or could be made capable of receiving foreign research reactor spent nuclear fuel transported by rail or highway. Therefore, shipment of spent nuclear fuel will be analyzed along representative highway and railway routes for all ports and SNF&INEL Final EIS (DOE, 1995) alternatives.

As discussed above, each alternative can be defined as a set of origin and destination pairs representing shipment linkages between ports of entry and interim management sites. The calculation of the overland transportation risk for an alternative depends in part on characteristics of the transportation routes between the origin and destination sites. Regulatory routing criteria and the methods used to determine representative truck and rail routes for the transportation risk assessment are described below. In addition, the route characteristics that are important for the risk assessment are summarized.

E.4.1 Routing Regulations

Department of Transportation's public highway routing regulations are prescribed in 49 CFR Part 397. The regulations' objectives are to reduce the impacts of transporting radioactive materials, to establish consistent and uniform requirements for route selection, and to identify the role of State and local governments in the routing of radioactive materials. The regulations attempt to reduce potential hazards by avoiding populous areas and by minimizing travel times. Further, they require that the carrier of radioactive materials ensure that the vehicle is operated on routes that minimize radiological risks, and that accident rates, transit times, population density and activity, time of day, and day of week are considered in determining risk.

A shipment of a "highway route controlled quantity" of radioactive material, such as spent nuclear fuel, is required by 49 CFR 397 Subpart D to use the interstate highway system except when moving from origin to interstate or from interstate to destination, when making necessary repair or rest stops, or when emergency conditions make continued use of the interstate unsafe or impossible. Carriers are required to use interstate circumferential or bypass routes, if available, to avoid populous areas. Other "preferred highways" may be designated by any State or Tribe to replace or supplement the interstate system (DOT, 1992). Under its authority to regulate interstate transportation safety, the Department of Transportation can prohibit State and local bans and restrictions as "undue restraint of interstate commerce." State or local bans will be pre-empted if inconsistent with 49 CFR 397.

Currently, there are no Department of Transportation railroad routing regulations specific to the transportation of radioactive materials. Routes are generally fixed by the location of rail lines, and urban areas cannot be readily bypassed.

E.4.2 Determination of Representative Transportation Routes

Representative overland truck and rail routes have been determined for all pairs of origin and destination sites considered by the alternatives. The routes were selected consistent with current routing practices and all applicable routing regulations and guidelines. However, because the routes were determined for risk assessment purposes, they do not necessarily represent the actual routes that would be used to transport foreign research reactor spent nuclear fuel in the future. Specific routes cannot be identified in advance because the route would not be finalized until it had been reviewed and approved by the NRC. The selection of the actual route would be responsive to environmental and other conditions that were in effect or could reasonably be predicted at the time of shipment. Such conditions could include adverse weather conditions, truck or road conditions, bridge closures, etc. (Massey, 1994).

For both truck and rail transportation modes, the route characteristics that are important to the radiological risk assessment include the total shipment distance between each origin and destination pair and the population distribution along the route. The specific route selected determines both the total potentially exposed population and the expected frequency of transportation-related accidents. Route characteristics are summarized in Tables E-3 and E-4 for the ports of entry and management sites considered in this assessment. The ports of Philadelphia, PA; Elizabeth, NJ; and Long Beach, CA are included in the list to show the effects on overland transportation of choosing high population ports. The routes from Canada are representative for risk analysis purposes, many other routes are available for use. They are not included in the risk analysis described later in this appendix. The exposed population includes all persons living within 800 m [0.5 mile (mi)] on each side of the route. The representative routes are shown in Attachment 1 to this appendix.

Table E-3 Summary of Route Distances for Truck and Rail Modes

Shipments to Hanford Site:				
		Percentage in Zone		
Route[a]	*Distance km (mi)*	*Rural*	*Suburban*	*Urban*
From Eastern Ports				
Truck:				
Charleston, SC (NWS)	4579 (2858)	85.5	13.3	1.2
Charleston, SC (Wando Terminal)	4603 (2873)	85.3	13.4	1.3
Elizabeth, NJ	4527 (2812)	84.4	14.1	1.4
Galveston, TX	3746 (2327)	86.0	11.8	2.3
Jacksonville, FL	4708 (2924)	83.9	14.6	1.5
Newport News, VA	4682 (2908)	84.9	13.3	1.8
Norfolk, VA	4748 (2949)	84.4	13.8	1.7
Philadelphia, PA	4617 (2868)	82.9	15.6	1.5
Portsmouth, VA	4717 (2930)	84.5	13.6	1.9
Savannah, GA	4529 (2813)	84.7	13.8	1.5
MOTSU, NC	4617 (2868)	85.7	13.1	1.3
Wilmington, NC	4770 (2963)	85.3	13.5	1.1
Rail:				
Charleston, SC (NWS)	4925 (3059)	84.5	13.7	1.8
Charleston, SC (Wando Terminal)	4925 (3059)	84.5	13.7	1.8
Elizabeth, NJ	4846 (3010)	76.1	19.5	4.4
Galveston, TX	3851 (2392)	89.9	9.1	1.0
Jacksonville, FL	4941 (3069)	85.4	13.0	1.6
Newport News, VA	4972 (3088)	83.6	13.7	2.7
Norfolk, VA	5131 (3187)	83.8	13.6	2.7
Philadelphia, PA	4769 (2962)	77.1	18.6	4.3
Portsmouth, VA	5083 (3157)	84.0	13.4	2.6
Savannah, GA	4977 (3091)	85.3	13.2	1.4
MOTSU, NC	5157 (3203)	83.6	14.8	1.5
Wilmington, NC	5142 (3194)	83.7	14.7	1.5
From Western Ports				
Truck:				
Long Beach CA	1986 (1241)	80.5	14.3	5.2
NWS Concord, CA	1378 (856)	79.4	18.0	2.6
Portland, OR	407 (253)	81.5	15.3	3.3
Tacoma, WA	399 (248)	73.4	22.8	3.8
Rail:				
Long Beach, CA	2553 (1587)	85.6	8.9	5.5
NWS Concord, CA	1531 (951)	80.3	14.7	5.0
Portland, OR	385 (239)	82.1	13.4	4.5
Tacoma, WA	602 (374)	79.2	17.2	3.6
From DOE Sites/Canadian Border				
Truck:				
Alexandria Bay, NY	4456 (2768)	82.8	15.6	1.6
Idaho National Engineering Laboratory	964 (599)	91.3	7.6	1.1
Nevada Test Site	1816 (1128)	86.5	10.9	2.6
Oak Ridge Reservation	3967 (2464)	87.8	11.0	1.2
Savannah River	4390 (2727)	84.3	14.2	1.5
Sweetgrass, MT	1407 (874)	89.4	10.0	0.6
Rail:				
Alexandria Bay, NY	4634 (2878)	79.6	16.6	3.8
Idaho National Engineering Laboratory	1059 (658)	91.4	7.1	1.4

Shipments to Hanford Site:				
Route[a]	*Distance km (mi)*	*Percentage in Zone*		
		Rural	*Suburban*	*Urban*
Nevada Test Site	2096 (1302)	93.0	5.9	1.1
Oak Ridge Reservation	4188 (2601)	91.2	7.4	1.3
Savannah River	4754 (2953)	84.7	13.5	1.8
Sweetgrass, MT	976 (606)	91.7	6.8	1.6

Shipments to Idaho National Engineering Laboratory:				
Route[a]	*Distance km (mi)*	*Percentage in Zone*		
		Rural	*Suburban*	*Urban*
From Eastern Ports				
Truck:				
Charleston, SC (NWS)	3910 (2441)	84.4	14.3	1.3
Charleston, SC (Wando Terminal)	3935 (2456)	84.2	14.4	1.4
Elizabeth, NJ	3858 (2396)	82.9	15.5	1.5
Galveston, TX	3077 (1911)	84.5	13.0	2.5
Jacksonville, FL	4031 (2504)	82.5	15.9	1.5
Newport News, VA	4012 (2492)	83.5	14.6	1.9
Norfolk, VA	4073 (2530)	83.1	15.1	1.8
Philadelphia, PA	3948 (2452)	81.2	17.2	1.6
Portsmouth, VA	4048 (2514)	83.1	14.8	2.1
Savannah, GA	3861 (2398)	83.3	15.1	1.6
MOTSU, NC	3875 (2407)	85.3	13.5	1.2
Wilmington, NC	4099 (2546)	84.1	14.8	1.2
Rail:				
Charleston, SC (NWS)	4046 (2513)	82.6	15.3	2.1
Charleston, SC (Wando Terminal)	4046 (2513)	82.6	15.3	2.1
Elizabeth, NJ	3967 (2464)	72.3	22.5	5.2
Galveston, TX	2972 (1846)	88.9	10.1	1.0
Jacksonville, FL	4062 (2523)	83.7	14.6	1.7
Newport News, VA	4093 (2542)	81.5	15.4	3.1
Norfolk, VA	4252 (2641)	81.8	15.2	3.0
Philadelphia, PA	3890 (2416)	73.4	21.5	5.1
Portsmouth, VA	4204 (2611)	82.1	14.9	3.0
Savannah, GA	4097 (2545)	83.6	14.8	1.6
MOTSU, NC	4278 (2657)	81.6	16.7	1.7
Wilmington, NC	4263 (2648)	81.8	16.5	1.7
From Western Ports				
Truck:				
Long Beach, CA	1575 (979)	77.7	14.2	8.1
NWS Concord, CA	1518 (943)	85.9	11.1	3.1
Portland, OR	1188 (738)	88.6	9.8	1.7
Tacoma, WA	1312 (815)	87.0	11.4	1.6
Rail:				
Long Beach, CA	1675 (1041)	81.5	10.5	8.0
NWS Concord, CA	1473 (915)	89.0	8.7	2.4
Portland, OR	1264 (785)	92.6	5.8	1.6
Tacoma, WA	1504 (934)	88.6	9.2	2.2
From DOE Sites/Canadian Border				
Truck:				
Alexandria Bay, NY	3787 (2352)	81.0	17.2	1.7
Hanford Site	964 (599)	91.3	7.6	1.1
Nevada Test Site	1146 (712)	82.8	13.7	3.5

Shipments to Idaho National Engineering Laboratory:				
		Percentage in Zone		
Route[a]	*Distance km (mi)*	*Rural*	*Suburban*	*Urban*
Oak Ridge Reservation	3297 (2048)	86.8	12.0	1.2
Savannah River	3721 (2311)	82.8	15.6	1.6
Sweetgrass, MT	874 (543)	94.8	4.8	0.4
Rail:				
Alexandria Bay, NY	3755 (2332)	76.4	19.1	4.5
Hanford Site	1059 (658)	91.4	7.1	1.4
Nevada Test Site	1217 (756)	92.8	5.9	1.3
Oak Ridge Reservation	3309 (2055)	90.7	7.8	1.5
Savannah River	3875 (2407)	82.8	15.2	2.0
Sweetgrass, MT	1982 (1231)	93.2	5.8	1.0

Shipments to Nevada Test Site:				
		Percentage in Zone		
Route[a]	*Distance km (mi)*	*Rural*	*Suburban*	*Urban*
From Eastern Ports				
Truck:				
Charleston, SC (NWS)	3930 (2543)	84.5	14.1	1.4
Charleston, SC (Wando Terminal)	4098 (2558)	84.3	14.2	1.5
Elizabeth, NJ	4302 (2672)	80.5	17.2	2.3
Galveston ,TX	2998 (1862)	85.4	11.5	3.2
Jacksonville, FL	4197 (2607)	82.8	15.4	1.8
Newport News, VA	4178 (2595)	83.8	14.1	2.1
Norfolk, VA	4239 (2633)	83.4	14.6	2.0
Philadelphia, PA	4223 (2623)	80.4	17.4	2.2
Portsmouth, VA	4213 (2617)	83.4	14.3	2.3
Savannah, GA	4027 (2501)	83.6	14.6	1.8
MOTSU, NC	3956 (2457)	83.0	15.0	2.0
Wilmington, NC	4267 (2650)	84.3	14.3	1.4
Rail:				
Charleston, SC (NWS)	4741 (2945)	84.3	13.7	2.0
Charleston, SC (Wando Terminal)	4741 (2945)	84.3	13.7	2.0
Elizabeth, NJ	4661 (2895)	75.6	19.7	4.7
Galveston, TX	3148 (1955)	92.0	7.2	0.8
Jacksonville, FL	4758 (2955)	85.3	13.1	1.7
Newport News, VA	4787 (2973)	83.4	13.8	2.9
Norfolk, VA	4948 (3073)	83.6	13.6	2.8
Philadelphia, PA	4585 (2848)	76.6	18.8	4.6
Portsmouth, VA	4898 (3042)	83.8	13.4	2.8
Savannah, GA	4793 (2977)	85.2	13.2	1.5
MOTSU, NC	4973 (3089)	83.4	14.9	1.7
Wilmington, NC	4959 (3080)	83.5	14.8	1.7
From Western Ports				
Truck:				
Long Beach, CA	645 (401)	71.3	12.7	16.0
NWS Concord, CA	1146 (712)	81.8	11.3	6.9
Portland, OR	2045 (1270)	85.5	11.5	2.9
Tacoma, WA	2164 (1344)	84.7	12.6	2.7
Rail:				
Long Beach, CA	777 (483)	70.5	14.3	15.3
NWS Concord, CA	1369 (850)	77.8	16.7	5.6
Portland, OR	2301 (1429)	93.5	5.3	1.2

Shipments to Nevada Test Site:				
Route[a]	Distance km (mi)	Percentage in Zone		
		Rural	Suburban	Urban
Tacoma, WA	2542 (1579)	91.0	7.4	1.6
From DOE Sites/Canadian Border				
Truck:				
Alexandria Bay, NY	4217 (2619)	82.0	16.0	1.9
Hanford Site	1816 (1128)	86.5	10.9	2.6
Idaho National Engineering Laboratory	1146 (712)	82.8	13.7	3.5
Oak Ridge Reservation	3463 (2151)	86.9	11.5	1.6
Savannah River	3887 (2414)	83.1	15.1	1.8
Sweetgrass, MT	1900 (1180)	87.5	10.0	2.5
Rail:				
Alexandria Bay, NY	4448 (2763)	79.2	16.7	4.0
Hanford Site	2096 (1302)	93.0	5.9	1.1
Idaho National Engineering Laboratory	1217 (756)	92.8	5.9	1.3
Oak Ridge Reservation	4004 (2487)	91.4	7.2	1.5
Savannah River	4571 (2839)	84.5	13.5	1.9
Sweetgrass, MT	3019 (1875)	93.7	5.4	0.9

Shipments to Oak Ridge Reservation:				
Route[a]	Distance km (mi)	Percentage in Zone		
		Rural	Suburban	Urban
From Eastern Ports				
Truck:				
Charleston, SC (NWS)	644 (402)	71.6	27.6	0.8
Charleston, SC (Wando Terminal)	668 (417)	70.9	27.8	1.3
Elizabeth, NJ	1188 (738)	62.2	35.7	2.1
Galveston, TX	1550 (963)	73.3	24.6	2.1
Jacksonville, FL	913 (567)	66.8	32.0	1.3
Newport News, VA	890 (553)	69.8	27.6	2.6
Norfolk, VA	886 (550)	68.4	30.2	1.3
Philadelphia, PA	1095 (680)	64.7	31.7	3.6
Portsmouth, VA	926 (575)	68.4	28.2	3.4
Savannah, GA	723 (449)	74.3	25.0	0.6
MOTSU, NC	799 (496)	72.4	26.7	0.9
Wilmington, NC	819 (509)	72.6	26.5	0.9
Rail:				
Charleston, SC (NWS)	935 (581)	65.2	33.3	1.5
Charleston, SC (Wando Terminal)	935 (581)	65.2	33.3	1.5
Elizabeth, NJ	1264 (785)	44.7	43.2	12.2
Galveston, TX	1695 (1053)	70.5	26.2	3.3
Jacksonville, FL	910 (565)	65.7	31.9	2.4
Newport News, VA	1230 (764)	59.2	38.7	2.0
Norfolk, VA	1109 (689)	62.2	36.3	1.6
Philadelphia, PA	1129 (701)	48.6	43.0	8.4
Portsmouth, VA	1061 (659)	62.3	36.4	1.3
Savannah, GA	945 (587)	66.2	32.1	1.7
MOTSU, NC	873 (542)	61.5	37.1	1.5
Wilmington, NC	857 (532)	61.7	36.8	1.5
From Western Ports				
Truck:				
Long Beach, CA	3614 (2246)	85.0	11.0	3.8
NWS Concord, CA	4117 (2557)	86.3	10.9	2.8

Shipments to Oak Ridge Reservation:				
Route[a]	Distance km (mi)	Percentage in Zone		
		Rural	Suburban	Urban
Portland, OR	4200 (2609)	87.0	11.5	1.5
Tacoma, WA	4279 (2658)	88.0	11.0	1.0
Rail:				
Long Beach, CA	4302 (2674)	86.5	9.7	3.9
NWS Concord, CA	4524 (2810)	87.5	10.4	2.2
Portland, OR	4551 (2827)	85.5	12.1	2.4
Tacoma, WA	4568 (2837)	83.7	13.3	3.0
From DOE Sites/Canadian Border				
Truck:				
Alexandria Bay, NY	1492 (927)	65.9	33.5	0.7
Hanford Site	3967 (2464)	87.8	11.0	1.2
Idaho National Engineering Laboratory	3297 (2048)	86.8	12.0	1.2
Nevada Test Site	3463 (2151)	86.9	11.5	1.6
Savannah River	610 (379)	59.1	38.5	2.4
Sweetgrass, MT	1900 (1180)	87.5	10.0	2.5
Rail:				
Alexandria Bay, NY	1565 (972)	57.5	35.7	6.8
Hanford Site	4188 (2601)	91.2	7.4	1.3
Idaho National Engineering Laboratory	3309 (2055)	90.7	7.8	1.5
Nevada Test Site	4004 (2487)	91.4	7.2	1.5
Savannah River	671 (417)	68.8	29.8	1.4
Sweetgrass, MT	3375 (2096)	83.7	13.7	2.6

Shipments to Savannah River Site:				
Route[a]	Distance km (mi)	Percentage in Zone		
		Rural	Suburban	Urban
From Eastern Ports				
Truck:				
Charleston, SC (NWS)	301 (188)	72.9	26.2	0.9
Charleston, SC (Wando Terminal)	325 (203)	71.6	26.6	1.8
Elizabeth, NJ	1325 (823)	63.8	34.2	2.1
Galveston, TX	1610 (1000)	70.5	27.0	2.5
Jacksonville, FL	607 (377)	81.5	18.4	0.0
Newport News, VA	836 (519)	71.1	26.8	2.1
Norfolk, VA	802 (498)	72.8	26.2	1.0
Philadelphia, PA	1193 (741)	62.1	34.0	3.9
Portsmouth, VA	807 (501)	72.7	26.1	1.1
Savannah, GA	403 (250)	79.1	20.8	0.0
MOTSU, NC	403 (250)	82.5	17.2	0.3
Wilmington, NC	499 (310)	75.5	24.0	0.5
Rail:				
Charleston, SC (NWS)	225 (140)	83.9	13.6	2.5
Charleston, SC (Wando Terminal)	225 (140)	83.9	13.6	2.5
Elizabeth, NJ	1404 (872)	56.2	33.0	10.8
Galveston, TX	1890 (1174)	69.6	26.2	4.2
Jacksonville, FL	417 (259)	83.7	13.7	2.6
Newport News, VA	972 (604)	69.1	28.7	2.2
Norfolk, VA	852 (529)	74.3	24.1	1.6
Philadelphia, PA	1270 (789)	60.9	31.8	7.2
Portsmouth, VA	803 (499)	75.2	23.5	1.3
Savannah, GA	184 (114)	87.9	10.9	1.2

Shipments to Savannah River Site:				
Route[a]	Distance km (mi)	Percentage in Zone		
		Rural	Suburban	Urban
MOTSU, NC	615 (382)	77.9	20.5	1.6
Wilmington, NC	601 (373)	78.7	19.7	1.6
From Western Ports				
Truck:				
Long Beach, CA	3931 (2443)	78.8	18.0	3.3
NWS Concord, CA	4482 (2784)	79.4	17.2	3.3
Portland, OR	4635 (2879)	83.9	14.4	1.7
Tacoma, WA	4719 (2931)	84.8	13.9	1.3
Rail:				
Long Beach, CA	5212 (3239)	80.9	15.3	3.7
NWS Concord, CA	5123 (3182)	80.0	16.4	3.6
Portland, OR	5078 (3154)	82.0	15.4	2.6
Tacoma, WA	5096 (3165)	80.4	16.5	3.1
From DOE Sites/Canadian Border				
Truck:				
Alexandria Bay, NY	1629 (1012)	66.8	32.4	0.8
Hanford Site	4390 (2727)	84.3	14.2	1.5
Idaho National Engineering Laboratory	3721 (2311)	82.8	15.6	1.6
Nevada Test Site	3887 (2414)	83.1	15.1	1.8
Oak Ridge Reservation	610 (379)	59.1	38.5	2.4
Sweetgrass, MT	4147 (2576)	85.2	13.6	1.3
Rail:				
Alexandria Bay, NY	2062 (1281)	53.8	35.5	10.7
Hanford Site	4754 (2953)	84.7	13.5	1.8
Idaho National Engineering Laboratory	3875 (2407)	82.8	15.2	2.0
Nevada Test Site	4571 (2839)	84.5	13.5	1.9
Oak Ridge Reservation	671 (417)	68.8	29.8	1.4
Sweetgrass, MT	3903 (2424)	79.4	17.8	2.8

[a] *Route characteristics were generated using the routing models HIGHWAY (Johnson et al., 1993a) and INTERLINE (Johnson et al., 1993b) for truck and rail modes, respectively.*

Table E-4 Summary of the Population Distributions Along Routes for Truck and Rail Modes

Shipments to Hanford Site:				
Route[a]	Number of Affected Persons[b]	Average Persons/km^2		
		Rural	Suburban	Urban
From Eastern Ports				
Truck:				
Charleston, SC (NWS)	550,000	7.0	342.5	2149.1
Charleston, SC (Wando Terminal)	569,000	7.0	346.1	2158.6
Elizabeth, NJ	585,000	7.8	318.3	2233.1
Galveston, TX	575,000	4.9	401.5	2139.5
Jacksonville, FL	643,000	7.1	338.6	2180.5
Newport News, VA	677,000	7.5	356.9	2254.3
Norfolk, VA	694,000	7.6	362.0	2219.3
Philadelphia, PA	622,000	7.4	317.4	2079.3
Portsmouth, VA	718,000	7.5	364.3	2243.7
Savannah, GA	602,000	6.8	344.2	2205.1
MOTSU, NC	548,000	7.6	332.1	2146.8

Shipments to Hanford Site:				
Route[a]	Number of Affected Persons[b]	Average Persons/km^2		
		Rural	Suburban	Urban
Wilmington, NC	556,000	7.5	330.0	2149.9
Rail:				
Charleston, SC (NWS)	731,000	6.9	354.6	2296.8
Charleston, SC (Wando Terminal)	731,000	6.9	354.6	2296.8
Elizabeth, NJ	1,380,000	7.2	355.0	2506.4
Galveston, TX	347,000	4.8	374.8	2034.6
Jacksonville, FL	657,000	6.9	343.6	2272.5
Newport News, VA	936,000	7.5	329.1	2623.1
Norfolk, VA	960,000	7.6	338.8	2592.7
Philadelphia, PA	1,350,000	7.1	358.5	2567.1
Portsmouth, VA	934,000	7.6	334.2	2608.4
Savannah, GA	641,000	7.0	343.1	2244.5
MOTSU, NC	739,000	7.7	346.1	2288.1
Wilmington, NC	736,000	7.7	346.7	2288.1
From Western Ports				
Truck:				
Long Beach, CA	617,000	7.9	381.0	2693.6
NWS Concord, CA	263,000	9.3	335.1	2159.0
Portland, OR	85,700	6.3	413.3	2088.6
Tacoma, WA	98,600	7.7	321.9	2120.5
Rail:				
Long Beach, CA	783,000	3.6	471.4	2781.1
NWS Concord, CA	419,000	7.0	368.7	2363.7
Portland, OR	99,500	6.1	450.0	2294.4
Tacoma, WA	136,000	10.6	355.9	2161.1
From DOE Sites/Canadian Border				
Truck:				
Alexandria Bay, NY	612,000	7.7	300.4	2211.8
Idaho National Engineering Laboratory	82,800	5.5	363.0	2034.6
Nevada Test Site	305,000	4.1	447.3	2176.8
Oak Ridge Reservation	429,000	6.0	351.1	2207.3
Savannah River	599,000	6.7	354.7	2198.1
Sweetgrass, MT	106,000	4.5	314.4	2152.3
Rail:				
Alexandria Bay, NY	1,170,000	7.0	360.2	2584.5
Idaho National Engineering Laboratory	95,400	4.2	373.6	1935.8
Nevada Test Site	157,000	3.5	402.3	1980.5
Oak Ridge Reservation	410,000	6.7	375.7	2220.3
Savannah River	690,000	6.8	355.8	2267.6
Sweetgrass, MT	92,400	4.1	394.4	1979.9

Shipments to Idaho National Engineering Laboratory:				
Route[a]	Number of Affected Persons[b]	Average Persons/km^2		
		Rural	Suburban	Urban
From Eastern Ports				
Truck:				
Charleston, SC (NWS)	498,000	7.4	334.0	2157.4
Charleston, SC (Wando Terminal)	518,000	7.4	338.1	2167.2
Elizabeth, NJ	536,000	8.5	315.6	2257.0
Galveston, TX	526,000	5.1	405.8	2149.1

Shipments to Idaho National Engineering Laboratory:				
Route[a]	Number of Affected Persons[b]	Average Persons/km^2		
		Rural	Suburban	Urban
Jacksonville, FL	576,000	7.6	332.2	2224.8
Newport News, VA	628,000	8.0	356.8	2274.7
Norfolk, VA	631,000	8.1	362.5	2220.6
Philadelphia, PA	573,000	7.9	314.9	2084.2
Portsmouth, VA	670,000	8.0	364.7	2261.3
Savannah, GA	553,000	7.3	343.2	2224.8
MOTSU, NC	463,000	8.1	327.9	2155.2
Wilmington, NC	507,000	8.1	328.1	2166.9
Rail:				
Charleston, SC (NWS)	671,000	7.6	348.5	2332.6
Charleston, SC (Wando Terminal)	671,000	7.6	348.5	2332.6
Elizabeth, NJ	1, 320,000	8.2	350.8	2528.3
Galveston, TX	286,000	5.1	365.7	2068.7
Jacksonville, FL	597,000	7.7	336.3	2312.5
Newport News, VA	875,000	8.4	321.1	2665.7
Norfolk, VA	900,000	8.5	331.7	2632.7
Philadelphia, PA	1,290,000	8.1	354.2	2592.0
Portsmouth, VA	874,000	8.6	326.6	2650.6
Savannah, GA	580,000	7.8	335.9	2284.9
MOTSU, NC	679,000	8.7	340.2	2328.4
Wilmington, NC	675,000	8.7	340.8	2328.4
From Western Ports				
Truck:				
Long Beach, CA	692,000	3.8	487.0	2641.1
NWS Concord, CA	271,000	3.5	411.6	2181.5
Portland, OR	143,000	5.6	395.0	2082.7
Tacoma, WA	157,000	6.1	336.5	2098.8
Rail:				
Long Beach, CA	722,000	3.5	484.6	2830.1
NWS Concord, CA	198,000	4.4	337.2	2293.0
Portland, OR	116,000	4.3	330.2	2222.6
Tacoma, WA	199,000	6.1	326.5	2291.5
From DOE Sites/Canadian Border				
Truck:				
Alexandria Bay, NY	564,000	8.3	296.8	2230.8
Hanford Site	82,800	5.5	363.0	2034.6
Nevada Test Site	256,000	3.9	470.3	2201.5
Oak Ridge Reservation	380,000	6.3	350.4	2237.4
Savannah River	551,000	7.2	354.4	2217.9
Sweetgrass, MT	38,900	4.3	348.1	2057.3
Rail:				
Alexandria Bay NY	1,110,000	7.9	355.3	2614.7
Hanford Site	95,400	4.2	373.6	1935.8
Nevada Test Site	96,100	3.3	384.6	2022.2
Oak Ridge Reservation	350,000	7.5	365.3	2270.2
Savannah River	630,000	7.6	349.6	2303.3
Sweetgrass, MT	134,000	4.2	338.5	2068.1

Shipments to Nevada Test Site:				
Route[a]	Number of Affected Persons[b]	Average Persons/km^2		
		Rural	Suburban	Urban
From Eastern Ports				
Truck:				
Charleston, SC (NWS)	540,000	6.7	347.4	2179.0
Charleston, SC (Wando Terminal)	559,000	6.7	351.2	2186.6
Elizabeth, NJ	782,000	7.5	343.2	2300.4
Galveston, TX	595,000	4.1	463.8	2277.2
Jacksonville, FL	639,000	6.9	344.9	2265.9
Newport News, VA	691,000	7.3	370.6	2301.4
Norfolk, VA	694,000	7.4	375.5	2257.2
Philadelphia, PA	756,000	7.6	349.2	2199.9
Portsmouth, VA	732,000	7.3	378.0	2287.8
Savannah, GA	616,000	6.5	357.1	2265.9
MOTSU, NC	619,000	8.6	336.2	2218.3
Wilmington, NC	570,000	7.4	341.6	2229.9
Rail:				
Charleston, SC (NWS)	733,000	6.5	362.0	2314.6
Charleston, SC (Wando Terminal)	733,000	6.5	362.0	2314.6
Elizabeth, NJ	1,390,000	6.8	360.2	2511.5
Galveston, TX	231,000	4.3	374.6	2124.4
Jacksonville, FL	659,000	6.6	350.9	2294.0
Newport News, VA	938,000	7.1	335.5	2629.1
Norfolk, VA	963,000	7.3	345.5	2599.2
Philadelphia, PA	1,350,000	6.7	364.2	2571.7
Portsmouth, VA	936,000	7.3	340.8	2614.8
Savannah, GA	643,000	6.7	350.2	2268.7
MOTSU, NC	742,000	7.4	352.3	2308.6
Wilmington, NC	738,000	7.4	353.0	2308.6
From Western Ports				
Truck:				
Long Beach, CA	518,000	2.6	550.5	2817.2
NWS Concord, CA	437,000	3.8	559.2	2617.4
Portland, OR	375,000	4.3	452.0	2154.7
Tacoma, WA	379,000	4.7	409.3	2174.8
Rail:				
Long Beach, CA	628,000	3.4	522.1	2934.2
NWS Concord, CA	407,000	6.2	360.9	2313.2
Portland, OR	177,000	3.6	376.6	2183.0
Tacoma, WA	261,000	005	357.6	2251.6
From DOE Sites/Canadian Border				
Truck:				
Alexandria Bay NY	644,000	7.5	308.8	2262.5
Hanford Site	305,000	4.1	447.3	2176.8
Idaho National Engineering Laboratory	256,000	3.9	470.3	2201.5
Oak Ridge Reservation	443,000	5.5	370.8	2291.1
Savannah River	613,000	6.4	368.3	2261.8
Sweetgrass, MT	304,000	4.0	455.9	2167.2
Rail:				
Alexandria Bay NY	1,170,000	6.6	366.8	2589.6
Hanford Site	157,000	3.5	402.3	1980.5

Shipments to Nevada Test Site:				
Route[a]	Number of Affected Persons[b]	Average Persons/km^2		
		Rural	Suburban	Urban
Idaho National Engineering Laboratory	96,100	3.3	384.6	2022.2
Oak Ridge Reservation	413,000	6.3	394.1	2252.1
Savannah River	692,000	6.4	363.7	2287.5
Sweetgrass, MT	196,000	3.7	370.8	2067.5

Shipments to Oak Ridge Reservation:				
Route[a]	Number of Affected Persons[b]	Average Persons/km^2		
		Rural	Suburban	Urban
From Eastern Ports				
Truck:				
Charleston, SC (NWS)	108,000	15.0	297.5	1842.7
Charleston, SC (Wando Terminal)	127,000	14.7	311.5	2027.0
Elizabeth, NJ	290,000	19.9	273.2	2343.1
Galveston, TX	337,000	13.5	330.3	2358.5
Jacksonville, FL	175,000	15.3	266.0	2322.6
Newport News, VA	209,000	18.5	286.8	2316.6
Norfolk, VA	174,000	17.6	292.1	2073.3
Philadelphia, PA	335,000	18.8	335.1	2215.7
Portsmouth, VA	251,000	18.2	309.4	2270.2
Savannah, GA	101,000	14.1	274.1	1764.7
MOTSU, NC	128,000	17.6	283.4	1854.5
Wilmington, NC	128,000	16.7	280.4	1764.7
Rail:				
Charleston, SC (NWS)	194,000	17.4	272.6	2202.7
Charleston, SC (Wando Terminal)	194,000	17.4	272.6	2202.7
Elizabeth, NJ	949,000	17.1	353.3	2694.7
Galveston, TX	471,000	13.4	360.1	2306.2
Jacksonville, FL	235,000	11.6	335.9	2233.3
Newport News, VA	305,000	16.8	277.3	2175.5
Norfolk, VA	241,000	17.3	270.6	2077.6
Philadelphia, PA	649,000	16.9	333.2	2653.3
Portsmouth, VA	215,000	17.8	259.8	2075.0
Savannah, GA	218,000	12.1	335.1	2090.0
MOTSU, NC	186,000	17.7	263.7	2038.3
Wilmington, NC	183,000	17.8	263.3	2038.3
From Western Ports				
Truck:				
Long Beach, CA	823,000	6.2	380.8	2607.0
NWS Concord, CA	742,000	6.0	401.1	2426.5
Portland, OR	519,000	6.0	367.2	2195.4
Tacoma, WA	431,000	6.2	343.7	2213.8
Rail:				
Long Beach, CA	995,000	6.6	398.5	2736.4
NWS Concord, CA	664,000	6.9	379.3	2317.2
Portland, OR	765,000	7.6	393.4	2272.1
Tacoma, WA	919,000	7.7	407.7	2330.2
From DOE Sites/Canadian Border				
Truck:				
Alexandria Bay, NY	257,000	19.9	258.2	1896.7
Hanford Site	429,000	6.0	351.0	2207.3

Shipments to Oak Ridge Reservation:				
Route[a]	Number of Affected Persons[b]	Average Persons/km^2		
		Rural	Suburban	Urban
Idaho National Engineering Laboratory	380,000	6.3	350.0	2237.4
Nevada Test Site	443,000	5.5	371.0	2291.1
Savannah River	175,000	17	318.0	2244.1
Sweetgrass, MT	346,000	6.3	336.3	2180.9
Rail:				
Alexandria Bay NY	752,000	18.2	378.0	2443.0
Hanford Site	416,000	6.7	376.0	2220.3
Idaho National Engineering Laboratory	350,000	7.5	365.0	2270.2
Nevada Test Site	413,000	6.3	394.0	2252.1
Savannah River	132,000	15.2	289.0	2164.4
Sweetgrass, MT	627,000	8.7	395.5	2256.5

Shipments to Savannah River Site:				
Route[a]	Number of Affected Persons[b]	Average Person/km^2		
		Rural	Suburban	Urban
From Eastern Ports				
Truck:				
Charleston, SC (NWS)	46,200	16.3	275.0	1764.7
Charleston, SC (Wando Terminal)	65,700	15.6	306.1	2077.9
Elizabeth, NJ	316,000	17.6	277.6	2377.5
Galveston, TX	430,000	12.7	359.1	2254.1
Jacksonville, FL	46,900	13.2	211.4	1764.7
Newport News, VA	181,000	16.2	302.9	2281.5
Norfolk, VA	131,000	16.4	283.9	2007.9
Philadelphia, PA	397,000	16.5	348.5	2228.9
Portsmouth, VA	135,000	16.3	281.8	2033.1
Savannah, GA	37,300	13.6	233.4	1764.7
MOTSU, NC	34,200	15.0	213.0	1925.6
Wilmington, NC	64,700	17.7	256.7	1764.7
Rail:				
Charleston, SC (NWS)	41,200	6.8	328.6	2735.5
Charleston, SC (Wando Terminal)	41,200	6.8	328.6	2735.5
Elizabeth, NJ	903,000	14.2	353.0	2726.4
Galveston, TX	609,000	11.9	394.0	2330.3
Jacksonville, FL	72,200	10.6	290.3	2466.3
Newport News, VA	218,000	13.2	285.6	2444.8
Norfolk, VA	153,000	13.5	275.3	2469.8
Philadelphia, PA	603,000	14.0	328.8	2704.1
Portsmouth, VA	128,000	13.9	253.7	2615.8
Savannah, GA	21,300	9.6	309.0	2707.8
MOTSU, NC	99,000	12.7	260.9	2580.4
Wilmington, NC	95,500	12.8	259.6	2580.4
From Western Ports				
Truck:				
Long Beach, CA	714,000	7.5	369.4	2905.8
NWS Concord, CA	1,040,000	7.3	378.5	2381.7
Portland, OR	686,000	6.7	365.2	2188.9
Tacoma, WA	601,000	6.8	349.2	2202.0
Rail:				
Long Beach, CA	1,280,000	6.9	359.9	2653.0

Shipments to Savannah River Site:				
Route[a]	*Number of Affected Persons*[b]	*Average Person/km*^{2}		
		Rural	*Suburban*	*Urban*
NWS Concord, CA	1,210,000	7.1	381.6	2369.0
Portland, OR	950,000	7.5	369.0	2246.2
Tacoma, WA	1,100,000	7.5	381.0	2300.7
From DOE Sites/Canadian Border				
Truck:				
Alexandria, Bay NY	284,000	18.0	262.7	2072.4
Hanford Site	599,000	6.7	354.7	2198.1
Idaho National Engineering Laboratory	551,000	7.2	354.4	2217.9
Nevada Test Site	613,000	6.4	368.3	2261.8
Oak Ridge Reservation	175,000	17.0	317.7	2244.1
Sweetgrass, MT	513,000	7.1	344.0	2175.8
Rail:				
Alexandria Bay, NY	1,340,000	14.8	333.1	2756.8
Hanford Site	690,000	6.8	355.8	2267.6
Idaho National Engineering Laboratory	630,000	7.6	349.6	2303.3
Nevada Test Site	692,000	6.4	363.7	2287.5
Oak Ridge Reservation	132,000	15.2	289.2	2164.4
Sweetgrass, MT	812,000	8.4	367.3	2228.5

[a] *Route characteristics were generated using the routing models HIGHWAY (Johnson et al., 1993a) and INTERLINE (Johnson et al., 1993b) for truck and rail modes, respectively.*

[b] *The affected population includes all persons within 800 m (0.5 mi) of the route.*

The representative truck and rail routes were determined by using the routing models HIGHWAY (Johnson et al., 1993a) and INTERLINE (Johnson et al., 1993b), respectively. These models are described briefly below.

The HIGHWAY computer program is used for selecting highway routes for transporting radioactive materials within the United States by truck. The HIGHWAY data base is a computerized road atlas that currently describes approximately 386,400 kilometer (km) (240,000 mi) of roads. A complete description of the Interstate System and all United States highways is included in the database. In addition, most of the principal State highways and a number of local and community highways are also identified. The code is updated periodically to reflect current road conditions and has been benchmarked against reported mileages and observations of commercial truck firms.

Routes are calculated within the model by minimizing the total impedance between the origin and the destination. The impedance is basically defined as a function of distance and driving time along a particular highway segment. One of the special features of the HIGHWAY model is its ability to calculate routes that maximize the use of interstate highways. This feature allows the user to select routes for shipment of radioactive materials that conform to Department of Transportation regulations, specifically 49 CFR 397 Subpart D. The population densities along a route are derived from 1990 U.S. Bureau of the Census data. Rural, suburban, and urban areas are characterized according to the following breakdown: rural population densities range from 0 to 54 persons per km^2 (0 to 139 persons per mi^2); the suburban range is 55 to 1,284 persons per km^2 (140 to 3,326 persons per mi^2); and urban is taken as all population densities greater than 1,284 persons per km^2 (3,326 persons per mi^2).

The INTERLINE computer program is designed to simulate routing of the United States rail system. The INTERLINE database consists of 94 separate subnetworks and represents various competing rail companies in the United States. The database used by INTERLINE was originally based on Federal Railroad Administration data and reflected the United States railroad system in 1974. The data base has since been expanded and modified over the past 2 decades. The code is updated periodically to reflect current track conditions and has been benchmarked against reported mileages and observations of commercial rail firms.

The INTERLINE model uses a shortest-route algorithm that finds the minimum impedance path within an individual subnetwork. A separate routine is used to find paths along the subnetworks. The routes selected for this study used the standard assumptions in the INTERLINE model that simulate the selection process that railroads would use to direct shipments of spent nuclear fuel. The population densities along a route are derived from 1990 U.S. Bureau of the Census data. Rural, suburban, and urban areas are characterized according to the following breakdown: rural population densities range from 0 to 54 persons per km^2 (0 to 139 persons per mi^2); the suburban range is 55 to 1,284 persons per km^2 (140 to 3,326 persons per mi^2); and urban is taken as all population densities greater than 1,284 persons per km^2 (3,326 persons per mi^2).

E.5 Methods for Calculating Transportation Risks

The overland transportation risk assessment approach is summarized in Figure E-13. The first step in the ground transportation analysis was to determine the incident-free and accident risk factors, on a per-shipment basis, for transportation of the various types of spent nuclear fuel. Risk factors, as any risk estimate, are the product of the probability of exposure and the magnitude of the exposure. Accident risk factors were calculated for radiological and nonradiological traffic accidents. The probabilities, which are much lower than one, and the magnitudes of exposure were multiplied, yielding very low risk numbers. Incident-free risk factors were calculated for crew and public exposure to radiation emanating from the cask and public exposure to the chemical toxicity of the transportation vehicle exhaust. The probability of incident-free exposure is unity (one).

Radiological risk factors are expressed in units of rem. Later in the analysis, they will be multiplied by International Commission on Radiation Protection Publication 60 (ICRP, 1991) conversion factors and estimated numbers of shipments (see Section E.7.1) to give risk estimates in units of LCFs. The vehicle emission risk factors are calculated in latent mortalities, and the vehicle accident risk factors are calculated in mortalities. The nonradiological risk factors will be multiplied by the number of shipments.

For each alternative, risks were assessed for both incident-free transportation and accident conditions. For the incident-free assessment, risks were calculated for both collective populations of potentially exposed individuals and for MEIs. The accident assessment consists of two components: 1) a probabilistic accident risk assessment that considers the probabilities and consequences of a range of possible transportation accident environments, including low-probability accidents that have high consequences and high-probability accidents that have low consequences; and 2) an accident consequence assessment that considers only the consequences of the most severe transportation accidents postulated.

The RADTRAN 4 computer code (Neuhauser and Kanipe, 1993) is used for the incident-free and accident risk assessments to estimate the impacts to collective populations. RADTRAN 4 was developed by Sandia National Laboratories to calculate population risk associated with the transportation of radioactive materials by a variety of modes, including truck, rail, air, ship, and barge.

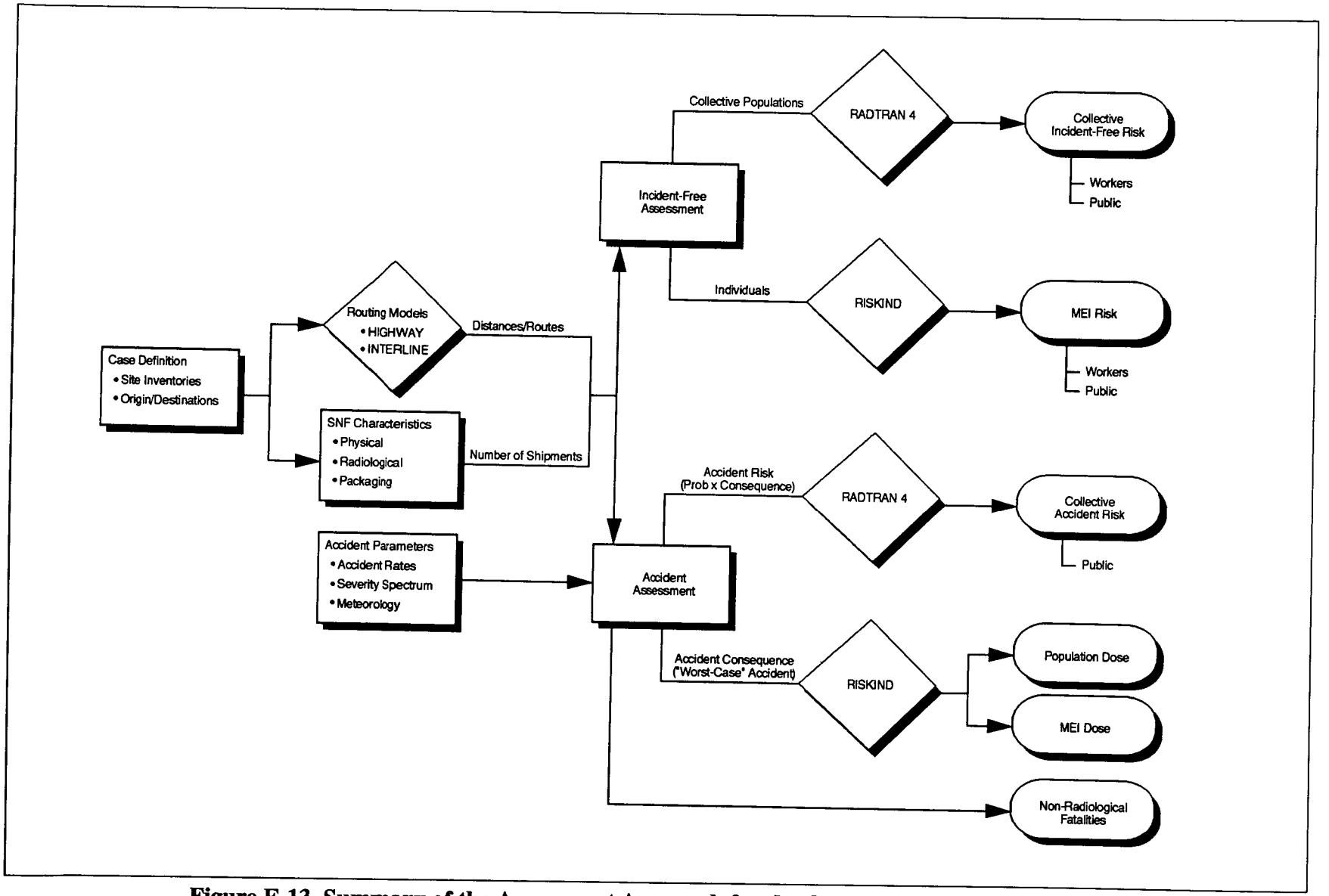

Figure E-13 Summary of the Assessment Approach for the Overland Transportation Risk Assessment

The RADTRAN 4 population risk calculations take into account both the consequences and probabilities of potential exposure events. The collective population risk is a measure of the total radiological risk posed to society as a whole by the alternative being considered. As such, the collective population risk is used as the primary means of comparing the various alternatives.

The RISKIND computer code (Yuan et al., 1993) is used to estimate the incident-free doses to MEIs and for estimating impacts for the accident consequence assessment. The RISKIND computer code was developed for DOE's Office of Civilian Radioactive Waste Management to analyze the exposure of individuals during the incident-free transportation of spent nuclear fuel. In addition, the RISKIND code was designed to allow a detailed assessment of the consequences to individuals and population subgroups from severe spent nuclear fuel transportation accidents under various environmental settings.

The RISKIND calculations were conducted to supplement the collective risk results calculated with RADTRAN 4. Whereas the collective risk results provide a measure of the overall risks of each alternative, the RISKIND calculations are meant to address areas of specific concern to individuals and population subgroups. Essentially, the RISKIND analyses are meant to address "What if" questions, such as, "What if I live next to a site access road?" or "What if an accident happens near my town?"

E.5.1 Incident-Free Risk Assessment Methodology

Radiological dose during normal, incident-free transportation of spent nuclear fuel results from exposure to the external radiation field that surrounds the shipping containers. The dose is a function of the number of people exposed, their proximity to the containers, their length of time of exposure, and the intensity of the radiation field surrounding the containers.

Collective Population Risk: The consequences (dose) during incident-free conditions are expected to occur, therefore, the probability of incident-free consequences is taken to be unity (one) in the RADTRAN 4 code. The radiological risk associated with incident-free transportation conditions results from the potential exposure of people to external radiation in the vicinity of loaded shipments. The maximum allowable external dose rates for exclusive-use shipments were presented in Section E.3.

For incident-free transportation conditions, the RADTRAN 4 computer code considers all major groups of potentially exposed persons. The RADTRAN 4 risk calculations for incident-free highway and rail transportation include exposures of the following population groups:

- Persons along the route (off-link population): Collective doses are calculated for all persons living or working within 800 m (0.5 mi) on each side of a transportation route. The total number of persons within the 1.6 km (1 mi) corridor is calculated separately for each route considered in the assessment.

- Persons sharing the route (on-link population): Collective doses are calculated for persons in all vehicles sharing the transportation route. This group would include persons traveling in the same or opposite direction as the shipment, as well as persons in vehicles passing the shipment.

- Persons at stops: Collective doses are calculated for people who could be exposed while a shipment was stopped en route. For truck transportation, this would include refueling stops, food stops, and rest stops. For rail transportation, stops are assumed to occur for classification purposes.

- Crew Members: Collective doses are calculated for truck and rail transportation crew members.

The doses calculated for the first three population groups are added together to yield the collective dose to the general public. The dose calculated for the fourth group represents the collective dose to workers. The RADTRAN 4 incident-free dose models are not intended to be used for estimating specific risks to individuals.

The RADTRAN 4 incident-free dose calculations are based on expressing the dose rate as a function of distance from a point source (Neuhauser and Kanipe, 1993). Associated with the calculation of incident-free doses for each exposed population group are parameters such as the radiation field strength, source-receptor distance, exposure time, vehicle speed, stop time, traffic density, and route characteristics such as population density. The RADTRAN 4 code user's manual contains derivations of the equations and descriptions of these parameters (Neuhauser and Kanipe, 1993). The values for many of the most important parameters are presented in Section E.6.

The collective incident-free risks are calculated for each specific alternative as follows. Each alternative is first defined as a set of origin and destination pairs. Representative highway and rail routes are determined for each unique pair as described in Section E.4. For each pair, RADTRAN 4 is used to calculate the collective risks to workers and the public for a single shipment based on representative radiological and physical properties of the spent nuclear fuel. These estimates for a single shipment are referred to as per-shipment risk factors. The number of shipments transported across each linkage is then determined for both truck and rail modes. The collective risks for an alternative are calculated by multiplying the number of shipments by the appropriate per-shipment risk factor.

MEI Risk: In addition to the incident-free collective population risk assessment, the risk to MEIs has been estimated for a number of hypothetical exposure events using RISKIND. The receptors include transportation crew members, inspectors, and members of the public exposed during traffic delays, while working at a service station, or living near a port of entry or DOE site.

The dose to each MEI considered is calculated with RISKIND for a given distance, duration, and frequency of exposure specific to that receptor. The distances and durations of exposure are similar to those given in previous transportation assessments and are presented in Section E.6. The exposure scenarios are not meant to be exhaustive, but were selected to provide a realistic range of potential exposure situations.

The RISKIND external dose model considers direct external exposure and exposure from radiation scattered from the ground and air. RISKIND is used to calculate the dose as a function of distance (mrem per hr for stationary exposures and mrem per event for moving shipments) from a spent nuclear fuel shipment based on the dimensions of the shipment. The code models the shipment as a cylindrical volume source; and the calculated dose includes contributions from buildup, cloudshine, and groundshine. The dose rates calculated by using RISKIND have been compared with output from existing shielding codes. The RISKIND code has been found to produce realistic but conservative results. As a conservative measure, potential shielding between the cask and the receptor is not considered.

Nonradiological Risk (Vehicle Related): Vehicle-related health risks resulting from incident-free transport may be associated with the generation of air pollutants by transport vehicles during spent nuclear fuel shipment, and are independent of the radioactive nature of the shipment. The health end point assessed under incident-free transport conditions is the excess latent mortality due to inhalation of vehicle exhaust emissions. Risk factors for pollutant inhalation in terms of latent mortality have been generated (Rao et

al., 1982). These risks are $1x10^{-7}$ mortality per km ($1.6x10^{-7}$ per mi) and $1.3x10^{-7}$ mortality per km ($2.1x10^{-7}$ per mi) of truck and rail travel in urban areas, respectively. The risk factors are based on regression analyses of the effects of sulfur dioxide and particulate releases from diesel exhaust on mortality rates. Excess latent mortalities are assumed to be equivalent to LCF. Vehicle-related risks from incident-free transportation are calculated for each case by multiplying the total distance traveled in urban areas by the appropriate risk factor. Similar data are not available for rural and suburban areas.

Risks are summed over the entire route and over all shipments for each spent nuclear fuel case. This method has been used in several reports to calculate risks from incident-free transport. Lack of information for rural and suburban areas is an obvious data gap, although the risk factor would presumably be lower than for urban areas because of lower total emissions from all sources and lower population densities in rural and suburban areas.

E.5.2 Accident Assessment Methodology

The offsite spent nuclear fuel transportation accident analysis considers the impacts of accidents during the transportation of spent nuclear fuel by truck or rail. Under accident conditions, impacts to human health and the environment could result from the release and dispersal of radioactive material. Because of the rigorous design specifications for spent nuclear fuel shipping casks, the NRC has estimated that casks will withstand 99.4 percent of truck or rail accidents without sustaining damage sufficient to breach the cask (Fischer et al., 1987). The 0.6 percent of accidents that could potentially breach the cask are represented by a spectrum of accident severities and radioactive material release conditions. Accident analysis methodology has been developed by the NRC for calculating the probabilities and consequences from this spectrum of unlikely accidents, but it is not possible to predict where along the shipping route such accidents might occur. To provide an assessment of spent nuclear fuel transportation accident impacts, two types of analyses were performed. First, an accident risk assessment was performed that takes into account the probabilities and consequences of a spectrum of accident severities using methodology developed by the NRC (Fischer et al., 1987). The accident risk assessment used route-specific information for accident rates and population densities. For the spectrum of accidents considered in the analysis, accident consequences in terms of collective dose to the population within 80 km (50 mi) were multiplied by the accident probabilities to yield dose risk. Second, to represent the maximum reasonably foreseeable impacts to individuals and populations should an accident occur, radiological consequences were calculated for an accident of maximum credible severity in each population zone. An accident is considered credible if its probability of occurrence is greater than 1×10^{-7} per yr.

Accident Risk Assessment: The risk analysis of potential accidents differs from the incident-free analysis because accident occurrences are statistical in nature. The accident risk assessment is treated probabilistically in RADTRAN 4. Accident risk is defined as the product of the accident consequence (dose) and the probability of the accident occurring. In this respect, the RADTRAN 4 code estimates the collective accident risk to populations by considering a spectrum of transportation accidents. The accident spectrum is designed to encompass a range of possible accident environments, including low-probability accidents that have high consequences and high-probability accidents that have low consequences (i.e., "fender benders"). The collective accident risk results can be directly compared with the incident-free collective risk results because they incorporate the probabilities of accident occurrences.

The RADTRAN 4 calculation of collective accident risk employs models that quantify the range of potential accident severities and the responses of transport packages (i.e., casks) to accident environments. The accident severity spectrum is divided into a number of accident severity categories. Each severity category is assigned a conditional probability of occurrence; that is, the probability that an accident will be

of a particular severity if an accident occurs. The more severe the accident, the more remote the chance of such an accident. Release fractions, defined as the fraction of the material in a package that could be released in an accident, are assigned to each accident severity category based on the physical and chemical form of the spent nuclear fuel. The models take into account the transportation mode and the type of packaging being considered. The accident rates, definition of accident severity categories, and release fractions used in this analysis are discussed further in Section E.6.

For accidents involving the release of radioactive material, RADTRAN 4 assumes the material is dispersed in the environment according to standard Gaussian diffusion models. For the risk assessment, default atmospheric dispersion data were used representing an instantaneous ground-level release and a small diameter source cloud (Neuhauser and Kanipe, 1993). The calculation of collective population dose following the release and dispersal of radioactive material includes the following exposure pathways:

- external exposure to the passing radioactive cloud,
- external exposure to contaminated ground,
- internal exposure from inhalation of airborne contaminants, and
- internal exposure from the ingestion of contaminated food.

For the ingestion pathway, state-specific food transfer factors, which relate the amount of radioactive material ingested by people to the amount deposited on the ground, were derived in accordance with the methods described by NRC Guide 1.109 (NRC, 1977b). Radiation doses are calculated using standard dose conversion factors in DOE/EH-0070 (DOE, 1988a) and DOE/EH-0071 (DOE, 1988b).

The collective accident risk for each alternative is determined in a manner similar to that described for incident-free collective risks. Accident risks are first calculated for each unique origin and destination pair ("per-shipment" risk factors) and then summed over all pairs to estimate the total risk for the alternative. The accident risk assessment uses site- and spent nuclear fuel-type-specific radiological and physical characteristics, described further in Section E-6. In addition, the assessment uses route-specific population density information and accident rates derived for individual States.

Accident Consequence Assessment: The RISKIND code is used to provide a detailed assessment of the consequences of the most severe transportation accidents. Whereas the RADTRAN 4 accident risk assessment considers the entire range of accident severities and their related probabilities, the RISKIND accident consequence assessment assumes that an accident of the highest credible severity has occurred. The accident consequence assessment is intended to provide an estimate of the maximum potential impact posed by a severe transportation accident involving spent nuclear fuel.

The severe accidents considered in the consequence assessment are characterized by extreme mechanical and thermal forces. In all cases, these accidents result in a release of radioactive material to the environment. The accidents correspond to those within the highest accident severity category as described above. These accidents represent low-probability, high-consequence events. The probability of accidents of this magnitude occurring for each alternative depends on the total shipment distance. However, accidents of this severity are extremely rare in general.

RISKIND was used for the accident consequence assessment for two reasons. First, the code has the ability to model the complex atmospheric dispersion present in severe accident environments. The atmospheric dispersion is modeled as an instantaneous release using standard Gaussian puff methods. In addition, because severe accidents routinely involve fires, modeling of the potential radiological

consequences takes into account physical phenomena resulting from the fire, such as buoyant plume rise. Second, RISKIND can be used to estimate the dose to MEIs in the vicinity of an accident. The location of the MEI is determined by RISKIND based on the atmospheric conditions assumed at the time of the accident and thermal characteristics of the release.

The consequences of the most severe accidents are calculated for both local populations and MEIs. The population dose includes the population within 80 km (50 mi) of the accident site. The exposure pathways considered are similar to those discussed above for the accident risk assessment. Although post-accident remedial activities (e.g., immediate evacuation of the public or cleanup of dispersed radioactive material) would reduce the consequences of an accident, these activities were not given credit in the dose calculations.

Because it is impossible to predict the exact location of a severe transportation accident, separate accident consequences are calculated for accidents occurring in rural, suburban, and urban population density zones. Moreover, to address the effects of the atmospheric conditions existing at the time of an accident, two different atmospheric conditions are considered. The first case assumes neutral atmospheric conditions, and the second, stable conditions. Atmospheric conditions are discussed further in Section E.6.

Nonradiological Accident Risk Assessment: The nonradiological accident risk refers to the potential occurrence of transportation accidents that directly result in fatalities that are not related to the shipment cargo. This risk represents fatalities from mechanical causes. State-specific transportation fatality rates are used in the assessment and are discussed in Section E.6. Nonradiological accident risks are calculated for each alternative by multiplying the total distance traveled in each State by the appropriate State fatality rate. In all cases, the nonradiological accident risks are calculated using round-trip shipment distances.

E.6 Input Parameters and Assumptions

The transportation risk assessment is designed to ensure—through uniform and judicious selection of models, data, and assumptions—that relative comparisons of risk among the various alternatives are meaningful. The major input parameters and assumptions used in the transportation risk assessment are discussed below.

Appendix B lists the casks that are being considered for intersite shipments. The sizes of casks identified vary considerably. Since it is not clear what size of cask would be used for intersite shipments, and since the shipments would not begin until 2005, hypothetical cask sizes are used in this assessment. Additionally, fuel that arrives at an interim site would be physically modified, depending on the dry or wet storage option chosen. Therefore, it is assumed that if spent nuclear fuel were shipped by truck, the number of shipments would be one-quarter of the number of shipments from ports. If the spent nuclear fuel were shipped by rail, the number of shipments would be one-tenth of the number of shipments from ports.

E.6.1 Spent Nuclear Fuel Inventory and Characterization Data

For the purposes of analysis, the foreign research reactor spent nuclear fuel has been characterized into five different spent nuclear fuel categories for shipments into ports and two for shipments between DOE sites. The detailed discussion of the fuel and casks is provided in Appendix B. The curie content of fully loaded shipments is summarized in Table E-5. The approach for calculating the number of shipments from the various countries is shown in Appendix B.

Table E-5 Curie Content of Fully Loaded Shipping Casks for Representative Fuel Types

Isotopes	Material Type					
	BR-2	RHF	TRIGA	NRU	HLW (1 yr)	Target
Tritium	$8.64\times10^{+1}$	$3.70\times10^{+1}$	$1.31\times10^{+1}$	9.48×10^{-1}	~ 0	~ 0
Krypton 85	$2.47\times10^{+3}$	$1.07\times10^{+3}$	$3.63\times10^{+2}$	$2.71\times10^{+3}$	~ 0	~ 0
Strontium 89	$4.08\times10^{+4}$	$1.76\times10^{+4}$	$2.75\times10^{+3}$	$9.72\times10^{+3}$	$3.07\times10^{+6}$	$1.95\times10^{+2}$
Strontium 90	$2.08\times10^{+4}$	$8.93\times10^{+3}$	$3.16\times10^{+3}$	$2.32\times10^{+4}$	$1.74\times10^{+6}$	$1.58\times10^{+2}$
Yttrium 90	$2.08\times10^{+4}$	$8.93\times10^{+3}$	$3.16\times10^{+3}$	$2.32\times10^{+4}$	$1.74\times10^{+6}$	$1.58\times10^{+2}$
Yttrium 91	$7.30\times10^{+4}$	$3.14\times10^{+4}$	$4.56\times10^{+3}$	$2.02\times10^{+4}$	$5.48\times10^{+6}$	$3.69\times10^{+2}$
Zirconium 95	$1.07\times10^{+5}$	$4.63\times10^{+4}$	$6.48\times10^{+3}$	$3.38\times10^{+4}$	$8.08\times10^{+6}$	$5.67\times10^{+2}$
Niobium 95	$2.20\times10^{+5}$	$9.49\times10^{+4}$	$1.28\times10^{+4}$	$7.34\times10^{+4}$	$1.65\times10^{+7}$	$1.21\times10^{+3}$
Ruthenium 103	$8.90\times10^{+3}$	$3.77\times10^{+3}$	$8.44\times10^{+2}$	$1.44\times10^{+3}$	$7.16\times10^{+5}$	$3.57\times10^{+1}$
Rhodium 103m	$8.90\times10^{+3}$	$3.77\times10^{+3}$	$8.44\times10^{+2}$	$1.44\times10^{+3}$	$7.16\times10^{+5}$	$3.57\times10^{+1}$
Ruthenium 106	$2.15\times10^{+4}$	$9.16\times10^{+3}$	$2.54\times10^{+3}$	$1.84\times10^{+4}$	$1.88\times10^{+6}$	$1.49\times10^{+2}$
Rhodium 106m	$2.15\times10^{+4}$	$9.16\times10^{+3}$	$2.54\times10^{+3}$	$1.84\times10^{+4}$	$1.88\times10^{+6}$	$1.49\times10^{+2}$
Tin 123	$4.27\times10^{+2}$	$1.84\times10^{+2}$	$2.71\times10^{+1}$	$2.40\times10^{+2}$	$5.84\times10^{+4}$	$2.70\times10^{+0}$
Antimony 125	$8.90\times10^{+2}$	$3.81\times10^{+2}$	$1.19\times10^{+2}$	$9.12\times10^{+2}$	$7.57\times10^{+4}$	$6.51\times10^{+0}$
Tellurium 125m	$2.12\times10^{+2}$	$9.06\times10^{+1}$	$2.87\times10^{+1}$	$2.21\times10^{+2}$	$1.81\times10^{+4}$	$1.56\times10^{+0}$
Tellurium 127m	$8.87\times10^{+2}$	$3.82\times10^{+2}$	$5.57\times10^{+1}$	$4.42\times10^{+2}$	$6.97\times10^{+4}$	$5.39\times10^{+0}$
Tellurium 129m	$1.89\times10^{+2}$	$7.98\times10^{+1}$	$2.31\times10^{+1}$	$2.30\times10^{+1}$	$1.59\times10^{+4}$	6.73×10^{-1}
Cesium 134	$1.64\times10^{+4}$	$4.00\times10^{+3}$	$1.16\times10^{+3}$	$3.54\times10^{+4}$	$1.41\times10^{+6}$	6.12×10^{-1}
Cesium-137	$2.06\times10^{+4}$	$8.87\times10^{+3}$	$3.19\times10^{+3}$	$2.30\times10^{+4}$	$1.74\times10^{+6}$	$1.56\times10^{+2}$
Cerium 141	$5.74\times10^{+3}$	$2.44\times10^{+3}$	$6.97\times10^{+2}$	$6.65\times10^{+3}$	$5.59\times10^{+5}$	$2.03\times10^{+1}$
Cerium 144	$3.12\times10^{+5}$	$1.35\times10^{+5}$	$2.55\times10^{+4}$	$2.54\times10^{+5}$	$2.49\times10^{+7}$	$2.18\times10^{+3}$
Praseodymium 144	$3.12\times10^{+5}$	$1.35\times10^{+5}$	$2.55\times10^{+4}$	$2.54\times10^{+5}$	$2.49\times10^{+7}$	$2.18\times10^{+3}$
Promethium 147	$4.83\times10^{+4}$	$2.46\times10^{+4}$	$7.02\times10^{+3}$	$2.98\times10^{+4}$	$3.70\times10^{+6}$	$5.14\times10^{+2}$
Promethium 148m	$7.56\times10^{+1}$	$2.92\times10^{+1}$	$4.68\times10^{+1}$	$1.40\times10^{+0}$	$7.13\times10^{+3}$	2.43×10^{-2}
Europium 154	$6.20\times10^{+2}$	$1.63\times10^{+2}$	$4.18\times10^{+1}$	$1.35\times10^{+3}$	$6.24\times10^{+4}$	7.90×10^{-2}
Europium 155	$1.30\times10^{+2}$	$4.56\times10^{+1}$	$2.27\times10^{+1}$	$2.45\times10^{+2}$	$1.29\times10^{+4}$	$3.35\times10^{+0}$
Uranium 234	9.14×10^{-4}	3.74×10^{-4}	1.81×10^{-4}	1.57×10^{-3}	~ 0	6.81×10^{-6}
Uranium 235	1.38×10^{-2}	1.09×10^{-2}	7.91×10^{-3}	6.06×10^{-3}	~ 0	3.98×10^{-3}
Uranium 238	3.41×10^{-4}	2.06×10^{-4}	6.51×10^{-3}	2.67×10^{-5}	~ 0	7.22×10^{-5}
Plutonium 238	$6.42\times10^{+1}$	$1.03\times10^{+1}$	$3.03\times10^{+0}$	$2.70\times10^{+2}$	$8.48\times10^{+3}$	1.60×10^{-4}
Plutonium 239	$1.84\times10^{+0}$	8.89×10^{-2}	5.50×10^{-1}	3.32×10^{-1}	$4.05\times10^{+2}$	2.95×10^{-2}
Plutonium 240	$1.20\times10^{+0}$	4.21×10^{-1}	$2.09\times10^{+0}$	2.42×10^{-1}	$3.26\times10^{+2}$	6.85×10^{-4}
Plutonium 241	$2.84\times10^{+2}$	$6.77\times10^{+1}$	$2.13\times10^{+2}$	$7.09\times10^{+1}$	$7.84\times10^{+4}$	7.09×10^{-3}
Americium 241	3.96×10^{-1}	9.67×10^{-2}	4.07×10^{-1}	1.24×10^{-1}	$9.84\times10^{+1}$	1.16×10^{-5}
Americium 242m	1.05×10^{-3}	1.55×10^{-4}	9.00×10^{-3}	6.00×10^{-4}	6.70×10^{-1}	2.13×10^{-10}
Americium 243	4.33×10^{-3}	3.76×10^{-3}	4.38×10^{-4}	3.51×10^{-3}	$1.44\times10^{+1}$	1.47×10^{-10}
Curium 244	$1.33\times10^{+0}$	9.26×10^{-3}	7.14×10^{-3}	2.70×10^{-1}	$1.22\times10^{+2}$	1.63×10^{-10}
Curium 242	$1.75\times10^{+0}$	1.27×10^{-1}	$5.25\times10^{+0}$	$1.03\times10^{+0}$	$9.91\times10^{+2}$	6.86×10^{-8}

E.6.2 Shipment External Dose Rates

The dose and corresponding risk to populations and MEIs during incident-free transportation conditions are directly proportional to the assumed shipment external dose rate. The Federal regulations for maximum allowable external dose rates for exclusive-use shipments were presented in Section E.3.

The actual shipment dose rate is a complex function of the composition and configuration of shielding and containment materials used in the cask, the geometry of the loaded shipments, and characteristics of the spent nuclear fuel itself. Based on actual measurements of the dose rate outside real shipping casks, a realistic dose rate of 1 mrem per hr at a distance of 2 m (6.6 ft) was estimated, as described in Appendix F.

However, since individual casks would be expected to exceed this average value, the analysis assumes that all casks would be at the regulatory limits of 10 mrem per hr at 2 m (6.6 ft). In practice, external dose rates would vary from spent nuclear fuel type to spent nuclear fuel type and from shipment to shipment.

E.6.3 Accident Involvement Rates

For the calculation of accident risks, vehicle accident and fatality rates are taken from data provided in other reports (Saricks and Kvitek, 1994). For each transport mode, accident rates are generically defined as the number of accident involvements (or fatalities) in a given year per unit of travel of that mode in that same year. Therefore, the rate is a fractional value, with accident-involvement count as the numerator of the fraction and vehicular activity (total travel distance) as its denominator. Accident rates are generally determined for a multi-year period. For assessment purposes, the total number of expected accidents or fatalities is calculated by multiplying the total shipment distance for a specific case by the appropriate accident or fatality rate.

For truck transportation, the rates presented are specifically for heavy combination trucks involved in interstate commerce (Saricks and Kvitek, 1994). Heavy combination trucks are rigs composed of a separable tractor unit containing the engine and one to three freight trailers connected to each other. Heavy combination trucks are typically used for radioactive waste shipments. The truck accident rates are computed for each State based on statistics compiled by the Department of Transportation Office of Motor Carriers for 1986–1988. Saricks and Kvitek present accident involvement and fatality counts; estimated kilometers of travel by State; and the corresponding average accident involvement, fatality, and injury rates for the 3 years investigated. Fatalities are deaths (including crew members) that are attributable to the accident or that occurred at any time within 30 days thereafter.

Rail accident rates are computed and presented similarly to truck accident rates; however, the unit of haulage is considered to be the railcar (Saricks and Kvitek, 1994). The State-specific rail accident involvement and fatality rates are based on statistics compiled by the Federal Railroad Administration for 1985–1988. Rail accident rates include both main line accidents and those occurring in railyards. It is important to note that the accident rates used in this assessment were computed using the universe of all interstate heavy combination truck shipments, independent of shipment cargo. The cited report points out that shippers and carriers of radioactive material generally have a higher-than-average awareness of transport risk and prepare cargoes and drivers for such shipments accordingly (Saricks and Kvitek, 1994). This preparation should have a twofold effect of reducing component/equipment failure and mitigating the human error contribution to accident causation. These effects were not given credit in the accident assessment.

E.6.4 Cask Accident Response Characteristics

E.6.4.1 Accident Severity Categories

A generic method to characterize the potential severity of transportation accidents was first described in an NRC report commonly referred to as NUREG-0170 (NRC, 1977a). The NRC method divided the spectrum of transportation accident severities into eight categories. Subsequently, other studies have divided the same accident spectrum into 6 categories (Wilmot, 1981) and 20 categories (Fischer et al., 1987). Results from the latter study, which utilizes 20 severity categories and is commonly referred to as the "modal study," are used in this analysis.

The modal study (Fischer et al., 1987) was the result of an initiative taken by the NRC to refine more precisely the analysis presented in NUREG-0170 (NRC, 1977a) for spent nuclear fuel shipping casks. Whereas the NUREG-0170 analysis was primarily performed using best engineering judgments and presumptions concerning cask response, the modal study relies on sophisticated structural and thermal engineering analysis and a probabilistic assessment of the conditions that could be experienced in severe transportation accidents. The modal study results are based on representative spent nuclear fuel casks that were assumed to have been designed, manufactured, operated, and maintained in accordance with national codes and standards. Design parameters of the representative casks were chosen to meet the minimum test criteria specified in 10 CFR Part 71. The study is believed to provide realistic, yet conservative, results for radiological releases under transport accident conditions.

In the modal study, potential accident damage to a cask is categorized according to the magnitude of the mechanical forces (impact) and thermal forces (fire) to which a cask may be subjected during an accident. Because all accidents can be described in these terms, severity is independent of the specific accident sequence. In other words, any sequence of events that results in an accident in which a cask is subjected to forces within a certain range of values is assigned to the accident severity category associated with that range. The accident severity scheme is designed to take into account all potential foreseeable transportation accidents, including accidents with low probability but high consequences and those with high probability but low consequences.

Each severity category actually represents a set of accidents defined by a combination of mechanical and thermal forces. A conditional probability of occurrence—that is, the probability that if an accident occurs, it is of a particular severity—is assigned to each category. The cask response regions and the fractional occurrences by accident severity category are shown in Figure E-14 for truck and rail accidents. Accidents in Region (1,1) are the least severe but most frequent, whereas accidents in Region (4,5) are very severe but very infrequent. To determine the expected frequency of an accident of a given severity, the conditional probability in the category is multiplied by the baseline accident rate. The entire spectrum of accident severities is considered in the accident risk assessment.

As discussed above, the accident consequence assessment only considers the potential impacts from the most severe transportation accidents. In terms of risk, the severity of an accident must be viewed in terms of potential radiological consequences, which are directly proportional to the fraction of the radioactive material within a cask that is released to the environment during the accident. In terms of the modal study accident characterization scheme (Figure E-15), the most severe transportation accidents correspond to those in Regions (4,1), (4,2), (4,3), (4,4), (4,5), (3,5), (2,5), and (1,5). Although these regions span the entire range of mechanical and thermal accident loads considered in the modal study, they are characterized by a single set of release fractions and are therefore considered together in the accident consequence assessment.

The conditional probability of the most severe accidents (i.e., the probability that an accident is of maximum severity, assuming that one has occurred) is found by summing the modal study conditional probabilities for the eight individual accident regions listed above. The resultant overall conditional probability is found to be 0.00000984 for truck transportation and 0.000124 for rail transportation. The stated probabilities encompass the entire spectrum of severe accidents, although over 97 percent of the severe truck accidents and nearly 100 percent of the severe rail accidents actually occur in Region (1,5), which is characterized by high thermal stresses and moderate mechanical stresses.

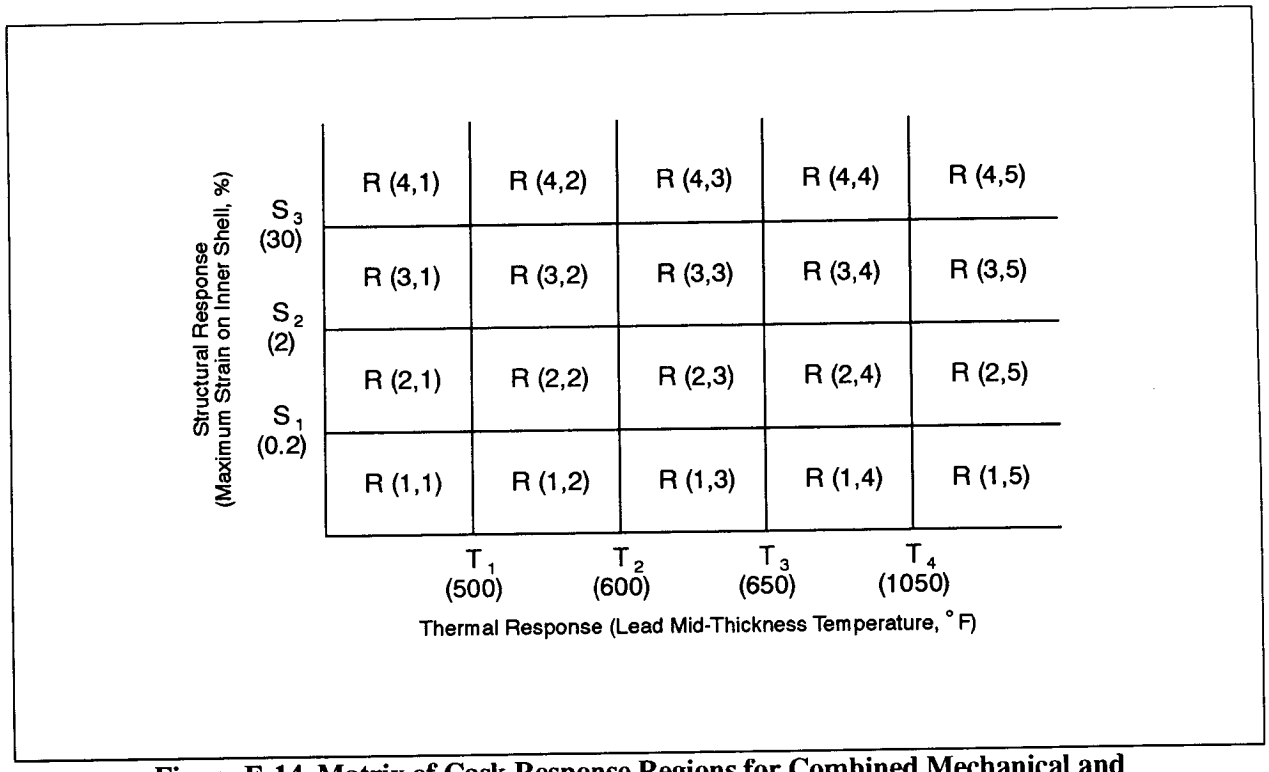

Figure E-14 Matrix of Cask Response Regions for Combined Mechanical and Thermal Loads

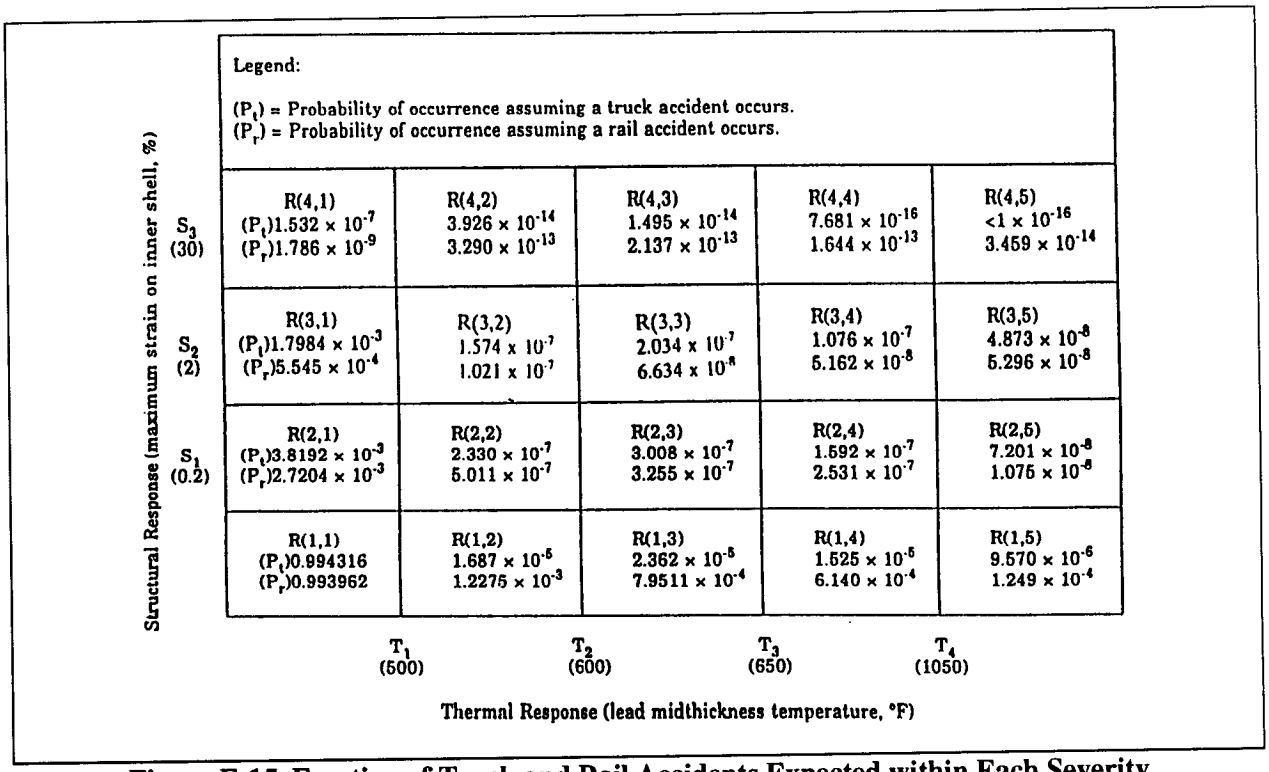

Figure E-15 Fraction of Truck and Rail Accidents Expected within Each Severity Category, Assuming an Accident Occurs

E.6.4.2 Cask Release Fractions

Radiological consequences are calculated by assigning cask release fractions to each accident severity category. The release fraction is defined as the fraction of the radioactive material in a cask that could be released from the package in a given severity of accident. Release fractions take into account all mechanisms necessary to create a release of radioactive material from a damaged cask to the environment. Release fractions vary according to the spent nuclear fuel type and the physical and chemical characteristics of specific radionuclides within the spent nuclear fuel. For instance, most solid radionuclides are difficult to release in particulate form and are therefore relatively nondispersible. Conversely, gaseous radionuclides are relatively easy to release in the unlikely event that the cask and spent nuclear fuel elements are compromised in an accident.

Cask release fractions are given in Table E-6. Two sets of release fractions were used in the assessment depending on the spent nuclear fuel type, consistent with the SNF&INEL Final EIS (DOE, 1995). Release fractions developed for MTR spent nuclear fuel were used for aluminum-clad fuels including BR-2, RHF, and NRU spent nuclear fuel; Release fractions for TRIGA were used for the PRR-1 spent nuclear fuel.

Table E-6 Release Fractions Spent Nuclear Fuel

Cask Response Region	*Release Fractions*[a]				
	Inert Gas	*Iodine*	*Cesium*	*Ruthenium*	*Particulate*
TRIGA Fuel:					
R(1,1)	0.0	0.0	0.0	0.0	0.0
R(1,2), R(1,3)	0.0099	0.000075	0.000006	8.1×10^{-7}	6.0×10^{-8}
R(2,1), R(2,2), R(2,3)	0.03	0.00025	0.00002	0.0000027	2.0×10^{-7}
R(1,4), R(2,4), R(3,4)	0.39	0.0043	0.0002	0.000048	0.000002
R(3,1), R(3,2), R(3,3)	0.33	0.0025	0.0002	0.000027	0.000002
R(1,5), R(2,5), R(3,5), R(4,5), R(4,1), R(4,2), R(4,3), R(4,4)	0.63	0.043	0.002	0.00048	0.00002
Aluminum and Metallic Fuel:[b]					
R(1,1)	0.0	0.0	0.0	0.0	0.0
R(1,2), R(1,3)	0.0099	1.1×10^{-7}	3.0×10^{-8}	4.1×10^{-9}	3.0×10^{-10}
R(2,1), R(2,2), R(2,3)	0.033	3.5×10^{-7}	1.0×10^{-7}	1.4×10^{-8}	1.0×10^{-9}
R(1,4), R(2,4), R(3,4)	0.39	0.000006	0.000001	2.4×10^{-7}	1.0×10^{-8}
R(3,1), R(3,2), R(3,3)	0.33	0.0000035	0.000001	1.4×10^{-7}	1.0×10^{-8}
R(1,5), R(2,5), R(3,5), R(4,5), R(4,1), R(4,2), R(4,3), R(4,4)	0.63	0.00006	0.00001	0.0000024	1.0×10^{-7}

[a] *The fraction of the radioactive material released from a cask to the environment during an accident.*

[b] *These release fractions are applicable to all non-TRIGA, aluminum-clad fuel.*

For waste shipments of material other than spent nuclear fuel, the modal study results are not applicable. Therefore, more conservative release fractions from NUREG-0170 are used for vitrified high-level waste and target material. The NUREG-0170 recommendations for release fractions for Type B casks, regardless of content, are given below:

NUREG-0170 Severity Category	Release Fraction
1	0
2	0
3	0.01
4	0.1
5	1
6	1

Source: NRC, 1977a

The values indicate that in the most severe accidents, 100 percent of the material is released from the cask; a highly conservative assumption for most solid waste forms, and somewhat conservative for a powder or cake-like material. The accident assessment also utilizes the fraction of the release that is aerosolized and the fraction of the aerosol that is respirable. The values for high-level waste and target material (assumed to behave as a loose powdered material) were taken from the recommendations provided in RADTRAN 4. These values are shown below:

Physical Waste Form	Aerosolized Fraction	Respirable Fraction
Vitrified wastes	0.000001	0.05
Chunks (i.e., calcinated target material)	0.01	0.05
Loose powders (i.e., oxidized target material)	0.1	0.05

Source: Neuhauser and Kanipe, 1993

Therefore, the maximum total respirable release fraction for the most severe accidents is 5×10^{-8} for high-level waste shipments and 0.005 for shipments of target material. The values shown above have been used in the accident calculations for shipments of target material and vitrified material for the foreign research reactor spent nuclear fuel EIS.

E.6.5 Atmospheric Conditions

Radioactive material released to the atmosphere is transported by the wind. The amount of dispersion, or dilution, of the radioactive material concentrations in the air depends on the meteorological conditions at the time of the accident. Because it is impossible to predict the specific location of an overland transportation accident, generic atmospheric conditions were selected for the accident risk and consequence assessments.

For the accident risk assessment, neutral weather conditions (Pasquill Stability Class D with a wind speed of 4 m per sec or 9 mph) were assumed. Since neutral meteorological conditions are the most frequently occurring atmospheric stability condition in the United States, they are most likely to be present in the event of an accident involving a spent nuclear fuel shipment. On the basis of observations from National Weather Service surface meteorological stations at over 300 locations in the United States, on an annual average, neutral conditions (Pasquill Classes C and D) occur about half (50 percent) of the time, while stable (Pasquill Classes E and F) and unstable (Pasquill Class A and B) conditions occur about one-third (33 percent) and one-sixth (17 percent) of the time, respectively (Doty et al., 1976). The neutral category predominates in all seasons, but most frequently in the winter (nearly 60 percent of the observations).

For the accident consequence assessment, doses were assessed under both neutral (Pasquill Stability Class D with a wind speed of 4 m per sec or 9 mph) and stable (Pasquill Stability Class F with a wind speed of 1 m per sec or 2.4 mph) atmospheric conditions. The results calculated for neutral conditions represent the most likely consequences, and the results for stable conditions represent a "worst-case" weather situation.

E.6.6 Health Risk Conversion Factors

The health risk conversion factors used to estimate expected cancer fatalities were taken from International Commission on Radiation Protection Publication 60 (ICRP, 1991): 0.0005 and 0.0004 fatal cancer cases per person-rem for members of the public and workers, respectively. Cancer fatalities and incidence occur over the lifetimes of the exposed populations, and thus are called LCF.

E.6.7 Maximally Exposed Individual Exposure Scenarios

The risk to MEIs has been estimated for a number of hypothetical exposure scenarios during overland transportation using the RISKIND code. The receptors include crew members, departure inspectors, and members of the public exposed during traffic obstructions (traffic jam), while working at a service station, or by living near a port of entry or management site. The dose and risk to MEIs were calculated for given distances and durations of exposure. The distances and durations of exposure for each receptor are similar to those given in previous transportation assessments (DOE, 1987b; DOE, 1995), and are believed to be realistic but conservative. The exposure scenarios considered are the following:

- Crew Members: Truck and rail crew members are not assumed to be occupational radiation workers. Dose estimates are based on realistic locations and estimated travel time, and no credit is taken for shielding in addition to the cask.

- Inspectors (truck and rail): Inspectors are assumed to be either Federal or State vehicle inspectors, and are not assumed to be monitored by a dosimetry program. An average exposure distance of 3 m (10 ft) and an exposure time of 30 minutes (min) is assumed.

- Rail Yard Crew Member: A rail yard crew member is not assumed to be monitored by a dosimetry program. An average exposure distance of 10 m (33 ft) and an exposure time of 2 hr is assumed.

- Resident (truck and rail): A resident is assumed to live 30 m (100 ft) from a port or management site entrance route (truck or rail). Shipments are assumed to pass at a velocity of 24 km per hr (15 mph), and the resident is assumed to be exposed unshielded (i.e., no shielding in addition to the cask, such as that afforded by a structure.) Cumulative doses are assessed for each alternative based on the number of shipments entering or exiting the site and assuming the resident is present for 100 percent of the shipments.

- Person in Traffic Obstruction (truck and rail): A person is assumed to be stopped next to a spent nuclear fuel shipment (due to traffic, etc.). The person is assumed to be exposed (no credit is taken for radiation blocked by the individual's vehicle) at a distance of 1 m (3.3 ft) for a duration of 30 min.

- Person at a Truck Service Station: A person is assumed to be exposed at an average distance of 20 m (66 ft) for a duration of 2 hr. This receptor could be a worker at a truck stop, or a member of the public stopped at the same location.

- Resident Near a Rail Stop: A resident is assumed to live near a rail classification yard. The resident is assumed to be exposed unshielded at a distance of 200 m (660 ft) for a duration of 20 hr.

The largest uncertainty in predicting the dose to MEIs during transportation involves determining the frequency of exposure occurrences. This difficulty results from the uncertainties in future shipment schedules, route selection, and the inherent uncertainty in predicting the frequency of random or chance events. For instance, it is conceivable that an individual could be stopped in traffic next to a shipment of foreign research reactor spent nuclear fuel; however, it is difficult to predict how often the same individual would experience this event. Therefore, for the majority of receptors considered, doses are assessed on a per-event basis. To account for possible multiple exposures, ranges of realistic total doses are discussed qualitatively. One exception is the calculation of the dose to a hypothetical resident living near a port of entry or management site entrance route. For these residents, total doses are calculated based on the number of shipments entering or exiting each site for each of the alternatives.

E.6.8 General RADTRAN Input Parameters

In addition to the specific parameters discussed above, values for a number of general parameters must be specified within the RADTRAN code. These general parameters define basic shipment and traffic characteristics and are specific to the mode of transportation. The RADTRAN code user's manual (Neuhauser and Kanipe, 1993) contains derivations and descriptions of these parameters. The general RADTRAN input parameters used in the transportation risk assessment are summarized in Table E-7.

Table E-7 Summary of General RADTRAN Input Parameters

Parameter	*Truck*	*Rail*
Package type	Type B Cask	Type B Cask
Package dimension	3.2 m (10.6 ft)	3.2 m (10.6 ft)
Number of crewmen	2	5
Distance from source to crew	3 m (9.9 ft)	152 m (501.6 ft)
Velocity		
Rural	88 km/hr (55 mph)	64 km/hr (40 mph)
Suburban	40 km/hr (25 mph)	40 km/hr (25 mph)
Urban	24 km/hr (15 mph)	24 km/hr (15 mph)
Stop time per kilometer	0.011 hr/km (0.018 hr/mi)	0.033 hr/km (0.053 hr/mi)
Number of people exposed while stopped	50	Based on Suburban Population Density
Number of people per vehicle sharing route	2	3
Population densities (persons/km^2)	Route Specific (see Table E-4)	Route Specific (see Table E-4)
One-way traffic count (vehicles/hr)		
Rural	470	1
Suburban	780	5
Urban	2,800	5
Cask inventory (Ci)	(see Table E-5)	(see Table E-5)
Accident release fractions	(see Table E-6)	(see Table E-6)
Accident conditional probabilities	(see Figure E-15)	(see Figure E-15)

Source: Neuhauser and Kanipe, 1993.

E.7 Risk Assessment Results

In this section, the risk assessment results are presented for the ports of entry and management sites being considered. The collective population risk results are presented in Section E.7.1. First, the per-shipment risks results are presented in Section E.7.1.1. Then, in Section E.7.1.2, the results are analyzed, evaluated, and simplified so the different program alternatives and options can be evaluated in Section E.7.2.

The risks to MEIs during incident-free transportation conditions are provided in Section E.7.3. The accident consequence results calculated for the most severe transportation accidents are presented in Section E.7.4 for both collective populations and MEIs.

E.7.1 Collective Population Risk Results

E.7.1.1 Per-Shipment Risk Factors

Per-shipment risk factors have been calculated for the collective populations of exposed persons for shipments between all representative ports of entry and the five management sites. Results were calculated for both truck and rail modes, assuming that one cask would be shipped per truck or rail car. Additionally, the risk factors for the ports of Elizabeth, NJ; Philadelphia, PA; and Long Beach, CA are included to show the effect of using high population ports. Risk factors are included for some site-to-site routes, even though there are no shipments anticipated on these routes.

The radiological risks are presented in terms of dose per shipment for each unique route. The doses can be converted to health risks using the International Commission on Radiological Protection Publication 60 conversion factors described in Section E.6.6 (ICRP, 1991). The radiological dose per shipment factors for incident-free transportation conditions are presented in Table E-8 for crew members and members of the general public. The tabulated incident-free doses are based on the external dose rate which is conservatively assumed to be at the regulatory limit of 10 mrem per hr at 2 m. The radiological dose risk factors for accident transportation conditions are presented in Table E-9. The accident risk factors are referred to as "dose risk" because the values incorporate the spectrum of accident severity probabilities and the associated release fractions.

Table E-8 Incident-Free Dose per Shipment for All Spent Nuclear Fuel Types (Person-Rem/Shipment)[a]

Shipments to Hanford Site:						
Route(s)		*Crew*	*General Public*			
			Off-Link	*On-Link*	*Stops*	*Total*
From Eastern Ports						
Charleston, SC (NWS)	Truck	2.50×10^{-1}	9.26×10^{-3}	3.96×10^{-2}	5.92×10^{-1}	6.41×10^{-1}
	Rail	6.33×10^{-2}	2.91×10^{-2}	1.13×10^{-3}	1.70×10^{-2}	4.73×10^{-2}
Charleston, SC (Wando Terminal)	Truck	2.51×10^{-1}	9.61×10^{-3}	4.03×10^{-2}	5.95×10^{-1}	6.45×10^{-1}
	Rail	6.33×10^{-2}	2.91×10^{-2}	1.13×10^{-3}	1.70×10^{-2}	4.73×10^{-2}
Elizabeth, NJ	Truck	2.49×10^{-1}	9.96×10^{-3}	4.10×10^{-2}	5.82×10^{-1}	6.33×10^{-1}
	Rail	6.24×10^{-2}	6.03×10^{-2}	1.66×10^{-3}	1.68×10^{-2}	7.88×10^{-2}
Galveston, TX	Truck	2.05×10^{-1}	1.00×10^{-2}	3.77×10^{-2}	4.82×10^{-1}	5.30×10^{-1}
	Rail	5.20×10^{-2}	1.31×10^{-2}	6.59×10^{-4}	1.51×10^{-2}	2.88×10^{-2}
Jacksonville, FL	Truck	2.60×10^{-1}	1.09×10^{-2}	4.35×10^{-2}	6.05×10^{-1}	6.60×10^{-1}
	Rail	6.35×10^{-2}	2.58×10^{-2}	1.08×10^{-3}	1.65×10^{-2}	4.34×10^{-2}
Newport News, VA	Truck	2.57×10^{-1}	1.16×10^{-2}	4.44×10^{-2}	6.02×10^{-1}	6.58×10^{-1}
	Rail	6.38×10^{-2}	4.02×10^{-2}	1.25×10^{-3}	1.59×10^{-2}	5.73×10^{-2}

Shipments to Hanford Site:						
Route(s)		*Crew*	*General Public*			
			Off-Link	*On-Link*	*Stops*	*Total*
Norfolk, VA	Truck	2.62×10^{-1}	1.19×10^{-2}	4.50×10^{-2}	6.10×10^{-1}	6.67×10^{-1}
	Rail	6.54×10^{-2}	4.10×10^{-2}	1.28×10^{-3}	1.67×10^{-2}	5.90×10^{-2}
Philadelphia, PA	Truck	2.58×10^{-1}	1.06×10^{-2}	4.31×10^{-2}	5.94×10^{-1}	6.47×10^{-1}
	Rail	6.16×10^{-2}	5.90×10^{-2}	1.58×10^{-3}	1.68×10^{-2}	7.74×10^{-2}
Portsmouth, VA	Truck	2.61×10^{-1}	1.24×10^{-2}	4.60×10^{-2}	6.07×10^{-1}	6.65×10^{-1}
	Rail	6.49×10^{-2}	3.99×10^{-2}	1.25×10^{-3}	1.64×10^{-2}	5.76×10^{-2}
Savannah, GA	Truck	2.48×10^{-1}	1.03×10^{-2}	4.13×10^{-2}	5.82×10^{-1}	6.34×10^{-1}
	Rail	6.38×10^{-2}	2.48×10^{-2}	1.08×10^{-3}	1.66×10^{-2}	4.24×10^{-2}
MOTSU, NC	Truck	2.50×10^{-1}	9.26×10^{-3}	4.00×10^{-2}	5.94×10^{-1}	6.43×10^{-1}
	Rail	6.57×10^{-2}	2.85×10^{-2}	1.20×10^{-3}	1.71×10^{-2}	4.68×10^{-2}
Wilmington, NC	Truck	2.59×10^{-1}	9.34×10^{-3}	4.07×10^{-2}	6.13×10^{-1}	6.63×10^{-1}
	Rail	6.56×10^{-2}	2.84×10^{-2}	1.19×10^{-3}	1.71×10^{-2}	4.67×10^{-2}
From Western Ports						
NWS Concord, CA	Truck	8.06×10^{-2}	4.55×10^{-3}	1.55×10^{-2}	1.77×10^{-1}	1.97×10^{-1}
	Rail	2.77×10^{-2}	1.88×10^{-2}	4.83×10^{-4}	8.77×10^{-3}	2.81×10^{-2}
Long Beach, CA	Truck	1.19×10^{-1}	1.13×10^{-2}	2.98×10^{-2}	2.57×10^{-1}	2.98×10^{-1}
	Rail	3.84×10^{-2}	3.71×10^{-2}	7.16×10^{-4}	1.46×10^{-2}	5.25×10^{-2}
Portland, OR	Truck	2.35×10^{-2}	1.50×10^{-3}	4.90×10^{-3}	5.24×10^{-2}	5.88×10^{-2}
	Rail	1.57×10^{-2}	4.36×10^{-3}	1.12×10^{-4}	7.04×10^{-3}	1.15×10^{-2}
Tacoma, WA	Truck	2.50×10^{-2}	1.73×10^{-3}	5.45×10^{-3}	5.14×10^{-2}	5.85×10^{-2}
	Rail	1.80×10^{-2}	5.69×10^{-3}	1.82×10^{-4}	6.12×10^{-3}	1.20×10^{-2}
From DOE Sites/Canadian Border						
Alexandria Bay, NY	Truck	2.49×10^{-1}	1.05×10^{-2}	4.23×10^{-2}	5.73×10^{-1}	6.26×10^{-1}
	Rail	6.02×10^{-2}	5.10×10^{-2}	1.40×10^{-3}	1.65×10^{-2}	6.89×10^{-2}
Idaho National Engineering Laboratory	Truck	4.92×10^{-1}	1.42×10^{-3}	7.63×10^{-3}	1.24×10^{-1}	1.33×10^{-1}
	Rail	2.28×10^{-2}	3.88×10^{-3}	1.76×10^{-4}	7.64×10^{-3}	1.17×10^{-2}
Nevada Test Site	Truck	9.91×10^{-2}	5.37×10^{-3}	1.92×10^{-2}	2.34×10^{-1}	2.58×10^{-1}
	Rail	3.36×10^{-1}	6.24×10^{-3}	3.08×10^{-4}	1.12×10^{-2}	1.77×10^{-2}
Oak Ridge Reservation	Truck	2.10×10^{-1}	7.29×10^{-3}	3.31×10^{-2}	5.10×10^{-1}	5.50×10^{-1}
	Rail	5.56×10^{-2}	1.64×10^{-2}	6.92×10^{-4}	1.60×10^{-1}	3.31×10^{-2}
Savannah River	Truck	2.42×10^{-1}	1.02×10^{-2}	4.01×10^{-2}	5.65×10^{-1}	6.15×10^{-1}
	Rail	6.15×10^{-2}	2.74×10^{-2}	1.08×10^{-3}	1.66×10^{-2}	4.51×10^{-2}
Sweetgrass, MT	Truck	7.27×10^{-1}	1.76×10^{-3}	1.03×10^{-2}	1.81×10^{-1}	1.93×10^{-1}
	Rail	2.19×10^{-2}	3.81×10^{-3}	1.62×10^{-4}	7.83×10^{-3}	1.18×10^{-2}

Shipments to Idaho National Engineering Laboratory:						
Route(s)		*Crew*	*General Public*			
			Off-Link	*On-Link*	*Stops*	*Total*
From Eastern Ports						
Charleston, SC (NWS)	Truck	2.16×10^{-1}	8.41×10^{-3}	3.48×10^{-2}	5.05×10^{-1}	5.49×10^{-1}
	Rail	5.41×10^{-2}	2.68×10^{-2}	1.01×10^{-3}	1.45×10^{-2}	4.24×10^{-2}
Charleston, SC (Wando Terminal)	Truck	2.18×10^{-1}	8.76×10^{-3}	3.56×10^{-2}	5.09×10^{-1}	5.53×10^{-1}
	Rail	5.41×10^{-2}	2.68×10^{-2}	1.01×10^{-3}	1.45×10^{-2}	4.24×10^{-2}
Elizabeth, NJ	Truck	2.15×10^{-1}	9.11×10^{-3}	3.59×10^{-2}	4.96×10^{-1}	5.41×10^{-1}
	Rail	5.32×10^{-2}	5.81×10^{-2}	1.53×10^{-3}	1.44×10^{-2}	7.40×10^{-2}
Galveston, TX	Truck	1.71×10^{-1}	9.18×10^{-3}	3.26×10^{-2}	3.96×10^{-1}	4.37×10^{-1}
	Rail	4.28×10^{-2}	1.08×10^{-2}	5.35×10^{-4}	1.24×10^{-2}	2.38×10^{-2}
Jacksonville, FL	Truck	2.26×10^{-1}	9.78×10^{-3}	3.77×10^{-2}	5.18×10^{-1}	5.66×10^{-1}
	Rail	5.42×10^{-2}	2.35×10^{-2}	9.54×10^{-4}	1.40×10^{-2}	3.85×10^{-2}
Newport News, VA	Truck	2.24×10^{-1}	1.08×10^{-2}	3.93×10^{-2}	5.16×10^{-1}	5.66×10^{-1}
	Rail	5.45×10^{-2}	3.79×10^{-2}	1.13×10^{-3}	1.35×10^{-2}	5.25×10^{-2}

Shipments to Idaho National Engineering Laboratory:						
Route(s)		*Crew*	*General Public*			
			Off-Link	*On-Link*	*Stops*	*Total*
From Eastern Ports						
Norfolk, VA	Truck	2.28×10^{-1}	1.08×10^{-2}	3.93×10^{-2}	5.24×10^{-1}	5.74×10^{-1}
	Rail	5.62×10^{-2}	3.87×10^{-2}	1.16×10^{-3}	1.43×10^{-2}	5.42×10^{-2}
Philadelphia, PA	Truck	2.24×10^{-1}	9.71×10^{-3}	3.80×10^{-2}	5.08×10^{-1}	5.55×10^{-1}
	Rail	5.24×10^{-2}	5.67×10^{-2}	1.46×10^{-3}	1.44×10^{-2}	7.25×10^{-2}
Portsmouth, VA	Truck	2.27×10^{-1}	1.15×10^{-2}	4.09×10^{-2}	5.20×10^{-1}	5.73×10^{-1}
	Rail	5.57×10^{-2}	3.76×10^{-2}	1.13×10^{-3}	1.40×10^{-2}	5.27×10^{-2}
Savannah, GA	Truck	2.15×10^{-1}	9.41×10^{-3}	3.62×10^{-2}	4.96×10^{-1}	5.42×10^{-1}
	Rail	5.46×10^{-2}	2.25×10^{-2}	9.53×10^{-4}	1.41×10^{-2}	3.75×10^{-2}
MOTSU, NC	Truck	2.11×10^{-1}	7.80×10^{-3}	3.35×10^{-2}	4.98×10^{-1}	5.40×10^{-1}
	Rail	5.65×10^{-2}	2.62×10^{-2}	1.07×10^{-3}	1.47×10^{-2}	4.20×10^{-2}
Wilmington, NC	Truck	2.25×10^{-1}	8.50×10^{-3}	3.56×10^{-2}	5.27×10^{-1}	5.71×10^{-1}
	Rail	5.63×10^{-2}	2.61×10^{-2}	1.07×10^{-3}	1.47×10^{-2}	4.19×10^{-2}
From Western Ports						
NWS Concord, CA	Truck	8.40×10^{-2}	4.84×10^{-3}	1.72×10^{-2}	1.95×10^{-1}	2.17×10^{-1}
	Rail	2.71×10^{-2}	8.71×10^{-3}	2.96×10^{-4}	7.88×10^{-3}	1.69×10^{-2}
Long Beach, CA	Truck	9.93×10^{-2}	1.28×10^{-2}	3.06×10^{-2}	2.03×10^{-1}	2.46×10^{-1}
	Rail	2.92×10^{-2}	3.48×10^{-2}	5.92×10^{-4}	1.20×10^{-2}	4.74×10^{-2}
Portland, OR	Truck	6.27×10^{-2}	2.46×10^{-3}	1.06×10^{-2}	1.53×10^{-1}	1.66×10^{-1}
	Rail	2.49×10^{-2}	5.01×10^{-3}	2.01×10^{-4}	7.23×10^{-3}	1.24×10^{-2}
Tacoma, WA	Truck	7.04×10^{-2}	2.71×10^{-3}	1.19×10^{-2}	1.69×10^{-1}	1.83×10^{-1}
	Rail	2.74×10^{-2}	8.57×10^{-3}	3.04×10^{-4}	7.71×10^{-3}	1.66×10^{-2}
From DOE Sites/Canadian Border						
Alexandria Bay, NY	Truck	2.16×10^{-1}	9.64×10^{-3}	3.72×10^{-2}	4.87×10^{-1}	5.34×10^{-1}
	Rail	5.10×10^{-2}	4.87×10^{-2}	1.28×10^{-3}	1.41×10^{-2}	6.40×10^{-2}
Hanford Site	Truck	4.92×10^{-1}	1.42×10^{-2}	7.63×10^{-2}	1.24×10^{-1}	1.33×10^{-1}
	Rail	2.28×10^{-1}	3.88×10^{-2}	1.76×10^{-3}	7.64×10^{-2}	1.17×10^{-2}
Nevada Test Site	Truck	6.56×10^{-1}	4.52×10^{-2}	1.40×10^{-1}	1.47×10^{-1}	1.66×10^{-1}
	Rail	2.44×10^{-1}	3.95×10^{-2}	1.84×10^{-3}	8.29×10^{-2}	1.24×10^{-2}
Oak Ridge Reservation	Truck	1.76×10^{-1}	6.45×10^{-1}	2.80×10^{-1}	4.24×10^{-1}	4.58×10^{-1}
	Rail	4.63×10^{-1}	1.41×10^{-1}	5.69×10^{-3}	1.33×10^{-1}	2.80×10^{-2}
Savannah River	Truck	2.08×10^{-1}	9.34×10^{-2}	3.50×10^{-1}	4.79×10^{-1}	5.23×10^{-1}
	Rail	5.23×10^{-1}	2.51×10^{-1}	9.56×10^{-3}	1.41×10^{-1}	4.02×10^{-2}
Sweetgrass, MT	Truck	4.25×10^{-1}	6.45×10^{-3}	5.67×10^{-2}	1.12×10^{-1}	1.19×10^{-1}
	Rail	3.24×10^{-1}	5.37×10^{-2}	2.84×10^{-3}	9.14×10^{-2}	1.48×10^{-2}

Shipments to Nevada Test Site:						
Route(s)		*Crew*	*General Public*			
			Off-Link	*On-Link*	*Stops*	*Total*
From Eastern Ports						
Charleston, SC (NWS)	Truck	2.25×10^{-1}	9.15×10^{-3}	3.69×10^{-2}	5.27×10^{-1}	5.73×10^{-1}
	Rail	6.13×10^{-2}	2.95×10^{-2}	1.11×10^{-3}	1.69×10^{-2}	4.75×10^{-2}
Charleston, SC (Wando Terminal)	Truck	2.27×10^{-1}	9.50×10^{-3}	3.76×10^{-2}	5.30×10^{-1}	5.77×10^{-1}
	Rail	6.13×10^{-2}	2.95×10^{-2}	1.11×10^{-3}	1.69×10^{-2}	4.75×10^{-2}
Elizabeth, NJ	Truck	2.48×10^{-1}	1.35×10^{-2}	4.60×10^{-2}	5.53×10^{-1}	6.13×10^{-1}
	Rail	6.05×10^{-2}	6.07×10^{-3}	1.63×10^{-3}	1.66×10^{-2}	7.8×10^{-2}
Jacksonville, FL	Truck	2.35×10^{-1}	1.10×10^{-2}	4.07×10^{-2}	5.40×10^{-1}	5.91×10^{-1}
	Rail	6.15×10^{-2}	2.61×10^{-2}	1.05×10^{-3}	1.64×10^{-2}	4.36×10^{-2}
Newport News, VA	Truck	2.33×10^{-1}	1.20×10^{-2}	4.23×10^{-2}	5.37×10^{-1}	5.92×10^{-1}
	Rail	6.18×10^{-2}	4.05×10^{-2}	1.22×10^{-3}	1.57×10^{-2}	5.75×10^{-2}

Shipments to Nevada Test Site:						
Route(s)		*Crew*	*General Public*			
			Off-Link	*On-Link*	*Stops*	*Total*
Norfolk, VA	Truck	$2.73x10^{-1}$	$1.19x10^{-2}$	$4.23x10^{-2}$	$5.45x10^{-1}$	$5.99x10^{-1}$
	Rail	$6.35x10^{-2}$	$4.14x10^{-2}$	$1.2 x10^{-3}$	$1.66x10^{-2}$	$5.92x10^{-2}$
Philadelphia, PA	Truck	$2.44x10^{-1}$	$1.30x10^{-2}$	$4.49x10^{-2}$	$5.43x10^{-1}$	$6.01x10^{-1}$
	Rail	$5.97x10^{-2}$	$5.94x10^{-2}$	$1.56x10^{-3}$	$1.66x10^{-2}$	$7.75x10^{-2}$
Portsmouth, VA	Truck	$2.36x10^{-1}$	$1.27x10^{-2}$	$4.39x10^{-2}$	$5.42x10^{-1}$	$5.98x10^{-1}$
	Rail	$6.30x10^{-2}$	$4.3x10^{-2}$	$1.23x10^{-3}$	$1.63x10^{-2}$	$5.78x10^{-2}$
Savannah, GA	Truck	$2.24x10^{-1}$	$1.06x10^{-2}$	$3.92x10^{-2}$	$5.18x10^{-1}$	$5.67x10^{-1}$
	Rail	$6.19x10^{-2}$	$2.51x10^{-2}$	$1.05x10^{-3}$	$1.64x10^{-2}$	$4.26x10^{-2}$
MOTSU, NC	Truck	$2.22x10^{-1}$	$1.06x10^{-2}$	$3.95x10^{-2}$	$5.09x10^{-1}$	$5.59x10^{-1}$
	Rail	$6.38x10^{-2}$	$2.89x10^{-2}$	$1.17x10^{-3}$	$1.70x10^{-2}$	$4.70x10^{-2}$
Wilmington, NC	Truck	$2.35x10^{-1}$	$9.67x10^{-3}$	$3.86x10^{-2}$	$5.49x10^{-1}$	$5.97x10^{-1}$
	Rail	$6.36x10^{-2}$	$2.88x10^{-2}$	$1.16x10^{-3}$	$1.70x10^{-2}$	$4.69x10^{-2}$
From Western Ports						
NWS Concord, CA	Truck	$6.88x10^{-2}$	$8.04x10^{-3}$	$1.99x10^{-2}$	$1.47x10^{-1}$	$1.75x10^{-1}$
	Rail	$2.60x10^{-2}$	$1.83x10^{-2}$	$4.73x10^{-4}$	$8.17x10^{-3}$	$2.70x10^{-2}$
Long Beach, CA	Truck	$4.63x10^{-2}$	$9.79x10^{-3}$	$2.04x10^{-2}$	$8.30x10^{-2}$	$1.13x10^{-1}$
	Rail	$1.98x10^{-2}$	$3.09x10^{-2}$	$4.37x10^{-4}$	$9.63x10^{-3}$	$4.10x10^{-2}$
Portland, OR	Truck	$1.13x10^{-1}$	$6.62x10^{-3}$	$2.28x10^{-2}$	$2.63x10^{-1}$	$2.92x10^{-1}$
	Rail	$3.58x10^{-2}$	$7.38x10^{-3}$	$3.33x10^{-1}$	$1.10x10^{-2}$	$1.87x10^{-2}$
Tacoma, WA	Truck	$1.20x10^{-1}$	$6.66x10^{-3}$	$2.34x10^{-2}$	$2.78x10^{-1}$	$3.08x10^{-1}$
	Rail	$3.83x10^{-2}$	$1.09x10^{-2}$	$4.36x10^{-4}$	$1.11x10^{-2}$	$2.24x10^{-2}$
From DOE Sites/Canadian Border						
Alexandria Bay, NY	Truck	$2.39x10^{-1}$	$1.11x10^{-2}$	$4.21x10^{-2}$	$5.42x10^{-1}$	$5.95x10^{-1}$
	Rail	$5.83x10^{-2}$	$5.13x10^{-2}$	$1.37x10^{-3}$	$1.63x10^{-2}$	$6.90x10^{-2}$
Hanford Site	Truck	$9.91x10^{-2}$	$5.37x10^{-3}$	$1.92x10^{-2}$	$2.34x10^{-1}$	$2.58x10^{-1}$
	Rail	$3.36x10^{-2}$	$6.24x10^{-3}$	$3.08x10^{-1}$	$1.12x10^{-2}$	$1.77x10^{-2}$
Idaho National Engineering Laboratory	Truck	$6.56x10^{-2}$	$4.52x10^{-3}$	$1.40x10^{-2}$	$1.47x10^{-1}$	$1.66x10^{-1}$
	Rail	$2.44x10^{-2}$	$3.95x10^{-3}$	$1.84x10^{-1}$	$8.29x10^{-3}$	$1.24x10^{-2}$
Oak Ridge Reservation	Truck	$1.86x10^{-1}$	$7.6x10^{-3}$	$3.10x10^{-2}$	$4.45x10^{-1}$	$4.84x10^{-1}$
	Rail	$5.36x10^{-2}$	$1.68x10^{-2}$	$6.66x10^{-1}$	$1.63x10^{-2}$	$3.37x10^{-2}$
Savannah River	Truck	$2.17x10^{-1}$	$1.05x10^{-2}$	$3.80x10^{-2}$	$5.00x10^{-1}$	$5.48x10^{-1}$
	Rail	$5.96x10^{-2}$	$2.77x10^{-2}$	$1.05x10^{-3}$	$1.65x10^{-2}$	$4.53x10^{-2}$

Shipments to Oak Ridge Reservation:						
Route(s)		*Crew*	*General Public*			
			Off-Link	*On-Link*	*Stops*	*Total*
From Eastern Ports						
Charleston, SC (NWS)	Truck	$3.98x10^{-2}$	$1.73x10^{-3}$	$6.11x10^{-3}$	$8.32x10^{-2}$	$9.11x10^{-2}$
	Rail	$2.15x10^{-2}$	$6.88x10^{-3}$	$3.60x10^{-4}$	$5.33x10^{-3}$	$1.26x10^{-2}$
Charleston, SC (Wando Terminal)	Truck	$4.18x10^{-2}$	$2.09x10^{-3}$	$6.85x10^{-3}$	$8.63x10^{-2}$	$9.53x10^{-2}$
	Rail	$2.15x10^{-2}$	$6.88x10^{-3}$	$3.60x10^{-4}$	$5.33x10^{-3}$	$1.26x10^{-2}$
Elizabeth, NJ	Truck	$8.02x10^{-2}$	$4.85x10^{-3}$	$1.45x10^{-2}$	$1.53x10^{-1}$	$1.72x10^{-1}$
	Rail	$2.49x10^{-2}$	$4.30x10^{-2}$	$9.20x10^{-4}$	$7.73x10^{-3}$	$5.17x10^{-2}$
Galveston, TX	Truck	$9.53x10^{-2}$	$5.71x10^{-3}$	$1.73x10^{-2}$	$1.99x10^{-1}$	$2.22x10^{-1}$
	Rail	$2.94x10^{-2}$	$1.87x10^{-2}$	$6.28x10^{-4}$	$8.98x10^{-3}$	$2.83x10^{-2}$
Jacksonville, FL	Truck	$5.88x10^{-2}$	$2.88x10^{-3}$	$9.64x10^{-3}$	$1.17x10^{-1}$	$1.30x10^{-1}$
	Rail	$2.12x10^{-2}$	$8.80x10^{-3}$	$3.59x10^{-4}$	$6.51x10^{-3}$	$1.57x10^{-2}$
Newport News, VA	Truck	$5.68x10^{-2}$	$3.57x10^{-3}$	$1.09x10^{-2}$	$1.15x10^{-1}$	$1.29x10^{-1}$
	Rail	$2.45x10^{-2}$	$1.11x10^{-2}$	$5.45x10^{-4}$	$6.00x10^{-3}$	$1.77x10^{-2}$
Norfolk, VA	Truck	$5.63x10^{-2}$	$2.85x10^{-3}$	$9.27x10^{-3}$	$1.14x10^{-1}$	$1.26x10^{-1}$
	Rail	$2.33x10^{-2}$	$8.51x10^{-3}$	$4.56x10^{-4}$	$5.63x10^{-3}$	$1.46x10^{-2}$

Shipments to Oak Ridge Reservation:						
Route(s)		*General Public*				
		Crew	*Off-Link*	*On-Link*	*Stops*	*Total*
Philadelphia, PA	Truck	7.36×10^{-2}	5.74×10^{-3}	1.56×10^{-2}	1.41×10^{-1}	1.62×10^{-1}
	Rail	2.35×10^{-2}	2.83×10^{-2}	7.16×10^{-4}	6.98×10^{-3}	3.60×10^{-2}
Portsmouth, VA	Truck	6.01×10^{-2}	4.32×10^{-3}	1.25×10^{-2}	1.19×10^{-1}	1.36×10^{-1}
	Rail	2.28×10^{-2}	7.44×10^{-3}	4.30×10^{-4}	5.31×10^{-3}	1.32×10^{-2}
Savannah, GA	Truck	4.33×10^{-2}	1.61×10^{-3}	6.44×10^{-3}	9.29×10^{-2}	1.01×10^{-1}
	Rail	2.16×10^{-2}	7.78×10^{-3}	3.58×10^{-4}	6.58×10^{-3}	1.47×10^{-2}
MOTSU, NC	Truck	4.88×10^{-2}	2.07×10^{-3}	7.52×10^{-3}	1.03×10^{-1}	1.12×10^{-1}
	Rail	2.08×10^{-2}	6.52×10^{-3}	3.63×10^{-4}	5.04×10^{-3}	1.19×10^{-2}
Wilmington, NC	Truck	5.00×10^{-2}	2.06×10^{-3}	7.70×10^{-3}	1.05×10^{-1}	1.15×10^{-1}
	Rail	2.06×10^{-2}	6.41×10^{-3}	3.55×10^{-4}	5.00×10^{-3}	1.18×10^{-2}
From Western Ports						
NWS Concord, CA	Truck	2.26×10^{-1}	1.32×10^{-2}	4.47×10^{-2}	5.29×10^{-1}	5.87×10^{-1}
	Rail	5.91×10^{-2}	2.76×10^{-2}	9.50×10^{-4}	1.71×10^{-2}	4.57×10^{-2}
Long Beach, CA	Truck	2.03×10^{-1}	1.49×10^{-2}	4.52×10^{-2}	4.65×10^{-1}	5.25×10^{-1}
	Rail	5.68×10^{-2}	4.55×10^{-2}	1.06×10^{-3}	1.73×10^{-2}	6.39×10^{-2}
Portland, OR	Truck	2.25×10^{-1}	8.88×10^{-3}	3.72×10^{-2}	5.40×10^{-1}	5.86×10^{-1}
	Rail	5.94×10^{-2}	3.16×10^{-2}	1.05×10^{-3}	1.78×10^{-2}	5.04×10^{-2}
Tacoma, WA	Truck	2.26×10^{-1}	7.26×10^{-3}	3.44×10^{-2}	5.50×10^{-1}	5.92×10^{-1}
	Rail	5.95×10^{-2}	3.86×10^{-2}	1.17×10^{-3}	1.85×10^{-2}	5.83×10^{-2}
From DOE Sites/Canadian Border						
Alexandria Bay, NY	Truck	9.64×10^{-2}	4.11×10^{-3}	1.46×10^{-2}	1.92×10^{-1}	2.11×10^{-1}
	Rail	2.80×10^{-2}	3.17×10^{-2}	8.38×10^{-4}	9.07×10^{-3}	4.16×10^{-2}
Hanford Site	Truck	2.10×10^{-1}	7.29×10^{-2}	3.31×10^{-1}	5.10×10^{-1}	5.50×10^{-1}
	Rail	5.56×10^{-1}	1.64×10^{-1}	6.92×10^{-3}	1.60×10^{-1}	3.31×10^{-2}
Idaho National Engineering Laboratory	Truck	1.76×10^{-1}	6.45×10^{-2}	2.80×10^{-1}	4.24×10^{-1}	4.58×10^{-1}
	Rail	4.63×10^{-1}	1.41×10^{-1}	5.69×10^{-3}	1.33×10^{-1}	2.80×10^{-2}
Nevada Test Site	Truck	1.86×10^{-1}	7.63×10^{-2}	3.10×10^{-1}	4.45×10^{-1}	4.84×10^{-1}
	Rail	5.36×10^{-1}	1.68×10^{-1}	6.66×10^{-3}	1.63×10^{-1}	3.37×10^{-2}
Savannah River	Truck	4.23×10^{-1}	2.93×10^{-2}	7.96×10^{-2}	7.84×10^{-1}	8.93×10^{-1}
	Rail	1.87×10^{-1}	4.69×10^{-2}	2.38×10^{-3}	5.11×10^{-2}	1.00×10^{-2}
Sweetgrass, MT	Truck	1.94×10^{-1}	5.82×10^{-2}	2.93×10^{-1}	4.79×10^{-1}	5.14×10^{-1}
	Rail	4.70×10^{-1}	2.57×10^{-1}	8.41×10^{-3}	1.46×10^{-1}	4.11×10^{-2}

Shipments to Savannah River Site:						
Route(s)		*Crew*	*General Public*			
			Off-Link	*On-Link*	*Stops*	*Total*
From Eastern Ports						
Charleston, SC (NWS)	Truck	1.84×10^{-2}	7.44×10^{-4}	2.83×10^{-3}	3.89×10^{-2}	4.25×10^{-2}
	Rail	1.40×10^{-2}	1.77×10^{-3}	5.53×10^{-6}	4.77×10^{-3}	6.59×10^{-3}
Charleston, SC (Wando Terminal)	Truck	2.04×10^{-2}	1.10×10^{-3}	3.57×10^{-3}	4.21×10^{-2}	4.67×10^{-2}
	Rail	1.40×10^{-2}	1.77×10^{-3}	5.53×10^{-6}	4.77×10^{-3}	6.59×10^{-3}
Elizabeth, NJ	Truck	8.83×10^{-2}	5.31×10^{-3}	1.60×10^{-2}	1.70×10^{-1}	1.92×10^{-1}
	Rail	2.64×10^{-2}	4.14×10^{-2}	8.55×10^{-4}	8.08×10^{-3}	5.04×10^{-2}
Galveston, TX	Truck	1.02×10^{-1}	6.82×10^{-3}	1.94×10^{-2}	2.07×10^{-1}	2.33×10^{-1}
	Rail	3.15×10^{-2}	2.48×10^{-2}	7.41×10^{-4}	1.04×10^{-2}	3.59×10^{-2}
Jacksonville, FL	Truck	3.37×10^{-2}	7.25×10^{-4}	4.42×10^{-3}	7.81×10^{-2}	8.32×10^{-2}
	Rail	1.60×10^{-2}	3.06×10^{-3}	1.04×10^{-4}	4.61×10^{-3}	7.77×10^{-3}
Newport News, VA	Truck	5.24×10^{-2}	3.06×10^{-3}	9.51×10^{-3}	1.07×10^{-1}	1.20×10^{-1}
	Rail	2.18×10^{-2}	8.37×10^{-3}	3.55×10^{-4}	5.66×10^{-3}	1.44×10^{-2}
Norfolk, VA	Truck	4.89×10^{-2}	2.13×10^{-3}	7.66×10^{-3}	1.03×10^{-1}	1.13×10^{-1}
	Rail	2.06×10^{-2}	5.78×10^{-3}	2.66×10^{-4}	5.22×10^{-3}	1.13×10^{-2}

Shipments to Savannah River Site:						
Route(s)		*Crew*	*General Public*			
			Off-Link	*On-Link*	*Stops*	*Total*
Philadelphia, PA	Truck	8.21×10^{-2}	6.81×10^{-3}	1.78×10^{-2}	1.53×10^{-1}	1.78×10^{-1}
	Rail	2.50×10^{-2}	2.67×10^{-2}	6.51×10^{-4}	7.21×10^{-3}	3.46×10^{-2}
Portsmouth, VA	Truck	4.93×10^{-2}	2.21×10^{-3}	7.90×10^{-3}	1.04×10^{-1}	1.14×10^{-1}
	Rail	2.01×10^{-2}	4.71×10^{-3}	2.39×10^{-4}	4.72×10^{-3}	9.67×10^{-3}
Savannah, GA	Truck	2.29×10^{-2}	5.78×10^{-4}	3.04×10^{-3}	5.18×10^{-2}	5.54×10^{-2}
	Rail	1.36×10^{-2}	8.37×10^{-4}	3.51×10^{-5}	4.39×10^{-3}	5.27×10^{-3}
MOTSU, NC	Truck	2.22×10^{-2}	5.41×10^{-4}	3.06×10^{-3}	5.17×10^{-2}	5.53×10^{-2}
	Rail	1.81×10^{-2}	3.82×10^{-3}	1.73×10^{-4}	4.51×10^{-3}	8.50×10^{-3}
Wilmington, NC	Truck	2.96×10^{-2}	1.03×10^{-3}	4.30×10^{-3}	6.42×10^{-2}	6.95×10^{-2}
	Rail	1.79×10^{-2}	3.71×10^{-3}	1.65×10^{-4}	4.46×10^{-3}	8.33×10^{-3}
From Western Ports						
NWS Concord, CA	Truck	2.64×10^{-1}	1.83×10^{-2}	5.52×10^{-2}	5.76×10^{-1}	6.50×10^{-1}
	Rail	6.54×10^{-2}	5.17×10^{-2}	1.52×10^{-3}	1.88×10^{-2}	7.20×10^{-2}
Long Beach, CA	Truck	2.33×10^{-1}	1.61×10^{-2}	4.83×10^{-2}	5.06×10^{-1}	5.70×10^{-1}
	Rail	6.63×10^{-2}	5.65×10^{-2}	1.51×10^{-3}	1.80×10^{-2}	7.60×10^{-2}
Portland, OR	Truck	2.57×10^{-1}	1.17×10^{-2}	4.42×10^{-2}	5.96×10^{-1}	6.52×10^{-1}
	Rail	6.49×10^{-2}	3.88×10^{-2}	1.34×10^{-3}	1.81×10^{-2}	5.82×10^{-2}
Seattle, WA	Truck	2.54×10^{-1}	9.50×10^{-3}	4.00×10^{-2}	6.00×10^{-1}	6.50×10^{-1}
	Rail	6.44×10^{-2}	4.13×10^{-2}	1.37×10^{-3}	1.82×10^{-2}	6.09×10^{-2}
Tacoma, WA	Truck	2.58×10^{-1}	1.02×10^{-2}	4.15×10^{-2}	6.07×10^{-1}	6.59×10^{-1}
	Rail	6.51×10^{-2}	4.59×10^{-2}	1.45×10^{-3}	1.87×10^{-2}	6.60×10^{-2}
From DOE Sites/Canadian Border						
Alexandria Bay, NY	Truck	1.04×10^{-1}	4.58×10^{-3}	1.61×10^{-2}	2.10×10^{-1}	2.30×10^{-1}
	Rail	3.33×10^{-2}	6.15×10^{-2}	1.30×10^{-3}	9.18×10^{-3}	7.20×10^{-2}
Hanford Site	Truck	2.42×10^{-1}	1.02×10^{-2}	4.01×10^{-2}	5.65×10^{-1}	6.15×10^{-1}
	Rail	6.15×10^{-2}	2.74×10^{-2}	1.08×10^{-3}	1.66×10^{-2}	4.51×10^{-2}
Idaho National Engineering Laboratory	Truck	2.08×10^{-1}	9.34×10^{-3}	3.50×10^{-2}	4.79×10^{-1}	5.23×10^{-1}
	Rail	5.23×10^{-2}	2.51×10^{-2}	9.56×10^{-4}	1.41×10^{-2}	4.02×10^{-2}
Nevada Test Site	Truck	2.17×10^{-1}	1.05×10^{-2}	3.80×10^{-2}	5.00×10^{-1}	5.48×10^{-1}
	Rail	5.96×10^{-2}	2.77×10^{-2}	1.05×10^{-3}	1.65×10^{-2}	4.53×10^{-2}
Oak Ridge Reservation	Truck	4.23×10^{-2}	2.93×10^{-3}	7.96×10^{-3}	7.84×10^{-2}	8.93×10^{-2}
	Rail	1.87×10^{-2}	4.69×10^{-3}	2.38×10^{-4}	5.11×10^{-3}	1.00×10^{-2}
Sweetgrass, MT	Truck	2.26×10^{-1}	8.66×10^{-3}	3.62×10^{-2}	5.33×10^{-1}	5.78×10^{-1}
	Rail	5.26×10^{-2}	3.30×10^{-2}	1.13×10^{-3}	1.49×10^{-2}	4.90×10^{-2}

[a] *Incident free risk factors are based on dose rates of 10 mrem per hr at 2 m (6.6 ft) (the regulatory limit).*

MOTSU = Military Ocean Terminal at Sunny Point, NWS = Naval Weapons Station

Table E-9 Accident Dose Risk per Shipment for All Spent Nuclear Fuel Types (Person-Rem/shipment)

Shipments to Hanford Site:		
Source/Route	*Truck*	*Rail*
From Eastern Ports		
BR-2 Belgium Spent Nuclear Fuel		
Charleston, SC (NWS)	1.51×10^{-4}	2.06×10^{-5}
Charleston, SC (Wando Terminal)	1.54×10^{-4}	2.06×10^{-5}
Elizabeth, NJ	1.30×10^{-4}	4.19×10^{-5}
Galveston, TX	9.53×10^{-5}	8.81×10^{-6}
Jacksonville, FL	1.71×10^{-4}	1.86×10^{-5}

Shipments to Hanford Site:		
Source/Route	*Truck*	*Rail*
Newport News, VA	1.44×10^{-4}	3.28×10^{-5}
Norfolk, VA	1.47×10^{-4}	3.33×10^{-5}
Philadelphia, PA	1.31×10^{-4}	3.75×10^{-5}
Portsmouth, VA	1.49×10^{-4}	3.28×10^{-5}
Savannah, GA	1.65×10^{-4}	1.86×10^{-5}
MOTSU, NC	1.45×10^{-4}	2.14×10^{-5}
Wilmington, NC	1.51×10^{-4}	2.13×10^{-5}
RHF France Spent Nuclear Fuel		
Charleston, SC (NWS)	6.54×10^{-5}	8.86×10^{-6}
Charleston, SC (Wando Terminal)	6.67×10^{-5}	8.86×10^{-6}
Elizabeth, NJ	5.59×10^{-5}	1.80×10^{-5}
Galveston, TX	4.12×10^{-5}	3.80×10^{-6}
Jacksonville, FL	7.39×10^{-5}	8.00×10^{-6}
Newport News, VA	6.21×10^{-5}	1.41×10^{-5}
Norfolk, VA	6.35×10^{-5}	1.43×10^{-5}
Philadelphia, PA	5.67×10^{-5}	1.61×10^{-5}
Portsmouth, VA	6.44×10^{-5}	1.41×10^{-5}
Savannah, GA	7.11×10^{-5}	8.03×10^{-6}
MOTSU, NC	6.28×10^{-5}	9.20×10^{-6}
Wilmington, NC	6.51×10^{-5}	9.15×10^{-6}
NRU Canada Spent Nuclear Fuel		
Charleston, SC (NWS)	2.09×10^{-4}	2.86×10^{-5}
Charleston, SC (Wando Terminal)	2.13×10^{-4}	2.86×10^{-5}
Elizabeth, NJ	1.79×10^{-4}	5.83×10^{-5}
Galveston, TX	1.32×10^{-4}	1.22×10^{-5}
Jacksonville, FL	2.36×10^{-4}	2.58×10^{-5}
Newport News, VA	1.99×10^{-4}	4.56×10^{-5}
Norfolk, VA	2.03×10^{-4}	4.64×10^{-5}
Philadelphia, PA	1.82×10^{-4}	5.22×10^{-5}
Portsmouth, VA	2.06×10^{-4}	4.57×10^{-5}
Savannah, GA	2.27×10^{-4}	2.59×10^{-5}
MOTSU, NC	2.01×10^{-4}	2.97×10^{-5}
Wilmington, NC	2.08×10^{-4}	2.95×10^{-5}
PRR-1 TRIGA Spent Nuclear Fuel		
Charleston, SC (NWS)	4.33×10^{-4}	9.80×10^{-5}
Charleston, SC (Wando Terminal)	4.40×10^{-4}	9.80×10^{-5}
Elizabeth, NJ	4.49×10^{-4}	2.11×10^{-4}
Galveston, TX	2.68×10^{-4}	3.71×10^{-5}
Jacksonville, FL	4.81×10^{-4}	9.21×10^{-5}
Newport News, VA	4.23×10^{-4}	1.83×10^{-4}
Norfolk, VA	4.31×10^{-4}	1.85×10^{-4}
Philadelphia, PA	4.63×10^{-4}	1.97×10^{-4}
Portsmouth, VA	4.36×10^{-4}	1.84×10^{-4}
Savannah, GA	4.64×10^{-4}	9.25×10^{-5}
MOTSU, NC	4.27×10^{-4}	1.01×10^{-4}
Wilmington, NC	4.32×10^{-4}	1.01×10^{-4}
Calcined Target Material		
Charleston, SC (NWS)	3.96×10^{-2}	7.21×10^{-3}
Charleston, SC (Wando Terminal)	3.98×10^{-2}	7.21×10^{-3}
Elizabeth, NJ	6.73×10^{-2}	1.66×10^{-2}
Jacksonville, FL	4.09×10^{-2}	7.17×10^{-3}

Shipments to Hanford Site:		
Source/Route	***Truck***	***Rail***
Newport News, VA	4.22×10^{-2}	1.62×10^{-2}
Norfolk, VA	4.27×10^{-2}	1.63×10^{-2}
Philadelphia, PA	7.31×10^{-2}	1.62×10^{-2}
Portsmouth, VA	4.25×10^{-2}	1.63×10^{-2}
Savannah, GA	4.01×10^{-2}	7.21×10^{-3}
MOTSU, NC	4.35×10^{-2}	7.41×10^{-3}
Wilmington, NC	4.07×10^{-2}	7.40×10^{-3}
Galveston, TX	2.25×10^{-2}	2.16×10^{-3}
Oxidized Target Material		
Charleston, SC (NWS)	9.91×10^{-2}	1.80×10^{-2}
Charleston, SC (Wando Terminal)	9.95×10^{-2}	1.80×10^{-2}
Elizabeth, NJ	1.68×10^{-1}	4.14×10^{-2}
Jacksonville, FL	1.02×10^{-1}	1.79×10^{-2}
Newport News, VA	1.05×10^{-1}	4.06×10^{-2}
Norfolk, VA	1.07×10^{-1}	4.09×10^{-2}
Philadelphia, PA	1.83×10^{-1}	4.06×10^{-2}
Portsmouth, VA	1.06×10^{-1}	4.08×10^{-2}
Savannah, GA	1.00×10^{-1}	1.80×10^{-2}
MOTSU, NC	1.09×10^{-1}	1.85×10^{-2}
Wilmington, NC	1.02×10^{-1}	1.85×10^{-2}
Galveston, TX	5.62×10^{-2}	5.40×10^{-3}
From Western Ports		
BR-2 Belgium Spent Nuclear Fuel		
NWS, Concord CA	4.46×10^{-5}	1.50×10^{-5}
Long Beach, CA	7.36×10^{-5}	1.59×10^{-5}
Portland, OR	1.15×10^{-5}	2.10×10^{-6}
Tacoma, WA	8.55×10^{-6}	2.08×10^{-6}
RHF France Spent Nuclear Fuel		
NWS, Concord CA	1.93×10^{-5}	6.47×10^{-6}
Long Beach, CA	3.18×10^{-5}	6.86×10^{-6}
Portland, OR	4.99×10^{-6}	9.08×10^{-7}
Tacoma, WA	3.69×10^{-6}	8.99×10^{-7}
NRU Canada Spent Nuclear Fuel		
NWS Concord, CA	6.15×10^{-5}	2.07×10^{-5}
Long Beach, CA	1.02×10^{-4}	2.20×10^{-5}
Portland, OR	1.59×10^{-5}	2.91×10^{-6}
Tacoma, WA	1.18×10^{-5}	2.88×10^{-6}
PRR-1 TRIGA Spent Nuclear Fuel		
NWS Concord, CA	1.15×10^{-4}	5.15×10^{-5}
Long Beach, CA	1.90×10^{-4}	5.50×10^{-5}
Portland, OR	2.97×10^{-5}	7.50×10^{-6}
Tacoma, WA	2.46×10^{-5}	7.79×10^{-6}
Calcined Target Material		
NWS Concord, CA	4.92×10^{-3}	1.50×10^{-3}
Long Beach, CA	7.06×10^{-3}	1.63×10^{-3}
Portland, OR	1.28×10^{-3}	2.54×10^{-4}
Tacoma, WA	1.90×10^{-3}	3.11×10^{-4}
Oxidized Target Material		
NWS Concord, CA	1.23×10^{-2}	3.75×10^{-3}
Long Beach, CA	1.77×10^{-2}	4.08×10^{-3}
Portland, OR	3.21×10^{-3}	6.36×10^{-4}

Shipments to Hanford Site:		
Source/Route	***Truck***	***Rail***
Tacoma, WA	4.75×10^{-3}	7.80×10^{-4}
From DOE Sites/Canadian Border		
BR-2 Belgium Spent Nuclear Fuel		
Alexandria Bay, NY	1.52×10^{-4}	3.76×10^{-5}
Idaho National Engineering Laboratory	1.00×10^{-5}	3.08×10^{-6}
Nevada Test Site	5.07×10^{-5}	4.62×10^{-6}
Oak Ridge Reservation	1.13×10^{-4}	1.16×10^{-5}
Savannah River	1.61×10^{-4}	1.97×10^{-5}
Sweetgrass, MT	2.25×10^{-5}	1.56×10^{-6}
RHF France Spent Nuclear Fuel		
Alexandria Bay, NY	6.56×10^{-5}	1.62×10^{-5}
Idaho National Engineering Laboratory	4.33×10^{-6}	1.33×10^{-6}
Nevada Test Site	2.19×10^{-5}	1.99×10^{-6}
Oak Ridge Reservation	4.86×10^{-5}	4.97×10^{-6}
Savannah River	6.94×10^{-5}	8.47×10^{-6}
Sweetgrass, MT	9.72×10^{-6}	6.72×10^{-7}
NRU Canada Spent Nuclear Fuel		
Alexandria Bay, NY	2.10×10^{-4}	5.23×10^{-5}
Idaho National Engineering Laboratory	1.38×10^{-5}	4.27×10^{-6}
Nevada Test Site	6.99×10^{-5}	6.39×10^{-6}
Oak Ridge Reservation	1.56×10^{-4}	1.62×10^{-5}
Savannah River	2.22×10^{-4}	2.73×10^{-5}
Sweetgrass, MT	3.11×10^{-5}	2.16×10^{-6}
PRR-1 TRIGA Spent Nuclear Fuel		
Alexandria Bay, NY	4.99×10^{-4}	1.98×10^{-4}
Idaho National Engineering Laboratory	2.94×10^{-5}	1.21×10^{-5}
Nevada Test Site	1.29×10^{-4}	1.74×10^{-5}
Oak Ridge Reservation	3.35×10^{-4}	7.04×10^{-5}
Savannah River	4.53×10^{-4}	9.49×10^{-5}
Sweetgrass, MT	6.49×10^{-5}	6.18×10^{-6}
Calcined Target Material		
Alexandria Bay, NY	6.72×10^{-2}	1.63×10^{-2}
Idaho National Engineering Laboratory	2.69×10^{-3}	5.83×10^{-4}
Nevada Test Site	4.74×10^{-3}	7.41×10^{-4}
Oak Ridge Reservation	3.55×10^{-2}	6.78×10^{-3}
Savannah River	3.96×10^{-2}	7.11×10^{-3}
Sweetgrass, MT	6.01×10^{-3}	3.03×10^{-4}
Oxidized Target Material		
Alexandria Bay, NY	1.68×10^{-1}	4.07×10^{-2}
Idaho National Engineering Laboratory	6.74×10^{-3}	1.46×10^{-3}
Nevada Test Site	1.19×10^{-2}	1.85×10^{-3}
Oak Ridge Reservation	8.88×10^{-2}	1.70×10^{-2}
Savannah River	9.90×10^{-2}	1.78×10^{-2}
Sweetgrass, MT	1.50×10^{-2}	7.57×10^{-4}

Shipments to Idaho National Engineering Laboratory:		
Source/Route	***Truck***	***Rail***
From Eastern Ports		
BR-2 Belgium Spent Nuclear Fuel		
Charleston, SC (NWS)	1.45×10^{-4}	1.85×10^{-5}
Charleston, SC (Wando Terminal)	1.48×10^{-4}	1.85×10^{-5}
Elizabeth, NJ	1.23×10^{-4}	3.98×10^{-5}

Shipments to Idaho National Engineering Laboratory:		
Source/Route	*Truck*	*Rail*
Galveston, TX	8.88×10^{-5}	6.71×10^{-6}
Jacksonville, FL	1.62×10^{-4}	1.65×10^{-5}
Newport News, VA	1.37×10^{-4}	3.07×10^{-5}
Norfolk, VA	1.39×10^{-4}	3.12×10^{-5}
Philadelphia, PA	1.25×10^{-4}	3.54×10^{-5}
Portsmouth, VA	1.43×10^{-4}	3.07×10^{-5}
Savannah, GA	1.58×10^{-4}	1.66×10^{-5}
MOTSU, NC	1.34×10^{-4}	1.93×10^{-5}
Wilmington, NC	1.44×10^{-4}	1.92×10^{-5}
RHF France Spent Nuclear Fuel		
Charleston, SC (NWS)	6.26×10^{-5}	7.96×10^{-6}
Charleston, SC (Wando Terminal)	6.39×10^{-5}	7.96×10^{-6}
Elizabeth, NJ	5.31×10^{-5}	1.71×10^{-5}
Galveston, TX	3.84×10^{-5}	2.89×10^{-6}
Jacksonville, FL	7.02×10^{-5}	7.10×10^{-6}
Newport News, VA	5.93×10^{-5}	1.32×10^{-5}
Norfolk, VA	6.01×10^{-5}	1.34×10^{-5}
Philadelphia, PA	5.39×10^{-5}	1.52×10^{-5}
Portsmouth, VA	6.16×10^{-5}	1.32×10^{-5}
Savannah, GA	6.83×10^{-5}	7.12×10^{-6}
MOTSU, NC	5.78×10^{-5}	8.30×10^{-6}
Wilmington, NC	6.22×10^{-5}	8.25×10^{-6}
NRU Canada Spent Nuclear Fuel		
Charleston, SC (NWS)	2.00×10^{-4}	2.57×10^{-5}
Charleston, SC (Wando Terminal)	2.04×10^{-4}	2.57×10^{-5}
Elizabeth, NJ	1.23×10^{-4}	5.54×10^{-5}
Galveston, TX	1.70×10^{-4}	9.29×10^{-6}
Jacksonville, FL	2.24×10^{-4}	2.29×10^{-5}
Newport News, VA	1.90×10^{-4}	4.27×10^{-5}
Norfolk, VA	1.92×10^{-4}	4.35×10^{-5}
Portsmouth, VA	1.97×10^{-4}	4.28×10^{-5}
Savannah, GA	2.18×10^{-4}	2.30×10^{-5}
MOTSU, NC	1.85×10^{-4}	2.68×10^{-5}
Wilmington, NC	1.99×10^{-4}	2.66×10^{-5}
PRR-1 TRIGA Spent Nuclear Fuel		
Charleston, SC (NWS)	4.14×10^{-4}	8.94×10^{-5}
Charleston, SC (Wando Terminal)	4.21×10^{-4}	8.94×10^{-5}
Elizabeth, NJ	4.30×10^{-4}	2.02×10^{-4}
Galveston, TX	4.49×10^{-4}	8.47×10^{-5}
Jacksonville, FL	4.57×10^{-4}	8.36×10^{-5}
Newport News, VA	4.04×10^{-4}	1.75×10^{-4}
Norfolk, VA	4.09×10^{-4}	1.77×10^{-4}
Philadelphia, PA	4.44×10^{-4}	1.88×10^{-4}
Portsmouth, VA	4.17×10^{-4}	1.75×10^{-4}
Savannah, GA	4.45×10^{-4}	8.39×10^{-5}
MOTSU, NC	3.97×10^{-4}	9.26×10^{-5}
Wilmington, NC	4.13×10^{-4}	9.22×10^{-5}
Calcined Target Material		
Charleston, SC (NWS)	3.79×10^{-2}	6.76×10^{-3}
Charleston, SC (Wando Terminal)	3.81×10^{-2}	6.76×10^{-3}
Elizabeth, NJ	6.57×10^{-2}	1.61×10^{-2}

Shipments to Idaho National Engineering Laboratory:		
Source/Route	***Truck***	***Rail***
Jacksonville, FL	3.91×10^{-2}	6.72×10^{-3}
Newport News, VA	4.05×10^{-2}	1.58×10^{-2}
Norfolk, VA	4.10×10^{-2}	1.59×10^{-2}
Philadelphia, PA	7.15×10^{-2}	1.58×10^{-2}
Portsmouth, VA	4.09×10^{-2}	1.59×10^{-2}
Savannah, GA	3.84×10^{-2}	6.76×10^{-3}
MOTSU, NC	4.18×10^{-2}	6.96×10^{-3}
Wilmington, NC	3.91×10^{-2}	6.95×10^{-3}
Galveston, TX	2.08×10^{-2}	1.71×10^{-3}
Oxidized Target Material		
Charleston, SC (NWS)	9.49×10^{-2}	1.69×10^{-2}
Charleston, SC (Wando Terminal)	9.53×10^{-2}	1.69×10^{-2}
Elizabeth, NJ	1.64×10^{-1}	4.03×10^{-2}
Jacksonville, FL	9.79×10^{-2}	1.68×10^{-2}
Newport News, VA	1.01×10^{-1}	3.95×10^{-2}
Norfolk, VA	1.03×10^{-1}	3.98×10^{-2}
Philadelphia, PA	1.79×10^{-1}	3.95×10^{-2}
Portsmouth, VA	1.02×10^{-1}	3.96×10^{-2}
Savannah, GA	9.62×10^{-2}	1.69×10^{-2}
MOTSU, NC	1.05×10^{-1}	1.74×10^{-2}
Wilmington, NC	9.78×10^{-2}	1.74×10^{-2}
Galveston, TX	5.21×10^{-2}	4.28×10^{-3}
From Western Ports		
BR-2 Belgium Spent Nuclear Fuel		
NWS Concord, CA	3.83×10^{-5}	4.00×10^{-6}
Long Beach, CA	7.40×10^{-5}	1.38×10^{-5}
Portland, OR	1.93×10^{-5}	4.94×10^{-6}
Tacoma, WA	1.66×10^{-5}	6.85×10^{-6}
RHF France Spent Nuclear Fuel		
NWS Concord, CA	1.66×10^{-5}	1.73×10^{-6}
Long Beach, CA	3.20×10^{-5}	5.96×10^{-6}
Portland, OR	8.35×10^{-6}	2.13×10^{-6}
Tacoma, WA	7.19×10^{-6}	2.95×10^{-6}
NRU Canada Spent Nuclear Fuel		
NWS Concord, CA	5.29×10^{-5}	5.53×10^{-6}
Long Beach, CA	1.02×10^{-4}	1.91×10^{-5}
Portland, OR	2.67×10^{-5}	6.84×10^{-6}
Tacoma, WA	2.30×10^{-5}	9.47×10^{-6}
PRR-1 TRIGA Spent Nuclear Fuel		
NWS Concord, CA	9.68×10^{-5}	1.42×10^{-5}
Long Beach, CA	1.85×10^{-4}	4.64×10^{-5}
Portland, OR	5.19×10^{-5}	1.85×10^{-5}
Tacoma, WA	4.88×10^{-5}	2.50×10^{-5}
Calcined Target Material		
NWS Concord, CA	3.21×10^{-3}	4.70×10^{-4}
Long Beach, CA	4.75×10^{-3}	1.18×10^{-3}
Portland, OR	3.23×10^{-3}	7.61×10^{-4}
Tacoma, WA	4.35×10^{-3}	9.55×10^{-4}
Oxidized Target Material		
NWS Concord, CA	8.05×10^{-3}	1.18×10^{-3}
Long Beach, CA	1.19×10^{-2}	2.95×10^{-3}

Shipments to Idaho National Engineering Laboratory:		
Source/Route	*Truck*	*Rail*
Portland, OR	8.07×10^{-3}	1.91×10^{-3}
Tacoma, WA	1.09×10^{-2}	2.39×10^{-3}
From DOE Sites/Canadian Border		
BR-2 Belgium Spent Nuclear Fuel		
Alexandria Bay, NY	1.45×10^{-4}	3.55×10^{-5}
Hanford Site	1.00×10^{-5}	3.08×10^{-6}
Nevada Test Site	4.41×10^{-5}	2.52×10^{-6}
Oak Ridge Reservation	1.06×10^{-4}	9.48×10^{-6}
Savannah River	1.54×10^{-4}	1.76×10^{-5}
Sweetgrass, MT	1.59×10^{-5}	3.84×10^{-6}
RHF France Spent Nuclear Fuel		
Hanford Site	4.33×10^{-6}	1.33×10^{-6}
Nevada Test Site	1.91×10^{-5}	1.09×10^{-6}
Oak Ridge Reservation	4.58×10^{-5}	4.07×10^{-6}
Savannah River	6.66×10^{-5}	7.57×10^{-6}
NRU Canada Spent Nuclear Fuel		
Alexandria Bay, NY	2.01×10^{-4}	4.94×10^{-5}
Hanford Site	1.38×10^{-5}	4.27×10^{-6}
Nevada Test Site	6.09×10^{-5}	3.48×10^{-6}
Oak Ridge Reservation	1.46×10^{-4}	1.33×10^{-5}
Savannah River	2.13×10^{-4}	2.44×10^{-5}
Sweetgrass, MT	2.20×10^{-5}	5.32×10^{-6}
PRR-1 TRIGA Spent Nuclear Fuel		
Hanford Site	2.94×10^{-5}	1.21×10^{-5}
Nevada Test Site	1.09×10^{-4}	8.79×10^{-6}
Oak Ridge Reservation	3.16×10^{-4}	6.19×10^{-5}
Savannah River	4.34×10^{-4}	8.63×10^{-5}
Calcined Target Material		
Alexandria Bay, NY	6.55×10^{-2}	1.58×10^{-2}
Hanford Site	2.69×10^{-3}	5.83×10^{-4}
Nevada Test Site	3.10×10^{-3}	2.90×10^{-4}
Oak Ridge Reservation	3.38×10^{-2}	6.33×10^{-3}
Savannah River	3.79×10^{-2}	6.66×10^{-3}
Sweetgrass, MT	3.56×10^{-3}	8.19×10^{-4}
Oxidized Target Material		
Alexandria Bay, NY	1.64×10^{-1}	3.96×10^{-2}
Hanford	6.74×10^{-3}	1.46×10^{-3}
Nevada Test Site	7.76×10^{-3}	7.27×10^{-4}
Oak Ridge Reservation	8.47×10^{-2}	1.58×10^{-2}
Savannah River	9.49×10^{-2}	1.67×10^{-2}
Sweetgrass, MT	8.91×10^{-3}	2.05×10^{-3}

Shipments to Nevada Test Site:		
Source/Route	*Truck*	*Rail*
From Eastern Ports		
BR-2 Belgium Spent Nuclear Fuel		
Charleston, SC (NWS)	1.65×10^{-4}	1.99×10^{-5}
Charleston, SC (Wando Terminal)	1.68×10^{-4}	1.99×10^{-5}
Elizabeth, NJ	1.77×10^{-4}	4.12×10^{-5}
Galveston, TX	9.13×10^{-5}	5.16×10^{-6}
Jacksonville, FL	1.89×10^{-4}	1.79×10^{-5}
Newport News, VA	1.64×10^{-4}	3.21×10^{-5}

Shipments to Nevada Test Site:		
Source/Route	***Truck***	***Rail***
Norfolk, VA	$1.66x10^{-4}$	$3.27x10^{-5}$
Philadelphia, PA	$1.75x10^{-4}$	$3.68x10^{-5}$
Portsmouth, VA	$1.69x10^{-4}$	$3.22x10^{-5}$
Savannah, GA	$1.85x10^{-4}$	$1.80x10^{-5}$
MOTSU, NC	$1.65x10^{-4}$	$2.07x10^{-5}$
Wilmington, NC	$1.71x10^{-4}$	$2.06x10^{-5}$
RHF France Spent Nuclear Fuel		
Charleston, SC (NWS)	$7.12x10^{-5}$	$8.57x10^{-6}$
Charleston, SC (Wando Terminal)	$7.25x10^{-5}$	$8.57x10^{-6}$
Elizabeth, NJ	$7.66x10^{-5}$	$1.78x10^{-5}$
Galveston, TX	$3.95x10^{-5}$	$2.42x10^{-6}$
Jacksonville, FL	$8.17x10^{-5}$	$7.71x10^{-6}$
Newport News, VA	$7.08x10^{-5}$	$1.38x10^{-5}$
Norfolk, VA	$7.16x10^{-5}$	$1.40x10^{-5}$
Philadelphia, PA	$7.56x10^{-5}$	$1.58x10^{-5}$
Portsmouth, VA	$7.31x10^{-5}$	$1.38x10^{-5}$
Savannah, GA	$7.98x10^{-5}$	$7.74x10^{-6}$
MOTSU, NC	$7.14x10^{-5}$	$8.91x10^{-6}$
Wilmington, NC	$7.37x10^{-5}$	$8.86x10^{-6}$
NRU Canada Spent Nuclear Fuel		
Charleston, SC (NWS)	$2.27x10^{-4}$	$2.76x10^{-5}$
Charleston, SC (Wando Terminal)	$2.32x10^{-4}$	$2.76x10^{-5}$
Elizabeth, NJ	$2.45x10^{-4}$	$5.73x10^{-5}$
Galveston, TX	$1.26x10^{-4}$	$7.77x10^{-6}$
Jacksonville, FL	$2.61x10^{-4}$	$2.49x10^{-5}$
Newport News, VA	$2.26x10^{-4}$	$4.47x10^{-5}$
Norfolk, VA	$2.29x10^{-4}$	$4.55x10^{-5}$
Philadelphia, PA	$2.42x10^{-4}$	$5.12x10^{-5}$
Portsmouth, VA	$2.34x10^{-4}$	$4.48x10^{-5}$
Savannah, GA	$2.55x10^{-4}$	$2.50x10^{-5}$
MOTSU, NC	$2.28x10^{-4}$	$2.87x10^{-5}$
Wilmington, NC	$2.36x10^{-4}$	$2.86x10^{-5}$
PRR-1 TRIGA Spent Nuclear Fuel		
Charleston, SC (NWS)	$4.62x10^{-4}$	$9.35x10^{-5}$
Charleston, SC (Wando Terminal)	$4.69x10^{-4}$	$9.35x10^{-5}$
Elizabeth, NJ	$5.19x10^{-4}$	$2.07x10^{-4}$
Galveston, TX	$2.37x10^{-4}$	$2.44x10^{-5}$
Jacksonville, FL	$5.21x10^{-4}$	$8.77x10^{-5}$
Newport News, VA	$4.68x10^{-4}$	$1.79x10^{-4}$
Norfolk, VA	$4.73x10^{-4}$	$1.81x10^{-4}$
Philadelphia, PA	$5.17x10^{-4}$	$1.92x10^{-4}$
Portsmouth, VA	$4.81x10^{-4}$	$1.79x10^{-4}$
Savannah, GA	$5.10x10^{-4}$	$8.80x10^{-5}$
MOTSU, NC	$4.19x10^{-4}$	$9.67x10^{-5}$
Wilmington, NC	$4.78x10^{-4}$	$9.63x10^{-5}$
20 yr old vitrified HLW		
Charleston, SC (NWS)	$1.40x10^{-3}$	$2.33x10^{-4}$
Charleston, SC (Wando Terminal)	$1.42x10^{-3}$	$2.33x10^{-4}$
Elizabeth, NJ	$1.70x10^{-3}$	$5.33x10^{-4}$
Jacksonville, FL	$1.45x10^{-3}$	$2.27x10^{-4}$
Newport News, VA	$1.45x10^{-3}$	$5.06x10^{-4}$

Shipments to Nevada Test Site:		
Source/Route	***Truck***	***Rail***
Norfolk, VA	1.47×10^{-3}	5.10×10^{-4}
Philadelphia, PA	1.73×10^{-3}	5.14×10^{-4}
Portsmouth, VA	1.46×10^{-3}	5.07×10^{-4}
Savannah, GA	1.42×10^{-3}	2.28×10^{-4}
MOTSU, NC	7.07×10^{-4}	2.40×10^{-4}
Wilmington, NC	1.44×10^{-3}	2.40×10^{-4}
Galveston, TX	4.20×10^{-4}	4.70×10^{-5}
Calcined Target Material		
Charleston, SC (NWS)	3.90×10^{-2}	6.78×10^{-3}
Charleston, SC (Wando Terminal)	3.92×10^{-2}	6.78×10^{-3}
Elizabeth, NJ	4.86×10^{-2}	1.61×10^{-2}
Jacksonville, FL	4.03×10^{-2}	6.74×10^{-3}
Newport News, VA	4.16×10^{-2}	1.58×10^{-2}
Norfolk, VA	4.21×10^{-2}	1.59×10^{-2}
Philadelphia, PA	5.03×10^{-2}	1.58×10^{-2}
Portsmouth, VA	4.20×10^{-2}	1.59×10^{-2}
Savannah, GA	3.96×10^{-2}	6.78×10^{-3}
MOTSU, NC	1.79×10^{-2}	6.98×10^{-3}
Wilmington, NC	4.02×10^{-2}	6.97×10^{-3}
Galveston, TX	1.11×10^{-2}	1.43×10^{-3}
Oxidized Target Material		
Charleston, SC (NWS)	9.76×10^{-2}	1.70×10^{-2}
Charleston, SC (Wando Terminal)	9.81×10^{-2}	1.70×10^{-2}
Elizabeth, NJ	1.22×10^{-1}	4.04×10^{-2}
Jacksonville, FL	1.01×10^{-1}	1.69×10^{-2}
Newport News, VA	1.04×10^{-1}	3.95×10^{-2}
Norfolk, VA	1.05×10^{-1}	3.98×10^{-2}
Philadelphia, PA	1.26×10^{-1}	3.95×10^{-2}
Portsmouth, VA	1.05×10^{-1}	3.97×10^{-2}
Savannah, GA	9.90×10^{-2}	1.70×10^{-2}
MOTSU, NC	4.48×10^{-2}	1.75×10^{-2}
Wilmington, NC	1.01×10^{-1}	1.74×10^{-2}
Galveston, TX	2.78×10^{-2}	3.57×10^{-3}
From Western Ports		
BR-2 Belgium Spent Nuclear Fuel		
NWS Concord, CA	4.88×10^{-5}	8.09×10^{-6}
Long Beach, CA	5.28×10^{-5}	1.13×10^{-5}
Portland, OR	6.10×10^{-5}	6.48×10^{-6}
Tacoma, WA	5.73×10^{-5}	8.38×10^{-6}
RHF France Spent Nuclear Fuel		
NWS Concord, CA	2.11×10^{-5}	3.49×10^{-6}
Long Beach, CA	2.28×10^{-5}	4.89×10^{-6}
Portland, OR	2.64×10^{-5}	2.80×10^{-6}
Tacoma, WA	2.48×10^{-5}	3.62×10^{-6}
NRU Canada Spent Nuclear Fuel		
NWS Concord, CA	6.73×10^{-5}	1.12×10^{-5}
Long Beach, CA	7.28×10^{-5}	1.56×10^{-5}
Portland, OR	8.41×10^{-5}	8.96×10^{-6}
Tacoma, WA	7.91×10^{-5}	1.16×10^{-5}
PRR-1 TRIGA Spent Nuclear Fuel		
NWS Concord, CA	1.26×10^{-4}	2.91×10^{-5}

Shipments to Nevada Test Site:		
Source/Route	*Truck*	*Rail*
Long Beach, CA	1.31×10^{-4}	3.77×10^{-5}
Portland, OR	1.53×10^{-4}	2.37×10^{-5}
Tacoma, WA	1.48×10^{-4}	3.02×10^{-5}
Calcined Target Material		
NWS Concord, CA	4.13×10^{-3}	9.39×10^{-4}
Long Beach, CA	2.42×10^{-3}	8.94×10^{-4}
Portland, OR	5.26×10^{-3}	9.19×10^{-4}
Tacoma, WA	6.39×10^{-3}	1.11×10^{-3}
Oxidized Target Material		
NWS Concord, CA	1.03×10^{-2}	2.35×10^{-3}
Long Beach, CA	6.05×10^{-3}	2.24×10^{-3}
Portland, OR	1.32×10^{-2}	2.30×10^{-3}
Tacoma, WA	1.60×10^{-2}	2.79×10^{-3}
From DOE Sites/Canadian Border		
BR-2 Belgium Spent Nuclear Fuel		
Alexandria Bay, NY	1.79×10^{-4}	3.69×10^{-5}
Hanford Site	5.07×10^{-5}	4.62×10^{-6}
Idaho National Engineering Laboratory	4.41×10^{-5}	2.52×10^{-6}
Oak Ridge Reservation	1.33×10^{-4}	1.09×10^{-5}
Savannah River	1.81×10^{-4}	1.90×10^{-5}
Sweetgrass, MT	6.08×10^{-5}	5.38×10^{-6}
RHF France Spent Nuclear Fuel		
Alexandria Bay, NY	7.71×10^{-5}	1.59×10^{-5}
Hanford Site	2.19×10^{-5}	1.99×10^{-6}
Idaho National Engineering Laboratory	1.91×10^{-5}	1.09×10^{-6}
Oak Ridge Reservation	5.73×10^{-5}	4.68×10^{-6}
Savannah River	7.81×10^{-5}	8.18×10^{-6}
Sweetgrass, MT	2.63×10^{-5}	2.32×10^{-6}
NRU Canada Spent Nuclear Fuel		
Alexandria Bay, NY	2.47×10^{-4}	5.14×10^{-5}
Hanford Site	6.99×10^{-5}	6.39×10^{-6}
Idaho National Engineering Laboratory	6.09×10^{-5}	3.48×10^{-6}
Oak Ridge Reservation	1.83×10^{-4}	1.52×10^{-5}
Savannah River	2.49×10^{-4}	2.64×10^{-5}
Sweetgrass, MT	8.38×10^{-5}	7.45×10^{-6}
PRR-1 TRIGA Spent Nuclear Fuel		
Alexandria Bay, NY	5.58×10^{-4}	1.93×10^{-4}
Hanford Site	1.29×10^{-4}	1.74×10^{-5}
Idaho National Engineering Laboratory	1.09×10^{-4}	8.79×10^{-6}
Oak Ridge Reservation	3.81×10^{-4}	6.60×10^{-5}
Savannah River	4.99×10^{-4}	9.04×10^{-5}
Sweetgrass MT	1.54×10^{-4}	2.09×10^{-5}
Calcined Target Material		
Alexandria Bay, NY	6.55×10^{-2}	1.58×10^{-2}
Hanford	4.74×10^{-3}	7.41×10^{-4}
Idaho National Engineering Laboratory	3.10×10^{-3}	2.90×10^{-4}
Oak Ridge Reservation	3.50×10^{-2}	6.35×10^{-3}
Savannah River	3.91×10^{-2}	6.68×10^{-3}
Sweetgrass, MT	6.29×10^{-3}	9.78×10^{-4}
Oxidized Target Material		
Alexandria Bay, NY	1.64×10^{-1}	3.96×10^{-2}

Shipments to Nevada Test Site:		
Source/Route	*Truck*	*Rail*
Hanford	1.19×10^{-2}	1.85×10^{-3}
Idaho National Engineering Laboratory	7.76×10^{-3}	7.27×10^{-4}
Oak Ridge Reservation	8.75×10^{-2}	1.59×10^{-2}
Savannah River	9.77×10^{-2}	1.67×10^{-2}
Sweetgrass, MT	1.58×10^{-2}	2.45×10^{-3}

Shipments to Oak Ridge Reservation:		
Source/Route	*Truck*	*Rail*
	From Eastern Ports	
BR-2 Belgium Spent Nuclear Fuel		
Charleston, SC (NWS)	3.28×10^{-5}	5.39×10^{-6}
Charleston, SC (Wando Terminal)	3.59×10^{-5}	5.39×10^{-6}
Elizabeth, NJ	5.86×10^{-5}	2.60×10^{-5}
Galveston, TX	6.99×10^{-5}	1.77×10^{-5}
Jacksonville, FL	4.98×10^{-5}	6.73×10^{-6}
Newport News, VA	4.20×10^{-5}	7.94×10^{-6}
Norfolk, VA	3.90×10^{-5}	6.68×10^{-6}
Philadelphia, PA	6.36×10^{-5}	1.76×10^{-5}
Portsmouth, VA	4.74×10^{-5}	6.18×10^{-6}
Savannah, GA	3.20×10^{-5}	6.79×10^{-6}
MOTSU, NC	3.60×10^{-5}	5.33×10^{-6}
Wilmington, NC	3.85×10^{-5}	5.22×10^{-6}
RHF France Spent Nuclear Fuel		
Charleston, SC (NWS)	1.42×10^{-5}	2.33×10^{-6}
Charleston, SC (Wando Terminal)	1.55×10^{-5}	2.33×10^{-6}
Elizabeth, NJ	2.53×10^{-5}	1.13×10^{-5}
Galveston, TX	3.02×10^{-5}	7.64×10^{-6}
Jacksonville, FL	2.15×10^{-5}	2.91×10^{-6}
Newport News, VA	1.81×10^{-5}	3.43×10^{-6}
Norfolk, VA	1.69×10^{-5}	2.88×10^{-6}
Philadelphia, PA	2.75×10^{-5}	7.60×10^{-6}
Portsmouth, VA	2.05×10^{-5}	2.67×10^{-6}
Savannah, GA	1.38×10^{-5}	2.93×10^{-6}
MOTSU, NC	1.56×10^{-5}	2.30×10^{-6}
Wilmington, NC	1.66×10^{-5}	2.25×10^{-6}
NRU Canada Spent Nuclear Fuel		
Charleston, SC (NWS)	4.53×10^{-5}	7.45×10^{-6}
Charleston, SC (Wando Terminal)	4.95×10^{-5}	7.45×10^{-6}
Elizabeth, NJ	8.08×10^{-5}	3.60×10^{-5}
Galveston, TX	9.63×10^{-5}	2.44×10^{-5}
Jacksonville, FL	6.86×10^{-5}	9.30×10^{-6}
Newport News, VA	5.79×10^{-5}	1.10×10^{-5}
Norfolk, VA	5.38×10^{-5}	9.23×10^{-6}
Philadelphia, PA	8.77×10^{-5}	2.43×10^{-5}
Portsmouth, VA	6.53×10^{-5}	8.54×10^{-6}
Savannah, GA	4.41×10^{-5}	9.38×10^{-6}
MOTSU, NC	4.97×10^{-5}	7.36×10^{-6}
Wilmington, NC	5.31×10^{-5}	7.21×10^{-6}
PRR-1 TRIGA Spent Nuclear Fuel		
Charleston, SC (NWS)	8.32×10^{-5}	1.94×10^{-5}
Charleston, SC (Wando Terminal)	9.06×10^{-5}	1.94×10^{-5}
Elizabeth, NJ	1.53×10^{-4}	8.64×10^{-5}

Shipments to Oak Ridge Reservation:		
Source/Route	*Truck*	*Rail*
Galveston, TX	$1.75x10^{-4}$	$6.15x10^{-5}$
Jacksonville, FL	$1.26x10^{-4}$	$2.40x10^{-5}$
Newport News, VA	$1.09x10^{-4}$	$2.84x10^{-5}$
Norfolk, VA	$1.01x10^{-4}$	$2.43x10^{-5}$
Philadelphia, PA	$1.66x10^{-4}$	$5.90x10^{-5}$
Portsmouth, VA	$1.22x10^{-4}$	$2.26x10^{-5}$
Savannah, GA	$8.13x10^{-5}$	$2.43x10^{-5}$
MOTSU, NC	$9.18x10^{-5}$	$1.94x10^{-5}$
Wilmington, NC	$9.85x10^{-5}$	$1.90x10^{-5}$
Calcined Target Material		
Charleston, SC (NWS)	$4.14x10^{-3}$	$7.70x10^{-4}$
Charleston, SC (Wando Terminal)	$4.32x10^{-3}$	$7.70x10^{-4}$
Elizabeth, NJ	$8.03x10^{-3}$	$2.18x10^{-3}$
Jacksonville, FL	$5.87x10^{-3}$	$9.16x10^{-4}$
Newport News, VA	$5.46x10^{-3}$	$1.10x10^{-3}$
Norfolk, VA	$5.50x10^{-3}$	$9.94x10^{-4}$
Philadelphia, PA	$8.57x10^{-3}$	$1.59x10^{-3}$
Portsmouth, VA	$5.79x10^{-3}$	$9.45x10^{-4}$
Savannah, GA	$4.19x10^{-3}$	$9.55x10^{-4}$
MOTSU, NC	$4.78x10^{-3}$	$8.03x10^{-4}$
Wilmington, NC	$5.32x10^{-3}$	$7.89x10^{-4}$
Galveston, TX	$7.44x10^{-3}$	$2.10x10^{-3}$
Oxidized Target Material		
Charleston, SC (NWS)	$1.04x10^{-2}$	$1.93x10^{-3}$
Charleston, SC (Wando Terminal)	$1.08x10^{-2}$	$1.93x10^{-3}$
Elizabeth, NJ	$2.01x10^{-2}$	$5.46x10^{-3}$
Jacksonville, FL	$1.47x10^{-2}$	$2.30x10^{-3}$
Newport News, VA	$1.37x10^{-2}$	$2.76x10^{-3}$
Norfolk, VA	$1.38x10^{-2}$	$2.49x10^{-3}$
Philadelphia, PA	$2.15x10^{-2}$	$3.97x10^{-3}$
Portsmouth, VA	$1.45x10^{-2}$	$2.37x10^{-3}$
Savannah, GA	$1.05x10^{-2}$	$2.39x10^{-3}$
MOTSU, NC	$1.20x10^{-2}$	$2.01x10^{-3}$
Wilmington, NC	$1.33x10^{-2}$	$1.98x10^{-3}$
Galveston, TX	$1.86x10^{-2}$	$5.25x10^{-3}$
From Western Ports		
BR-2 Belgium Spent Nuclear Fuel		
NWS Concord, CA	$1.46x10^{-4}$	$1.56x10^{-5}$
Long Beach, CA	$1.50x10^{-4}$	$2.08x10^{-5}$
Portland, OR	$1.33x10^{-4}$	$2.40x10^{-5}$
Tacoma, WA	$1.20x10^{-4}$	$2.55x10^{-5}$
RHF France Spent Nuclear Fuel		
NWS Concord, CA	$6.33x10^{-5}$	$6.72x10^{-6}$
Long Beach, CA	$6.50x10^{-5}$	$8.97x10^{-6}$
Portland, OR	$5.75x10^{-5}$	$1.03x10^{-5}$
Tacoma, WA	$5.16x10^{-5}$	$1.10x10^{-5}$
NRU Canada Spent Nuclear Fuel		
NWS Concord, CA	$2.02x10^{-4}$	$2.17x10^{-5}$
Long Beach, CA	$2.07x10^{-4}$	$2.89x10^{-5}$
Portland, OR	$1.84x10^{-4}$	$3.35x10^{-5}$
Tacoma, WA	$1.65x10^{-4}$	$3.56x10^{-5}$

Shipments to Oak Ridge Reservation:		
Source/Route	***Truck***	***Rail***
PRR-1 TRIGA Spent Nuclear Fuel		
NWS Concord, CA	3.81×10^{-4}	7.68×10^{-5}
Long Beach, CA	3.86×10^{-4}	9.42×10^{-5}
Portland, OR	3.85×10^{-4}	1.25×10^{-4}
Tacoma, WA	3.78×10^{-4}	1.30×10^{-4}
Calcined Target Material		
NWS Concord, CA	1.77×10^{-2}	5.82×10^{-3}
Long Beach, CA	1.60×10^{-2}	6.15×10^{-3}
Portland, OR	3.65×10^{-2}	8.50×10^{-3}
Tacoma, WA	4.74×10^{-2}	8.59×10^{-3}
Oxidized Target Material		
NWS Concord, CA	4.43×10^{-2}	1.46×10^{-2}
Long Beach, CA	4.01×10^{-2}	1.54×10^{-2}
Portland, OR	9.13×10^{-2}	2.13×10^{-2}
Tacoma, WA	1.19×10^{-1}	2.15×10^{-2}
From DOE Sites/Canadian Border		
BR-2 Belgium Spent Nuclear Fuel		
Alexandria Bay, NY	6.57×10^{-5}	1.83×10^{-5}
Hanford Site	1.13×10^{-4}	1.16×10^{-5}
Idaho National Engineering Laboratory	1.06×10^{-4}	9.48×10^{-6}
Nevada Test Site	1.33×10^{-4}	1.09×10^{-5}
Savannah River	5.10×10^{-5}	3.67×10^{-6}
Sweetgrass, MT	1.21×10^{-4}	2.12×10^{-5}
RHF France Spent Nuclear Fuel		
Alexandria Bay, NY	2.84×10^{-5}	7.91×10^{-6}
Hanford Site	4.86×10^{-5}	4.97×10^{-6}
Idaho National Engineering Laboratory	4.58×10^{-5}	4.07×10^{-6}
Nevada Test Site	5.73×10^{-5}	4.68×10^{-6}
Savannah River	2.21×10^{-5}	1.59×10^{-6}
Sweetgrass, MT	5.22×10^{-5}	9.11×10^{-6}
NRU Canada Spent Nuclear Fuel		
Alexandria Bay, NY	9.07×10^{-5}	2.53×10^{-5}
Hanford Site	1.56×10^{-4}	1.62×10^{-5}
Idaho National Engineering Laboratory	1.46×10^{-4}	1.33×10^{-5}
Nevada Test Site	1.83×10^{-4}	1.52×10^{-5}
Savannah River	7.03×10^{-5}	5.08×10^{-6}
Sweetgrass, MT	1.67×10^{-4}	2.95×10^{-5}
PRR-1 TRIGA Spent Nuclear Fuel		
Alexandria Bay, NY	1.77×10^{-4}	6.60×10^{-5}
Hanford Site	3.35×10^{-4}	7.04×10^{-5}
Idaho National Engineering Laboratory	3.16×10^{-4}	6.19×10^{-5}
Nevada Test Site	3.81×10^{-4}	6.60×10^{-5}
Savannah River	1.27×10^{-4}	1.31×10^{-5}
Sweetgrass, MT	3.76×10^{-4}	1.14×10^{-4}
Calcined Target Material		
Alexandria Bay, NY	1.04×10^{-2}	2.20×10^{-3}
Hanford Site	3.55×10^{-2}	6.78×10^{-3}
Idaho National Engineering Laboratory	3.38×10^{-2}	6.33×10^{-3}
Nevada Test Site	3.50×10^{-2}	6.35×10^{-3}
Savannah River	5.03×10^{-3}	5.03×10^{-4}
Sweetgrass, MT	4.51×10^{-2}	8.02×10^{-3}

Shipments to Oak Ridge Reservation:		
Source/Route	***Truck***	***Rail***
Oxidized Target Material		
Alexandria Bay, NY	2.61×10^{-2}	5.51×10^{-3}
Hanford Site	8.88×10^{-2}	1.70×10^{-2}
Idaho National Engineering Laboratory	8.47×10^{-2}	1.58×10^{-2}
Nevada Test Site	8.75×10^{-2}	1.59×10^{-2}
Savannah River	1.26×10^{-2}	1.26×10^{-3}
Sweetgrass, MT	1.13×10^{-1}	2.01×10^{-2}

Shipments to Savannah River Site:		
Source/Route	***Truck***	***Rail***
	From Eastern Ports	
BR-2 Belgium Spent Nuclear Fuel		
Charleston, SC (NWS)	8.42×10^{-6}	8.97×10^{-7}
Charleston, SC (Wando Terminal)	1.14×10^{-5}	8.97×10^{-7}
Elizabeth, NJ	5.89×10^{-5}	2.50×10^{-5}
Galveston, TX	8.20×10^{-5}	2.19×10^{-5}
Jacksonville, FL	9.46×10^{-6}	1.65×10^{-6}
Newport News, VA	3.16×10^{-5}	5.04×10^{-6}
Norfolk, VA	2.55×10^{-5}	3.77×10^{-6}
Philadelphia, PA	6.56×10^{-5}	1.65×10^{-5}
Portsmouth, VA	2.59×10^{-5}	3.27×10^{-6}
Savannah, GA	7.13×10^{-6}	5.84×10^{-7}
MOTSU, NC	6.37×10^{-6}	2.43×10^{-6}
Wilmington, NC	1.36×10^{-5}	2.32×10^{-6}
RHF France Spent Nuclear Fuel		
Charleston, SC (NWS)	3.64×10^{-6}	3.87×10^{-7}
Charleston, SC (Wando Terminal)	4.95×10^{-6}	3.87×10^{-7}
Elizabeth, NJ	2.54×10^{-5}	1.08×10^{-5}
Galveston, TX	3.55×10^{-5}	9.46×10^{-6}
Jacksonville, FL	4.09×10^{-6}	7.13×10^{-7}
Newport News, VA	1.37×10^{-5}	2.17×10^{-6}
Norfolk, VA	1.10×10^{-5}	1.63×10^{-6}
Philadelphia, PA	2.83×10^{-5}	7.13×10^{-6}
Portsmouth, VA	1.12×10^{-5}	1.41×10^{-6}
Savannah GA	3.08×10^{-6}	2.52×10^{-7}
MOTSU NC	2.75×10^{-6}	1.05×10^{-6}
Wilmington NC	5.90×10^{-6}	1.00×10^{-6}
NRU Canada Spent Nuclear Fuel		
Charleston, SC (NWS)	1.16×10^{-5}	1.24×10^{-6}
Charleston, SC (Wando Terminal)	1.58×10^{-5}	1.24×10^{-6}
Elizabeth, NJ	8.12×10^{-5}	3.45×10^{-5}
Galveston, TX	1.13×10^{-4}	3.02×10^{-5}
Jacksonville, FL	1.31×10^{-5}	2.28×10^{-6}
Newport News, VA	4.36×10^{-5}	6.96×10^{-6}
Norfolk, VA	3.52×10^{-5}	5.21×10^{-6}
Philadelphia, PA	9.04×10^{-5}	2.28×10^{-5}
Portsmouth, VA	3.57×10^{-5}	4.52×10^{-6}
Savannah, GA	9.83×10^{-6}	8.07×10^{-7}
MOTSU, NC	8.79×10^{-6}	3.36×10^{-6}
Wilmington, NC	1.88×10^{-5}	3.21×10^{-6}
PRR-1 TRIGA Spent Nuclear Fuel		
Charleston, SC (NWS)	2.14×10^{-5}	3.19×10^{-6}

Shipments to Savannah River Site:		
Source/Route	***Truck***	***Rail***
Charleston, SC (Wando Terminal)	2.89×10^{-5}	3.19×10^{-6}
Elizabeth, NJ	1.54×10^{-4}	8.32×10^{-5}
Galveston, TX	2.05×10^{-4}	7.50×10^{-5}
Jacksonville, FL	2.56×10^{-5}	6.32×10^{-6}
Newport News, VA	8.21×10^{-5}	1.79×10^{-5}
Norfolk, VA	6.71×10^{-5}	1.37×10^{-5}
Philadelphia, PA	1.70×10^{-4}	5.58×10^{-5}
Portsmouth, VA	6.80×10^{-5}	1.20×10^{-5}
Savannah, GA	1.87×10^{-5}	2.22×10^{-6}
MOTSU, NC	1.73×10^{-5}	8.90×10^{-6}
Wilmington, NC	3.58×10^{-5}	8.52×10^{-6}
HLW Vitrified		
Charleston, SC (NWS)	1.27×10^{-4}	1.65×10^{-5}
Charleston, SC (Wando Terminal)	1.71×10^{-4}	1.65×10^{-5}
Elizabeth, NJ	1.19×10^{-3}	3.16×10^{-4}
Galveston, TX	1.21×10^{-3}	3.45×10^{-4}
Jacksonville, FL	2.93×10^{-4}	4.13×10^{-5}
Newport News, VA	6.64×10^{-4}	9.55×10^{-5}
Norfolk, VA	6.23×10^{-4}	7.95×10^{-5}
Philadelphia, PA	1.25×10^{-3}	2.28×10^{-4}
Portsmouth, VA	6.25×10^{-4}	7.24×10^{-5}
Savannah, GA	1.84×10^{-4}	1.44×10^{-5}
MOTSU, NC	1.98×10^{-4}	5.24×10^{-5}
Wilmington, NC	3.43×10^{-4}	5.04×10^{-5}
Calcined Target Material		
Charleston, SC (NWS)	1.15×10^{-3}	1.16×10^{-4}
Charleston, SC (Wando Terminal)	1.33×10^{-3}	1.16×10^{-4}
Elizabeth, NJ	8.28×10^{-3}	2.17×10^{-3}
Jacksonville, FL	2.09×10^{-3}	2.96×10^{-4}
Newport News, VA	4.69×10^{-3}	6.69×10^{-4}
Norfolk, VA	4.41×10^{-3}	5.60×10^{-4}
Philadelphia, PA	8.79×10^{-3}	1.58×10^{-3}
Portsmouth, VA	4.42×10^{-3}	5.12×10^{-4}
Savannah, GA	1.30×10^{-3}	1.03×10^{-4}
MOTSU, NC	1.42×10^{-3}	3.71×10^{-4}
Wilmington, NC	2.43×10^{-3}	3.57×10^{-4}
Galveston, TX	8.43×10^{-3}	2.40×10^{-3}
Oxidized Target Material		
Charleston, SC (NWS)	2.88×10^{-3}	2.90×10^{-4}
Charleston, SC (Wando Terminal)	3.33×10^{-3}	2.90×10^{-4}
Elizabeth, NJ	2.07×10^{-2}	5.44×10^{-3}
Jacksonville, FL	5.23×10^{-3}	7.40×10^{-4}
Newport News, VA	1.17×10^{-2}	1.68×10^{-3}
Norfolk, VA	1.10×10^{-2}	1.40×10^{-3}
Philadelphia, PA	2.20×10^{-2}	3.95×10^{-3}
Portsmouth, VA	1.11×10^{-2}	1.28×10^{-3}
Savannah, GA	3.25×10^{-3}	2.57×10^{-4}
MOTSU, NC	3.54×10^{-3}	9.28×10^{-4}
Wilmington, NC	6.08×10^{-3}	8.93×10^{-4}
Galveston, TX	2.11×10^{-2}	6.00×10^{-3}

Shipments to Savannah River Site:		
Source/Route	***Truck***	***Rail***
	From Western Ports	
BR-2 Belgium Spent Nuclear Fuel		
NWS Concord, CA	1.52×10^{-4}	3.67×10^{-5}
Long Beach, CA	1.37×10^{-4}	3.15×10^{-5}
Portland, OR	1.80×10^{-4}	3.14×10^{-5}
Tacoma, WA	1.68×10^{-4}	3.29×10^{-5}
RHF France Spent Nuclear Fuel		
NWS Concord, CA	6.56×10^{-5}	1.58×10^{-5}
Long Beach, CA	5.94×10^{-5}	1.36×10^{-5}
Portland, OR	7.76×10^{-5}	1.35×10^{-5}
Tacoma, WA	7.24×10^{-5}	1.42×10^{-5}
NRU Canada Spent Nuclear Fuel		
NWS Concord, CA	2.09×10^{-4}	5.07×10^{-5}
Long Beach, CA	1.89×10^{-4}	4.37×10^{-5}
Portland, OR	2.48×10^{-4}	4.37×10^{-5}
Tacoma, WA	2.31×10^{-4}	4.57×10^{-5}
PRR-1 TRIGA Spent Nuclear Fuel		
NWS Concord, CA	3.90×10^{-4}	1.31×10^{-4}
Long Beach, CA	3.51×10^{-4}	1.46×10^{-4}
Portland, OR	5.00×10^{-4}	1.55×10^{-4}
Tacoma, WA	4.96×10^{-4}	1.59×10^{-4}
Calcined Target Material		
NWS Concord, CA	1.81×10^{-2}	4.78×10^{-3}
Long Beach, CA	1.61×10^{-2}	1.01×10^{-2}
Portland, OR	4.05×10^{-2}	1.02×10^{-2}
Tacoma, WA	5.15×10^{-2}	1.03×10^{-2}
Oxidized Target Material		
NWS Concord, CA	4.54×10^{-2}	1.20×10^{-2}
Long Beach, CA	4.03×10^{-2}	2.53×10^{-2}
Portland, OR	1.01×10^{-1}	2.54×10^{-2}
Tacoma, WA	1.29×10^{-1}	2.57×10^{-2}
	From DOE Sites/Canadian Border	
BR-2 Belgium Spent Nuclear Fuel		
Alexandria Bay, NY	6.60×10^{-5}	4.27×10^{-5}
Hanford Site	1.61×10^{-4}	1.97×10^{-5}
Idaho National Engineering Laboratory	1.54×10^{-4}	1.76×10^{-5}
Nevada Test Site	1.81×10^{-4}	1.90×10^{-5}
Oak Ridge Reservation	5.10×10^{-5}	3.67×10^{-6}
Sweetgrass, MT	1.67×10^{-4}	2.85×10^{-5}
RHF France Spent Nuclear Fuel		
Alexandria Bay, NY	2.85×10^{-5}	1.85×10^{-5}
Hanford Site	6.94×10^{-5}	8.47×10^{-6}
Idaho National Engineering Laboratory	6.66×10^{-5}	7.57×10^{-6}
Nevada Test Site	7.81×10^{-5}	8.18×10^{-6}
Oak Ridge Reservation	2.21×10^{-5}	1.59×10^{-6}
Sweetgrass, MT	7.23×10^{-5}	1.23×10^{-5}
NRU Canada Spent Nuclear Fuel		
Alexandria Bay, NY	9.11×10^{-5}	5.90×10^{-5}
Hanford Site	2.22×10^{-4}	2.73×10^{-5}
Idaho National Engineering Laboratory	2.13×10^{-4}	2.44×10^{-5}
Nevada Test Site	2.49×10^{-4}	2.64×10^{-5}

Shipments to Savannah River Site:		
Source/Route	***Truck***	***Rail***
Oak Ridge Reservation	7.03×10^{-5}	5.08×10^{-6}
Sweetgrass, MT	2.31×10^{-4}	3.97×10^{-5}
PRR-1 TRIGA Spent Nuclear Fuel		
Alexandria Bay, NY	1.78×10^{-4}	1.43×10^{-4}
Hanford Site	4.53×10^{-4}	9.49×10^{-5}
Idaho National Engineering Laboratory	4.34×10^{-4}	8.63×10^{-5}
Nevada Test Site	4.99×10^{-4}	9.04×10^{-5}
Oak Ridge Reservation	1.27×10^{-4}	1.31×10^{-5}
Sweetgrass, MT	4.90×10^{-4}	1.44×10^{-4}
Calcined Target Material		
Alexandria Bay, NY	1.07×10^{-2}	3.61×10^{-3}
Hanford Site	3.96×10^{-2}	7.11×10^{-3}
Idaho National Engineering Laboratory	3.79×10^{-2}	6.66×10^{-3}
Nevada Test Site	3.91×10^{-2}	6.68×10^{-3}
Oak Ridge Reservation	5.03×10^{-3}	5.03×10^{-4}
Sweetgrass, MT	4.91×10^{-2}	9.69×10^{-3}
Oxidized Target Material		
Alexandria Bay, NY	2.68×10^{-2}	9.05×10^{-3}
Hanford Site	9.90×10^{-2}	1.78×10^{-2}
Idaho National Engineering Laboratory	9.49×10^{-2}	1.67×10^{-2}
Nevada Test Site	9.77×10^{-2}	1.67×10^{-2}
Oak Ridge Reservation	1.26×10^{-2}	1.26×10^{-3}
Sweetgrass, MT	1.23×10^{-1}	2.42×10^{-2}

The nonradiological risk factors are presented in terms of mortalities per shipment in Table E-10. Separate risk factors are provided for mortalities resulting from hydrocarbon emissions and transportation accidents (fatalities resulting from mechanical impact).

Table E-10 Vehicle-Related (Nonradiological) Risk Factors per Shipment to Spent Nuclear Fuel Types (Fatalities/Shipment)

Shipments to Hanford Site:			
Mode		***Emission***	***Accident***
		From Eastern Ports	
Truck			
	Charleston, SC (NWS)	1.11×10^{-5}	2.00×10^{-4}
	Charleston, SC (Wando Terminal)	1.18×10^{-5}	2.01×10^{-4}
	Elizabeth, NJ	1.31×10^{-5}	1.66×10^{-4}
	Galveston, TX	1.69×10^{-5}	1.50×10^{-4}
	Jacksonville, FL	1.44×10^{-5}	1.95×10^{-4}
	Newport News, VA	1.66×10^{-5}	1.80×10^{-4}
	Norfolk, VA	1.64×10^{-5}	1.83×10^{-4}
	Philadelphia, PA	1.42×10^{-5}	1.65×10^{-4}
	Portsmouth, VA	1.82×10^{-5}	1.82×10^{-4}
	Savannah, GA	1.36×10^{-5}	1.86×10^{-4}
	Sunny Point, NC	1.17×10^{-5}	1.82×10^{-4}
	Wilmington, NC	1.09×10^{-5}	2.10×10^{-4}
Rail			
	Charleston, SC (NWS)	2.35×10^{-5}	6.40×10^{-6}
	Charleston, SC (Wando Terminal)	2.35×10^{-5}	6.40×10^{-6}
	Elizabeth, NJ	5.58×10^{-5}	6.30×10^{-6}
	Galveston, TX	9.83×10^{-6}	5.00×10^{-6}

Shipments to Hanford Site:			
	Mode	***Emission***	***Accident***
	Jacksonville, FL	2.01×10^{-5}	6.42×10^{-6}
	Newport News, VA	3.49×10^{-5}	6.46×10^{-6}
	Norfolk, VA	3.56×10^{-5}	6.67×10^{-6}
	Philadelphia, PA	5.38×10^{-5}	6.20×10^{-6}
	Portsmouth, VA	3.46×10^{-5}	6.60×10^{-6}
	Savannah, GA	1.86×10^{-5}	6.47×10^{-6}
	Sunny Point, NC	2.07×10^{-5}	6.70×10^{-6}
	Wilmington, NC	2.07×10^{-5}	6.68×10^{-6}
	From Western Ports		
Truck			
	Concord, CA	7.18×10^{-6}	4.81×10^{-5}
	Long Beach, CA	2.08×10^{-5}	7.74×10^{-5}
	Portland, OR	2.67×10^{-6}	1.04×10^{-5}
	Tacoma, WA	3.06×10^{-6}	1.03×10^{-5}
Rail			
	Concord, CA	1.99×10^{-5}	1.99×10^{-6}
	Long Beach, CA	3.67×10^{-5}	3.32×10^{-6}
	Portland, OR	4.48×10^{-6}	5.00×10^{-7}
	Tacoma, WA	5.61×10^{-6}	7.82×10^{-7}
	From DOE Sites/Canadian Border		
Truck			
	Alexandria Bay, NY	1.46×10^{-5}	1.49×10^{-4}
	Idaho National Engineering Laboratory	2.19×10^{-6}	3.07×10^{-5}
	Nevada Test Site	9.50×10^{-6}	6.38×10^{-5}
	Oak Ridge Reservation	9.50×10^{-6}	1.61×10^{-4}
	Savannah River	1.31×10^{-5}	1.81×10^{-4}
	Sweetgrass, MT	1.74×10^{-6}	4.15×10^{-5}
Rail			
	Alexandria Bay, NY	4.59×10^{-5}	6.02×10^{-6}
	Idaho National Engineering Laboratory	3.98×10^{-6}	1.38×10^{-6}
	Nevada Test Site	5.90×10^{-6}	2.72×10^{-6}
	Oak Ridge Reservation	1.45×10^{-5}	5.44×10^{-6}
	Savannah River	2.21×10^{-5}	6.18×10^{-6}
	Sweetgrass MT	3.98×10^{-6}	1.27×10^{-6}

Shipments to Idaho National Engineering Laboratory:			
	Mode	***Emission***	***Accident***
	From Eastern Ports		
Truck			
	Charleston, SC (NWS)	1.03×10^{-5}	1.80×10^{-4}
	Charleston, SC (Wando Terminal)	1.09×10^{-5}	1.81×10^{-4}
	Elizabeth, NJ	1.17×10^{-5}	1.46×10^{-4}
	Galveston, TX	1.54×10^{-5}	1.30×10^{-4}
	Jacksonville, FL	1.22×10^{-5}	1.75×10^{-4}
	Newport News, VA	1.52×10^{-5}	1.60×10^{-4}
	Norfolk, VA	1.43×10^{-5}	1.63×10^{-4}
	Philadelphia, PA	1.28×10^{-5}	1.45×10^{-4}
	Portsmouth, VA	1.67×10^{-5}	1.62×10^{-4}
	Savannah, GA	1.22×10^{-5}	1.66×10^{-4}
	Sunny Point, NC	9.53×10^{-6}	1.59×10^{-4}
	Wilmington, NC	9.50×10^{-6}	1.89×10^{-4}

Shipments to Idaho National Engineering Laboratory:			
Mode		*Emission*	*Accident*
Rail			
	Charleston, SC (NWS)	2.16×10^{-5}	5.26×10^{-6}
	Charleston, SC (Wando Terminal)	2.16×10^{-5}	5.26×10^{-6}
	Elizabeth, NJ	5.39×10^{-5}	5.15×10^{-6}
	Galveston, TX	7.91×10^{-6}	3.86×10^{-6}
	Jacksonville, FL	1.82×10^{-5}	5.28×10^{-6}
	Newport News, VA	3.30×10^{-5}	5.32×10^{-6}
	Norfolk, VA	3.37×10^{-5}	5.53×10^{-6}
	Philadelphia, PA	5.19×10^{-5}	5.05×10^{-6}
	Portsmouth, VA	3.26×10^{-5}	5.46×10^{-6}
	Savannah, GA	1.67×10^{-5}	5.33×10^{-6}
	Sunny Point, NC	1.88×10^{-5}	5.56×10^{-6}
	Wilmington, NC	1.88×10^{-5}	5.54×10^{-6}
	From Western Ports		
Truck			
	Concord, CA	9.40×10^{-6}	5.52×10^{-5}
	Long Beach, CA	2.55×10^{-5}	6.21×10^{-5}
	Portland, OR	3.93×10^{-6}	3.62×10^{-5}
	Sweetgrass, MT	7.08×10^{-7}	2.89×10^{-5}
	Tacoma, WA	4.28×10^{-6}	3.97×10^{-5}
Rail			
	Concord, CA	9.08×10^{-6}	1.91×10^{-6}
	Long Beach, CA	3.48×10^{-5}	2.18×10^{-6}
	Portland, OR	5.36×10^{-6}	1.64×10^{-6}
	Sweetgrass, MT	5.06×10^{-6}	2.58×10^{-6}
	Tacoma, WA	8.62×10^{-6}	1.96×10^{-6}
	From DOE Sites/Canadian Border		
Truck			
	Alexandria Bay, NY	1.32×10^{-5}	1.29×10^{-4}
	Hanford Site	2.19×10^{-6}	3.07×10^{-5}
	Nevada Test Site	8.08×10^{-6}	4.36×10^{-5}
	Oak Ridge Reservation	8.08×10^{-6}	1.41×10^{-4}
	Savannah River	1.17×10^{-5}	1.61×10^{-4}
Rail			
	Alexandria Bay, NY	4.40×10^{-5}	4.88×10^{-6}
	Hanford Site	3.98×10^{-6}	1.38×10^{-6}
	Nevada Test Site	3.98×10^{-6}	1.58×10^{-6}
	Oak Ridge Reservation	1.26×10^{-5}	4.30×10^{-6}
	Savannah River	2.01×10^{-5}	5.04×10^{-6}

Shipments to Nevada Test Site:			
Mode		*Emission*	*Accident*
	From Eastern Ports		
Truck			
	Charleston, SC (NWS)	1.16×10^{-5}	1.92×10^{-4}
	Charleston, SC (Wando Terminal)	1.23×10^{-5}	1.94×10^{-4}
	Elizabeth, NJ	1.98×10^{-5}	1.87×10^{-4}
	Galveston, TX	1.90×10^{-5}	1.32×10^{-4}
	Jacksonville, FL	1.49×10^{-5}	1.88×10^{-4}
	Newport News, VA	1.79×10^{-5}	1.74×10^{-4}
	Norfolk, VA	1.70×10^{-5}	1.76×10^{-4}
	Philadelphia, PA	1.90×10^{-5}	1.85×10^{-4}

Shipments to Nevada Test Site:			
	Mode	***Emission***	***Accident***
	Portsmouth, VA	1.94×10^{-5}	1.75×10^{-4}
	Savannah, GA	1.49×10^{-5}	1.79×10^{-4}
	Sunny Point, NC	1.57×10^{-5}	1.90×10^{-4}
	Wilmington, NC	1.22×10^{-5}	2.03×10^{-4}
Rail			
	Charleston, SC (NWS)	2.42×10^{-5}	6.16×10^{-6}
	Charleston, SC (Wando Terminal)	2.42×10^{-5}	6.16×10^{-6}
	Elizabeth, NJ	5.64×10^{-5}	6.06×10^{-6}
	Galveston, TX	6.44×10^{-6}	4.09×10^{-6}
	Jacksonville, FL	2.08×10^{-5}	6.18×10^{-6}
	Newport News, VA	3.56×10^{-5}	6.22×10^{-6}
	Norfolk, VA	3.63×10^{-5}	6.43×10^{-6}
	Philadelphia, PA	5.45×10^{-5}	5.96×10^{-6}
	Portsmouth, VA	3.52×10^{-5}	6.37×10^{-6}
	Savannah, GA	1.92×10^{-5}	6.23×10^{-6}
	Sunny Point, NC	2.14×10^{-5}	6.46×10^{-6}
	Wilmington, NC	2.14×10^{-5}	6.44×10^{-6}
	From Western Ports		
Truck			
	Concord, CA	1.59×10^{-5}	5.34×10^{-5}
	Long Beach, CA	2.06×10^{-5}	2.83×10^{-5}
	Portland, OR	1.20×10^{-5}	6.95×10^{-5}
	Tacoma, WA	1.16×10^{-5}	7.28×10^{-5}
Rail			
	Concord, CA	1.97×10^{-5}	1.78×10^{-6}
	Long Beach, CA	3.08×10^{-5}	1.01×10^{-6}
	Portland, OR	7.28×10^{-6}	2.99×10^{-6}
	Tacoma, WA	1.05×10^{-5}	3.30×10^{-6}
	From DOE Sites/Canadian Border		
Truck			
	Alexandria Bay, NY	1.62×10^{-5}	1.58×10^{-4}
	Hanford Site	9.50×10^{-6}	6.38×10^{-5}
	Idaho National Engineering Laboratory	8.08×10^{-6}	4.36×10^{-5}
	Oak Ridge Reservation	1.08×10^{-5}	1.54×10^{-4}
	Savannah River	1.43×10^{-5}	1.74×10^{-4}
	Sweetgrass, MT	9.59×10^{-6}	6.77×10^{-5}
Rail			
	Alexandria Bay, NY	4.66×10^{-5}	5.78×10^{-6}
	Hanford Site	5.90×10^{-6}	2.72×10^{-6}
	Idaho National Engineering Laboratory	3.98×10^{-6}	1.58×10^{-6}
	Oak Ridge Reservation	1.52×10^{-5}	5.20×10^{-6}
	Savannah River	2.27×10^{-5}	5.94×10^{-6}
	Sweetgrass, MT	7.03×10^{-6}	3.92×10^{-6}

Shipments to Oak Ridge Reservation:			
	Mode	***Emission***	***Accident***
	From Eastern Ports		
Truck			
	Charleston, SC (NWS)	1.06×10^{-6}	3.81×10^{-5}
	Charleston, SC (Wando Terminal)	1.74×10^{-6}	3.94×10^{-5}
	Elizabeth, NJ	4.89×10^{-6}	5.42×10^{-5}
	Galveston, TX	6.60×10^{-6}	7.19×10^{-5}

Shipments to Oak Ridge Reservation: Mode		*Emission*	*Accident*
	Jacksonville, FL	$2.29x10^{-6}$	$4.23x10^{-5}$
	Newport News, VA	$4.67x10^{-6}$	$3.66x10^{-5}$
	Norfolk, VA	$2.32x10^{-6}$	$3.64x10^{-5}$
	Philadelphia, PA	$7.95x10^{-6}$	$4.81x10^{-5}$
	Portsmouth, VA	$6.21x10^{-6}$	$3.79x10^{-5}$
	Savannah, GA	$9.33x10^{-7}$	$4.18x10^{-5}$
	Sunny Point, NC	$1.38x10^{-6}$	$4.66x10^{-5}$
	Wilmington, NC	$1.42x10^{-6}$	$4.94x10^{-5}$
Rail			
	Charleston, SC (NWS)	$3.60x10^{-6}$	$1.22x10^{-6}$
	Charleston, SC (Wando Terminal)	$3.60x10^{-6}$	$1.22x10^{-6}$
	Elizabeth, NJ	$4.00x10^{-5}$	$1.64x10^{-6}$
	Galveston, TX	$1.46x10^{-5}$	$2.20x10^{-6}$
	Jacksonville, FL	$5.61x10^{-6}$	$1.18x10^{-6}$
	Newport News, VA	$6.44x10^{-6}$	$1.60x10^{-6}$
	Norfolk, VA	$4.48x10^{-6}$	$1.44x10^{-6}$
	Philadelphia, PA	$2.46x10^{-5}$	$1.47x10^{-6}$
	Portsmouth, VA	$3.47x10^{-6}$	$1.38x10^{-6}$
	Savannah, GA	$4.06x10^{-6}$	$1.23x10^{-6}$
	Sunny Point, NC	$3.35x10^{-6}$	$1.13x10^{-6}$
	Wilmington, NC	$3.35x10^{-6}$	$1.11x10^{-6}$
From Western Ports			
Truck			
	Concord, CA	$2.31x10^{-5}$	$1.95x10^{-4}$
	Long Beach, CA	$2.78x10^{-5}$	$1.70x10^{-4}$
	Portland, OR	$1.25x10^{-5}$	$1.68x10^{-4}$
	Tacoma, WA	$8.56x10^{-6}$	$1.38x10^{-4}$
Rail			
	Concord, CA	$2.53x10^{-5}$	$5.88x10^{-6}$
	Long Beach, CA	$4.33x10^{-5}$	$5.59x10^{-6}$
	Portland, OR	$2.87x10^{-5}$	$5.91x10^{-6}$
	Tacoma, WA	$3.56x10^{-5}$	$5.93x10^{-6}$
From DOE Sites/Canadian Border			
Truck			
	Alexandria Bay, NY	$1.96x10^{-6}$	$6.31x10^{-5}$
	Hanford Site	$9.50x10^{-6}$	$1.61x10^{-4}$
	Idaho National Engineering Laboratory	$8.08x10^{-6}$	$1.41x10^{-4}$
	Nevada Test Site	$1.08x10^{-5}$	$1.54x10^{-4}$
	Savannah River	$2.96x10^{-6}$	$2.92x10^{-5}$
	Sweetgrass, MT	$6.98x10^{-6}$	$1.24x10^{-4}$
Rail			
	Alexandria Bay, NY	$2.78x10^{-5}$	$2.03x10^{-6}$
	Hanford Site	$1.45x10^{-5}$	$5.44x10^{-6}$
	Idaho National Engineering Laboratory	$1.26x10^{-5}$	$4.30x10^{-6}$
	Nevada Test Site	$1.52x10^{-5}$	$5.20x10^{-6}$
	Savannah River	$2.51x10^{-6}$	$8.72x\ 10^{-7}$
	Sweetgrass, MT	$2.31x10^{-5}$	$4.39x10^{-6}$

Shipments to Savannah River Site:			
Mode		Emission	Accident
		From Eastern Ports	
Truck			
	Charleston, SC (NWS)	5.15×10^{-7}	1.61×10^{-5}
	Charleston, SC (Wando Terminal)	1.19×10^{-6}	1.74×10^{-5}
	Elizabeth, NJ	5.47×10^{-6}	6.58×10^{-5}
	Galveston, TX	8.11×10^{-6}	7.15×10^{-5}
	Jacksonville, FL	3.22×10^{-8}	2.94×10^{-5}
	Newport News, VA	3.54×10^{-6}	4.57×10^{-5}
	Norfolk, VA	1.58×10^{-6}	4.45×10^{-5}
	Philadelphia, PA	9.37×10^{-6}	6.30×10^{-5}
	Portsmouth, VA	1.83×10^{-6}	4.47×10^{-5}
	Savannah, GA	3.22×10^{-8}	2.10×10^{-5}
	Sunny Point, NC	2.57×10^{-7}	2.17×10^{-5}
	Wilmington, NC	5.15×10^{-7}	2.87×10^{-5}
Rail			
	Charleston, SC (NWS)	1.46×10^{-6}	2.93×10^{-7}
	Charleston, SC (Wando Terminal)	1.46×10^{-6}	2.93×10^{-7}
	Elizabeth, NJ	3.92×10^{-5}	1.82×10^{-6}
	Galveston, TX	2.06×10^{-5}	2.46×10^{-6}
	Jacksonville, FL	2.80×10^{-6}	5.42×10^{-7}
	Newport News, VA	5.61×10^{-6}	1.26×10^{-6}
	Norfolk, VA	3.64×10^{-6}	1.11×10^{-6}
	Philadelphia, PA	2.39×10^{-5}	1.65×10^{-6}
	Portsmouth, VA	2.64×10^{-6}	1.04×10^{-6}
	Savannah, GA	5.86×10^{-7}	2.38×10^{-7}
	Sunny Point, NC	2.55×10^{-6}	7.99×10^{-7}
	Wilmington, NC	2.55×10^{-6}	7.80×10^{-7}
		From Western Ports	
Truck			
	Concord, CA	2.99×10^{-5}	1.96×10^{-4}
	Long Beach, CA	2.57×10^{-5}	1.68×10^{-4}
	Portland, OR	1.60×10^{-5}	1.88×10^{-4}
	Tacoma, WA	1.21×10^{-5}	1.59×10^{-4}
Rail			
	Concord, CA	4.80×10^{-5}	6.66×10^{-6}
	Long Beach, CA	5.07×10^{-5}	6.78×10^{-6}
	Portland, OR	3.44×10^{-5}	6.60×10^{-6}
	Tacoma, WA	4.13×10^{-5}	6.62×10^{-6}
		From DOE Sites/Canadian Border	
Truck			
	Alexandria Bay, NY	2.54×10^{-6}	7.47×10^{-5}
	Hanford Site	1.31×10^{-5}	1.81×10^{-4}
	Idaho National Engineering Laboratory	1.17×10^{-5}	1.61×10^{-4}
	Nevada Test Site	1.43×10^{-5}	1.74×10^{-4}
	Oak Ridge Reservation	2.96×10^{-6}	2.92×10^{-5}
	Sweetgrass, MT	1.05×10^{-5}	1.43×10^{-4}
Rail			
	Alexandria Bay, NY	5.76×10^{-5}	2.68×10^{-6}
	Hanford Site	2.21×10^{-5}	6.18×10^{-6}
	Idaho National Engineering Laboratory	2.01×10^{-5}	5.04×10^{-6}
	Nevada Test Site	2.27×10^{-5}	5.94×10^{-6}

Shipments to Savannah River Site:			
	Mode	Emission	Accident
	Oak Ridge Reservation	2.51×10^{-6}	8.72×10^{-7}
	Sweetgrass, MT	2.87×10^{-5}	5.07×10^{-6}

The total risks for any alternative or option can be calculated by multiplying the number of foreign research reactor spent nuclear fuel shipments by the per-shipment risk factors provided in Tables E-8 through E-10.

E.7.1.2 Characterization of Shipment Risks

The results of the per-shipment analysis are shown in Tables E-8 through E-10. From these tables, it is clear that the incident-free dose would be much higher than the accident dose for each of the fuel types. The accident doses are based on realistic, yet conservative fuel loadings. Since most of the public dose would be from incident-free exposure, it is not overly conservative to assume, for assessment purposes, that all spent nuclear fuel can be represented by the fuel type with the highest risk factors for the remainder of the transportation analysis.

E.7.2 Evaluation of the Basic Implementation

The following sections describe the evaluation of the basic implementation of the Management Alternative 1 of the proposed action. The evaluation of the management and implementation alternatives are described in Section E.8.

E.7.2.1 Shipments

Under all SNF&INEL Final EIS (DOE, 1995) alternatives, the shipment of foreign research reactor spent nuclear fuel would require the movement of 837 casks from points of entry (marine ports and Canadian border crossings) to DOE facilities. The basic assumption used in determining the number of shipments is that spent nuclear fuel from countries bordering the Atlantic Ocean and Mediterranean Sea was assumed to arrive on the east coast of the United States, and spent nuclear fuel from countries bordering the Indian and Pacific Oceans was assumed to arrive on the west coast. This is conservative from an overland transportation standpoint, because, as shown in Tables E-8 through E-10, shipment to the coast nearest the management site would reduce the risk factors for the overland shipment. Additionally, this assumption is considered to be realistic because the long shipping times required to ship from the Pacific Ocean to east coast ports and from the Atlantic Ocean to west coast ports, would be costly in terms of shipping, and would tie up the world's already short supply of casks. The foreign research reactor spent nuclear fuel could arrive at any port that meets the criteria identified in Appendix D, and would be likely to arrive at a variety of these ports. The basic shipment count, by point of origin is:

	East Coast		West Coast		Totals
	Aluminum	TRIGA	Aluminum	TRIGA	
Phase 1	419	82	101	42	644
Phase 2	125	25	30	13	193
Totals	544	107	131	55	837

Several of the SNF&INEL Final EIS (DOE, 1995) alternatives involve consolidation of all spent nuclear fuel to Idaho National Engineering Laboratory and/or Savannah River Site and, therefore, are single-phase programs that would require no additional shipments. However, many of the possible options require the use of Hanford Site, Nevada Test Site and/or Oak Ridge Reservation; and, thus, would require intersite shipments. The number of intersite shipments is calculated based on the assumption that the equivalent of

10 seagoing foreign research reactor casks would fit into a single rail cask that would travel between DOE sites. Similarly, it is assumed that the contents of four foreign research reactor casks would fit into a single truck cask for intersite shipment. This is based on the distribution of cask capacities described in Appendix B. As described in Appendix B, there is considerable uncertainty in what storage mode would be used at the Phase 1 site, and therefore in what form the fuel would be for intersite shipment. Additionally, it is not clear what casks would be licensed and available when the intersite shipments would begin (approximately 2006). Therefore, these assumptions, which are neither definitely conservative nor nonconservative, are considered to be reasonable and realistic.

The number of intersite shipments for SNF&INEL Final EIS (DOE, 1995) alternatives that would require two-phased approaches varies between 13 and 161. The variation is caused by the large number of unique combinations of Phase 1 and Phase 2 approaches depending on the specific management sites selected. Additionally, the variation is affected by the assumption that larger truck and rail casks would be used for intersite shipments. The actual numbers of shipments are shown in Tables E-1 and E-2.

E.7.2.2 Evaluation Using Risk Factors

Since the fuel would actually arrive at a variety of ports, average shipment risk factors were calculated for east coast ports to each DOE site, and an average shipment risk factor for west coast ports to each DOE site. This approach does not require that a specific port be selected for analysis purposes. It instead models the average affect the foreign research reactor spent nuclear fuel acceptance policy might actually have on the public. This approach is conservative since the dose rates and curie content of the fuel used for the analyses were selected to be conservative, but as realistic as possible, since it is impossible to predict the distribution of shipments among the capable ports.

The upper and lower bound risk estimates for the foreign research reactor spent nuclear fuel policy were also calculated. The upper bound assumes that DOE chooses the acceptable port with the highest per-shipment risk factors for all shipments, and the lower bound risk estimates assume that DOE chooses the acceptable port with the lowest per-shipment risk factors. In general, the highest risk factors result from the longest shipments, and the smallest risk factors from the shortest shipments.

Impacts of Incident-Free Ground Transport

The incident-free transportation of spent nuclear fuel was estimated to result in total latent fatalities that ranged from 0.013 to 0.30 over the entire duration of the program. These fatalities are the sum of the estimated number of radiation-related LCF to the public and the crews.

The range of fatality estimates is caused by three factors: 1) the option of using truck or rail to transport spent nuclear fuel, 2) combinations of Phase 1 and Phase 2 sites that create varying shipment numbers and distances, and 3) the difference between the risk factors for the port-to-site routes.

The estimated number of radiation-related LCFs for transportation workers ranged from 0.006 to 0.071. The shipment by truck would yield higher crew exposures than the shipment by rail since the truck drivers would tend to sit closer to the cask than engineers. Doses to inspectors, security guards, and rail switchyard workers are also considered.

Truck and rail crew members are not radiation workers and, therefore, are not allowed to exceed a dosage of 100 mrem per yr. The regulatory limit for dose rate in occupied areas of the truck or train is 2 mrem per hr. Since a cross-country trip can take just over 50 hr of driving, if the radiation levels were at the

maximum allowed, a driver could exceed his or her annual limit. Therefore, DOE would implement administrative controls beyond those required by Federal regulations to ensure that vehicle operators would not exceed their annual dose limits.

The public would be exposed to a small amount of radiation emanating from the cask, and also to pollutants associated with the diesel exhaust. The estimated number of radiation-related LCFs for the general population ranged from 0.007 to 0.22, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.001 to 0.05. The fact that all these risk numbers are less than one means that the basic implementation would be unlikely to increase the total number of individuals that die of cancer in the United States (there are approximately 300,000 cancer deaths per yr in the United States) by a single fatality.

Impacts of Accidents During Ground Transport

The cumulative transportation accident risks over the entire program are estimated to range from 0.000004 to 0.00028 LCF from radiation and from 0.001 to 0.14 for traffic fatality, depending on the transportation mode and DOE sites selected. The reason for the range of fatality estimates is the same as those described for incident-free transportation. These risks, especially in the case of radiological accident risks, are much lower than those for incident-free transportation. The risk estimates are probabilistic, which means that they take the probability of an accident's occurring and the consequences of these accidents into account. The risk estimates indicate that the likelihood of a death or an injury from a vehicle accident not involving radiation or radioactive release would be much higher than a death from a radiation-related accident. Both indicate an expectation of less than one fatality.

The impacts of overland transportation for all alternatives and options are shown in Tables E-11 through E-19. As shown in Tables E-1 and E-2, there are 35 distinct approaches to the basic implementation of Management Alternative 1 of the proposed action. These 35 approaches are all the Phase 1/Phase 2 combinations allowed by the SNF&INEL Final EIS (DOE, 1995). Each of these 35 approaches is evaluated for three different transportation mode assumptions: 1) all shipments are on trucks, 2) that shipments from ports to sites are on trucks and intersite shipments are on rail, and 3) that all shipments are on rail. The transportation mode assumptions of all by truck and all by rail are analyzed to bound the risks of any combination of transportation modes. The third mode assumption is provided as an example of a realistic approach. Each distinct approach and mode assumption is evaluated using the average, upper bound, and lower bound risk factors.

These tables are designed to provide risk estimate factors for all expected implementation alternatives. For example, if the SNF&INEL Final EIS alternative selected is Centralization to Nevada Test Site, "Centralization" should be in the first column of each table, and "Nevada Test Site" in the second column of each table. The Phase 1 approaches available are listed in the third column. The decision as to which of the possible Phase 1 approaches would be used will be part of the foreign research reactor spent nuclear fuel policy described in this EIS. The risk estimates for the foreign research reactor spent nuclear fuel EIS policy are given for "Geographic" distribution of spent nuclear fuel during Phase 1 (to Idaho National Engineering Laboratory and Savannah River Site), for "By Fuel" distribution of spent nuclear fuel during Phase 1 (TRIGA to Idaho National Engineering Laboratory and aluminum-based to Savannah River Site), for "All to Idaho National Engineering Laboratory" during Phase 1, and for "All to Savannah River Site" during Phase 1. The risks, expressed in LCF and traffic accident fatalities are provided. These risk estimates include Phase 1 port-to-site shipments (Savannah River Site and/or Idaho National Engineering Laboratory), intersite shipments to, in this case, Nevada Test Site, and Phase 2 port-to-Nevada Test Site

Table E-11 Tabulation of Overland Transportation Risks: Basic Implementation. All Shipments via Truck, Average Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.019	0.056	0.002	0.035	0.00002
1992/1993 Planning Basis	INEL/SRS		0.019	0.056	0.002	0.035	0.00002
Regionalization by Fuel Type	INEL/SRS		0.036	0.111	0.005	0.067	0.00004
Regionalization	INEL/SRS		0.019	0.056	0.002	0.035	0.00002
by	INEL/ORR	Geographic	0.022	0.063	0.003	0.040	0.00005
Geography		By Fuel	0.035	0.105	0.005	0.064	0.00007
		All to INEL	0.052	0.165	0.008	0.095	0.00006
	NTS/SRS	Geographic	0.020	0.060	0.003	0.038	0.00003
		By Fuel	0.033	0.102	0.005	0.062	0.00004
		All to SRS	0.030	0.091	0.005	0.056	0.00003
	NTS/ORR	Geographic	0.023	0.068	0.003	0.042	0.00006
		By Fuel	0.036	0.110	0.006	0.067	0.00008
		All to INEL	0.057	0.179	0.009	0.103	0.00009
		All to SRS	0.033	0.100	0.005	0.061	0.00007
	HS/SRS	Geographic	0.019	0.056	0.002	0.035	0.00002
		By Fuel	0.032	0.098	0.005	0.060	0.00004
		All to SRS	0.029	0.087	0.004	0.054	0.00003
	HS/ORR	Geographic	0.022	0.064	0.003	0.040	0.00005
		By Fuel	0.035	0.106	0.005	0.065	0.00007
		All to INEL	0.055	0.173	0.008	0.099	0.00007
		All to SRS	0.032	0.096	0.005	0.059	0.00007
Centralization	INEL		0.062	0.195	0.009	0.112	0.00007
	SRS		0.033	0.097	0.005	0.061	0.00003
	HS	Geographic	0.043	0.134	0.006	0.079	0.00015
		By Fuel	0.057	0.177	0.008	0.104	0.00017
		All to INEL	0.066	0.211	0.010	0.119	0.00008
		All to SRS	0.056	0.176	0.008	0.104	0.00019
	NTS	Geographic	0.042	0.127	0.007	0.080	0.00017
		By Fuel	0.055	0.170	0.009	0.105	0.00019
		All to INEL	0.067	0.212	0.011	0.123	0.00011
		All to SRS	0.054	0.167	0.009	0.104	0.00021
	ORR	Geographic	0.027	0.080	0.003	0.050	0.00008
		By Fuel	0.040	0.121	0.006	0.074	0.00009
		All to INEL	0.066	0.210	0.010	0.123	0.00016
		All to SRS	0.036	0.107	0.005	0.066	0.00008

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-12 Tabulation of Overland Transportation Risks: Basic Implementation, Shipments from Ports via Truck, Intersite Shipments via Rail, Average Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization by Geography	INEL/SRS						
	INEL/ORR	Geographic	0.020	0.058	0.003	0.036	0.00002
		By Fuel	0.033	0.100	0.005	0.061	0.00004
		All to INEL	0.052	0.165	0.008	0.095	0.00006
	NTS/SRS	Geographic	0.019	0.057	0.003	0.036	0.00002
		By Fuel	0.033	0.100	0.005	0.061	0.00003
		All to SRS	0.030	0.091	0.005	0.056	0.00003
	NTS/ORR	Geographic	0.020	0.059	0.003	0.037	0.00002
		By Fuel	0.034	0.102	0.005	0.062	0.00004
		All to INEL	0.054	0.166	0.008	0.096	0.00006
		All to SRS	0.031	0.093	0.005	0.057	0.00004
	HS/SRS	Geographic	0.018	0.054	0.002	0.034	0.00002
		By Fuel	0.032	0.096	0.005	0.059	0.00003
		All to SRS	0.029	0.087	0.004	0.054	0.00003
	HS/ORR	Geographic	0.019	0.056	0.003	0.035	0.00002
		By Fuel	0.033	0.098	0.005	0.060	0.00004
		All to INEL	0.053	0.163	0.008	0.095	0.00006
		All to SRS	0.030	0.089	0.004	0.055	0.00004
Centralization	INEL						
	SRS						
	HS	Geographic	0.032	0.094	0.005	0.055	0.00005
		By Fuel	0.045	0.136	0.008	0.080	0.00007
		All to INEL	0.064	0.200	0.010	0.114	0.00007
		All to SRS	0.042	0.128	0.007	0.075	0.00007
	NTS	Geographic	0.031	0.093	0.006	0.057	0.00006
		By Fuel	0.044	0.135	0.008	0.081	0.00007
		All to INEL	0.063	0.199	0.010	0.116	0.00007
		All to SRS	0.042	0.126	0.008	0.076	0.00008
	ORR	Geographic	0.023	0.067	0.003	0.041	0.00003
		By Fuel	0.036	0.109	0.005	0.066	0.00005
		All to INEL	0.056	0.174	0.009	0.101	0.00008
		All to SRS	0.033	0.100	0.005	0.061	0.00004

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-13 Tabulation of Overland Transportation Risks: Basic Implementation. All Shipments via Rail, Average Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.008	0.009	0.009	0.001	0.00001
1992/1993 Planning Basis	INEL/SRS		0.008	0.009	0.009	0.001	0.00001
Regionalization by Fuel Type	INEL/SRS		0.011	0.014	0.018	0.002	0.00001
Regionalization by Geography	INEL/SRS		0.008	0.009	0.009	0.001	0.00001
	INEL/ORR	Geographic	0.009	0.013	0.010	0.003	0.00001
		By Fuel	0.012	0.016	0.015	0.004	0.00001
		All to INEL	0.015	0.018	0.019	0.005	0.00001
	NTS/SRS	Geographic	0.009	0.014	0.011	0.004	0.00001
		By Fuel	0.012	0.018	0.016	0.005	0.00001
		All to SRS	0.011	0.018	0.016	0.005	0.00001
	NTS/ORR	Geographic	0.011	0.020	0.011	0.008	0.00004
		By Fuel	0.013	0.020	0.016	0.006	0.00002
		All to INEL	0.020	0.033	0.021	0.013	0.00005
		All to SRS	0.012	0.018	0.015	0.005	0.00002
	HS/SRS	Geographic	0.008	0.011	0.011	0.002	0.00001
		By Fuel	0.011	0.015	0.016	0.003	0.00001
		All to SRS	0.010	0.014	0.015	0.003	0.00001
	HS/ORR	Geographic	0.010	0.016	0.010	0.006	0.00004
		By Fuel	0.012	0.017	0.015	0.004	0.00002
		All to INEL	0.018	0.027	0.019	0.009	0.00002
		All to SRS	0.011	0.014	0.015	0.003	0.00001
Centralization	INEL		0.016	0.016	0.023	0.004	0.00002
	SRS		0.011	0.013	0.017	0.002	0.00001
	HS	Geographic	0.023	0.052	0.015	0.026	0.00012
		By Fuel	0.015	0.020	0.020	0.005	0.00004
		All to INEL	0.020	0.030	0.023	0.010	0.00003
		All to SRS	0.014	0.018	0.020	0.004	0.00004
	NTS	Geographic	0.022	0.049	0.016	0.027	0.00014
		By Fuel	0.016	0.024	0.021	0.007	0.00004
		All to INEL	0.022	0.036	0.024	0.014	0.00005
		All to SRS	0.015	0.021	0.020	0.006	0.00004
	ORR	Geographic	0.014	0.027	0.011	0.012	0.00005
		By Fuel	0.016	0.032	0.016	0.014	0.00004
		All to INEL	0.029	0.064	0.021	0.033	0.00012
		All to SRS	0.014	0.025	0.015	0.009	0.00002

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-14 Tabulation of Overland Transportation Risks: Basic Implementation, All Shipments via Truck, Lower Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.013	0.040	0.001	0.024	0.000007
1992/1993 Planning Basis	INEL/SRS		0.013	0.040	0.001	0.024	0.000007
Regionalization by Fuel Type	INEL/SRS		0.030	0.093	0.003	0.052	0.000012
Regionalization	INEL/SRS		0.013	0.040	0.001	0.024	0.000007
by	INEL/ORR	Geographic	0.017	0.049	0.002	0.030	0.000039
Geography		By Fuel	0.029	0.089	0.003	0.052	0.000045
		All to INEL	0.044	0.138	0.006	0.078	0.000020
	NTS/SRS	Geographic	0.014	0.043	0.002	0.026	0.000015
		By Fuel	0.027	0.084	0.003	0.048	0.000018
		All to SRS	0.025	0.075	0.003	0.042	0.000011
	NTS/ORR	Geographic	0.018	0.052	0.002	0.032	0.000048
		By Fuel	0.030	0.092	0.004	0.054	0.000052
		All to INEL	0.048	0.151	0.008	0.086	0.000055
		All to SRS	0.028	0.085	0.003	0.049	0.000053
	HS/SRS	Geographic	0.013	0.040	0.001	0.024	0.000009
		By Fuel	0.026	0.081	0.003	0.046	0.000013
		All to SRS	0.024	0.072	0.002	0.040	0.000011
	HS/ORR	Geographic	0.017	0.049	0.002	0.030	0.000041
		By Fuel	0.029	0.089	0.003	0.052	0.000047
		All to INEL	0.046	0.146	0.006	0.082	0.000029
		All to SRS	0.028	0.082	0.003	0.047	0.000052
Centralization	INEL		0.051	0.163	0.007	0.091	0.000023
	SRS		0.028	0.085	0.003	0.047	0.000012
	HS	Geographic	0.036	0.114	0.004	0.065	0.000127
		By Fuel	0.050	0.156	0.006	0.088	0.000135
		All to INEL	0.056	0.179	0.008	0.098	0.000032
		All to SRS	0.050	0.157	0.006	0.088	0.000161
	NTS	Geographic	0.034	0.105	0.005	0.065	0.000145
		By Fuel	0.047	0.146	0.007	0.087	0.000152
		All to INEL	0.056	0.177	0.009	0.100	0.000059
		All to SRS	0.047	0.146	0.007	0.087	0.000176
	ORR	Geographic	0.022	0.066	0.002	0.039	0.000063
		By Fuel	0.034	0.105	0.004	0.060	0.000065
		All to INEL	0.058	0.184	0.007	0.105	0.000122
		All to SRS	0.031	0.094	0.003	0.053	0.000053

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-15 Tabulation of Overland Transportation Risks: Basic Implementation, Shipments from Ports via Truck, Intersite Shipments via Rail, Lower Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization by Geography	INEL/SRS						
	INEL/ORR	Geographic	0.015	0.043	0.001	0.026	0.000011
		By Fuel	0.028	0.084	0.003	0.048	0.000015
		All to INEL	0.044	0.138	0.006	0.078	0.000020
	NTS/SRS	Geographic	0.014	0.040	0.001	0.025	0.000008
		By Fuel	0.027	0.081	0.003	0.047	0.000012
		All to SRS	0.025	0.075	0.003	0.042	0.000011
	NTS/ORR	Geographic	0.015	0.043	0.002	0.027	0.000012
		By Fuel	0.028	0.084	0.003	0.049	0.000016
		All to INEL	0.044	0.138	0.007	0.079	0.000023
		All to SRS	0.026	0.078	0.003	0.045	0.000016
	HS/SRS	Geographic	0.013	0.038	0.001	0.023	0.000008
		By Fuel	0.026	0.079	0.003	0.045	0.000012
		All to SRS	0.024	0.072	0.002	0.040	0.000011
	HS/ORR	Geographic	0.014	0.041	0.001	0.025	0.000012
		By Fuel	0.027	0.082	0.003	0.047	0.000016
		All to INEL	0.043	0.136	0.006	0.077	0.000023
		All to SRS	0.025	0.075	0.002	0.043	0.000016
Centralization	INEL						
	SRS						
	HS	Geographic	0.025	0.074	0.004	0.042	0.000036
		By Fuel	0.038	0.115	0.005	0.063	0.000040
		All to INEL	0.053	0.168	0.008	0.093	0.000027
		All to SRS	0.036	0.109	0.005	0.059	0.000046
	NTS	Geographic	0.024	0.070	0.004	0.042	0.000035
		By Fuel	0.037	0.111	0.006	0.063	0.000040
		All to INEL	0.052	0.164	0.008	0.093	0.000026
		All to SRS	0.035	0.105	0.006	0.059	0.000045
	ORR	Geographic	0.018	0.052	0.002	0.031	0.000016
		By Fuel	0.031	0.093	0.003	0.052	0.000020
		All to INEL	0.048	0.148	0.007	0.083	0.000041
		All to SRS	0.029	0.087	0.003	0.048	0.000017

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-16 Tabulation of Overland Transportation Risks: Basic Implementation, All Shipments via Rail, Lower Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.006	0.007	0.008	0.001	0.000004
1992/1993 Planning Basis	INEL/SRS		0.006	0.007	0.008	0.001	0.000004
Regionalization by Fuel Type	INEL/SRS		0.010	0.011	0.014	0.002	0.000005
Regionalization by Geography	INEL/SRS		0.006	0.007	0.008	0.001	0.000004
	INEL/ORR	Geographic	0.008	0.010	0.008	0.002	0.000007
		By Fuel	0.010	0.013	0.012	0.003	0.000008
		All to INEL	0.013	0.013	0.013	0.004	0.000004
	NTS/SRS	Geographic	0.007	0.010	0.008	0.003	0.000005
		By Fuel	0.010	0.013	0.013	0.004	0.000005
		All to SRS	0.009	0.014	0.012	0.004	0.000005
	NTS/ORR	Geographic	0.010	0.016	0.008	0.007	0.000036
		By Fuel	0.011	0.016	0.012	0.005	0.000015
		All to INEL	0.017	0.027	0.015	0.012	0.000039
		All to SRS	0.010	0.014	0.012	0.004	0.000009
	HS/SRS	Geographic	0.006	0.008	0.008	0.001	0.000005
		By Fuel	0.009	0.011	0.012	0.002	0.000005
		All to SRS	0.009	0.011	0.012	0.002	0.000005
	HS/ORR	Geographic	0.009	0.013	0.008	0.005	0.000036
		By Fuel	0.010	0.013	0.012	0.003	0.000009
		All to INEL	0.015	0.022	0.013	0.008	0.000013
		All to SRS	0.009	0.011	0.012	0.002	0.000008
Centralization	INEL		0.013	0.011	0.015	0.003	0.000004
	SRS		0.009	0.011	0.013	0.002	0.000005
	HS	Geographic	0.021	0.048	0.011	0.025	0.000119
		By Fuel	0.013	0.015	0.015	0.004	0.000031
		All to INEL	0.017	0.023	0.016	0.008	0.000013
		All to SRS	0.012	0.014	0.015	0.003	0.000036
	NTS	Geographic	0.020	0.044	0.012	0.025	0.000131
		By Fuel	0.013	0.018	0.016	0.006	0.000035
		All to INEL	0.019	0.028	0.017	0.012	0.000039
		All to SRS	0.013	0.016	0.016	0.005	0.000034
	ORR	Geographic	0.012	0.025	0.008	0.010	0.000041
		By Fuel	0.015	0.029	0.012	0.012	0.000028
		All to INEL	0.027	0.059	0.014	0.031	0.000106
		All to SRS	0.013	0.023	0.012	0.007	0.000009

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-17 Tabulation of Overland Transportation Risks: Basic Implementation, All Shipments via Truck, Upper Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.033	0.096	0.006	0.057	0.00007
1992/1993 Planning Basis	INEL/SRS		0.033	0.096	0.006	0.057	0.00007
Regionalization by Fuel Type	INEL/SRS		0.048	0.143	0.010	0.088	0.00011
Regionalization	INEL/SRS		0.033	0.096	0.006	0.057	0.00007
by	INEL/ORR	Geographic	0.035	0.101	0.007	0.061	0.00010
Geography		By Fuel	0.046	0.137	0.009	0.085	0.00013
		All to INEL	0.057	0.179	0.011	0.110	0.00012
	NTS/SRS	Geographic	0.034	0.101	0.007	0.060	0.00008
		By Fuel	0.046	0.137	0.010	0.083	0.00011
		All to SRS	0.044	0.129	0.010	0.078	0.00010
	NTS/ORR	Geographic	0.036	0.105	0.007	0.063	0.00011
		By Fuel	0.048	0.142	0.010	0.087	0.00014
		All to INEL	0.062	0.194	0.012	0.118	0.00016
		All to SRS	0.046	0.136	0.010	0.083	0.00014
	HS/SRS	Geographic	0.034	0.098	0.006	0.058	0.00007
		By Fuel	0.045	0.134	0.009	0.082	0.00010
		All to SRS	0.043	0.127	0.009	0.077	0.00010
	HS/ORR	Geographic	0.035	0.103	0.007	0.061	0.00010
		By Fuel	0.047	0.139	0.009	0.085	0.00013
		All to INEL	0.060	0.189	0.011	0.115	0.00013
		All to SRS	0.045	0.133	0.009	0.081	0.00014
Centralization	INEL		0.065	0.205	0.012	0.126	0.00014
	SRS		0.046	0.137	0.010	0.083	0.00011
	HS	Geographic	0.055	0.169	0.010	0.100	0.00020
		By Fuel	0.067	0.206	0.012	0.124	0.00024
		All to INEL	0.070	0.222	0.013	0.134	0.00015
		All to SRS	0.068	0.209	0.013	0.125	0.00026
	NTS	Geographic	0.054	0.161	0.011	0.100	0.00023
		By Fuel	0.065	0.198	0.013	0.124	0.00026
		All to INEL	0.071	0.222	0.014	0.137	0.00018
		All to SRS	0.066	0.199	0.014	0.125	0.00028
	ORR	Geographic	0.040	0.117	0.007	0.072	0.00013
		By Fuel	0.051	0.152	0.010	0.095	0.00016
		All to INEL	0.071	0.224	0.013	0.139	0.00023
		All to SRS	0.048	0.142	0.010	0.088	0.00014

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-18 Tabulation of Overland Transportation Risks: Basic Implementation, Shipments from Ports via Truck, Intersite Shipments via Rail, Upper Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization by Geography	INEL/SRS						
	INEL/ORR	Geographic	0.033	0.095	0.006	0.057	0.00007
		By Fuel	0.044	0.131	0.009	0.081	0.00010
		All to INEL	0.057	0.179	0.011	0.110	0.00012
	NTS/SRS	Geographic	0.034	0.098	0.007	0.058	0.00007
		By Fuel	0.045	0.134	0.009	0.082	0.00010
		All to SRS	0.044	0.129	0.010	0.078	0.00010
	NTS/ORR	Geographic	0.034	0.097	0.007	0.058	0.00007
		By Fuel	0.045	0.134	0.009	0.082	0.00010
		All to INEL	0.058	0.181	0.011	0.111	0.00013
		All to SRS	0.044	0.129	0.010	0.078	0.00010
	HS/SRS	Geographic	0.033	0.096	0.006	0.057	0.00007
		By Fuel	0.044	0.132	0.009	0.081	0.00010
		All to SRS	0.043	0.127	0.009	0.077	0.00010
	HS/ORR	Geographic	0.033	0.095	0.006	0.057	0.00007
		By Fuel	0.044	0.131	0.009	0.081	0.00010
		All to INEL	0.058	0.179	0.011	0.110	0.00013
		All to SRS	0.043	0.126	0.009	0.077	0.00010
Centralization	INEL						
	SRS						
	HS	Geographic	0.044	0.129	0.009	0.076	0.00011
		By Fuel	0.055	0.165	0.012	0.100	0.00014
		All to INEL	0.068	0.212	0.013	0.129	0.00015
		All to SRS	0.054	0.161	0.012	0.096	0.00015
	NTS	Geographic	0.043	0.126	0.010	0.077	0.00012
		By Fuel	0.054	0.163	0.012	0.101	0.00015
		All to INEL	0.067	0.209	0.013	0.130	0.00015
		All to SRS	0.053	0.158	0.013	0.097	0.00015
	ORR	Geographic	0.036	0.103	0.007	0.063	0.00008
		By Fuel	0.047	0.140	0.010	0.087	0.00011
		All to INEL	0.061	0.188	0.012	0.116	0.00015
		All to SRS	0.046	0.135	0.010	0.083	0.00011

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-19 Tabulation of Overland Transportation Risks: Basic Implementation, All Shipments via Rail, Upper Bound Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.010	0.015	0.019	0.002	0.00003
1992/1993 Planning Basis	INEL/SRS		0.010	0.015	0.019	0.002	0.00003
Regionalization by Fuel Type	INEL/SRS		0.013	0.020	0.031	0.003	0.00004
Regionalization by Geography	INEL/SRS		0.010	0.015	0.019	0.002	0.00003
	INEL/ORR	Geographic	0.012	0.019	0.018	0.004	0.00003
		By Fuel	0.014	0.023	0.027	0.005	0.00004
		All to INEL	0.016	0.022	0.041	0.006	0.00005
	NTS/SRS	Geographic	0.012	0.022	0.020	0.005	0.00003
		By Fuel	0.014	0.025	0.028	0.006	0.00004
		All to SRS	0.014	0.026	0.025	0.006	0.00004
	NTS/ORR	Geographic	0.014	0.026	0.019	0.009	0.00006
		By Fuel	0.015	0.027	0.027	0.007	0.00005
		All to INEL	0.021	0.038	0.042	0.013	0.00008
		All to SRS	0.014	0.025	0.024	0.006	0.00004
	HS/SRS	Geographic	0.011	0.019	0.019	0.004	0.00003
		By Fuel	0.014	0.023	0.028	0.005	0.00004
		All to SRS	0.013	0.023	0.025	0.005	0.00004
	HS/ORR	Geographic	0.013	0.024	0.018	0.008	0.00006
		By Fuel	0.014	0.024	0.027	0.006	0.00004
		All to INEL	0.019	0.032	0.041	0.010	0.00006
		All to SRS	0.014	0.023	0.023	0.005	0.00004
Centralization	INEL		0.016	0.020	0.049	0.004	0.00005
	SRS		0.013	0.020	0.027	0.003	0.00004
	HS	Geographic	0.026	0.059	0.030	0.027	0.00015
		By Fuel	0.017	0.027	0.038	0.007	0.00007
		All to INEL	0.021	0.035	0.052	0.011	0.00006
		All to SRS	0.017	0.026	0.036	0.006	0.00007
	NTS	Geographic	0.025	0.056	0.027	0.028	0.00016
		By Fuel	0.018	0.030	0.035	0.008	0.00008
		All to INEL	0.023	0.040	0.049	0.014	0.00009
		All to SRS	0.017	0.028	0.032	0.007	0.00007
	ORR	Geographic	0.016	0.033	0.019	0.014	0.00007
		By Fuel	0.019	0.038	0.028	0.015	0.00007
		All to INEL	0.030	0.067	0.043	0.034	0.00015
		All to SRS	0.016	0.031	0.024	0.011	0.00005

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

shipments. Tables E-11 through E-13 present these risk estimates using average risk parameters. Tables E-14 through E-16 provide the lower bound risk estimates, and Tables E-17 through E-19 provide the upper bound risk estimates.

E.7.3 MEI Results for Routine Conditions

The risks to MEIs under incident-free transportation conditions have been estimated for the exposure scenarios described in Section E.6.7. The estimated dose to each of the receptors considered is presented in Table E-20 on a per-event basis (person-rem per event). Note that the potential exists for individual exposures if multiple exposure events occur. For instance, the dose to a person stuck in traffic next to a spent nuclear fuel shipment for 30 min is calculated to be 11 mrem. If the exposure duration was longer, the dose would rise proportionally. Therefore, it is conceivable that a person could receive a dose on the order of 30 to 50 mrem while stopped in traffic next to a shipment. In addition, a person working at a truck service station could receive a significant dose if trucks were to use the same stops repeatedly. If a truckstop worker was present for 100 shipment stops (at the distance and duration given above), the calculated dose is on the order of 30 mrem. Administrative controls could be instituted to control the location and duration of truck stops if multiple exposures were to happen routinely.

Table E-20 Estimated Doses (Rem/Event) to MEIs During Incident-free Transportation Conditions[a, b]

Receptor		*Dose to MEI*	
		Truck	*Rail*
Workers	Crew Member	0.1 rem/yr[c]	0.1 rem/yr[c]
	Inspector	0.0029 rem/event	0.0029 rem/event
	Rail Yard Crew Member	N/A	1.3×10^{-3} rem/event
Public	Resident	4.0×10^{-7} rem/event	4.0×10^{-7} rem/event
	Person in Traffic Obstruction	0.011 rem/event	0.011 rem/event
	Person at Service Station	0.00031 rem/event	N/A
	Resident Near Rail Stop	N/A	0.000013 rem/event

[a] *The exposure scenario assumptions are described in Section E.6.6.*

[b] *Doses are calculated assuming that the shipment external dose rate is equal to the regulatory limit of 10 mrem per hr at 2 m (6.6 ft) from the shipment.*

[c] *Dose to truck drivers could exceed the legal limit of rem per yr in the absence of administrative controls.*

The cumulative dose to a resident was calculated assuming all 837 shipments arrived at a single port or management site. The cumulative doses assume that the resident is present for every shipment and is unshielded at a distance of 30 m (66 ft) from the route. Therefore, the cumulative dose is only a function of the number of shipments passing a particular point and is independent of the actual site being considered. The maximum dose to this resident, if all the spent nuclear fuel were to be shipped to a single site, would be less than 0.1 mrem. The annual individual dose can be estimated by assuming that shipments would occur uniformly over a 15-year time period.

E.7.4 Accident Consequence Assessment - Maximum Severity Accident Results

The accident consequence assessment is intended to provide an estimate of the maximum potential impacts posed by the most severe potential transportation accidents involving a spent nuclear fuel shipment.

The accident consequence results are presented in Table E-21 for the maximum severity accidents as defined in the modal study. The population doses are for a uniform population density within an 80 km- (50 mi-) radius (Neuhuser and Kanipe, 1993). The location of the MEI is determined based on atmospheric conditions at the time of the accident and the buoyant characteristics of the released plume. The locations of maximum exposure would be 160 m (528 ft) and 400 m (1,320 ft) from the accident site for neutral and stable conditions, respectively. The dose to the MEI is independent of the location of the accident. In general, the dose to MEIs for the most severe accidents would be less than 10 mrem. No acute or early fatalities would be expected from radiological causes.

Table E-21 Potential Doses to Populations and MEIs for the Most Severe Transportation Accidents Involving Spent Nuclear Fuel[a,b]

	Neutral Conditions[c]				*Stable Conditions*[d]			
	Population[e]		*MEI*[f]		*Population*[e]		*MEI*[f]	
Mode and Accident Location	*Dose (person-rem)*	*Consequences (cancer fatalities)*	*Dose (rem)*	*Consequences (cancer fatality)*	*Dose (person-rem)*	*Consequences (cancer fatalities)*	*Dose (person-rem)*	*Consequences (cancer fatality)*
Truck								
Urban	14	0.007	0.0024	0.0000012	120	0.06	0.0079	0.000004
Suburban	2.7	0.0014	0.0024	0.0000012	21	0.01	0.0079	0.000004
Rural	0.15	0.000075	0.0024	0.0000012	1.2	0.0006	0.0079	0.000004
Rail								
Urban	14	0.007	0.0024	0.0000012	120	0.06	0.0079	0.000004
Suburban	2.7	0.0014	0.0024	0.0000012	21	0.01	0.0079	0.000004
Rural	0.15	0.000075	0.0024	0.0000012	1.2	0.0006	0.0079	0.000004

[a] *The most severe accidents correspond to the modal study accident severity category 6 (DOE, 1995).*

[b] *Buoyant plume rise resulting from fire for a severe accident was included in the exposure model.*

[c] *Neutral weather conditions result in moderate dispersion and dilution of the release plume. Neutral conditions were taken to be Pasquill stability Class D with a wind speed of 4 m per sec (9 mph). Neutral conditions occur approximately 50 percent of the time in the United States.*

[d] *Stable weather conditions result in minimal dispersion and dilution of the release plume and are thus unfavorable. Stable conditions were taken to be Pasquill stability Class F with a wind speed of 1 m per sec (2.2 mph). Stable conditions occur approximately one-third of the time in the United States.*

[e] *Populations extend at a uniform population density to a radius of 80 km (50 mi) from the accident site. Population exposure pathways include acute inhalation, acute cloudshine, groundshine, resuspended inhalation, resuspended cloudshine, and ingestion of food, including initially contaminated food (rural only). No decontamination or mitigative actions are taken.*

[f] *The MEI is assumed to be at the location of maximum exposure. The locations of maximum exposure would be 160 m (528 ft) and 400 m (1,320 ft) from the accident site under neutral and stable atmospheric conditions, respectively. Individual exposure pathways include acute inhalation, acute cloudshine, and groundshine during passage of the plume. No ingested dose is considered.*

The maximum foreseeable offsite transportation accident involves a shipment of spent nuclear fuel in a suburban population zone under neutral (average) weather conditions. The accident has a probability of occurrence of about 1 every 10,000,000 years and could result in 2.7 person-rem and no fatalities. The probability of an accident occurring is at least 10 times smaller in either an urban area or under stable atmospheric conditions, and the consequences are less than 10 times larger.

E.8 Impacts of Implementation Alternatives of the Spent Nuclear Fuel Acceptance Policy

E.8.1 Implementation Alternative - Implementing an Acceptance Policy of Alternative Amounts of Spent Nuclear Fuel - Accept only from Developing Nations

This implementation alternative was analyzed using the same set of assumptions as used in analyzing the basic implementation. The results are as follows:

Shipments

Under all SNF&INEL Final EIS (DOE, 1995) alternatives, the shipment of foreign research reactor spent nuclear fuel would require the movement of 168 casks from ports of entry to DOE facilities. The basic shipment count, by point of origin is:

	East Coast		*West Coast*		
	Aluminum	*TRIGA*	*Aluminum*	*TRIGA*	*Totals*
Phase 1	31	54	15	30	130
Phase 2	9	16	4	9	38
Totals	**40**	**70**	**19**	**39**	**168**

Calculated in the same manner as described in Section E.7.2.1, the number of intersite shipments for two-phased approaches to this alternative varies between 4 and 33. The variation is caused by the wide variety of phased approaches.

Impacts of Incident-Free Ground Transport

The incident-free transportation of spent nuclear fuel was estimated to result in total latent fatalities that ranged from 0.002 to 0.06 over the entire duration of the program. These fatalities are the sum of the estimated number of radiation-related LCFs to the public and the crew.

The range of fatality estimates is caused by three factors: 1) the option of using truck or rail to transport spent nuclear fuel, 2) combinations of Phase 1 and Phase 2 sites that created varying shipment numbers and distances, and 3) the difference between the risk factors for the port-to-site routes.

The estimated number of radiation-related LCFs for transportation workers ranged from 0.001 to 0.015. The estimated number of radiation-related LCFs for the general population ranged from 0.0006 to 0.045, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.0002 to 0.01.

Impacts of Accidents During Ground Transport

The cumulative transportation accident risks over the entire program are estimated to range from 0.0000001 to 0.00006 LCFs from radiation and from 0.0001 to 0.028 for traffic fatality, depending on the transportation mode and DOE sites selected. The reasons for the range of fatality estimates are the same as those described for incident-free transportation. Both indicate an expectation of less than one fatality.

The impacts of overland transportation are shown in Tables E-22 through E-30. The analysis for this alternative implementation is analogous to the analysis performed for the Basic Implementation (see Section E.7.2), and the interpretation of the tables is the same as described in Section E.7.2.

The consequences of the most severe accident hypothesized are the same as described for the Basic Implementation since the material at risk is the same.

Table E-22 Tabulation of Overland Transportation Risks: Spent Nuclear Fuel from Developing Nations Only, All Shipments via Truck, Average Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.0034	0.0106	0.0005	0.0063	0.000003
1992/1993 Planning Basis	INEL/SRS		0.0034	0.0106	0.0005	0.0063	0.000003
Regionalization by Fuel Type	INEL/SRS		0.0098	0.0309	0.0016	0.0182	0.000011
Regionalization by Geography	INEL/SRS		0.0034	0.0106	0.0005	0.0063	0.000003
	INEL/ORR	Geographic	0.0040	0.0120	0.0006	0.0072	0.000009
		By Fuel	0.0087	0.0273	0.0014	0.0161	0.000012
		All to INEL	0.0096	0.0303	0.0015	0.0178	0.000010
	NTS/SRS	Geographic	0.0039	0.0120	0.0007	0.0071	0.000005
		By Fuel	0.0091	0.0285	0.0016	0.0167	0.000014
		All to SRS	0.0070	0.0215	0.0012	0.0127	0.000007
	NTS/ORR	Geographic	0.0044	0.0134	0.0008	0.0080	0.000011
		By Fuel	0.0094	0.0295	0.0017	0.0173	0.000017
		All to INEL	0.0106	0.0335	0.0018	0.0195	0.000018
		All to SRS	0.0077	0.0234	0.0014	0.0140	0.000016
	HS/SRS	Geographic	0.0035	0.0109	0.0005	0.0064	0.000003
		By Fuel	0.0086	0.0272	0.0013	0.0159	0.000010
		All to SRS	0.0067	0.0205	0.0011	0.0122	0.000007
	HS/ORR	Geographic	0.0040	0.0122	0.0006	0.0073	0.000009
		By Fuel	0.0090	0.0281	0.0014	0.0165	0.000013
		All to INEL	0.0101	0.0319	0.0015	0.0185	0.000012
		All to SRS	0.0074	0.0224	0.0012	0.0134	0.000016
Centralization	INEL		0.0112	0.0356	0.0017	0.0208	0.000012
	SRS		0.0078	0.0241	0.0013	0.0142	0.000008
	HS	Geographic	0.0078	0.0245	0.0011	0.0142	0.000025
		By Fuel	0.0119	0.0377	0.0018	0.0219	0.000023
		All to INEL	0.0120	0.0384	0.0018	0.0221	0.000014
		All to SRS	0.0120	0.0375	0.0019	0.0220	0.000039
	NTS	Geographic	0.0077	0.0237	0.0014	0.0146	0.000030
		By Fuel	0.0119	0.0376	0.0021	0.0224	0.000028
		All to INEL	0.0123	0.0390	0.0022	0.0229	0.000020
		All to SRS	0.0117	0.0361	0.0020	0.0221	0.000043
	ORR	Geographic	0.0056	0.0173	0.0008	0.0105	0.000017
		By Fuel	0.0110	0.0347	0.0017	0.0207	0.000026
		All to INEL	0.0127	0.0404	0.0019	0.0240	0.000032
		All to SRS	0.0083	0.0255	0.0014	0.0153	0.000017

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-23 Tabulation of Overland Transportation Risks: Spent Nuclear Fuel from Developing Nations Only, Shipments from Ports via Truck, Intersite Shipments via Rail, Average Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization by Geography	INEL/SRS						
	INEL/ORR	Geographic	0.0037	0.0111	0.0006	0.0065	0.000004
		By Fuel	0.0086	0.0268	0.0014	0.0157	0.000009
		All to INEL	0.0096	0.0303	0.0015	0.0178	0.000010
	NTS/SRS	Geographic	0.0036	0.0111	0.0006	0.0066	0.000003
		By Fuel	0.0086	0.0269	0.0015	0.0158	0.000009
		All to SRS	0.0070	0.0215	0.0012	0.0127	0.000007
	NTS/ORR	Geographic	0.0039	0.0115	0.0007	0.0068	0.000004
		By Fuel	0.0088	0.0273	0.0015	0.0160	0.000010
		All to INEL	0.0098	0.0308	0.0016	0.0181	0.000011
		All to SRS	0.0072	0.0220	0.0013	0.0130	0.000009
	HS/SRS	Geographic	0.0033	0.0101	0.0005	0.0060	0.000003
		By Fuel	0.0083	0.0258	0.0013	0.0152	0.000009
		All to SRS	0.0067	0.0205	0.0011	0.0122	0.000007
	HS/ORR	Geographic	0.0035	0.0105	0.0006	0.0063	0.000004
		By Fuel	0.0085	0.0263	0.0014	0.0155	0.000010
		All to INEL	0.0095	0.0298	0.0015	0.0175	0.000011
		All to SRS	0.0069	0.0210	0.0012	0.0125	0.000008
Centralization	INEL						
	SRS						
	HS	Geographic	0.0057	0.0171	0.0010	0.0099	0.000009
		By Fuel	0.0105	0.0328	0.0018	0.0191	0.000014
		All to INEL	0.0115	0.0363	0.0018	0.0211	0.000013
		All to SRS	0.0091	0.0277	0.0017	0.0161	0.000016
	NTS	Geographic	0.0057	0.0172	0.0012	0.0103	0.000010
		By Fuel	0.0106	0.0329	0.0019	0.0195	0.000014
		All to INEL	0.0115	0.0364	0.0019	0.0215	0.000013
		All to SRS	0.0091	0.0277	0.0019	0.0165	0.000016
	ORR	Geographic	0.0045	0.0137	0.0008	0.0082	0.000006
		By Fuel	0.0095	0.0295	0.0016	0.0174	0.000013
		All to INEL	0.0106	0.0331	0.0018	0.0194	0.000015
		All to SRS	0.0079	0.0241	0.0013	0.0143	0.000009

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-24 Tabulation of Overland Transportation Risks: Spent Nuclear Fuel from Developing Nations Only, All Shipments via Rail, Average Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.0015	0.0011	0.0010	0.0002	0.000001
1992/1993 Planning Basis	INEL/SRS		0.0015	0.0011	0.0010	0.0002	0.000001
Regionalization by Fuel Type	INEL/SRS		0.0027	0.0027	0.0034	0.0006	0.000003
Regionalization by Geography	INEL/SRS		0.0015	0.0011	0.0010	0.0002	0.000001
	INEL/ORR	Geographic	0.0018	0.0023	0.0010	0.0008	0.000001
		By Fuel	0.0028	0.0035	0.0029	0.0011	0.000003
		All to INEL	0.0029	0.0036	0.0031	0.0011	0.000003
	NTS/SRS	Geographic	0.0019	0.0027	0.0011	0.0010	0.000001
		By Fuel	0.0029	0.0039	0.0030	0.0014	0.000003
		All to SRS	0.0025	0.0038	0.0025	0.0013	0.000002
	NTS/ORR	Geographic	0.0023	0.0037	0.0011	0.0017	0.000007
		By Fuel	0.0035	0.0057	0.0031	0.0023	0.000008
		All to INEL	0.0039	0.0068	0.0035	0.0028	0.000010
		All to SRS	0.0027	0.0039	0.0026	0.0013	0.000003
	HS/SRS	Geographic	0.0016	0.0017	0.0009	0.0005	0.000001
		By Fuel	0.0026	0.0029	0.0028	0.0008	0.000003
		All to SRS	0.0022	0.0028	0.0024	0.0007	0.000002
	HS/ORR	Geographic	0.0020	0.0027	0.0010	0.0011	0.000007
		By Fuel	0.0030	0.0044	0.0029	0.0014	0.000004
		All to INEL	0.0034	0.0052	0.0032	0.0019	0.000004
		All to SRS	0.0024	0.0029	0.0025	0.0007	0.000003
Centralization	INEL		0.0030	0.0028	0.0038	0.0007	0.000003
	SRS		0.0024	0.0026	0.0029	0.0005	0.000002
	HS	Geographic	0.0042	0.0089	0.0020	0.0046	0.000022
		By Fuel	0.0035	0.0048	0.0037	0.0016	0.000006
		All to INEL	0.0038	0.0056	0.0039	0.0020	0.000005
		All to SRS	0.0030	0.0036	0.0035	0.0009	0.000009
	NTS	Geographic	0.0042	0.0089	0.0020	0.0050	0.000024
		By Fuel	0.0039	0.0062	0.0039	0.0024	0.000010
		All to INEL	0.0043	0.0072	0.0041	0.0030	0.000010
		All to SRS	0.0033	0.0045	0.0035	0.0015	0.000009
	ORR	Geographic	0.0030	0.0059	0.0012	0.0030	0.000009
		By Fuel	0.0050	0.0109	0.0031	0.0056	0.000017
		All to INEL	0.0060	0.0137	0.0035	0.0074	0.000024
		All to SRS	0.0033	0.0061	0.0026	0.0026	0.000004

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-25 Tabulation of Overland Transportation Risks: Spent Nuclear Fuel from Developing Nations Only, All Shipment via Truck, Lower Bound Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.0023	0.0072	0.0002	0.0039	0.0000004
1992/1993 Planning Basis	INEL/SRS		0.0023	0.0072	0.0002	0.0039	0.0000004
Regionalization by Fuel Type	INEL/SRS		0.0080	0.0256	0.0010	0.0142	0.0000022
Regionalization by Geography	INEL/SRS		0.0023	0.0072	0.0002	0.0039	0.0000004
	INEL/ORR	Geographic	0.0029	0.0087	0.0003	0.0050	0.0000061
		By Fuel	0.0071	0.0226	0.0009	0.0127	0.0000049
		All to INEL	0.0077	0.0245	0.0011	0.0141	0.0000020
	NTS/SRS	Geographic	0.0026	0.0082	0.0004	0.0046	0.0000031
		By Fuel	0.0073	0.0232	0.0011	0.0130	0.0000064
		All to SRS	0.0058	0.0181	0.0007	0.0096	0.0000018
	NTS/ORR	Geographic	0.0032	0.0098	0.0005	0.0058	0.0000088
		By Fuel	0.0077	0.0244	0.0012	0.0139	0.0000096
		All to INEL	0.0086	0.0273	0.0014	0.0157	0.0000093
		All to SRS	0.0066	0.0202	0.0008	0.0111	0.0000103
	HS/SRS	Geographic	0.0023	0.0073	0.0002	0.0039	0.0000010
		By Fuel	0.0069	0.0221	0.0009	0.0122	0.0000030
		All to SRS	0.0056	0.0173	0.0006	0.0091	0.0000017
	HS/ORR	Geographic	0.0029	0.0088	0.0003	0.0051	0.0000068
		By Fuel	0.0074	0.0233	0.0010	0.0130	0.0000062
		All to INEL	0.0081	0.0260	0.0011	0.0147	0.0000039
		All to SRS	0.0063	0.0194	0.0007	0.0105	0.0000102
Centralization	INEL		0.0090	0.0288	0.0013	0.0164	0.0000023
	SRS		0.0068	0.0212	0.0007	0.0110	0.0000021
	HS	Geographic	0.0063	0.0201	0.0008	0.0112	0.0000215
		By Fuel	0.0100	0.0319	0.0013	0.0177	0.0000143
		All to INEL	0.0098	0.0315	0.0014	0.0176	0.0000043
		All to SRS	0.0106	0.0336	0.0013	0.0184	0.0000320
	NTS	Geographic	0.0060	0.0188	0.0010	0.0113	0.0000255
		By Fuel	0.0098	0.0312	0.0016	0.0180	0.0000189
		All to INEL	0.0098	0.0316	0.0017	0.0181	0.0000096
		All to SRS	0.0101	0.0316	0.0015	0.0183	0.0000352
	ORR	Geographic	0.0045	0.0142	0.0005	0.0080	0.0000140
		By Fuel	0.0095	0.0301	0.0012	0.0170	0.0000185
		All to INEL	0.0108	0.0348	0.0014	0.0200	0.0000232
		All to SRS	0.0074	0.0229	0.0008	0.0122	0.0000105

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-26 Tabulation of Overland Transportation Risks: Spent Nuclear Fuel from Developing Nations Only, Shipments from Ports via Truck, Intersite Shipments via Rail, Lower Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization by Geography	INEL/SRS						
	INEL/ORR	Geographic	0.0025	0.0078	0.0003	0.0044	0.0000011
		By Fuel	0.0070	0.0221	0.0009	0.0124	0.0000022
		All to INEL	0.0077	0.0245	0.0011	0.0141	0.0000020
	NTS/SRS	Geographic	0.0023	0.0072	0.0004	0.0041	0.0000007
		By Fuel	0.0068	0.0215	0.0010	0.0121	0.0000022
		All to SRS	0.0058	0.0181	0.0007	0.0096	0.0000018
	NTS/ORR	Geographic	0.0026	0.0079	0.0004	0.0046	0.0000014
		By Fuel	0.0071	0.0222	0.0010	0.0126	0.0000027
		All to INEL	0.0078	0.0247	0.0012	0.0143	0.0000027
		All to SRS	0.0061	0.0188	0.0008	0.0101	0.0000028
	HS/SRS	Geographic	0.0021	0.0065	0.0002	0.0035	0.0000006
		By Fuel	0.0066	0.0208	0.0009	0.0115	0.0000023
		All to SRS	0.0056	0.0173	0.0006	0.0091	0.0000017
	HS/ORR	Geographic	0.0024	0.0071	0.0003	0.0041	0.0000014
		By Fuel	0.0069	0.0214	0.0009	0.0121	0.0000027
		All to INEL	0.0076	0.0239	0.0011	0.0137	0.0000028
		All to SRS	0.0059	0.0180	0.0006	0.0096	0.0000026
Centralization	INEL						
	SRS						
	HS	Geographic	0.0042	0.0128	0.0007	0.0069	0.0000054
		By Fuel	0.0086	0.0270	0.0013	0.0149	0.0000051
		All to INEL	0.0092	0.0294	0.0013	0.0166	0.0000031
		All to SRS	0.0077	0.0237	0.0011	0.0125	0.0000083
	NTS	Geographic	0.0040	0.0123	0.0008	0.0071	0.0000052
		By Fuel	0.0084	0.0265	0.0014	0.0150	0.0000050
		All to INEL	0.0091	0.0289	0.0015	0.0167	0.0000030
		All to SRS	0.0076	0.0232	0.0013	0.0126	0.0000081
	ORR	Geographic	0.0035	0.0106	0.0004	0.0057	0.0000029
		By Fuel	0.0080	0.0249	0.0011	0.0137	0.0000053
		All to INEL	0.0088	0.0274	0.0013	0.0154	0.0000063
		All to SRS	0.0069	0.0214	0.0007	0.0112	0.0000030

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-27 Tabulation of Overland Transportation Risks: Spent Nuclear Fuel from Developing Nations Only, All Shipments via Rail, Lower Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.0012	0.0006	0.0004	0.0001	0.0000001
1992/1993 Planning Basis	INEL/SRS		0.0012	0.0006	0.0004	0.0001	0.0000001
Regionalization by Fuel Type	INEL/SRS		0.0023	0.0017	0.0021	0.0005	0.0000003
Regionalization	INEL/SRS		0.0012	0.0006	0.0004	0.0001	0.0000001
by	INEL/ORR	Geographic	0.0015	0.0018	0.0004	0.0006	0.0000007
Geography		By Fuel	0.0024	0.0026	0.0017	0.0009	0.0000006
		All to INEL	0.0024	0.0025	0.0018	0.0009	0.0000002
	NTS/SRS	Geographic	0.0015	0.0017	0.0005	0.0008	0.0000004
		By Fuel	0.0024	0.0026	0.0018	0.0011	0.0000007
		All to SRS	0.0021	0.0027	0.0018	0.0010	0.0000005
	NTS/ORR	Geographic	0.0019	0.0028	0.0006	0.0015	0.0000060
		By Fuel	0.0029	0.0044	0.0020	0.0020	0.0000053
		All to INEL	0.0033	0.0053	0.0022	0.0026	0.0000075
		All to SRS	0.0023	0.0029	0.0019	0.0011	0.0000013
	HS/SRS	Geographic	0.0012	0.0010	0.0004	0.0002	0.0000004
		By Fuel	0.0021	0.0018	0.0017	0.0005	0.0000008
		All to SRS	0.0019	0.0020	0.0016	0.0005	0.0000003
	HS/ORR	Geographic	0.0017	0.0020	0.0005	0.0009	0.0000060
		By Fuel	0.0026	0.0033	0.0018	0.0012	0.0000018
		All to INEL	0.0029	0.0040	0.0019	0.0016	0.0000022
		All to SRS	0.0021	0.0021	0.0017	0.0005	0.0000012
Centralization	INEL		0.0025	0.0017	0.0021	0.0005	0.0000002
	SRS		0.0021	0.0020	0.0021	0.0004	0.0000004
	HS	Geographic	0.0037	0.0080	0.0011	0.0043	0.0000204
		By Fuel	0.0030	0.0036	0.0023	0.0013	0.0000039
		All to INEL	0.0032	0.0042	0.0022	0.0017	0.0000022
		All to SRS	0.0026	0.0026	0.0024	0.0007	0.0000066
	NTS	Geographic	0.0037	0.0077	0.0013	0.0047	0.0000224
		By Fuel	0.0033	0.0046	0.0025	0.0021	0.0000072
		All to INEL	0.0036	0.0054	0.0026	0.0026	0.0000075
		All to SRS	0.0027	0.0032	0.0025	0.0012	0.0000064
	ORR	Geographic	0.0028	0.0055	0.0006	0.0026	0.0000075
		By Fuel	0.0047	0.0101	0.0020	0.0052	0.0000142
		All to INEL	0.0056	0.0128	0.0021	0.0069	0.0000214
		All to SRS	0.0031	0.0056	0.0018	0.0022	0.0000015

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-28 Tabulation of Overland Transportation Risks: Spent Nuclear Fuel from Developing Nations Only, All Shipments via Truck, Upper Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.0064	0.0191	0.0014	0.0111	0.000014
1992/1993 Planning Basis	INEL/SRS		0.0064	0.0191	0.0014	0.0111	0.000014
Regionalization by Fuel Type	INEL/SRS		0.0113	0.0352	0.0024	0.0220	0.000027
Regionalization by Geography	INEL/SRS		0.0064	0.0191	0.0014	0.0111	0.000014
	INEL/ORR	Geographic	0.0067	0.0200	0.0015	0.0117	0.000019
		By Fuel	0.0104	0.0320	0.0022	0.0199	0.000027
		All to INEL	0.0107	0.0335	0.0021	0.0211	0.000024
	NTS/SRS	Geographic	0.0069	0.0207	0.0016	0.0118	0.000017
		By Fuel	0.0110	0.0340	0.0025	0.0207	0.000029
		All to SRS	0.0099	0.0296	0.0024	0.0176	0.000024
	NTS/ORR	Geographic	0.0072	0.0215	0.0016	0.0125	0.000022
		By Fuel	0.0111	0.0344	0.0025	0.0210	0.000032
		All to INEL	0.0117	0.0368	0.0025	0.0227	0.000032
		All to SRS	0.0104	0.0310	0.0025	0.0186	0.000032
	HS/SRS	Geographic	0.0067	0.0198	0.0014	0.0113	0.000015
		By Fuel	0.0106	0.0329	0.0022	0.0201	0.000025
		All to SRS	0.0097	0.0289	0.0023	0.0173	0.000023
	HS/ORR	Geographic	0.0070	0.0206	0.0015	0.0120	0.000020
		By Fuel	0.0108	0.0333	0.0022	0.0204	0.000028
		All to INEL	0.0113	0.0355	0.0022	0.0220	0.000026
		All to SRS	0.0102	0.0303	0.0024	0.0183	0.000031
Centralization	INEL		0.0120	0.0379	0.0024	0.0240	0.000028
	SRS		0.0106	0.0319	0.0026	0.0192	0.000026
	HS	Geographic	0.0104	0.0320	0.0020	0.0188	0.000038
		By Fuel	0.0134	0.0420	0.0026	0.0257	0.000040
		All to INEL	0.0130	0.0411	0.0025	0.0254	0.000030
		All to SRS	0.0145	0.0445	0.0030	0.0267	0.000057
	NTS	Geographic	0.0102	0.0310	0.0022	0.0189	0.000043
		By Fuel	0.0134	0.0417	0.0029	0.0260	0.000045
		All to INEL	0.0131	0.0415	0.0028	0.0260	0.000036
		All to SRS	0.0141	0.0428	0.0032	0.0267	0.000060
	ORR	Geographic	0.0083	0.0251	0.0017	0.0152	0.000029
		By Fuel	0.0126	0.0393	0.0026	0.0247	0.000042
		All to INEL	0.0137	0.0435	0.0026	0.0275	0.000047
		All to SRS	0.0109	0.0328	0.0026	0.0202	0.000033

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-29 Tabulation of Overland Transportation Risks: Spent Nuclear Fuel from Developing Nations Only, Shipments from Ports via Truck, Intersite Shipments via Rail, Upper Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization by Geography	INEL/SRS						
	INEL/ORR	Geographic	0.0064	0.0190	0.0014	0.0111	0.000014
		By Fuel	0.0102	0.0315	0.0022	0.0195	0.000024
		All to INEL	0.0107	0.0335	0.0021	0.0211	0.000024
	NTS/SRS	Geographic	0.0067	0.0197	0.0015	0.0113	0.000015
		By Fuel	0.0105	0.0323	0.0023	0.0198	0.000025
		All to SRS	0.0099	0.0296	0.0024	0.0176	0.000024
	NTS/ORR	Geographic	0.0067	0.0196	0.0015	0.0113	0.000015
		By Fuel	0.0105	0.0322	0.0023	0.0198	0.000025
		All to INEL	0.0110	0.0341	0.0023	0.0213	0.000025
		All to SRS	0.0099	0.0296	0.0024	0.0177	0.000024
	HS/SRS	Geographic	0.0065	0.0190	0.0014	0.0110	0.000015
		By Fuel	0.0103	0.0316	0.0022	0.0194	0.000025
		All to SRS	0.0097	0.0289	0.0023	0.0173	0.000023
	HS/ORR	Geographic	0.0065	0.0189	0.0014	0.0110	0.000015
		By Fuel	0.0103	0.0314	0.0022	0.0195	0.000025
		All to INEL	0.0108	0.0334	0.0022	0.0210	0.000025
		All to SRS	0.0097	0.0289	0.0023	0.0173	0.000024
Centralization	INEL						
	SRS						
	HS	Geographic	0.0083	0.0246	0.0019	0.0145	0.000022
		By Fuel	0.0120	0.0371	0.0026	0.0229	0.000030
		All to INEL	0.0124	0.0390	0.0024	0.0244	0.000029
		All to SRS	0.0116	0.0346	0.0029	0.0209	0.000033
	NTS	Geographic	0.0082	0.0245	0.0020	0.0146	0.000023
		By Fuel	0.0120	0.0370	0.0027	0.0231	0.000031
		All to INEL	0.0124	0.0388	0.0026	0.0246	0.000030
		All to SRS	0.0115	0.0345	0.0030	0.0210	0.000033
	ORR	Geographic	0.0073	0.0215	0.0017	0.0129	0.000018
		By Fuel	0.0111	0.0341	0.0025	0.0214	0.000029
		All to INEL	0.0116	0.0361	0.0025	0.0229	0.000030
		All to SRS	0.0104	0.0314	0.0025	0.0192	0.000026

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-30 Tabulation of Overland Transportation Risks: Spent Nuclear Fuel from Developing Nations Only, All Shipments via Rail, Upper Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.0020	0.0025	0.0028	0.0004	0.000005
1992/1993 Planning Basis	INEL/SRS		0.0020	0.0025	0.0028	0.0004	0.000005
Regionalization by Fuel Type	INEL/SRS		0.0030	0.0036	0.0076	0.0007	0.000010
Regionalization	INEL/SRS		0.0020	0.0025	0.0028	0.0004	0.000005
by	INEL/ORR	Geographic	0.0024	0.0037	0.0027	0.0011	0.000006
Geography		By Fuel	0.0031	0.0046	0.0064	0.0013	0.000009
		All to INEL	0.0031	0.0044	0.0076	0.0013	0.000009
	NTS/SRS	Geographic	0.0026	0.0044	0.0029	0.0013	0.000006
		By Fuel	0.0034	0.0053	0.0067	0.0016	0.000010
		All to SRS	0.0032	0.0056	0.0046	0.0015	0.000009
	NTS/ORR	Geographic	0.0029	0.0053	0.0028	0.0019	0.000011
		By Fuel	0.0038	0.0069	0.0067	0.0025	0.000014
		All to INEL	0.0042	0.0078	0.0080	0.0030	0.000017
		All to SRS	0.0033	0.0056	0.0045	0.0015	0.000009
	HS/SRS	Geographic	0.0023	0.0037	0.0028	0.0010	0.000006
		By Fuel	0.0031	0.0046	0.0065	0.0012	0.000010
		All to SRS	0.0030	0.0049	0.0045	0.0012	0.000008
	HS/ORR	Geographic	0.0027	0.0046	0.0027	0.0016	0.000011
		By Fuel	0.0035	0.0059	0.0064	0.0019	0.000011
		All to INEL	0.0038	0.0065	0.0077	0.0023	0.000012
		All to SRS	0.0031	0.0048	0.0044	0.0012	0.000009
Centralization	INEL		0.0031	0.0035	0.0092	0.0007	0.000010
	SRS		0.0029	0.0041	0.0051	0.0007	0.000009
	HS	Geographic	0.0048	0.0107	0.0050	0.0051	0.000027
		By Fuel	0.0039	0.0063	0.0086	0.0020	0.000014
		All to INEL	0.0041	0.0069	0.0098	0.0024	0.000013
		All to SRS	0.0036	0.0055	0.0067	0.0014	0.000016
	NTS	Geographic	0.0048	0.0104	0.0043	0.0052	0.000029
		By Fuel	0.0043	0.0074	0.0080	0.0026	0.000018
		All to INEL	0.0045	0.0082	0.0092	0.0031	0.000019
		All to SRS	0.0038	0.0061	0.0060	0.0017	0.000016
	ORR	Geographic	0.0035	0.0072	0.0030	0.0036	0.000014
		By Fuel	0.0053	0.0118	0.0067	0.0061	0.000024
		All to INEL	0.0062	0.0144	0.0081	0.0078	0.000032
		All to SRS	0.0038	0.0074	0.0046	0.0031	0.000011

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

E.8.2 Implementation Alternative - Implementing an Acceptance Policy of Alternative Amounts of Spent Nuclear Fuel - Accept Only from Reactors that Use Highly-Enriched Uranium (HEU)

This alternative was not analyzed for policy reasons. See Chapter 4.

E.8.3 Implementation Alternative - Implementing an Acceptance Policy of Alternative Amounts of Spent Nuclear Fuel - Accept Target Material

Target material is currently stored overseas as a liquid. In order to allow shipment, it must be processed into a solid form by either calcination or oxidation. Calcination results in a solid, but easily crumbled material, and oxidation results in a powder. Oxidation removes the aluminum and, therefore, would lead to fewer shipments than calcination. Shipment counts in Appendix B indicate that just over five shipments would be arriving on the east coast. However, in order to be conservative, six full shipments are used for transportation risk analysis. Similarly, the amount of material that could arrive on the west coast is much less than one full cask. The analysis conservatively assumes one full cask.

Form	*Port of Entry*		
	East Coast	*West Coast*	*Eastern Canada*
Calcinate	14	1	125
Oxidized Powder	6	1	50

Analysis of the target material and potential casks indicates that the maximum dose rate from any cask would be 0.1 mrem per hr at 2 m (3.3 ft). This low radiation level is based on the low burn-up of target material. Because of the conservative release fractions assigned to the oxidized material (see Section E.6.4.2), the results are emphasized below. The risks tabulated in this section would be added to those associated with the basic implementation of Management Alternative 1 if both aspects of the policy were to be performed.

Impacts of Incident-Free Ground Transport

The incident-free transportation of oxidized target material was estimated to result in total latent fatalities that ranged from 0.0002 to 0.003 over the entire duration of the program. The calcinated target material results are 2.5 times higher. These fatalities are the sum of the estimated number of radiation-related LCFs to the public and the crew. This represents an increase to the risk associated with the basic implementation.

The range of fatality estimates is caused by three factors: 1) the option of using truck or rail to transport spent nuclear fuel 2) combinations of Phase 1 and Phase 2 sites that created varying shipment numbers and distances, and 3) the difference between the risk factors for the port-to-site routes.

The estimated number of radiation-related LCFs for transportation workers ranged from 0.00007 to 0.00074. The estimated number of radiation-related LCFs for the general population ranged from 0.00015 to 0.0023, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.0001 to 0.00396.

Impacts of Accidents During Ground Transport

The cumulative transportation accident risks over the entire policy are estimated to range from 0.00023 to 0.0054 LCF from radiation and from 0.0001 to 0.013 for traffic fatality, depending on the transportation mode and DOE sites selected. The risks would be four times lower if calcinated material is transported. Both indicate an expectation of less than one fatality.

The impacts of overland transportation are shown in Tables E-31 through E-39. The analysis for this implementation alternative is analogous to the analysis performed for the Basic Implementation (see Section E.7.2), and the interpretation of the tables is the same as described in Section E.7.2. The total policy risk with this implementation alternative is the sum of the values in the above referenced tables and those in Section E.7.2 describing the Basic Implementation.

Table E-40 gives the consequences for the most severe accident hypothesized if that accident were to occur at various locations. The maximum accident risks would be four times lower for calcinated material. The accident probabilities are described in Section 6 of this appendix.

E.8.4 Implementation Alternative - Implementing an Acceptance Policy for Varying Durations - Five-Year Spent Nuclear Fuel Acceptance

Under all SNF&INEL Final EIS (DOE, 1995) alternatives, the shipment of foreign research reactor spent nuclear fuel would require the movement of casks from ports of entry to DOE facilities. The basic shipment count, by point of origin is:

	East Coast		*West Coast*		Totals
	Aluminum	*TRIGA*	*Aluminum*	*TRIGA*	
Phase 1	419	101	105	53	678

Calculated in the same manner as described for the basic implementation of Management Alternative 1, the number of intersite shipments for the two-phased approaches to this strategy varies between 8 and 184. The variation is caused by the wide variety of phased approaches.

Impacts of Incident-Free Ground Transport

The incident-free transportation of spent nuclear fuel was estimated to result in total latent fatalities that ranged from 0.01 to 0.27 over the entire duration of the program. These fatalities are the sum of the estimated number of radiation-related LCFs to the public and the crew.

The range of fatality estimates is caused by two factors: 1) the option of using truck or rail to transport spent nuclear fuel, and 2) the difference between the risk factors for the port-to-site routes.

The estimated number of radiation-related LCFs for transportation workers ranged from 0.005 to 0.064. The estimated number of radiation-related LCFs for the general population ranged from 0.005 to 0.20, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.001 to 0.041.

Impacts of Accidents During Ground Transport

The cumulative transportation accident risks over the entire program are estimated to range from 0.000003 to 0.00026 LCFs from radiation and from 0.001 to 0.13 for traffic fatality, depending on the transportation mode and DOE sites selected. Both indicate an expectation of less than one fatality.

The impacts of overland transportation are shown in Tables E-41 through E-49. The analysis for this implementation alternative is analogous to the analysis performed for the basic implementation of Management Alternative 1 (see Section E.7.2), and the interpretation of the tables is the same as described in Section E.7.2.

Table E-31 Tabulation of Overland Transportation Risks: Accept Target Material Only, All Shipments via Truck, Average Risk Factors, Risk Increases over that of the Basic Implementation

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.00022	0.00061	0.00013	0.0040	0.00070
1992/1993 Planning Basis	INEL/SRS		0.00022	0.00061	0.00013	0.0040	0.00070
Regionalization by Fuel Type	INEL/SRS		0.00023	0.00064	0.00016	0.0041	0.00074
Regionalization	INEL/SRS		0.00022	0.00061	0.00013	0.0040	0.00070
by	INEL/ORR	Geographic	0.00029	0.00079	0.00026	0.0051	0.00071
Geography		By Fuel	0.00030	0.00082	0.00028	0.0053	0.00075
		All to INEL	0.00042	0.00129	0.00060	0.0066	0.00352
	NTS/SRS	Geographic	0.00022	0.00062	0.00015	0.0040	0.00070
		By Fuel	0.00023	0.00064	0.00016	0.0041	0.00074
		All to SRS	0.00023	0.00064	0.00016	0.0041	0.00074
	NTS/ORR	Geographic	0.00029	0.00080	0.00027	0.0052	0.00071
		By Fuel	0.00030	0.00082	0.00028	0.0053	0.00075
		All to INEL	0.00054	0.00166	0.00095	0.0085	0.00353
		All to SRS	0.00030	0.00082	0.00028	0.0053	0.00075
	HS/SRS	Geographic	0.00022	0.00062	0.00015	0.0040	0.00070
		By Fuel	0.00023	0.00064	0.00016	0.0041	0.00074
		All to SRS	0.00023	0.00064	0.00016	0.0041	0.00074
	HS/ORR	Geographic	0.00029	0.00080	0.00027	0.0051	0.00071
		By Fuel	0.00030	0.00082	0.00028	0.0053	0.00075
		All to INEL	0.00051	0.00159	0.00069	0.0079	0.00352
		All to SRS	0.00030	0.00082	0.00028	0.0053	0.00075
Centralization	INEL		0.00049	0.00152	0.00074	0.0075	0.00439
	SRS		0.00023	0.00055	0.00016	0.0041	0.00074
	HS	Geographic	0.00072	0.00221	0.00087	0.0128	0.00163
		By Fuel	0.00073	0.00225	0.00089	0.0131	0.00167
		All to INEL	0.00059	0.00186	0.00086	0.0091	0.00442
		All to SRS	0.00073	0.00225	0.00089	0.0131	0.00167
	NTS	Geographic	0.00067	0.00199	0.00094	0.0127	0.00160
		By Fuel	0.00068	0.00203	0.00096	0.0129	0.00165
		All to INEL	0.00061	0.00191	0.00114	0.0098	0.00439
		All to SRS	0.00068	0.00203	0.00096	0.0129	0.00165
	ORR	Geographic	0.00030	0.00082	0.00027	0.0053	0.00071
		By Fuel	0.00030	0.00082	0.00028	0.0053	0.00075
		All to INEL	0.00073	0.00230	0.00095	0.0128	0.00355
		All to SRS	0.00030	0.00082	0.00028	0.0053	0.00075

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-32 Tabulation of Overland Transportation Risks: Accept Target Material Only, Shipments from Ports via Truck, Intersite Shipments via Rail, Average Risk Factors, Risk Increases over that of the Basic Implementation

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization	INEL/SRS						
by	INEL/ORR	Geographic	0.00025	0.00062	0.00025	0.0039	0.00070
Geography		By Fuel	0.00026	0.00065	0.00026	0.0040	0.00074
		All to INEL	0.00042	0.00129	0.00060	0.0066	0.00352
	NTS/SRS	Geographic	0.00022	0.00061	0.00015	0.0040	0.00070
		By Fuel	0.00023	0.00064	0.00016	0.0041	0.00074
		All to SRS	0.00023	0.00064	0.00016	0.0041	0.00074
	NTS/ORR	Geographic	0.00025	0.00062	0.00025	0.0039	0.00070
		By Fuel	0.00026	0.00065	0.00026	0.0040	0.00074
		All to INEL	0.00047	0.00132	0.00077	0.0066	0.00352
		All to SRS	0.00026	0.00065	0.00026	0.0040	0.00074
	HS/SRS	Geographic	0.00022	0.00061	0.00015	0.0040	0.00070
		By Fuel	0.00023	0.00064	0.00016	0.0041	0.00074
		All to SRS	0.00023	0.00064	0.00016	0.0041	0.00074
	HS/ORR	Geographic	0.00025	0.00062	0.00025	0.0039	0.00070
		By Fuel	0.00026	0.00065	0.00026	0.0040	0.00074
		All to INEL	0.00046	0.00132	0.00077	0.0066	0.00352
		All to SRS	0.00026	0.00065	0.00026	0.0040	0.00074
Centralization	INEL						
	SRS						
	HS	Geographic	0.00041	0.00097	0.00125	0.0053	0.00161
		By Fuel	0.00041	0.00100	0.00129	0.0054	0.00165
		All to INEL	0.00054	0.00159	0.00094	0.0078	0.00442
		All to SRS	0.00041	0.00100	0.00129	0.0054	0.00165
	NTS	Geographic	0.00040	0.00094	0.00130	0.0054	0.00158
		By Fuel	0.00041	0.00097	0.00133	0.0055	0.00162
		All to INEL	0.00054	0.00157	0.00096	0.0079	0.00439
		All to SRS	0.00041	0.00097	0.00133	0.0055	0.00162
	ORR	Geographic	0.00025	0.00063	0.00026	0.0039	0.00070
		By Fuel	0.00026	0.00065	0.00026	0.0040	0.00074
		All to INEL	0.00050	0.00136	0.00115	0.0068	0.00353
		All to SRS	0.00026	0.00065	0.00026	0.0040	0.00074

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-33 Tabulation of Overland Transportation Risks: Accept Target Material Only, All Shipments via Rail, Average Risk Factors, Risk Increases over that of the Basic Implementation

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.00007	0.00018	0.00228	0.0001	0.00023
1992/1993 Planning Basis	INEL/SRS		0.00007	0.00018	0.00228	0.0001	0.00023
Regionalization by Fuel Type	INEL/SRS		0.00007	0.00019	0.00295	0.0001	0.00024
Regionalization	INEL/SRS		0.00007	0.00018	0.00228	0.0001	0.00023
by	INEL/ORR	Geographic	0.00010	0.00019	0.00267	0.0002	0.00021
Geography		By Fuel	0.00010	0.00019	0.00270	0.0002	0.00022
		All to INEL	0.00010	0.00016	0.00217	0.0002	0.00085
	NTS/SRS	Geographic	0.00007	0.00018	0.00292	0.0001	0.00023
		By Fuel	0.00007	0.00019	0.00295	0.0001	0.00024
		All to SRS	0.00007	0.00019	0.00295	0.0001	0.00024
	NTS/ORR	Geographic	0.00014	0.00036	0.00269	0.0014	0.00022
		By Fuel	0.00010	0.00019	0.00270	0.0002	0.00022
		All to INEL	0.00022	0.00052	0.00253	0.0022	0.00086
		All to SRS	0.00010	0.00019	0.00270	0.0002	0.00022
	HS/SRS	Geographic	0.00007	0.00018	0.00292	0.0001	0.00023
		By Fuel	0.00007	0.00019	0.00295	0.0001	0.00024
		All to SRS	0.00007	0.00019	0.00295	0.0001	0.00024
	HS/ORR	Geographic	0.00014	0.00036	0.00269	0.0014	0.00022
		By Fuel	0.00010	0.00019	0.00270	0.0002	0.00022
		All to INEL	0.00019	0.00045	0.00227	0.0016	0.00085
		All to SRS	0.00010	0.00019	0.00270	0.0002	0.00022
Centralization	INEL		0.00012	0.00016	0.00239	0.0003	0.00106
	SRS		0.00007	0.00015	0.00295	0.0001	0.00024
	HS	Geographic	0.00050	0.00151	0.00337	0.0080	0.00047
		By Fuel	0.00020	0.00029	0.00381	0.0005	0.00046
		All to INEL	0.00021	0.00047	0.00251	0.0016	0.00107
		All to SRS	0.00020	0.00029	0.00381	0.0005	0.00046
	NTS	Geographic	0.00046	0.00131	0.00343	0.0077	0.00047
		By Fuel	0.00019	0.00028	0.00384	0.0004	0.00046
		All to INEL	0.00024	0.00054	0.00278	0.0022	0.00107
		All to SRS	0.00019	0.00028	0.00384	0.0004	0.00046
	ORR	Geographic	0.00014	0.00036	0.00270	0.0014	0.00022
		By Fuel	0.00010	0.00019	0.00270	0.0002	0.00022
		All to INEL	0.00041	0.00117	0.00253	0.0064	0.00087
		All to SRS	0.00010	0.00019	0.00270	0.0002	0.00022

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-34 Tabulation of Overland Transportation Risks: Accept Target Material Only, All Shipments via Truck, Lower Bound Risk Factors, Risk Increases over that of the Basic Implementation

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.00021	0.00060	0.00013	0.0039	0.00068
1992/1993 Planning Basis	INEL/SRS		0.00021	0.00060	0.00013	0.0039	0.00068
Regionalization by Fuel Type	INEL/SRS		0.00022	0.00062	0.00014	0.0040	0.00070
Regionalization by Geography	INEL/SRS		0.00021	0.00060	0.00013	0.0039	0.00068
	INEL/ORR	Geographic	0.00028	0.00078	0.00025	0.0050	0.00095
		By Fuel	0.00029	0.00081	0.00026	0.0052	0.00098
		All to INEL	0.00041	0.00126	0.00058	0.0064	0.00341
	NTS/SRS	Geographic	0.00022	0.00060	0.00014	0.0039	0.00069
		By Fuel	0.00022	0.00062	0.00014	0.0040	0.00070
		All to SRS	0.00022	0.00062	0.00014	0.0040	0.00070
	NTS/ORR	Geographic	0.00029	0.00079	0.00026	0.0050	0.00096
		By Fuel	0.00029	0.00081	0.00026	0.0052	0.00098
		All to INEL	0.00053	0.00163	0.00093	0.0083	0.00358
		All to SRS	0.00029	0.00081	0.00026	0.0052	0.00098
	HS/SRS	Geographic	0.00022	0.00060	0.00013	0.0039	0.00069
		By Fuel	0.00022	0.00062	0.00014	0.0040	0.00070
		All to SRS	0.00022	0.00062	0.00014	0.0040	0.00070
	HS/ORR	Geographic	0.00029	0.00079	0.00025	0.0050	0.00096
		By Fuel	0.00029	0.00081	0.00026	0.0052	0.00098
		All to INEL	0.00050	0.00156	0.00067	0.0077	0.00356
		All to SRS	0.00029	0.00081	0.00026	0.0052	0.00098
Centralization	INEL		0.00048	0.00147	0.00072	0.0073	0.00426
	SRS		0.00022	0.00062	0.00014	0.0040	0.00070
	HS	Geographic	0.00071	0.00219	0.00085	0.0127	0.00369
		By Fuel	0.00073	0.00224	0.00087	0.0130	0.00375
		All to INEL	0.00058	0.00183	0.00084	0.0089	0.00443
		All to SRS	0.00073	0.00224	0.00087	0.0130	0.00375
	NTS	Geographic	0.00066	0.00197	0.00093	0.0125	0.00362
		By Fuel	0.00068	0.00201	0.00094	0.0128	0.00369
		All to INEL	0.00060	0.00188	0.00111	0.0095	0.00442
		All to SRS	0.00068	0.00201	0.00094	0.0128	0.00369
	ORR	Geographic	0.00029	0.00080	0.00026	0.0051	0.00100
		By Fuel	0.00029	0.00081	0.00026	0.0052	0.00098
		All to INEL	0.00072	0.00227	0.00093	0.0126	0.00528
		All to SRS	0.00029	0.00081	0.00026	0.0052	0.00098

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-35 Tabulation of Overland Transportation Risks: Accept Target Material Only, Shipments from Ports via Truck, Intersite via Rail, Lower Bound Risk Factors, Risk Increases over that of the Basic Implementation

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization by Geography	INEL/SRS						
	INEL/ORR	Geographic	0.00024	0.00061	0.00023	0.0038	0.00071
		By Fuel	0.00025	0.00063	0.00024	0.0039	0.00073
		All to INEL	0.00041	0.00126	0.00058	0.0064	0.00341
	NTS/SRS	Geographic	0.00022	0.00060	0.00014	0.0039	0.00068
		By Fuel	0.00022	0.00062	0.00014	0.0040	0.00070
		All to SRS	0.00022	0.00062	0.00014	0.0040	0.00070
	NTS/ORR	Geographic	0.00025	0.00061	0.00024	0.0038	0.00071
		By Fuel	0.00025	0.00063	0.00024	0.0039	0.00073
		All to INEL	0.00046	0.00129	0.00075	0.0065	0.00343
		All to SRS	0.00025	0.00063	0.00024	0.0039	0.00073
	HS/SRS	Geographic	0.00022	0.00060	0.00014	0.0039	0.00068
		By Fuel	0.00022	0.00062	0.00014	0.0040	0.00070
		All to SRS	0.00022	0.00062	0.00014	0.0040	0.00070
	HS/ORR	Geographic	0.00025	0.00061	0.00024	0.0038	0.00071
		By Fuel	0.00025	0.00063	0.00024	0.0039	0.00073
		All to INEL	0.00045	0.00129	0.00075	0.0064	0.00344
		All to SRS	0.00025	0.00063	0.00024	0.0039	0.00073
Centralization	INEL						
	SRS						
	HS	Geographic	0.00040	0.00096	0.00124	0.0052	0.00194
		By Fuel	0.00041	0.00098	0.00127	0.0053	0.00197
		All to INEL	0.00053	0.00156	0.00091	0.0076	0.00432
		All to SRS	0.00041	0.00098	0.00127	0.0053	0.00197
	NTS	Geographic	0.00039	0.00092	0.00129	0.0052	0.00188
		By Fuel	0.00040	0.00095	0.00131	0.0054	0.00190
		All to INEL	0.00053	0.00154	0.00093	0.0077	0.00426
		All to SRS	0.00040	0.00095	0.00131	0.0054	0.00190
	ORR	Geographic	0.00025	0.00061	0.00025	0.0038	0.00072
		By Fuel	0.00025	0.00063	0.00024	0.0039	0.00073
		All to INEL	0.00049	0.00132	0.00113	0.0066	0.00376
		All to SRS	0.00025	0.00063	0.00024	0.0039	0.00073

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-36 Tabulation of Overland Transportation Risks: Accept Target Material Only, All Shipments via Rail, Lower Bound Risk Factors, Risk Increases over that of the Basic Implementation

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-logical
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.00007	0.00018	0.00289	0.0001	0.00023
1992/1993 Planning Basis	INEL/SRS		0.00007	0.00018	0.00289	0.0001	0.00023
Regionalization by Fuel Type	INEL/SRS		0.00007	0.00018	0.00292	0.0001	0.00023
Regionalization	INEL/SRS		0.00007	0.00018	0.00289	0.0001	0.00023
by	INEL/ORR	Geographic	0.00010	0.00019	0.00264	0.0002	0.00023
Geography		By Fuel	0.00010	0.00019	0.00267	0.0002	0.00024
		All to INEL	0.00010	0.00015	0.00210	0.0002	0.00080
	NTS/SRS	Geographic	0.00007	0.00018	0.00289	0.0001	0.00023
		By Fuel	0.00007	0.00018	0.00292	0.0001	0.00023
		All to SRS	0.00007	0.00018	0.00292	0.0001	0.00023
	NTS/ORR	Geographic	0.00014	0.00036	0.00267	0.0014	0.00048
		By Fuel	0.00010	0.00019	0.00267	0.0002	0.00024
		All to INEL	0.00022	0.00052	0.00245	0.0022	0.00097
		All to SRS	0.00010	0.00019	0.00267	0.0002	0.00024
	HS/SRS	Geographic	0.00007	0.00018	0.00289	0.0001	0.00023
		By Fuel	0.00007	0.00018	0.00292	0.0001	0.00023
		All to SRS	0.00007	0.00018	0.00292	0.0001	0.00023
	HS/ORR	Geographic	0.00014	0.00036	0.00267	0.0014	0.00048
		By Fuel	0.00010	0.00019	0.00267	0.0002	0.00024
		All to INEL	0.00019	0.00045	0.00219	0.0016	0.00095
		All to SRS	0.00010	0.00019	0.00267	0.0002	0.00024
Centralization	INEL		0.00011	0.00017	0.00231	0.0003	0.00100
	SRS		0.00007	0.00018	0.00292	0.0001	0.00023
	HS	Geographic	0.00050	0.00150	0.00333	0.0080	0.00255
		By Fuel	0.00020	0.00028	0.00377	0.0005	0.00082
		All to INEL	0.00020	0.00046	0.00243	0.0016	0.00116
		All to SRS	0.00020	0.00028	0.00377	0.0005	0.00082
	NTS	Geographic	0.00046	0.00131	0.00339	0.0077	0.00251
		By Fuel	0.00019	0.00027	0.00380	0.0004	0.00079
		All to INEL	0.00023	0.00054	0.00269	0.0022	0.00117
		All to SRS	0.00019	0.00027	0.00380	0.0004	0.00079
	ORR	Geographic	0.00014	0.00036	0.00267	0.0014	0.00049
		By Fuel	0.00010	0.00019	0.00267	0.0002	0.00024
		All to INEL	0.00041	0.00116	0.00245	0.0064	0.00266
		All to SRS	0.00010	0.00019	0.00267	0.0002	0.00024

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-37 Tabulation of Overland Transportation Risks: Accept Target Material Only, All Shipments via Truck, Upper Bound Risk Factors, Risk Increases over that of the Basic Implementation

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.00024	0.00066	0.00019	0.0042	0.00074
1992/1993 Planning Basis	INEL/SRS		0.00024	0.00066	0.00019	0.0042	0.00074
Regionalization by Fuel Type	INEL/SRS		0.00024	0.00068	0.00021	0.0044	0.00080
Regionalization by Geography	INEL/SRS		0.00024	0.00066	0.00019	0.0042	0.00074
	INEL/ORR	Geographic	0.00030	0.00084	0.00030	0.0053	0.00100
		By Fuel	0.00031	0.00086	0.00033	0.0055	0.00107
		All to INEL	0.00043	0.00131	0.00062	0.0067	0.00355
	NTS/SRS	Geographic	0.00024	0.00066	0.00019	0.0043	0.00074
		By Fuel	0.00024	0.00068	0.00021	0.0044	0.00080
		All to SRS	0.00024	0.00068	0.00021	0.0044	0.00080
	NTS/ORR	Geographic	0.00031	0.00084	0.00031	0.0054	0.00101
		By Fuel	0.00031	0.00086	0.00033	0.0055	0.00107
		All to INEL	0.00054	0.00167	0.00098	0.0086	0.00372
		All to SRS	0.00031	0.00086	0.00033	0.0055	0.00107
	HS/SRS	Geographic	0.00024	0.00066	0.00019	0.0042	0.00074
		By Fuel	0.00024	0.00068	0.00021	0.0044	0.00080
		All to SRS	0.00024	0.00068	0.00021	0.0044	0.00080
	HS/ORR	Geographic	0.00031	0.00084	0.00031	0.0054	0.00101
		By Fuel	0.00031	0.00086	0.00033	0.0055	0.00107
		All to INEL	0.00051	0.00160	0.00072	0.0081	0.00370
		All to SRS	0.00031	0.00086	0.00033	0.0055	0.00107
Centralization	INEL		0.00049	0.00152	0.00077	0.0076	0.00442
	SRS		0.00024	0.00068	0.00021	0.0044	0.00080
	HS	Geographic	0.00073	0.00224	0.00091	0.0131	0.00376
		By Fuel	0.00074	0.00229	0.00094	0.0134	0.00387
		All to INEL	0.00059	0.00187	0.00088	0.0093	0.00459
		All to SRS	0.00074	0.00229	0.00094	0.0134	0.00387
	NTS	Geographic	0.00068	0.00203	0.00098	0.0129	0.00371
		By Fuel	0.00070	0.00207	0.00101	0.0131	0.00381
		All to INEL	0.00062	0.00192	0.00116	0.0099	0.00459
		All to SRS	0.00070	0.00207	0.00101	0.0131	0.00381
	ORR	Geographic	0.00031	0.00086	0.00031	0.0055	0.00105
		By Fuel	0.00031	0.00086	0.00033	0.0055	0.00107
		All to INEL	0.00074	0.00231	0.00098	0.0129	0.00541
		All to SRS	0.00031	0.00086	0.00033	0.0055	0.00107

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-38 Tabulation of Overland Transportation Risks: Accept Target Material Only, Shipments from Ports via Truck, Intersite Shipments via Rail, Upper Bound Risk Factors, Risk Increases over that of the Basic Implementation

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-
			Crew	Public	Emis.	Traffic	logical
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization	INEL/SRS						
by	INEL/ORR	Geographic	0.00026	0.00067	0.00028	0.0041	0.00076
Geography		By Fuel	0.00027	0.00069	0.00031	0.0043	0.00082
		All to INEL	0.00043	0.00131	0.00062	0.0067	0.00355
	NTS/SRS	Geographic	0.00024	0.00066	0.00019	0.0042	0.00074
		By Fuel	0.00024	0.00068	0.00021	0.0044	0.00080
		All to SRS	0.00024	0.00068	0.00021	0.0044	0.00080
	NTS/ORR	Geographic	0.00027	0.00067	0.00029	0.0041	0.00076
		By Fuel	0.00027	0.00069	0.00031	0.0043	0.00082
		All to INEL	0.00047	0.00133	0.00080	0.0068	0.00357
		All to SRS	0.00027	0.00069	0.00031	0.0043	0.00082
	HS/SRS	Geographic	0.00024	0.00066	0.00019	0.0042	0.00074
		By Fuel	0.00024	0.00068	0.00021	0.0044	0.00080
		All to SRS	0.00024	0.00068	0.00021	0.0044	0.00080
	HS/ORR	Geographic	0.00027	0.00067	0.00029	0.0041	0.00076
		By Fuel	0.00027	0.00069	0.00031	0.0043	0.00082
		All to INEL	0.00047	0.00133	0.00080	0.0068	0.00358
		All to SRS	0.00027	0.00069	0.00031	0.0043	0.00082
Centralization	INEL						
	SRS						
	HS	Geographic	0.00042	0.00101	0.00129	0.0055	0.00201
		By Fuel	0.00043	0.00104	0.00133	0.0057	0.00208
		All to INEL	0.00055	0.00160	0.00096	0.0080	0.00448
		All to SRS	0.00043	0.00104	0.00133	0.0057	0.00208
	NTS	Geographic	0.00041	0.00098	0.00134	0.0056	0.00196
		By Fuel	0.00042	0.00100	0.00138	0.0058	0.00203
		All to INEL	0.00054	0.00158	0.00098	0.0081	0.00444
		All to SRS	0.00042	0.00100	0.00138	0.0058	0.00203
	ORR	Geographic	0.00027	0.00067	0.00030	0.0041	0.00077
		By Fuel	0.00027	0.00069	0.00031	0.0043	0.00082
		All to INEL	0.00051	0.00137	0.00118	0.0069	0.00390
		All to SRS	0.00027	0.00069	0.00031	0.0043	0.00082

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-39 Tabulation of Overland Transportation Risks: Accept Target Material Only, All Shipments via Rail, Upper Bound Risk Factors, Risk Increases over that of the Basic Implementation

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS	[redacted]	0.00008	0.00019	0.00301	0.0002	0.00025
1992/1993 Planning Basis	INEL/SRS	[redacted]	0.00008	0.00019	0.00301	0.0002	0.00025
Regionalization by Fuel Type	INEL/SRS	[redacted]	0.00008	0.00019	0.00305	0.0002	0.00026
Regionalization	INEL/SRS	[redacted]	0.00008	0.00019	0.00301	0.0002	0.00025
by	INEL/ORR	Geographic	0.00010	0.00019	0.00276	0.0002	0.00025
Geography		By Fuel	0.00011	0.00020	0.00280	0.0002	0.00026
		All to INEL	0.00010	0.00016	0.00242	0.0002	0.00089
	NTS/SRS	Geographic	0.00008	0.00019	0.00302	0.0002	0.00025
		By Fuel	0.00008	0.00019	0.00305	0.0002	0.00026
		All to SRS	0.00008	0.00019	0.00305	0.0002	0.00026
	NTS/ORR	Geographic	0.00015	0.00037	0.00278	0.0014	0.00050
		By Fuel	0.00011	0.00020	0.00280	0.0002	0.00026
		All to INEL	0.00022	0.00053	0.00278	0.0022	0.00106
		All to SRS	0.00011	0.00020	0.00280	0.0002	0.00026
	HS/SRS	Geographic	0.00008	0.00019	0.00302	0.0002	0.00025
		By Fuel	0.00008	0.00019	0.00305	0.0002	0.00026
		All to SRS	0.00008	0.00019	0.00305	0.0002	0.00026
	HS/ORR	Geographic	0.00015	0.00037	0.00278	0.0014	0.00050
		By Fuel	0.00011	0.00020	0.00280	0.0002	0.00026
		All to INEL	0.00019	0.00045	0.00252	0.0016	0.00104
		All to SRS	0.00011	0.00020	0.00280	0.0002	0.00026
Centralization	INEL	[redacted]	0.00012	0.00018	0.00268	0.0003	0.00111
	SRS		0.00008	0.00019	0.00305	0.0002	0.00026
	HS	Geographic	0.00051	0.00151	0.00352	0.0080	0.00258
		By Fuel	0.00020	0.00029	0.00396	0.0005	0.00086
		All to INEL	0.00021	0.00047	0.00282	0.0016	0.00127
		All to SRS	0.00020	0.00029	0.00396	0.0005	0.00086
	NTS	Geographic	0.00046	0.00132	0.00354	0.0077	0.00255
		By Fuel	0.00019	0.00028	0.00396	0.0005	0.00082
		All to INEL	0.00024	0.00055	0.00306	0.0022	0.00128
		All to SRS	0.00019	0.00028	0.00396	0.0005	0.00082
	ORR	Geographic	0.00015	0.00037	0.00279	0.0014	0.00050
		By Fuel	0.00011	0.00020	0.00280	0.0002	0.00026
		All to INEL	0.00041	0.00117	0.00278	0.0064	0.00275
		All to SRS	0.00011	0.00020	0.00280	0.0002	0.00026

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-40 Potential Consequences for the Most Severe Accidents Involving Shipments of Target Material[a,b]

Mode and Accident Location	Neutral Conditions[c]				Stable Conditions[d]			
	Population[e]		MEI[f]		Population[e]		MEI[f]	
	Dose (person-rem)	Consequences (LCF)	Dose (rem)	Consequences (LCF)	Dose (person-rem)	Consequences (LCF)	Dose (person-rem)	Consequences (LCF)
Truck:								
Urban	206	0.1	0.15	0.000074	1650	0.83	0.50	0.00025
Suburban	38.3	0.019	0.15	0.000074	307	0.15	0.50	0.00025
Rural	0.70	0.00035	0.15	0.000074	5.5	0.0028	0.50	0.00025
Rail:								
Urban	206	0.1	0.15	0.000074	1650	0.83	0.50	0.00025
Suburban	38.3	0.19	0.15	0.000074	307	0.15	0.50	0.00025
Rural	0.70	0.00035	0.15	0.000074	5.5	0.0028	0.50	0.00025

[a] *The most severe accidents correspond to modal study accident severity category 6 (DOE, 1994b).*

[b] *Buoyant plume rise resulting from fire for a severe accident was included in the exposure model.*

[c] *Neutral weather conditions result in moderate dispersion and dilution of the release plume. Neutral conditions were taken to be Pasquill stability Class D with a wind speed of 4 m per sec (9 mph). Neutral conditions occur approximately 50 percent of the time in the United States.*

[d] *Stable weather conditions result in minimal dispersion and dilution of the release plume and are thus unfavorable. Stable conditions were taken to be Pasquill stability Class F with a wind speed of 1 m per sec (2.2 mph). Stable conditions occur approximately one-third of the time in the United States.*

[e] *Populations extend at a uniform population density to a radius of 80 km (50 mi) from the accident site. Population exposure pathways include acute inhalation, acute cloudshine, groundshine, resuspended inhalation, resuspended cloudshine, and ingestion of food, including initially contaminated food (rural only). No decontamination or mitigative actions are taken.*

[f] *The MEI is assumed to be at the location of maximum exposure. The locations of maximum exposure would be 160 m (528 ft) and 400 m (1,320 ft) from the accident site under neutral and stable atmospheric conditions, respectively. Individual exposure pathways include acute inhalation, acute cloudshine, and groundshine during passage of the plume. No ingested dose is considered.*

E.8.5 Implementation Alternative - Implementing an Acceptance Policy for Varying Durations - Indefinite HEU Acceptance

Since most LEU would come back within 10 years and spent nuclear fuel produced from the indefinite operation of HEU reactors is difficult to predict, it is reasonable to assume that the analysis for the basic implementation applies closely.

E.8.6 Implementation Alternative - Implementing an Acceptance Policy with Varying Financial Approaches

None of the financial approaches would have a significant effect on overland transportation. The effects calculated for the basic implementation adequately model this strategy.

Table E-41 Tabulation of Overland Transportation Risks: Five-Year Spent Nuclear Fuel Acceptance Only, All Shipments via Truck, Average Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.015	0.045	0.002	0.028	0.000013
1992/1993 Planning Basis	INEL/SRS		0.015	0.045	0.002	0.028	0.000013
Regionalization by Fuel Type	INEL/SRS		0.030	0.093	0.004	0.056	0.000032
Regionalization by Geography	INEL/SRS		0.015	0.045	0.002	0.028	0.000013
	INEL/ORR	Geographic	0.017	0.051	0.002	0.032	0.000046
		By Fuel	0.032	0.099	0.005	0.060	0.000066
		All to INEL	0.050	0.157	0.008	0.090	0.000055
	NTS/SRS	Geographic	0.016	0.049	0.002	0.030	0.000022
		By Fuel	0.031	0.096	0.005	0.058	0.000041
		All to SRS	0.027	0.082	0.004	0.050	0.000029
	NTS/ORR	Geographic	0.018	0.055	0.003	0.034	0.000055
		By Fuel	0.033	0.102	0.005	0.062	0.000074
		All to INEL	0.054	0.171	0.009	0.097	0.000092
		All to SRS	0.030	0.090	0.005	0.055	0.000072
	HS/SRS	Geographic	0.016	0.048	0.002	0.030	0.000016
		By Fuel	0.031	0.095	0.005	0.057	0.000035
		All to SRS	0.027	0.082	0.004	0.050	0.000029
	HS/ORR	Geographic	0.018	0.054	0.002	0.033	0.000049
		By Fuel	0.033	0.101	0.005	0.061	0.000068
		All to INEL	0.053	0.168	0.008	0.095	0.000065
		All to SRS	0.030	0.090	0.005	0.055	0.000072
Centralization	INEL		0.050	0.157	0.008	0.090	0.000055
	SRS		0.027	0.082	0.004	0.050	0.000029
	HS	Geographic	0.029	0.088	0.004	0.053	0.000133
		By Fuel	0.044	0.136	0.006	0.081	0.000153
		All to INEL	0.053	0.168	0.008	0.095	0.000065
		All to SRS	0.044	0.134	0.006	0.081	0.000183
	NTS	Geographic	0.028	0.083	0.004	0.053	0.000152
		By Fuel	0.043	0.130	0.007	0.081	0.000172
		All to INEL	0.054	0.171	0.009	0.097	0.000092
		All to SRS	0.042	0.127	0.006	0.080	0.000199
	ORR	Geographic	0.020	0.060	0.003	0.038	0.000071
		By Fuel	0.035	0.108	0.005	0.065	0.000090
		All to INEL	0.061	0.195	0.009	0.114	0.000162
		All to SRS	0.030	0.090	0.005	0.055	0.000072

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-42 Tabulation of Overland Transportation Risks: Five-Year Spent Nuclear Fuel Acceptance Only, Shipments from Ports via Truck, Intersite Shipments via Rail, Average Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radio-
			Crew	Public	Emis.	Traffic	logical
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization	INEL/SRS						
by	INEL/ORR	Geographic	0.016	0.046	0.002	0.028	0.000017
Geography		By Fuel	0.031	0.093	0.005	0.056	0.000036
		All to INEL	0.050	0.157	0.008	0.090	0.000055
	NTS/SRS	Geographic	0.015	0.046	0.002	0.028	0.000014
		By Fuel	0.030	0.093	0.004	0.056	0.000033
		All to SRS	0.027	0.082	0.004	0.050	0.000029
	NTS/ORR	Geographic	0.016	0.046	0.002	0.028	0.000017
		By Fuel	0.031	0.093	0.005	0.056	0.000037
		All to INEL	0.050	0.157	0.008	0.090	0.000058
		All to SRS	0.028	0.083	0.004	0.050	0.000033
	HS/SRS	Geographic	0.015	0.046	0.002	0.028	0.000014
		By Fuel	0.030	0.093	0.004	0.056	0.000033
		All to SRS	0.027	0.082	0.004	0.050	0.000029
	HS/ORR	Geographic	0.016	0.046	0.002	0.028	0.000018
		By Fuel	0.031	0.093	0.005	0.056	0.000037
		All to INEL	0.050	0.157	0.008	0.090	0.000059
		All to SRS	0.028	0.083	0.004	0.050	0.000033
Centralization	INEL						
	SRS						
	HS	Geographic	0.017	0.047	0.003	0.029	0.000039
		By Fuel	0.032	0.094	0.006	0.057	0.000058
		All to INEL	0.050	0.157	0.008	0.090	0.000059
		All to SRS	0.029	0.084	0.006	0.050	0.000061
	NTS	Geographic	0.017	0.047	0.003	0.029	0.000037
		By Fuel	0.032	0.094	0.006	0.056	0.000057
		All to INEL	0.050	0.157	0.008	0.090	0.000058
		All to SRS	0.029	0.084	0.006	0.050	0.000060
	ORR	Geographic	0.016	0.046	0.002	0.028	0.000022
		By Fuel	0.031	0.093	0.005	0.056	0.000041
		All to INEL	0.051	0.158	0.008	0.090	0.000076
		All to SRS	0.028	0.083	0.004	0.050	0.000033

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-43 Tabulation of Overland Transportation Risks: Five-Year Spent Nuclear Fuel Acceptance Only, All Shipments via Rail, Average Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.006	0.007	0.009	0.001	0.000005
1992/1993 Planning Basis	INEL/SRS		0.006	0.007	0.009	0.001	0.000005
Regionalization by Fuel Type	INEL/SRS		0.009	0.011	0.015	0.002	0.000010
Regionalization by Geography	INEL/SRS		0.006	0.007	0.009	0.001	0.000005
	INEL/ORR	Geographic	0.007	0.007	0.009	0.001	0.000008
		By Fuel	0.010	0.012	0.015	0.002	0.000013
		All to INEL	0.013	0.013	0.018	0.003	0.000013
	NTS/SRS	Geographic	0.006	0.007	0.009	0.001	0.000006
		By Fuel	0.009	0.011	0.015	0.002	0.000011
		All to SRS	0.009	0.011	0.014	0.002	0.000010
	NTS/ORR	Geographic	0.009	0.013	0.009	0.005	0.000039
		By Fuel	0.011	0.015	0.015	0.004	0.000022
		All to INEL	0.017	0.027	0.020	0.010	0.000050
		All to SRS	0.009	0.011	0.014	0.002	0.000014
	HS/SRS	Geographic	0.006	0.007	0.009	0.001	0.000006
		By Fuel	0.009	0.011	0.015	0.002	0.000011
		All to SRS	0.009	0.011	0.014	0.002	0.000010
	HS/ORR	Geographic	0.009	0.013	0.009	0.005	0.000039
		By Fuel	0.010	0.014	0.015	0.003	0.000016
		All to INEL	0.016	0.025	0.019	0.008	0.000023
		All to SRS	0.009	0.011	0.014	0.002	0.000014
Centralization	INEL		0.013	0.013	0.018	0.003	0.000013
	SRS		0.009	0.011	0.014	0.002	0.000010
	HS	Geographic	0.019	0.047	0.010	0.024	0.000124
		By Fuel	0.011	0.015	0.016	0.003	0.000037
		All to INEL	0.016	0.025	0.019	0.008	0.000023
		All to SRS	0.010	0.013	0.015	0.002	0.000042
	NTS	Geographic	0.018	0.041	0.010	0.024	0.000136
		By Fuel	0.012	0.016	0.016	0.004	0.000042
		All to INEL	0.017	0.027	0.020	0.010	0.000050
		All to SRS	0.010	0.012	0.015	0.002	0.000040
	ORR	Geographic	0.009	0.013	0.009	0.005	0.000043
		By Fuel	0.012	0.020	0.015	0.007	0.000038
		All to INEL	0.025	0.052	0.020	0.027	0.000120
		All to SRS	0.009	0.011	0.014	0.002	0.000014

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-44 Tabulation of Overland Transportation Risks: Five-Year Spent Nuclear Fuel Acceptance Only, All Shipments via Truck, Lower Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.011	0.033	0.001	0.019	0.000005
1992/1993 Planning Basis	INEL/SRS		0.011	0.033	0.001	0.019	0.000005
Regionalization by Fuel Type	INEL/SRS		0.025	0.078	0.003	0.044	0.000010
Regionalization by Geography	INEL/SRS		0.011	0.033	0.001	0.019	0.000005
	INEL/ORR	Geographic	0.013	0.039	0.001	0.023	0.000038
		By Fuel	0.027	0.084	0.003	0.048	0.000043
		All to INEL	0.041	0.131	0.006	0.073	0.000018
	NTS/SRS	Geographic	0.012	0.036	0.001	0.021	0.000014
		By Fuel	0.026	0.081	0.003	0.046	0.000019
		All to SRS	0.023	0.071	0.002	0.039	0.000010
	NTS/ORR	Geographic	0.014	0.042	0.002	0.025	0.000047
		By Fuel	0.029	0.087	0.003	0.049	0.000052
		All to INEL	0.046	0.145	0.007	0.081	0.000055
		All to SRS	0.026	0.079	0.003	0.044	0.000053
	HS/SRS	Geographic	0.012	0.035	0.001	0.021	0.000008
		By Fuel	0.026	0.081	0.003	0.045	0.000013
		All to SRS	0.023	0.071	0.002	0.039	0.000010
	HS/ORR	Geographic	0.014	0.041	0.001	0.025	0.000041
		By Fuel	0.028	0.087	0.003	0.049	0.000046
		All to INEL	0.045	0.143	0.006	0.078	0.000028
		All to SRS	0.026	0.079	0.003	0.044	0.000053
Centralization	INEL		0.041	0.131	0.006	0.073	0.000018
	SRS		0.023	0.071	0.002	0.039	0.000010
	HS	Geographic	0.024	0.075	0.003	0.044	0.000125
		By Fuel	0.039	0.121	0.004	0.069	0.000131
		All to INEL	0.045	0.143	0.006	0.078	0.000028
		All to SRS	0.040	0.123	0.004	0.070	0.000164
	NTS	Geographic	0.023	0.070	0.003	0.044	0.000144
		By Fuel	0.038	0.116	0.005	0.068	0.000149
		All to INEL	0.046	0.145	0.007	0.081	0.000055
		All to SRS	0.038	0.115	0.005	0.068	0.000180
	ORR	Geographic	0.016	0.048	0.002	0.029	0.000064
		By Fuel	0.030	0.093	0.003	0.053	0.000068
		All to INEL	0.053	0.170	0.007	0.097	0.000125
		All to SRS	0.026	0.079	0.003	0.044	0.000053

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-45 Tabulation of Overland Transportation Risks: Five-Year Spent Nuclear Fuel Acceptance Only, All Shipments from Ports via Truck, Intersite Shipments via Rail, Lower Bound Risk Factors

Alternative / Option			Routine			Accidental	
			Radiological		Nonradiological		Radio-
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Crew	Public	Emis.	Traffic	logical
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization by Geography	INEL/SRS						
	INEL/ORR	Geographic	0.011	0.033	0.001	0.020	0.000009
		By Fuel	0.026	0.078	0.003	0.044	0.000014
		All to INEL	0.041	0.131	0.006	0.073	0.000018
	NTS/SRS	Geographic	0.011	0.033	0.001	0.020	0.000006
		By Fuel	0.025	0.078	0.003	0.044	0.000011
		All to SRS	0.023	0.071	0.002	0.039	0.000010
	NTS/ORR	Geographic	0.011	0.033	0.001	0.020	0.000009
		By Fuel	0.026	0.078	0.003	0.044	0.000014
		All to INEL	0.042	0.132	0.006	0.073	0.000021
		All to SRS	0.024	0.071	0.002	0.039	0.000014
	HS/SRS	Geographic	0.011	0.033	0.001	0.020	0.000006
		By Fuel	0.025	0.078	0.003	0.044	0.000011
		All to SRS	0.023	0.071	0.002	0.039	0.000010
	HS/ORR	Geographic	0.011	0.033	0.001	0.020	0.000010
		By Fuel	0.026	0.078	0.003	0.044	0.000015
		All to INEL	0.042	0.132	0.006	0.073	0.000022
		All to SRS	0.024	0.071	0.002	0.039	0.000014
Centralization	INEL						
	SRS						
	HS	Geographic	0.012	0.034	0.002	0.020	0.000031
		By Fuel	0.027	0.079	0.004	0.044	0.000036
		All to INEL	0.042	0.132	0.006	0.073	0.000022
		All to SRS	0.025	0.073	0.004	0.039	0.000042
	NTS	Geographic	0.012	0.034	0.002	0.020	0.000030
		By Fuel	0.027	0.079	0.004	0.044	0.000035
		All to INEL	0.042	0.132	0.006	0.073	0.000021
		All to SRS	0.025	0.072	0.004	0.039	0.000041
	ORR	Geographic	0.012	0.033	0.001	0.020	0.000014
		By Fuel	0.026	0.079	0.003	0.044	0.000019
		All to INEL	0.042	0.132	0.007	0.074	0.000039
		All to SRS	0.024	0.071	0.002	0.039	0.000014

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-46 Tabulation of Overland Transportation Risks: Five-Year Spent Nuclear Fuel Acceptance Only, All Shipments via Rail, Lower Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.005	0.005	0.006	0.001	0.000003
1992/1993 Planning Basis	INEL/SRS		0.005	0.005	0.006	0.001	0.000003
Regionalization by Fuel Type	INEL/SRS		0.008	0.009	0.011	0.001	0.000004
Regionalization	INEL/SRS		0.005	0.005	0.006	0.001	0.000003
by	INEL/ORR	Geographic	0.006	0.006	0.007	0.001	0.000006
Geography		By Fuel	0.008	0.009	0.011	0.002	0.000007
		All to INEL	0.011	0.009	0.012	0.002	0.000003
	NTS/SRS	Geographic	0.005	0.006	0.006	0.001	0.000004
		By Fuel	0.008	0.009	0.011	0.002	0.000004
		All to SRS	0.008	0.009	0.011	0.001	0.000004
	NTS/ORR	Geographic	0.007	0.011	0.007	0.004	0.000037
		By Fuel	0.009	0.012	0.012	0.003	0.000016
		All to INEL	0.015	0.023	0.013	0.010	0.000040
		All to SRS	0.008	0.009	0.011	0.001	0.000008
	HS/SRS	Geographic	0.005	0.006	0.006	0.001	0.000004
		By Fuel	0.008	0.009	0.011	0.002	0.000005
		All to SRS	0.008	0.009	0.011	0.001	0.000004
	HS/ORR	Geographic	0.007	0.011	0.007	0.004	0.000037
		By Fuel	0.009	0.012	0.011	0.003	0.000009
		All to INEL	0.014	0.020	0.012	0.008	0.000013
		All to SRS	0.008	0.009	0.011	0.001	0.000008
Centralization	INEL		0.011	0.009	0.012	0.002	0.000003
	SRS		0.008	0.009	0.011	0.001	0.000004
	HS	Geographic	0.018	0.045	0.008	0.024	0.000122
		By Fuel	0.010	0.013	0.012	0.003	0.000031
		All to INEL	0.014	0.020	0.012	0.008	0.000013
		All to SRS	0.009	0.011	0.012	0.002	0.000036
	NTS	Geographic	0.017	0.040	0.008	0.023	0.000133
		By Fuel	0.010	0.013	0.013	0.004	0.000036
		All to INEL	0.015	0.023	0.013	0.010	0.000040
		All to SRS	0.009	0.010	0.013	0.002	0.000035
	ORR	Geographic	0.008	0.011	0.007	0.004	0.000041
		By Fuel	0.011	0.018	0.012	0.007	0.000032
		All to INEL	0.023	0.048	0.013	0.026	0.000110
		All to SRS	0.008	0.009	0.011	0.001	0.000008

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-47 Tabulation of Overland Transportation Risks: Five-Year Spent Nuclear Fuel Acceptance Only, All Shipments via Truck, Upper Bound Risk Factors

Alternative / Option			Routine				Accidental
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.027	0.078	0.005	0.046	0.00006
1992/1993 Planning Basis	INEL/SRS		0.027	0.078	0.005	0.046	0.00006
Regionalization by Fuel Type	INEL/SRS		0.039	0.118	0.008	0.073	0.00009
Regionalization by Geography	INEL/SRS		0.027	0.078	0.005	0.046	0.00006
	INEL/ORR	Geographic	0.029	0.083	0.006	0.050	0.00009
		By Fuel	0.041	0.124	0.009	0.077	0.00012
		All to INEL	0.052	0.165	0.010	0.101	0.00011
	NTS/SRS	Geographic	0.028	0.081	0.006	0.048	0.00006
		By Fuel	0.040	0.121	0.009	0.075	0.00010
		All to SRS	0.038	0.113	0.008	0.068	0.00009
	NTS/ORR	Geographic	0.030	0.087	0.006	0.052	0.00010
		By Fuel	0.042	0.127	0.009	0.078	0.00013
		All to INEL	0.057	0.179	0.011	0.109	0.00015
		All to SRS	0.041	0.120	0.009	0.073	0.00013
	HS/SRS	Geographic	0.027	0.080	0.005	0.047	0.00006
		By Fuel	0.040	0.121	0.008	0.074	0.00009
		All to SRS	0.038	0.113	0.008	0.068	0.00009
	HS/ORR	Geographic	0.030	0.086	0.006	0.051	0.00009
		By Fuel	0.042	0.126	0.009	0.078	0.00013
		All to INEL	0.056	0.176	0.010	0.107	0.00012
		All to SRS	0.041	0.120	0.009	0.073	0.00013
Centralization	INEL		0.052	0.165	0.010	0.101	0.00011
	SRS		0.038	0.113	0.008	0.068	0.00009
	HS	Geographic	0.040	0.120	0.007	0.071	0.00018
		By Fuel	0.053	0.161	0.010	0.098	0.00021
		All to INEL	0.056	0.176	0.010	0.107	0.00012
		All to SRS	0.054	0.165	0.011	0.099	0.00024
	NTS	Geographic	0.039	0.115	0.007	0.071	0.00019
		By Fuel	0.052	0.156	0.010	0.097	0.00023
		All to INEL	0.057	0.179	0.011	0.109	0.00015
		All to SRS	0.053	0.157	0.011	0.098	0.00026
	ORR	Geographic	0.032	0.093	0.006	0.056	0.00011
		By Fuel	0.044	0.133	0.009	0.082	0.00015
		All to INEL	0.064	0.203	0.011	0.125	0.00022
		All to SRS	0.041	0.120	0.009	0.073	0.00013

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-48 Tabulation of Overland Transportation Risks: Five-Year Spent Nuclear Fuel Acceptance Only, All Shipments from Ports via Truck, Intersite Shipments via Rail, Upper Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS						
1992/1993 Planning Basis	INEL/SRS						
Regionalization by Fuel Type	INEL/SRS						
Regionalization by Geography	INEL/SRS						
	INEL/ORR	Geographic	0.027	0.078	0.005	0.046	0.00006
		By Fuel	0.040	0.118	0.008	0.073	0.00009
		All to INEL	0.052	0.165	0.010	0.101	0.00011
	NTS/SRS	Geographic	0.027	0.078	0.005	0.046	0.00006
		By Fuel	0.039	0.118	0.008	0.073	0.00009
		All to SRS	0.038	0.113	0.008	0.068	0.00009
	NTS/ORR	Geographic	0.027	0.078	0.005	0.046	0.00006
		By Fuel	0.040	0.118	0.008	0.073	0.00009
		All to INEL	0.053	0.165	0.010	0.102	0.00012
		All to SRS	0.038	0.113	0.009	0.069	0.00009
	HS/SRS	Geographic	0.027	0.078	0.005	0.046	0.00006
		By Fuel	0.039	0.118	0.008	0.073	0.00009
		All to SRS	0.038	0.113	0.008	0.068	0.00009
	HS/ORR	Geographic	0.027	0.078	0.005	0.046	0.00006
		By Fuel	0.040	0.118	0.008	0.073	0.00009
		All to INEL	0.053	0.165	0.010	0.102	0.00012
		All to SRS	0.038	0.113	0.009	0.069	0.00009
Centralization	INEL						
	SRS						
	HS	Geographic	0.028	0.079	0.006	0.047	0.00008
		By Fuel	0.041	0.119	0.009	0.073	0.00012
		All to INEL	0.053	0.165	0.010	0.102	0.00012
		All to SRS	0.040	0.114	0.010	0.069	0.00012
	NTS	Geographic	0.028	0.079	0.006	0.047	0.00008
		By Fuel	0.041	0.119	0.009	0.073	0.00011
		All to INEL	0.053	0.165	0.010	0.102	0.00012
		All to SRS	0.040	0.114	0.010	0.069	0.00012
	ORR	Geographic	0.027	0.078	0.006	0.046	0.00006
		By Fuel	0.040	0.118	0.009	0.073	0.00010
		All to INEL	0.054	0.165	0.011	0.102	0.00014
		All to SRS	0.038	0.113	0.009	0.069	0.00009

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

Table E-49 Tabulation of Overland Transportation Risks: Five-Year Spent Nuclear Fuel Acceptance Only, All Shipments via Rail, Upper Bound Risk Factors

Alternative / Option			Routine			Accidental	
Programmatic SNF & INEL EIS Alternative	SNF Site Option	Phase I Approach	Radiological		Nonradiological		Radiological
			Crew	Public	Emis.	Traffic	
Decentralization	INEL/SRS		0.008	0.012	0.016	0.002	0.00002
1992/1993 Planning Basis	INEL/SRS		0.008	0.012	0.016	0.002	0.00002
Regionalization by Fuel Type	INEL/SRS		0.011	0.016	0.026	0.002	0.00003
Regionalization by Geography	INEL/SRS		0.008	0.012	0.016	0.002	0.00002
	INEL/ORR	Geographic	0.009	0.013	0.016	0.002	0.00002
		By Fuel	0.011	0.016	0.026	0.002	0.00004
		All to INEL	0.013	0.016	0.039	0.003	0.00004
	NTS/SRS	Geographic	0.009	0.012	0.016	0.002	0.00002
		By Fuel	0.011	0.016	0.026	0.002	0.00003
		All to SRS	0.011	0.017	0.022	0.002	0.00003
	NTS/ORR	Geographic	0.011	0.018	0.016	0.005	0.00005
		By Fuel	0.012	0.020	0.026	0.004	0.00004
		All to INEL	0.018	0.030	0.041	0.011	0.00008
		All to SRS	0.011	0.017	0.022	0.002	0.00004
	HS/SRS	Geographic	0.008	0.012	0.016	0.002	0.00002
		By Fuel	0.011	0.016	0.026	0.002	0.00003
		All to SRS	0.011	0.017	0.022	0.002	0.00003
	HS/ORR	Geographic	0.011	0.018	0.016	0.005	0.00005
		By Fuel	0.012	0.019	0.026	0.004	0.00004
		All to INEL	0.017	0.027	0.040	0.008	0.00005
		All to SRS	0.011	0.017	0.022	0.002	0.00004
Centralization	INEL		0.013	0.016	0.039	0.003	0.00004
	SRS		0.011	0.017	0.022	0.002	0.00003
	HS	Geographic	0.021	0.052	0.017	0.025	0.00014
		By Fuel	0.013	0.020	0.027	0.004	0.00006
		All to INEL	0.017	0.027	0.040	0.008	0.00005
		All to SRS	0.012	0.018	0.023	0.003	0.00006
	NTS	Geographic	0.020	0.046	0.017	0.024	0.00015
		By Fuel	0.013	0.020	0.027	0.004	0.00007
		All to INEL	0.018	0.030	0.041	0.011	0.00008
		All to SRS	0.012	0.018	0.023	0.003	0.00006
	ORR	Geographic	0.011	0.018	0.016	0.005	0.00006
		By Fuel	0.014	0.025	0.026	0.008	0.00006
		All to INEL	0.025	0.055	0.041	0.027	0.00015
		All to SRS	0.011	0.017	0.022	0.002	0.00004

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

E.8.7 Implementation Alternative - Implementing an Acceptance Policy by Taking Title at Varying Locations

The agency that has title to the spent nuclear fuel has no significant effect on overland transportation. The effects calculated for the basic implementation apply here.

E.8.8 Implementation Alternative - Implementing an Acceptance Policy and Storing Underwater

The use of underwater storage would have only minor effects on the location to which foreign research reactor spent nuclear fuel were delivered on the DOE sites. However, since there is some degree of uncertainty in the exact delivery location on all the DOE sites and intrasite transportation would be less likely, the effects calculated for the basic implementation apply here.

E.8.9 Implementation Alternative - Implementing an Acceptance Policy and Near-Term Chemical Separation in the United States

The performance of conventional or alternative chemical separation is only considered feasible at the Idaho National Engineering Laboratory and Savannah River Site sites. The requirements for overland transportation are not affected by the activities at the sites. Therefore, the impacts calculated in Section E.7 for the options to transport fuel to Idaho National Engineering Laboratory and/or Savannah River Site under the Regionalization by Fuel Type or Centralization alternatives would apply to this section. They are shown in Table E-50.

Table E-50 Tabulation of Overland Transportation Risks: Chemical Separation in the United States

Alternative/Option			*Incident-free*				*Accidental*
			Radiological		*Nonradiological*		
Implementation	*Mode*	*Risk Factors*	*Crew*	*Public*	*Emis.*	*Traffic*	*Radiological*
Regionalization by Fuel Type	Truck	Upper	0.048	0.143	0.010	0.088	0.000109
		Nominal	0.036	0.112	0.005	0.067	0.000039
		Lower	0.030	0.093	0.003	0.052	0.000012
	Rail	Upper	0.013	0.020	0.031	0.003	0.000040
		Nominal	0.011	0.014	0.018	0.002	0.000012
		Lower	0.010	0.011	0.014	0.002	0.000005
Centralization to Idaho National Engineering Laboratory	Truck	Upper	0.065	0.205	0.012	0.126	0.000143
		Nominal	0.062	0.195	0.009	0.112	0.000069
		Lower	0.051	0.163	0.007	0.091	0.000023
	Rail	Upper	0.016	0.020	0.049	0.004	0.000053
		Nominal	0.016	0.016	0.023	0.004	0.000016
		Lower	0.013	0.011	0.015	0.003	0.000004
Centralization to Savannah River Site	Truck	Upper	0.046	0.137	0.010	0.083	0.000107
		Nominal	0.033	0.097	0.005	0.062	0.000035
		Lower	0.028	0.085	0.003	0.047	0.000012
	Rail	Upper	0.013	0.020	0.027	0.003	0.000038
		Nominal	0.011	0.013	0.017	0.002	0.000012
		Lower	0.009	0.011	0.013	0.002	0.000005

All risks are expressed in latent cancer fatalities during the foreign research reactor spent nuclear fuel policy, except for the Accidental - Traffic column, which is the number of fatalities during the policy.

Impacts of Incident-Free Ground Transport

The incident-free transportation of spent nuclear fuel was estimated to result in total latent fatalities that ranged from 0.020 to 0.27 over the entire duration of the program. These fatalities are the sum of the estimated number of radiation-related LCFs to the public and the crew.

The range of fatality estimates is caused by two factors: 1) the option of using truck or rail to transport spent nuclear fuel, and, 2) the difference between the risk factors for the port-to-site routes.

The estimated number of radiation-related LCFs for transportation workers ranged from 0.009 to 0.065. The estimated number of radiation-related LCFs for the general population ranged from 0.011 to 0.21, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.003 to 0.05.

Impacts of Accidents During Ground Transport

The cumulative transportation accident risks over the entire program are estimated to range from 0.000004 to 0.00014 LCFs from radiation and from 0.002 to 0.13 for traffic fatality, depending on the transportation mode and DOE sites selected. Both indicate an expectation of less than one fatality.

The impacts of overland transportation are shown in Table E-50. The analysis for this implementation alternative is analogous to the analysis performed for the basic implementation of Management Alternative 1 (see Section E.7.2), and the interpretation of the tables is the same as described in Section E.7.2.

The consequences of the most severe accident hypothesized are the same as described for the Basic Implementation since the material at risk is the same.

E.8.10 Developmental Processing Capabilities

The overland transportation impacts would be based on the site selected for processing, and would be determined after that site is selected.

E.8.11 Management Alternative - Adopt a Strategy of Managing Foreign Research Reactor Spent Nuclear Fuel Overseas: Store Overseas

There would be no overland transportation impacts in the United States if this alternative were implemented.

E.8.12 Policy Alternative - Adopt a Strategy of Managing Foreign Research Reactor Spent Nuclear Fuel Overseas: Process Overseas and Ship Vitrified High-Level Waste to the United States

The total amount of foreign research reactor spent nuclear fuel could be reduced into 16 vitrified waste logs, which could be carried in 8 casks. The contents of each cask is described isotopically in Table E-3. The curie content is based on the total number of curies expected to be returned to the United States under the basic implementation of Management Alternative 1. Realistically, the logs might have to be allowed to decay at the vitrification facility until the dose rate was below the regulatory-limit. Therefore, all incident-free calculations assume the dose rate is 10 mrem per hr at 2 m (6.6 ft).

This alternative is assumed to be independent of the SNF&INEL Final EIS (DOE, 1995) results. The only site considered for interim storage of vitrified high-level waste is the Savannah River Site. The only overseas facilities are in Europe, so all shipments are assumed to arrive on the east coast.

Impacts of Incident-Free Ground Transport

The incident-free transportation of spent nuclear fuel was estimated to result in total latent fatalities that ranged from 0.0002 to 0.004 over the entire duration of the program. These results are the sum of the estimated number of radiation-related LCFs to the public and the crews.

The range of fatality estimates is caused by the difference between the risk factors for the port-to-site routes.

The estimated number of radiation-related LCFs for transportation workers ranged from 0.00014 to 0.001. The estimated number of radiation-related LCFs for the general population ranged from 0.00009 to 0.003, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.0001 to 0.0005.

Impacts of Accidents During Ground Transport

The cumulative transportation accident risks over the entire program are estimated to range from 1.9×10^{-7} to 5.9×10^{-6} LCF from radiation and from 0.00003 to 0.002 for traffic fatality, depending on the transportation mode and DOE sites selected. Both indicate an expectation of less than one fatality.

The impacts of overland transportation are shown in Tables E-51 and E-52.

Table E-51 Tabulation of Ground Transportation Risks: Vitrified High-Level Waste Acceptance Only

Alternative/Option			*Incident-free*				*Accidental*
			Radiological		*Nonradiological*		
Implementation	*Mode*	*Risk Factors*	*Crew*	*Public*	*Emis.*	*Traffic*	*Radiological*
Ship directly to repository	Truck	Upper	0.00076	0.00240	0.00016	0.00162	5.9×10^{-6}
		Nominal	0.00072	0.00227	0.00013	0.00143	5.0×10^{-6}
		Lower	0.00053	0.00172	0.00010	0.00106	1.7×10^{-6}
	Rail	Upper	0.00020	0.00024	0.00052	0.00005	2.0×10^{-6}
		Nominal	0.00019	0.00019	0.00025	0.00005	1.2×10^{-6}
		Lower	0.00014	0.00009	0.00015	0.00003	1.9×10^{-7}
Ship to Savannah River Site, then to repository	Truck	Upper	0.00102	0.00302	0.00018	0.00196	1.0×10^{-5}
		Nominal	0.00083	0.00249	0.00013	0.00168	7.6×10^{-6}
		Lower	0.00076	0.00227	0.00011	0.00153	6.3×10^{-6}
	Rail	Upper	0.00029	0.00030	0.00035	0.00007	2.3×10^{-6}
		Nominal	0.00025	0.00021	0.00022	0.00006	1.3×10^{-6}
		Lower	0.00023	0.00018	0.00019	0.00005	9.7×10^{-7}

All risks are expressed in latent cancer fatalities during the foreign research reactor spent nuclear fuel policy, except for the Accidental - Traffic column, which is the number of fatalities during the policy.

E.8.13 Management Alternative - The Hybrid Alternative

The hybrid alternative is based on the SNF&INEL Final EIS (DOE, 1995) Regionalization by Fuel Type. The origin of shipment count is described in detail in Chapter 2 and Appendix B. The shipment count is:

	East Coast		*West Coast*		*Totals*
	Aluminum	*TRIGA*	*Aluminum*	*TRIGA*	
Phase 1	212	82	101	42	437
Phase 2	63	25	30	13	131
Total	**275**	**107**	**131**	**55**	**568**

Table E-52 Potential Consequences for the Most Severe Accidents Involving Shipments of Foreign Research Reactor High-Level Waste[a,b]

	Neutral Conditions[c]				Stable Conditions[d]			
	Population[e]		MEI[f]		Population[e]		MEI[f]	
Mode and Accident Location	Dose (person-rem)	Consequences (LCF)	Dose (rem)	Consequences (LCF)	Dose (person-rem)	Consequences (LCF)	Dose (rem)	Consequences (LCF)
Truck								
Urban	121	0.06	0.09	0.000044	970	0.48	0.29	0.00015
Suburban	22.5	0.01	0.09	0.000044	180	0.09	0.29	0.00015
Rural	0.4	0.0002	0.09	0.000044	3.2	0.002	0.29	0.00015
Rail								
Urban	121	0.06	0.09	0.000044	907	0.48	0.29	0.00015
Suburban	22.5	0.01	0.09	0.000044	180	0.09	0.29	0.00015
Rural	0.4	0.0002	0.09	0.000044	3.2	0.002	0.29	0.00015

[a] *The most severe accidents correspond to the highest NUREG-0170 accident severity category (category VIII) (NRC, 1977a). It was assumed that 0.000001 of the radioactive material would be released from its packaging and 5 percent of the aerosolized release would be respirable following an accident.*

[b] *Buoyant plume rise resulting from fire for a severe accident was included in the exposure model.*

[c] *Neutral weather conditions result in moderate dispersion and dilution of the release plume. Neutral conditions were taken to be Pasquill stability Class D with a wind speed of 4 m per sec (9 mph). Neutral conditions occur approximately 50 percent of the time in the United States.*

[d] *Stable weather conditions result in minimal dispersion and dilution of the release plume and are thus unfavorable. Stable conditions were taken to be Pasquill stability Class F with a wind speed of 1 m per sec (2.2 mph). Stable conditions occur approximately one-third of the time in the United States.*

[e] *Populations extend at a uniform density to a radius of 80 km (50 mi) from the accident site. Population exposure pathways include acute inhalation; acute cloudshine; groundshine; resuspended inhalation; resuspended cloudshine; and ingestion of food, including initially contaminated food (rural only). No decontamination or mitigative actions are taken.*

[f] *The MEI is assumed to be at the location of maximum exposure. The locations of maximum exposure would be 160 m (528 ft) and 400 m (1,320 ft) from the accident site under neutral and stable atmospheric conditions, respectively. Individual exposure pathways include acute inhalation, acute cloudshine, and groundshine during passage of the plume. No ingested dose is considered.*

No intersite shipment is necessary for this alternative. The risk estimates are summarized in Table E-53.

Impacts of Incident-Free Ground Transport

The incident-free transportation of spent nuclear fuel was estimated to result in total latent fatalities that ranged from 0.009 to 0.15 over the entire duration of the program. These fatalities are the sum of the estimated number of radiation-related LCFs to the public and the crew.

The range of fatality estimates is caused by two factors: 1) the option of using truck or rail to transport spent nuclear fuel, and, 2) the difference between the risk factors for the port-to-site routes.

The estimated number of radiation-related LCFs for transportation workers ranged from 0.008 to 0.037. The estimated number of radiation-related LCFs for the general population ranged from 0.01 to 0.11, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.003 to 0.025.

Table E-53 Tabulation of Overland Transportation Risks: Management Alternative 3 (Hybrid Alternative)

Alternative/Option			*Incident-free*				*Accidental*
			Radiological		*Nonradiological*		
Implementation	*Mode*	*Risk Factors*	*Crew*	*Public*	*Emis.*	*Traffic*	*Radiological*
Regionalization by Fuel Type	Truck	Upper	0.037	0.112	0.008	0.069	0.000081
		Nominal	0.033	0.098	0.005	0.058	0.000035
		Lower	0.028	0.087	0.003	0.048	0.000012
	Rail	Upper	0.010	0.015	0.025	0.002	0.000030
		Nominal	0.009	0.012	0.016	0.002	0.000011
		Lower	0.008	0.010	0.013	0.002	0.000005

All risks are expressed in latent cancer fatalities during the foreign research reactor spent nuclear fuel except for the Accidental - Traffic column, which is the number of fatalities during the policy

Impacts of Accidents During Ground Transport

The cumulative transportation accident risks over the entire program are estimated to range from 4.5×10^{-6} to 0.000081 LCFs from radiation and from 0.0017 to 0.069 for traffic fatality, depending on the transportation mode and DOE sites selected. Both indicate an expectation of less than one fatality.

The impacts of overland transportation are shown in Table E-53. The analysis for this implementation alternative is analogous to the analysis performed for the basic implementation of Management Alternative 1 (see Section E.7.2), and the interpretation of the tables is the same as described in Section E.7.2.

E.8.14 Transportation Implementation Example - Ship All Foreign Research Reactor Spent Nuclear Fuel to a Single Port, Regionalization-By-Fuel-Type

All the implementation alternatives analyzed in Section E.8 have been analyzed under the assumption that all foreign research reactor spent nuclear fuel would be delivered to ports on the coast nearest to the foreign research reactor (Section E.3.3). This assumption is a reasonable approximation and simplification to a complex set of possible implementation approaches. The following section, however, presents the results of the analysis associated with overland transportation risk of transporting the foreign research reactor spent nuclear fuel from a single commercial or military port.

DOE could bring all spent nuclear fuel through any identified military or commercial port. This would result in 721 shipments to that single port over the 13-year duration of the policy. Canadian fuel would be shipped overland as previously analyzed. The impacts can be directly compared with the impacts of the basic implementation of Management Alternative 1 previously analyzed under the assumption that the foreign research reactor spent nuclear fuel would arrive at the coast nearest the foreign research reactor.

Impacts of Incident-Free Ground Transportation

The incident-free transportation of spent nuclear fuel was estimated to result in total latent fatalities that ranged from 0.017 to 0.272 over the entire duration of the program. These fatalities are the sums of the estimated number of radiation-related LCFs to the public and the crew.

The range of fatality estimates are caused by two factors: 1) the option of using truck or rail to transport spent nuclear fuel, and 2) the difference between the risk factors for the port-to-site routes.

The estimated number of radiation-related LCFs for transportation workers ranged from 0.008 to 0.069. The estimated number of radiation-related LCFs for the general population ranged from 0.009 to 0.213, and the estimated number of nonradiological fatalities from vehicular emissions ranged from 0.002 to 0.035.

Impacts of Accidents During Ground Transportation

The cumulative transportation accident risks over the entire program are estimated to range from 0.00001 to 0.00015 LCFs from radiation and from 0.001 to 0.127 for traffic fatality, depending on the transportation mode and management site(s) selected. The reasons for the range of fatality estimates are the same as those described for incident-free transportation. Both show an expectation of less than one fatality.

The consequences of the most severe accident hypothesized are the same as described for the basic implementation of Management Alternative 1 since the material at risk is the same.

Conclusion

The overland transportation risk associated with bringing all foreign research reactor spent nuclear fuel to a single port is generally within the bounds of the previous analysis that assumed that spent nuclear fuel would arrive at the coast nearest to the foreign source. In the specific case of Regionalization-By-Fuel-Type, the overland transportation risks are reduced by shipping the aluminum-based spent nuclear fuel to an east coast port. The estimated impacts of overland transportation are driven by DOE's selection of a port and the transportation mode. The increased cost and risk associated with shipping the spent nuclear fuel from Asia and Australia to the U.S. east coast are analyzed in Appendices C and F. Table E-54 gives the risk estimates associated with implementing the entire policy from each of the selected ports. The risk estimates are tabulated in a form that can be compared with the other policy and implementation alternatives analyzed in this appendix.

E.8.15 Transportation Implementation Example - Transportation by Barge

As an alternative to truck or rail transport of foreign research reactor spent nuclear fuel, barge transport from Savannah, GA to the Savannah River Site and from Portland, OR to the Hanford Site was evaluated. This section summarizes the impacts.

The analysis of the impacts of barge transportation closely parallels the analysis of truck and rail transportation described in preceding sections. Routing data was generated using the INTERLINE code for the barge routes and the HIGHWAY code for the short trucking segment. A conservative dose rate of 10 mrem per hr at 2 m (6.6 feet) from the vehicle, which is the regulatory limit, was used for calculational purposes. The RADTRAN 4 code was used to calculate the incident-free doses to the public and barge crew. The analysis of port worker consequences on breakbulk vessels was used to estimate the dose to handlers.

The barge analysis used the same radionuclide inventories used in previous sections. The RADTRAN 4 code was used to calculate the impacts of hypothetical accidental releases to the air. A specific waterborne analysis, was performed for barge accidents. Two very conservative assumptions were used in estimating the quantity of material released following an accident:

- Release fractions that determine the source term for dispersion into the water are the same as those used for similar airborne release scenarios, and

Table E-54 Tabulation of Overland Transportation Risks: Basic Implementation, All Shipments to Any Single Port, Regionalization by Fuel Type

Port	Mode	Routine				Accidental
		Radiological		Non-Radiological		Radiological
		Crew	Public	Emission	Traffic	
Charleston, SC (NWS)	Truck	0.023	0.070	0.002	0.047	0.00004
	Rail	0.008	0.009	0.011	0.001	0.00001
Charleston, SC (Wando Terminal)	Truck	0.024	0.071	0.003	0.048	0.00005
	Rail	0.008	0.009	0.011	0.001	0.00001
Galveston, TX	Truck	0.039	0.114	0.007	0.070	0.00008
	Rail	0.011	0.016	0.031	0.002	0.00003
Newport News, VA	Truck	0.031	0.093	0.005	0.060	0.00006
	Rail	0.010	0.012	0.015	0.002	0.00002
Norfolk, VA	Truck	0.031	0.091	0.003	0.060	0.00006
	Rail	0.010	0.012	0.014	0.002	0.00002
Portsmouth, VA	Truck	0.031	0.092	0.004	0.060	0.00006
	Rail	0.010	0.011	0.013	0.002	0.00002
Jacksonville, FL	Truck	0.027	0.082	0.002	0.053	0.00005
	Rail	0.009	0.009	0.011	0.001	0.00001
MOTSU, NC	Truck	0.023	0.073	0.002	0.047	0.00004
	Rail	0.009	0.010	0.011	0.002	0.00001
NWS-Concord, CA	Truck	0.069	0.213	0.019	0.127	0.00012
	Rail	0.018	0.026	0.035	0.004	0.00004
Portland, OR	Truck	0.066	0.209	0.010	0.120	0.00015
	Rail	0.018	0.021	0.027	0.004	0.00005
Savannah, GA	Truck	0.024	0.073	0.002	0.047	0.00005
	Rail	0.008	0.009	0.010	0.001	0.00001
Tacoma, WA	Truck	0.067	0.212	0.008	0.104	0.00015
	Rail	0.018	0.024	0.031	0.004	0.00005
Wilmington, NC	Truck	0.026	0.079	0.002	0.055	0.00005
	Rail	0.009	0.010	0.011	0.002	0.00001

- All of the source term resulting from an accident event is dispersed into the waterway, uniformly, over a one month period (i.e., it takes one month to recover the cask).

Barge accident statistics (Hutchinson, 1986) were used to estimate the probabilities of the accident severity classes defined in the Modal Study (Fischer et al., 1987). Barge transportation fatality statistics from Saricks and Kvitek, 1994 were used to estimate accident fatality rates. The following exposure pathways were assessed using the methodology developed by the NRC in Regulatory Guide 1.109 (NRC, 1977b):

- drinking water
- ingestion of fish
- ingestion of irrigated foods
- ingestion of meat and milk from exposed cattle
- shoreline deposits (external exposure)
- swimming (external exposure).

Collective doses were calculated for average densities for rural, suburban and urban populations, using route-specific river parameters. Additionally, MEI doses were calculated for each accident scenario in a manner analogous to that in preceding sections.

Unlike previous sections, where impacts were reported in terms of implementation of the foreign research reactor spent nuclear fuel policy, impacts are reported on a per shipment basis. As shown in Figures E-1 through E-12, the policy can be carried out in many ways, depending on the outcome of the SNF&INEL EIS (DOE, 1995) and its Record of Decision. The SNF&INEL EIS alternative that could be implemented using only barge transportation is Centralization to the Savannah River Site or the Hanford Site. All others would require various mixtures of barge transportation and overland transportation via truck or rail. Therefore, barge transportation impacts are reported on a per shipment basis and compared on that basis to shipments via truck or rail for the same origin/destination pair.

The results of the barge transportation analysis, along with comparable results from the analysis of truck and rail transportation are summarized in Table E-55.

Table E-55 Tabulation of Inland Transportation Risk Factors: Basic Implementation, Shipments via Barge to Hanford and Savannah River Sites

Alternative/ Option		*Incident Free*					*Accidental*	
		Radiological			*Nonradiological*		*Radiological*	
Port - Site	*Mode*	*Crew*	*Handlers*	*Public*	*Emission*[a]	*Traffic*	*Air-borne*	*Water-borne*
Savannah, GA to Savannah River Site	Truck	8.96×10^{-6}	N/A	0.0000277	3.22×10^{-8}	0.000021	9.35×10^{-9}	N/A
	Rail	5.44×10^{-6}	N/A	2.64×10^{-6}	5.86×10^{-7}	2.38×10^{-7}	1.11×10^{-9}	N/A
	Barge	7.64×10^{-8}	9.60×10^{-7}	1.94×10^{-6}	2.39×10^{-7}	3.42×10^{-6}	5.90×10^{-10}	2.93×10^{-8}
Portland, OR to Hanford Site	Truck	9.40×10^{-6}	N/A	0.0000294	2.67×10^{-6}	0.0000104	1.49×10^{-8}	N/A
	Rail	6.28×10^{-6}	N/A	5.75×10^{-6}	4.48×10^{-6}	5.00×10^{-7}	3.75×10^{-9}	N/A
	Barge[b]	6.40×10^{-7}	1.92×10^{-6}	4.26×10^{-6}	2.44×10^{-6}	6.69×10^{-6}	1.65×10^{-8}	1.87×10^{-8}

All risks are expressed in latent cancer fatalities during the implementation of the policy, except for the Accidental-Traffic column, which is a number of fatalities.

[a] *Assumes the same emission rate as rail transportation, and two-way travel.*

[b] *Includes truck shipment from Richland, WA to Hanford Site*

E.8.15.1 Evaluation of Barge Transportation from Portland, OR to the Hanford Site

Transportation Routes

Barge transportation from the port of Portland, OR, up the Columbia River to the town of Richland, WA, followed by truck shipment to the Hanford Site was analyzed. It was assumed that the port facilities at Portland could be used to load the casks to a barge without having to transport it into areas accessed by the public. The barge could have sailed up the river to either Richland, Pasco or Kennewick, WA. The difference in the risk parameters would be less than 5 percent. Richland was chosen for analysis because it is the largest of the three cities.

Incident-Free Transportation

The incident-free transportation of spent nuclear fuel was estimated to result in 1.17×10^{-5} total latent fatalities per shipment. These fatalities are the sum of the estimated number of radiation-related and emission-related latent fatalities for the crew, handlers, and public.

The estimated number of radiation-related LCFs for the barge and truck crews is 6.40×10^{-7}. The number of radiation-related LCFs for handlers during handling activities (other than the initial off-load from the seagoing ship and the on-site handling) is 1.92×10^{-6} per shipment. The number of radiation-related LCFs for the general population is 4.26×10^{-6} per shipment. The number of nonradiological fatalities from vehicle emissions is 4.88×10^{-6} per shipment.

The MEI risk would be the same as that in the basic implementation of Management Alternative 1, which is 0.00052 LCF for the duration of the program. This estimate is based on the conservative assumption that one individual is involved in enough driving, handling and/or inspection to reach the regulatory limit of 100 mrem per year every year for the 13-year duration of the program.

Transportation Accidents

The barge transportation accident risks from radiation exposure are estimated to be 3.63×10^{-8} LCF per shipment. These fatalities are the sum of the estimated number of radiation-related fatalities from atmospheric and waterborne releases. The estimated number of radiation-related LCFs from atmospheric releases is 1.65×10^{-8} per shipment, and 1.87×10^{-8} per shipment for waterborne releases. The barge transportation accident risks from other accidents than radiation are estimated to be 6.6×10^{-6} fatalities per shipment.

The consequences of the maximum foreseeable offsite transportation accident are 0.0295 LCF. The likelihood of this accident is approximately 1×10^{-7}.

E.8.15.2 Evaluation of Barge Transportation from Savannah, GA to the Savannah River Site

Transportation Routes

Barge transportation from the port of Savannah, GA, up the Savannah River to the Savannah River Site was analyzed. The Savannah River Site has a barge receiving facility that could be used to off-load the casks. Handling at that facility and the onsite movement to the Receiving Basin for Offsite Fuels would not result in a significant change in calculated onsite risks (Appendix D).

Incident-Free Transportation

The incident-free transportation of spent nuclear fuel was estimated to result in 3.45×10^{-6} total latent fatalities per shipment. These fatalities are the sum of the estimated number of radiation-related and emission-related latent fatalities for the crew, handlers, and public.

The estimated number of radiation-related LCFs for the barge and truck crews is 7.64×10^{-8}. The number of radiation-related LCFs for handlers during handling activities (other than the initial off-load from the seagoing ship and the on-site handling) is 9.60×10^{-7} per shipment. The number of radiation-related LCFs for the general population is 1.94×10^{-6} per shipment. The number of nonradiological fatalities from vehicle emissions is 4.97×10^{-7} per shipment.

The MEI risk would be the same as that in the basic implementation of Management Alternative 1, which is 0.00052 LCF for the duration of the program. This estimate is based on the conservative assumption that one individual is involved in enough driving, handling and/or inspection to reach the regulatory limit of 100 mrem per year every year for the 13-year duration of the program.

Transportation Accidents

The barge transportation accident risks are estimated to be 2.12×10^{-8} LCF per shipment. These fatalities are the sum of the estimated number of radiation-related fatalities from atmospheric and waterborne releases. The estimated number of radiation-related LCFs from atmospheric releases is 5.90×10^{-10} per shipment, and 2.93×10^{-8} per shipment for waterborne releases. The barge transportation accident risks from other than radiation are estimated to be 3.42×10^{-6} fatalities per shipment.

The consequences of the maximum foreseeable offsite transportation accident are 0.0259 LCF. The likelihood of this accident is approximately 1×10^{-7}.

E.8.15.3 Conclusions on Barge Transportation

Table E-55 provides a comparison of barge shipment parameters to truck and rail shipment parameters between the same two points. For incident-free transportation, the risk to the public and onboard crew is lower than for truck or rail shipment. However, the risk increase associated with additional handling of casks negates this risk reduction. The net incident-free risk for barge transportation is essentially identical to that for rail transportation. The radiological accident risk associated with barge transportation is larger than that of truck or rail because of the consequences of a hypothetical accident in which a damaged cask is dropped into a river. As evident from Table E-55, fatality rates for barge transportation accidents are higher than traffic fatality rates for rail shipment and lower than those for highway shipment. In total, the difference between the risks of shipping by truck, rail or barge is very low.

When traveling along a river, a barge can be observed from a long distance, and due to its slow speed, can be boarded while underway. Although not considered in detail, these characteristics would increase the vulnerability to terrorist attack.

E.9 Historical Account of Spent Nuclear Fuel Shipments and Cumulative Impacts of Transportation

E.9.1 Spent Nuclear Fuel Shipment History

The SNF&INEL Final EIS (DOE, 1995) contains a survey of transportation incidents from 1949 to 1993. For 1949 through 1970, there were 14 incidents involving irradiated fuel elements. No packages approximating a Type B shipping cask were breached as a result of these incidents. Between 1971 and 1993, there were seven transportation accidents involving spent nuclear fuel. Three involved rail shipments, and four of these accidents involved truck shipments. None of these accidents resulted in damage to the structural integrity of a cask or release of contents.

The number of spent nuclear fuel shipments and amount of spent nuclear fuel shipped throughout the entire history of spent nuclear fuel shipment cannot be precisely determined from available information. The NRC keeps accurate records of more recent (since 1979) shipments of spent nuclear fuel.

Tables E-56 and E-57 describe the spent nuclear fuel shipments in the United States that have occurred since 1979. The data for the tables comes from NUREG-0725 (NRC, 1993). These tables show detailed spent nuclear fuel shipment information, including mode of shipment (highway or rail) and shipment trends over time. Data for shipment miles are taken primarily from a road atlas and have been rounded to the nearest hundred miles for each year. Data on quantity of spent fuel shipped were provided by shippers,

and have been rounded to the nearest hundred kg (220 lb) (when more than 100 kg (220 lb) were shipped). These tables do not include DOE shipments (including Naval) of spent nuclear fuel, since these shipments are not regulated by the NRC.

Table E-56 Domestic and International Spent Nuclear Fuel Shipments: 1979-1992

Year	Domestic		International		Transient
	Highway	Railway	Export	Import	
1979	2	11	0	14	0
1980	73	5	2	55	0
1981	30	2	3	48	0
1982	80	0	1	43	0
1983	92	0	2	23	0
1984	209	3	2	34	0
1985	114	18	0	21	0
1986	88	15	0	17	0
1987	85	15	3	19	0
1988	10	7	0	15	0
1989	11	6	1	4	0
1990	0	8	2	0	3
1991	7	10	4	0	1
1992	17	6	0	0	0
Totals	**818**	**106**	**20**	**293**	**4**

Source: NRC, 1993

Table E-56 shows the pattern of highway and rail shipments throughout the period 1979 to 1992. The number of shipments generally rose in the early 1980s and then declined steadily through 1992. Import shipments have generally declined since 1980, with no shipments since 1989.

Table E-57 shows that most (91.4 percent) of approximately 1,200 spent nuclear fuel shipments during the 1979 to 1992 period were completed over highways. The highway shipments accounted for a larger percentage of the mileage (94.8 percent), meaning that the longer distance shipments tended to use the highways rather than rail. However, rail shipments moved 70 percent (by weight) of the fuel. This indicates that rail has been chosen for the larger shipments over shorter distances. A review of spent nuclear fuel shipments indicates that rail transportation was often used for shipments of commercial spent nuclear fuel, and research reactors almost exclusively used trucks (NRC, 1993).

E.9.2 Cumulative Impacts of Transportation

The SNF&INEL Final EIS (DOE, 1995) analyzed the cumulative impacts of transportation, taking into account impacts from: 1) historical shipments of spent nuclear fuel to Hanford Site, Savannah River Site, Idaho National Engineering Laboratory, Oak Ridge Reservation, and Nevada Test Site; 2) the programmatic alternatives; 3) other reasonably foreseeable actions that include transportation of radioactive material; and 4) general radioactive materials transportation that is not related to a particular action.

The total worker and general population collective doses are summarized in Table E-58. Total collective worker doses from all types of shipments (historical, the alternatives, reasonably foreseeable actions, and general transportation) were estimated to be 320,000 person-rem (130 LCFs) for the period of time 1943 through 2035 (93 yr). Total general population collective doses were also estimated to be 320,000 person-rem (160 LCFs). The majority of the collective dose for workers and the general population was due to the general transportation of radioactive material. Examples of these activities are

Table E-57 Summary Data for 1979-1992 Spent Nuclear Fuel Shipment Information

Year	Number of Shipments		Kilograms Spent Fuel Shipped (thousands)[a]		Shipment Kilometers (thousands)[b]	
	Highway	Railway	Highway	Railway	Highway	Railway
1979	16	11	0.1	30.2	12.9	3.7
1980	130	5	10.0	13.6	186.6	1.6
1981	81	2	7.9	6.0	62.0	0.6
1982	124	0	7.1	0.0	171.9	0.0
1983	117	0	36.6	0.0	134.6	0.0
1984	245	3	84.5	23.8	291.9	2.6
1985	135	18	74.0	119.4	114.1	14.0
1986	105	15	40.4	97.5	77.0	14.0
1987	107	15	82.3	101.4	67.3	13.5
1988	25	7	12.8	41.8	18.4	6.9
1989	16	6	0.1	30.8	26.9	2.7
1990	2	8	0.03	65.5	2.4	1.6
1991	11	10	0.1	98.4	15.5	2.4
1992	17	6	0.1	61.3	15.7	0.8
Totals	**1,131**	**106**	**356.0**	**689.7**	**1197.2**	**64.4**

Source: NRC, 1993

[a] *To convert kilogram values to pounds, multiply values given by 2.2.*

[b] *To convert kilometer values to miles, multiply by 0.62.*

Table E-58 Cumulative Transportation-Related Radiological Collective Doses and LCFs (1943 to 2035)

Category	Collective Occupational Dose (person-rem)	Collective General Population Dose (person-rem)
Historical	200	110
Spent Nuclear Fuel Shipments for SNF&INEL Final EIS Alternatives 1-5		
Truck	1.5 to 1,000	0.34 to 2,400
Rail	1.5 to 150	0.34 to 190
Reasonably Foreseeable Actions		
Truck	11,000	50,000
Rail	820	1,700
General Transportation (1943 to 2035)	310,000	270,000
Total Collective Dose	320,000	320,000
Total LCFs	130	160

Source: DOE, 1995

shipments of radiopharmaceuticals to nuclear medicine laboratories and shipments of commercial low-level radioactive waste to commercial disposal facilities. The total number of LCFs over the time period 1943 through 2035 was estimated to be 290. Over this same period of time (93 yr), approximately 28,000,000 people would die from cancer, based on 300,000 LCFs per yr (NRC, 1977a). It should be noted that the estimated number of transportation-related LCFs would be indistinguishable from other LCFs, and the transportation-related LCFs are 0.0010 percent of the total number of LCFs.

The transportation of foreign research reactor spent nuclear fuel, under any of the proposed options or alternatives in this EIS, is included in the calculated totals under the spent nuclear fuel shipments for SNF&INEL Final EIS Alternatives 1-5 (DOE, 1995). Proposed transportation of domestic and foreign spent nuclear fuel accounts for less than one percent of the total LCFs, attributable to the transportation of radioactive material, and foreign research reactor spent nuclear fuel accounts for less than one-quarter of that one percent.

E.10 Uncertainty and Conservatism in Estimated Impacts

The sequence of analyses performed to generate the estimates of radiological risk for the transportation of spent nuclear fuel includes: 1) determination of the inventory and characteristics, 2) estimation of shipment requirements, 3) determination of route characteristics, 4) calculation of radiation doses to exposed individuals (including estimation of environmental transport and uptake of radionuclides), and 5) estimation of health effects. Uncertainties are associated with each of these steps. Uncertainties exist in the way that the physical systems being analyzed are represented by the computational models, in the data required to exercise the models (due to measurement errors, sampling errors, natural variability, or unknowns simply caused by the future nature of the actions being analyzed), and in the calculations themselves (for example, approximate algorithms used by the computers).

In principle, one can estimate the uncertainty associated with each input or computational source and predict the resultant uncertainty in each set of calculations. Thus, one can propagate the uncertainties from one set of calculations to the next and estimate the uncertainty in the final, or absolute, result; however, conducting such a full-scale quantitative uncertainty analysis is often impractical and sometimes impossible, especially for actions to be initiated at an unspecified time in the future. Instead, the risk analysis is designed to ensure, through uniform and judicious selection of scenarios, models, and input parameters, that relative comparisons of risk among the various alternatives are meaningful. In the transportation risk assessment, this design is accomplished by uniformly applying common input parameters and assumptions to each alternative. Therefore, although considerable uncertainty is inherent in the absolute magnitude of the transportation risk for each alternative, much less uncertainty is associated with the relative differences among the alternatives in a given measure of risk.

In the following sections, areas of uncertainty are discussed for the assessment steps enumerated above. Special emphasis is placed on identifying whether the uncertainties affect relative or absolute measures of risk. The degree of reality conservatism of the assumption is addressed. Where practical, the parameters that most significantly affect the risk assessment results are identified.

E.10.1 Uncertainties in Spent Nuclear Fuel Inventory and Characterization

The spent nuclear fuel inventories (i.e., number of shipments) and the physical and radiological characteristics are important input parameters to the transportation risk assessment. The potential amount of transportation for any alternative is determined primarily by the projected spent nuclear fuel inventory and assumptions concerning shipment capacities. The physical and radiological characteristics are important in determining the amount of material released during accidents and the subsequent doses to exposed individuals through multiple environmental exposure pathways.

The development of projected spent nuclear fuel inventory and characterization data used to support the EIS is described in Appendix B. Uncertainties in the spent nuclear fuel inventory and characterization will be reflected to some degree in the transportation risk results. If the spent nuclear fuel inventory (number of elements) is overestimated (or underestimated), the resulting transportation risk estimates also will be overestimated (or underestimated) by roughly the same factor. However, the same spent nuclear fuel

inventory estimates are used to analyze the transportation impacts of each of the EIS alternatives. Therefore, for comparative purposes, the observed differences in transportation risks among alternatives are believed to represent unbiased, reasonably accurate estimates from current information in terms of relative risk comparisons.

The spent nuclear fuel type selected for the accident risk calculations was chosen to maximize the potential accident risk results. All accidents were analyzed for fuel that is less than 1 year old. However, much of the fuel has already been out of the foreign research reactors for more than 1 year and may not be brought back for several years. For calculations of MEIs, the cask loaded with the maximum possible amount of radioactive material should have been and was considered. However, the risk values were calculated under the assumption that all casks were loaded to this maximum value. Depending on the implementation of the program, very few, if any, of the casks would be carrying fuel as new as that used in the accident analysis. Selection of another spent nuclear fuel type, or consideration of all spent nuclear fuel types in detail, would result in accident risks less than those reported in the assessment of alternatives in this appendix.

E.10.2 Uncertainties in Casks, Shipment Capacities and Number of Shipments

The amount of transportation required for each alternative is based in part on assumptions concerning the packaging characteristics and shipment capacities for truck and rail modes. Representative shipment capacities have been defined for assessment purposes based on probable future shipment capacities. In reality, the actual shipment capacities may differ from the predicted capacities, so that the projected number of shipments, and consequently the total transportation risk, would change. However, although the predicted transportation risks would increase or decrease accordingly, the relative differences in risks among alternatives would remain about the same. It is in fact likely that DOE would deploy a large capacity truck or rail cask for large intersite shipping campaigns.

For the purposes of analysis, Phase 1 was assumed to last exactly 10 years and Phase 2 was assumed to last exactly 3 years. Realistically, the Phase 2 site may be ready somewhat sooner or later. Additionally, the fractions of the fuel arriving during each phase may not be precisely proportional to the duration of the phase. However, the risk changes are small when compared with the conservatism introduced in the radiological calculations.

The number of shipments to and from various points comes from a complex series of models of how the policy may be implemented. They are not intended to define how the policy would be implemented. Instead, they describe somewhat generally how the policy would be implemented. The risk factors for all conceivable routes between DOE sites and ports of entry are given to show that a slight deviation from the shipment pattern modeled could have a negligible affect on risk. For example, if the policy were being implemented with fuel arriving in the eastern United States going to Savannah River Site and fuel arriving in the western United States going to Idaho National Engineering Laboratory, the risk impact of transporting a few casks from eastern ports to Idaho National Engineering Laboratory (presumably for onsite logistical reasons) would have a small impact on program risk.

E.10.3 Uncertainties in Route Determination

Representative routes have been determined between all origin and destination sites considered in the EIS. The routes have been determined consistent with current guidelines, regulations, and practices, but may not be the actual routes that would be used in the future. In reality, the actual routes could differ from the representative ones in terms of distances and total population along the routes. Moreover, in that the assessment considers spent nuclear fuel could be transported over an extended period of time starting at

some time in the future, the highway and rail infrastructures and the demographics along routes could change. These effects have not been accounted for in the transportation assessment, however, it is not anticipated that these changes would significantly affect relative comparisons of risk among the alternatives considered in the EIS.

E.10.4 Uncertainties in the Calculation of Radiation Doses

The models used to calculate radiation doses from transportation activities introduce a further uncertainty in the risk assessment process. It is generally difficult to estimate the accuracy or absolute uncertainty of the risk assessment results. The accuracy of the calculated results is closely related to the limitations of the computational models and to the uncertainties in each of the input parameters that the model requires. The single greatest limitation facing users of RADTRAN, or any computer code of this type, is the scarcity of data for certain input parameters.

Uncertainties associated with the computational models are minimized by using state-of-the-art computer codes that have undergone extensive review. Because there are numerous uncertainties that are recognized but difficult to quantify, assumptions are made at each step of the risk assessment process that are intended to produce conservative results (i.e., overestimate the calculated dose and radiological risk). Because parameters and assumptions are applied equally to all alternatives, this model bias is not expected to affect the meaningfulness of relative comparisons of risk; however, the results may not represent risks in an absolute sense.

In order to understand the most important uncertainties and conservatism in the transportation risk assessment, the results for all cases were examined to identify the largest contributors to the collective population risk. The results of this examination are discussed briefly below.

For truck shipments, the largest contributors to the collective population dose were found to be, in decreasing order of importance: 1) incident-free dose to members of the public at stops, 2) incident-free dose to transportation crew members, 3) incident-free dose to members of the public sharing the route (on-link dose), 4) incident-free dose to members of the public residing along the route (off-link dose), and 5) accident dose risk to members of the public. Approximately 80 percent of the estimated public dose was incurred at stops, 15 percent by the on-link population, and 5 percent by the off-link population. In general, the accident contribution to the total risk was negligible compared with the incident-free risk.

For rail shipments, the largest contributors to the collective population dose were found to be, in decreasing order of importance: 1) incident-free dose to transportation crew members, 2) incident-free dose to members of the public residing along the route (off-link dose), 3) incident-free dose to members of the public at stops, 4) incident-free dose to members of the public sharing the route (on-link dose), and 5) accident dose risk to members of the public. Approximately 70 percent of the estimated public dose was incurred by the off-link population, 25 percent by the population at stops, and 5 percent by the on-link population. As with truck shipments, the accident contribution to the total risk in general was negligible compared with the incident-free risk, even when the spent nuclear fuel type was selected to maximize the accident risk results.

As shown above, incident-free transportation risks are the dominant component of the total transportation risk for both truck and rail modes. The most important parameter in calculating incident-free doses is the shipment external dose rate (incident-free doses are directly proportional to the shipment external dose rate). For this assessment, it was assumed that all shipments would have an external dose rate at the regulatory limit of 10 mrem per hr at 2 m. In practice, the external dose rates would vary from shipment to shipment. Although it is conceivably possible to load a cask with enough fresh foreign research reactor

spent nuclear fuel to obtain a dose rate equal to the regulatory limit, experience has shown this to be unlikely. In fact, the observed average dose rate described in Appendix B is approximately ten times lower than the regulatory limit. During the shipments of foreign research reactor to MOTSU and ultimately to Savannah River Site, the State of North Carolina detected less than 1 mrem on contact with the cask and no radiation above background at 2 m (Massey, 1994). Therefore, the incident-free risks are conservative, and would be ten times lower if calculated with the observed average dose.

Finally, the single largest contributor to the collective population doses calculated with RADTRAN was found to be the dose to members of the public at truck stops. Currently, RADTRAN uses a simple point-source approximation for truck-stop exposures and assumes that the total stop time for a shipment is proportional to the shipment distance. The parameters used in the stop model were based on a survey of a very limited number of radioactive material shipments that examined a variety of shipment types in different areas of the country (Wilmot, 1981). It was assumed that stops occur as a function of distance, with a stop rate of 0.011 h per km (0.018 h per mile). It was further assumed that at each stop, an average of 50 people are exposed at a distance of 20 m (66 ft). In RADTRAN, the population dose is directly proportional to the external shipment dose rate and the number of people exposed, and inversely proportional to the square of the distance. The stop rate assumed results in an hour of stop time per 100 km (62 miles) of travel.

Based upon the qualitative discussion with shippers of spent nuclear fuel, the parameter values used in the assessment appear to be conservative. However, data do not exist to qualitatively assess the degree of conservatism in the stop-dose model. As a practical matter, it is conceivable that DOE could take steps to control the location, frequency, and duration of truck stops if necessary. However, based on the regulatory requirements for continuous escort of the material (10 CFR 73) and the requirement for two drivers, it is clear that the trucks would be on the move essentially one-hundred percent of the time until arrival at the destination. Therefore, the calculated impacts are extremely conservative. By using these conservative parameters, the calculations in this EIS are consistent with the RADTRAN default values and the SNF&INEL Final EIS (DOE, 1995).

Shielding of exposed populations is not considered. For all incident-free exposure scenarios, no credit has been taken for shielding of exposed individuals. In reality, shielding would be afforded by trucks and cars sharing the transport routes, natural topography, and the houses and buildings in which people reside. Incident-free exposures to external radiation could be reduced significantly depending on the type of shielding present. For residential houses, shielding factors (i.e., the ratio of shielded to unshielded exposure rates) have been estimated to range from 0.02 to 0.7, with a recommended value of 0.33. If shielding were to be considered for the maximally exposed resident living near a transport route, the calculated doses and risks would be reduced by approximately 70 percent. Similar levels of shielding may be provided to individuals exposed in vehicles. However, consideration of shielding does not significantly affect the overall incident-free risks to the general population.

Post-accident mitigative actions are not considered for dispersal accidents. For severe accidents involving the release and dispersal of radioactive materials in the environment, no post-accident mitigative actions, such as interdiction of crops or evacuation of the accident vicinity, have been considered in this risk assessment. In reality, mitigative actions would take place following an accident in accordance with U.S. Environmental Protection Agency radiation protection guides for nuclear incidents (EPA, 1991). The effects of mitigative actions on population accident doses are highly dependent upon the spent nuclear fuel type involved and the severity, location, and timing of the accident. For this risk assessment, ingestion doses are only calculated for accidents occurring in rural areas (the calculated ingestion dose, however, assumes all food grown on contaminated ground is consumed and is not limited to the rural population).

Examination of the severe accident consequence assessment results has shown that ingestion of contaminated foodstuffs contributes on the order of 50 percent of the total population dose for rural accidents. Interdiction of foodstuffs would act to reduce, but not eliminate, this contribution.

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Attachment E1
Representative Routes for Overland Transportation

The purpose of this Attachment is to show the representative routes that are used in the risk analysis of overland transportation of foreign research reactor spent nuclear fuel. Identification of these representative routes is necessary to carry out the risk analysis described in Appendix E. The characteristics of these representative routes are used to estimate the driving time, which is needed to estimate the risk to the crew operating the truck, train, or barge and to estimate population along the route, which is exposed to small amounts of radiation emanating from the cask and could conceivably be exposed to an accident.

Representative routes between all potential ports and Canadian border crossings and all 5 DOE sites, as well as between the DOE sites, were identified. Because of the large number of routes, complexity of routes and the difficulty associated with manually tabulating population data, DOE has developed computer codes to select routes and tabulate populations. The HIGHWAY (Johnson, 1993a) code was used for the road route analysis and the INTERLINE (Johnson, 1993b) code was used for the rail and barge route analysis. The codes are described in Section E.4.

Representative routes are used in the analysis because specific routes cannot be identified in advance. A transportation route is not finalized until it has been reviewed and approved by the NRC (Massey, 1994). Therefore, the routes identified in this section are representative of the routes that may be used to ship spent nuclear fuel, but the actual routes shown may or may not be used if the policy were to be implemented. The codes used to select the representative routes automatically select preferred routes and minimize the transport time, as required by regulation. However, it is required that route selection also considers information such as the time of day and the day of week during which transportation will occur, current conditions such as adverse weather conditions (e.g., flooding, snow), track or road conditions, bridge closures, and seasonal traffic. Additionally, numerous U.S. interstates serve the Canadian border and could be used to transport spent nuclear fuel. HIGHWAY and INTERLINE cannot take these environmental, and other, conditions into account.

Specific requirements for the selection of road routes are found in 49 CFR 397, Subpart D. This regulation requires selection of "preferred routes", which are defined as Interstate System highways for which an alternative route is not designated by a State routing agency and/or State-designated routes selected by a State routing agency. 49 CFR 397 also gives specific directions for the selection of a route between a point of pickup or delivery (i.e., a port facility) and a preferred route. In some cases, the HIGHWAY code does not explicitly cover this short distance. These stretches of road were evaluated, and it was determined that they were very short compared to the overland routes.

This attachment provides maps and listings of the representative routes used in the transportation analysis. Information on population can be found in Tables E-3 and E-4. For each port of entry, a road map followed by a listings of the routes, and a rail map, followed by listings of the routes are provided.

The route listings are from the HIGHWAY and INTERLINE computer code output files. The columns of the HIGHWAY output, from left to right indicate the following: 1) The roadway on which the truck would be traveling, 2) codified information describing the road (# - toll bridge, $ - toll road) and other numbers used to identify the stretch of road, 3) the city nearest the node, 4) the position of the node relative to the city, 5) the intersecting roads that define the node, and 6) the state in which the node is located.

The INTERLINE output, from left to right, shows the following: 1) the railroad that owns a section of the track or, in the case of barge transportation, the letters BRG, 2) the INTERLINE code number for the node, 3) the city nearest the node, 4) the state in which the node is located, and 5) the distance traveled since the last node. Transfers between rail carriers are noted by dashed lines.

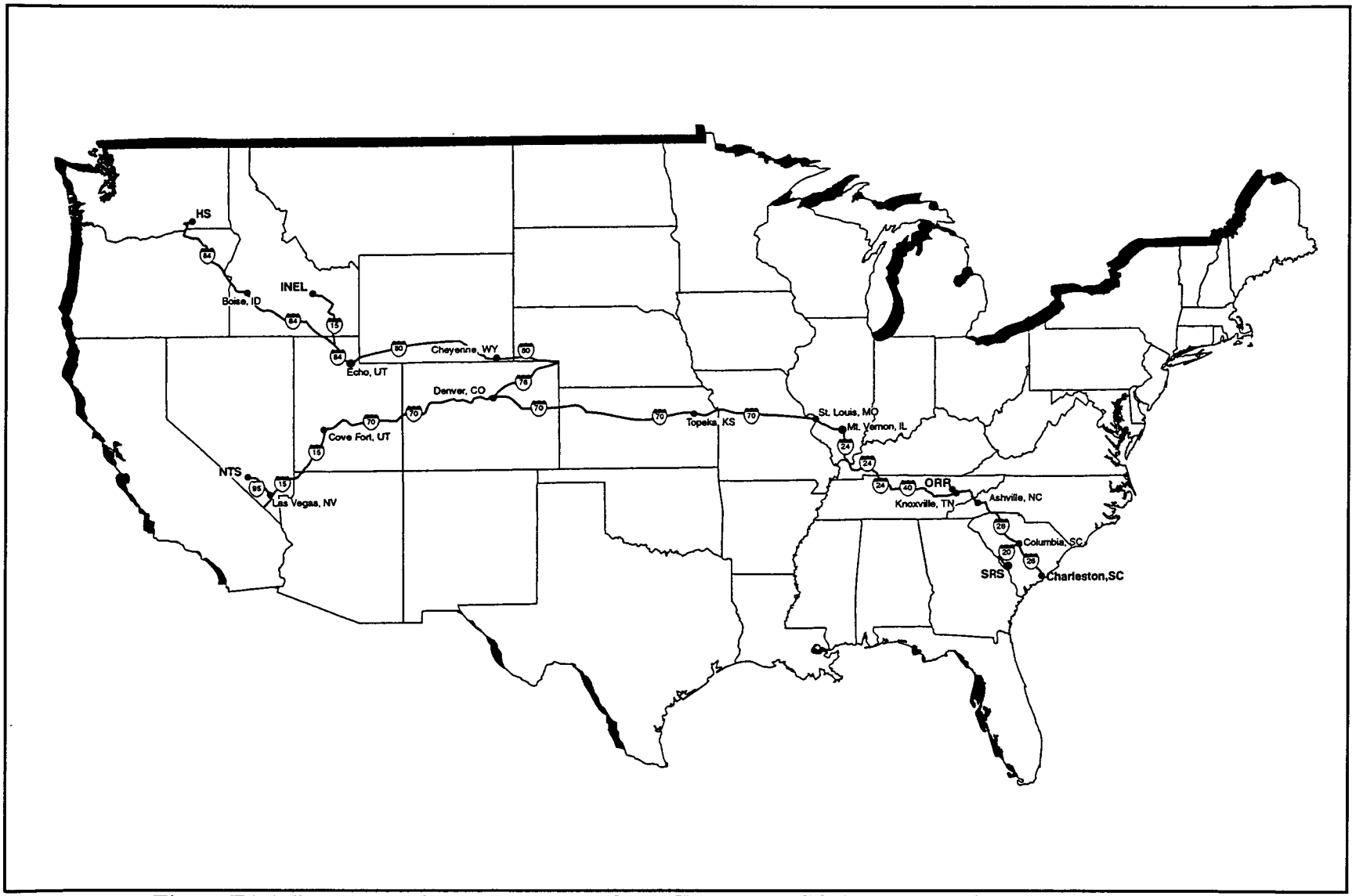

Figure E1-1 Representative Truck Routes from Charleston, SC Area Ports (Charleston-NWS and Charleston-Wando) to Department of Energy Management Sites

From: NWS CHARLESTON, SC
To : SRP BARCD 1

Routing through:

		N CHARLESTON	NW	I26	I526	SC
I26		COLUMBIA	NW	I20	I26	SC
I20		BELVEDERE	N	I20	X5	SC
U25		NORTH AUGUSTA	SE	U25	S125	SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		SRP BARCD 1		S125	LC	SC

From: NWS CHARLESTON, SC
To : ID NATL ENG LAB, ID

Routing through:

		N CHARLESTON	NW	I26	I526	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24		NASHVILLE	SE	I24	I440	TN
I440		NASHVILLE	W	I40	I440	TN
I40		NASHVILLE	W	I265	I40	TN
I265		NASHVILLE	N	I24	I265	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70		BONNER SPRINGS	N	I70	X224	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB		U20	LOCL	ID

From: NWS CHARLESTON, SC
To : HANFORD, WA

Routing through:

		N CHARLESTON	NW	I26	I526	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24		NASHVILLE	SE	I24	I440	TN
I440		NASHVILLE	W	I40	I440	TN
I40		NASHVILLE	W	I265	I40	TN
I265		NASHVILLE	N	I24	I265	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70		BONNER SPRINGS	N	I70	X224	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	X5	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: NWS CHARLESTON, SC
To : K-25, TN

Routing through:

		N CHARLESTON	NW	I26	I526	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		KINGSTON	E	I40	X356	TN
S58		K-25				TN

From: NWS CHARLESTON, SC
To : MERCURY, NV

Routing through:

		N CHARLESTON	NW	I26	I526	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24		NASHVILLE	SE	I24	I440	TN
I440		NASHVILLE	W	I40	I440	TN
I40		NASHVILLE	W	I265	I40	TN
I265		NASHVILLE	N	I24	I265	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70		BONNER SPRINGS	N	I70	X224	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		LAS VEGAS	W	U95	U95B	NV
U95BU		LAS VEGAS	NW	U95	U95B	NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

From: CHARLESTON (WANDO TERMINAL), SC
To : SRP BARCD 1, SC

Routing through:

		CHARLESTON	E	I526	X32	SC
I526		N CHARLESTON	NW	I26	I526	SC
I26		COLUMBIA	NW	I20	I26	SC
I20		BELVEDERE	N	I20	X5	SC
U25		NORTH AUGUSTA	SE	U25	S125	SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		SRP BARCD 1		S125	LC	SC

From: CHARLESTON (WANDO TERMINAL), SC
To : ID NATL ENG LAB, ID

Routing through:

		CHARLESTON	E	I526	X32	SC
I526		N CHARLESTON	NW	I26	I526	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24		NASHVILLE	SE	I24	I440	TN
I440		NASHVILLE	W	I40	I440	TN
I40		NASHVILLE	W	I265	I40	TN
I265		NASHVILLE	N	I24	I265	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70		BONNER SPRINGS	N	I70	X224	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB		U20	LOCL	ID

From: CHARLESTON (WANDO TERMINAL), SC
To : HANFORD, WA

Routing through:

		CHARLESTON	E	I526	X32	SC
I526		N CHARLESTON	NW	I26	I526	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24		NASHVILLE	SE	I24	I440	TN
I440		NASHVILLE	W	I40	I440	TN
I40		NASHVILLE	W	I265	I40	TN
I265		NASHVILLE	N	I24	I265	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70		BONNER SPRINGS	N	I70	X224	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	X5	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: CHARLESTON (WANDO TERMINAL), SC
To : K-25, TN

Routing through:

		CHARLESTON	E	I526	X32	SC
I526		N CHARLESTON	NW	I26	I526	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		KINGSTON	E	I40	X356	TN
S58		K-25				TN

From: CHARLESTON (WANDO TERMINAL), SC
To : MERCURY, NV

Routing through:

		CHARLESTON	E	I526	X32	SC
I526		N CHARLESTON	NW	I26	I526	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24		NASHVILLE	SE	I24	I440	TN
I440		NASHVILLE	W	I40	I440	TN
I40		NASHVILLE	W	I265	I40	TN
I265		NASHVILLE	N	I24	I265	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70		BONNER SPRINGS	N	I70	X224	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		LAS VEGAS	W	U95	U95B	NV
U95BU		LAS VEGAS	NW	U95	U95B	NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

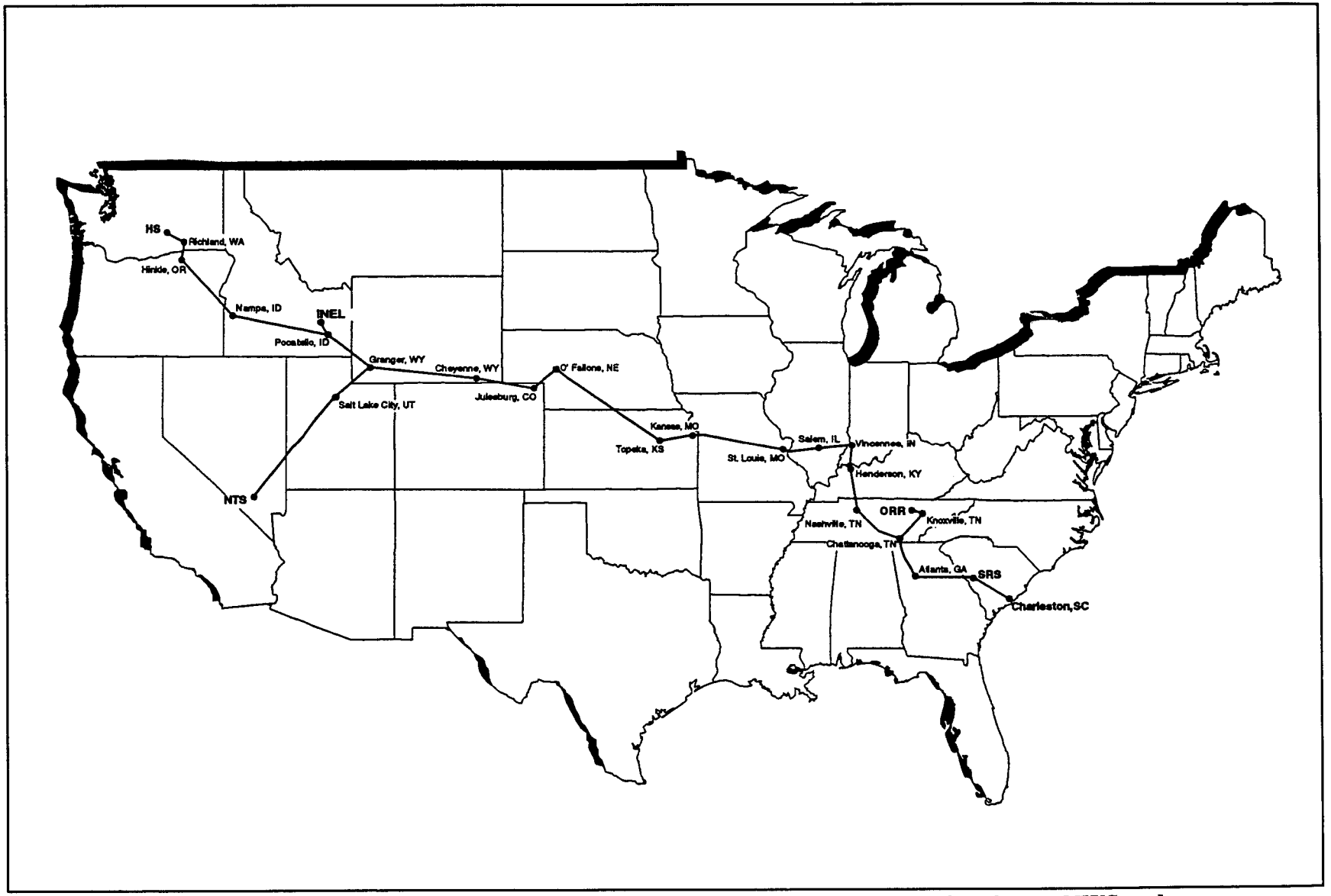

Figure E1-2 Representative Rail Routes from Charleston, SC Area Ports (Charleston-NWS and Charleston-Wando) to Department of Energy Management Sites

ROUTE FROM: CSXT 7690-CHARLESTON, SC
TO: SRP, SC

RR	NODE	STATE	DIST
CSXT	7690-CHARLESTON	SC	0.
CSXT	7739-FAIRFAX	SC	94.
CSXT	7732-ROBBINS	SC	123.
CSXT	7717-DUNBARTON / WELL	SC	132.
USG	7717-DUNBARTON / WELL	SC	132.
USG	15359-SRP	SC	140.

ROUTE FROM: CSXT 7690-CHARLESTON, SC
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
CSXT	7690-CHARLESTON	SC	0.
CSXT	7739-FAIRFAX	SC	94.
CSXT	7732-ROBBINS	SC	123.
CSXT	7961-AUGUSTA	GA	152.
CSXT	7914-ATLANTA	GA	327.
CSXT	7907-MARIETTA	GA	337.
CSXT	7889-CARTERSVILLE	GA	369.
CSXT	7888-DALTON	GA	420.
CSXT	7235-CHATTANOOGA	TN	458.
CSXT	7187-TULLAHOMA	TN	539.
CSXT	7202-NASHVILLE	TN	618.
CSXT	7201-MADISON	TN	628.
CSXT	7061-HOPKINSVILLE	KY	688.
CSXT	3839-HENDERSON	KY	775.
CSXT	3838-EVANSVILLE	IN	788.
CSXT	3812-VINCENNES	IN	838.
CSXT	4952-SALEM	IL	917.
CSXT	10859-EAST ST LOUIS	IL	982.
<TR>	10859-EAST ST LOUIS	IL	982.
<TR>	10858-ST LOUIS	MO	988.
UP	10858-ST LOUIS	MO	988.
UP	10656-JEFFERSON CITY	MO	1110.
UP	10616-KANSAS CITY	MO	1286.
UP	10617-KANSAS CITY	KS	1289.
UP	11823-LAWRENCE	KS	1328.
UP	11697-TOPEKA	KS	1358.
UP	11696-MENOKEN	KS	1363.
UP	11681-MARYSVILLE	KS	1438.
UP	11405-HASTINGS	NE	1548.
UP	11410-GIBBON	NE	1574.
UP	11352-NORTH PLATTE	NE	1652.
UP	11358-O FALLONS	NE	1701.
UP	13703-JULESBURG	CO	1769.
UP	13465-CHEYENNE	WY	1915.
UP	13462-LARAMIE	WY	1967.
UP	13494-GRANGER	WY	2243.
UP	13369-MC CAMMON	ID	2435.
UP	13370-POCATELLO	ID	2458.
UP	13336-SCOVILLE	ID	2514.

ROUTE FROM: CSXT 7690-CHARLESTON, SC
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
CSXT	7690-CHARLESTON	SC	0.
CSXT	7739-FAIRFAX	SC	94.
CSXT	7732-ROBBINS	SC	123.
CSXT	7961-AUGUSTA	GA	152.
CSXT	7914-ATLANTA	GA	327.
CSXT	7907-MARIETTA	GA	337.
CSXT	7889-CARTERSVILLE	GA	369.
CSXT	7888-DALTON	GA	420.
CSXT	7235-CHATTANOOGA	TN	458.
CSXT	7187-TULLAHOMA	TN	539.
CSXT	7202-NASHVILLE	TN	618.
CSXT	7201-MADISON	TN	628.
CSXT	7061-HOPKINSVILLE	KY	688.
CSXT	3839-HENDERSON	KY	775.
CSXT	3838-EVANSVILLE	IN	788.
CSXT	3812-VINCENNES	IN	838.
CSXT	4952-SALEM	IL	917.
CSXT	10859-EAST ST LOUIS	IL	982.
<TR>	10859-EAST ST LOUIS	IL	982.
<TR>	10858-ST LOUIS	MO	988.
UP	10858-ST LOUIS	MO	988.
UP	10656-JEFFERSON CITY	MO	1110.
UP	10616-KANSAS CITY	MO	1286.
UP	10617-KANSAS CITY	KS	1289.
UP	11823-LAWRENCE	KS	1328.
UP	11697-TOPEKA	KS	1358.
UP	11696-MENOKEN	KS	1363.
UP	11681-MARYSVILLE	KS	1438.
UP	11405-HASTINGS	NE	1548.
UP	11410-GIBBON	NE	1574.
UP	11352-NORTH PLATTE	NE	1652.
UP	11358-O FALLONS	NE	1701.
UP	13703-JULESBURG	CO	1769.
UP	13465-CHEYENNE	WY	1915.
UP	13462-LARAMIE	WY	1967.
UP	13494-GRANGER	WY	2243.
UP	13369-MC CAMMON	ID	2435.
UP	13370-POCATELLO	ID	2458.
UP	14220-PENDLETON	OR	2968.
UP	14223-HINKLE	OR	2999.
UP	13894-WALLULA	WA	3028.
UP	13964-KENNEWICK	WA	3043.
UP	13941-RICHLAND	WA	3052.
USG	13941-RICHLAND	WA	3052.
USG	16212-HANFORD S 300	WA	3060.

ROUTE FROM: CSXT 7690-CHARLESTON, SC
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
CSXT	7690-CHARLESTON	SC	0.
CSXT	7675-FLORENCE	SC	98.
CSXT	7671-DILLON	SC	127.
CSXT	7470-HAMLET	NC	165.
CSXT	7472-WADESBORO	NC	190.
WSS	7472-WADESBORO	NC	190.
WSS	7462-LEXINGTON	NC	258.
NS	7462-LEXINGTON	NC	258.
NS	7478-SALISBURY	NC	275.
NS	7394-HICKORY	NC	332.
NS	7387-MARION	NC	374.
NS	7343-ASHEVILLE	NC	414.
NS	7318-MORRISTOWN	TN	494.
NS	7286-KNOXVILLE	TN	535.
NS	7288-DOSSETT	TN	560.
NS	15316-K-25	TN	581.

ROUTE FROM: CSXT 7690-CHARLESTON, SC
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
CSXT	7690-CHARLESTON	SC	0.
CSXT	7739-FAIRFAX	SC	94.
CSXT	7732-ROBBINS	SC	123.
CSXT	7961-AUGUSTA	GA	152.
CSXT	7914-ATLANTA	GA	327.
CSXT	7907-MARIETTA	GA	337.
CSXT	7889-CARTERSVILLE	GA	369.
CSXT	7888-DALTON	GA	420.
CSXT	7235-CHATTANOOGA	TN	458.
CSXT	7187-TULLAHOMA	TN	539.
CSXT	7202-NASHVILLE	TN	618.
CSXT	7201-MADISON	TN	628.
CSXT	7061-HOPKINSVILLE	KY	688.
CSXT	3839-HENDERSON	KY	775.
CSXT	3838-EVANSVILLE	IN	788.
CSXT	3812-VINCENNES	IN	838.
CSXT	4952-SALEM	IL	917.
CSXT	10859-EAST ST LOUIS	IL	982.
<TR>	10859-EAST ST LOUIS	IL	982.
<TR>	10858-ST LOUIS	MO	988.
UP	10858-ST LOUIS	MO	988.
UP	10656-JEFFERSON CITY	MO	1110.
UP	10616-KANSAS CITY	MO	1286.
UP	10617-KANSAS CITY	KS	1289.
UP	11823-LAWRENCE	KS	1328.
UP	11697-TOPEKA	KS	1358.
UP	11696-MENOKEN	KS	1363.
UP	11681-MARYSVILLE	KS	1438.
UP	11405-HASTINGS	NE	1548.
UP	11410-GIBBON	NE	1574.
UP	11352-NORTH PLATTE	NE	1652.
UP	11358-O FALLONS	NE	1701.
UP	13703-JULESBURG	CO	1769.
UP	13465-CHEYENNE	WY	1915.
UP	13462-LARAMIE	WY	1967.
UP	13494-GRANGER	WY	2243.
UP	13568-OGDEN	UT	2382.
UP	13595-SALT LAKE CITY	UT	2417.
UP	13630-LYNNDYL	UT	2529.
UP	14766-VALLEY	NV	2846.
USG	14766-VALLEY	NV	2846.
USG	16333-YUCCA MOUNTAIN	NV	2945.

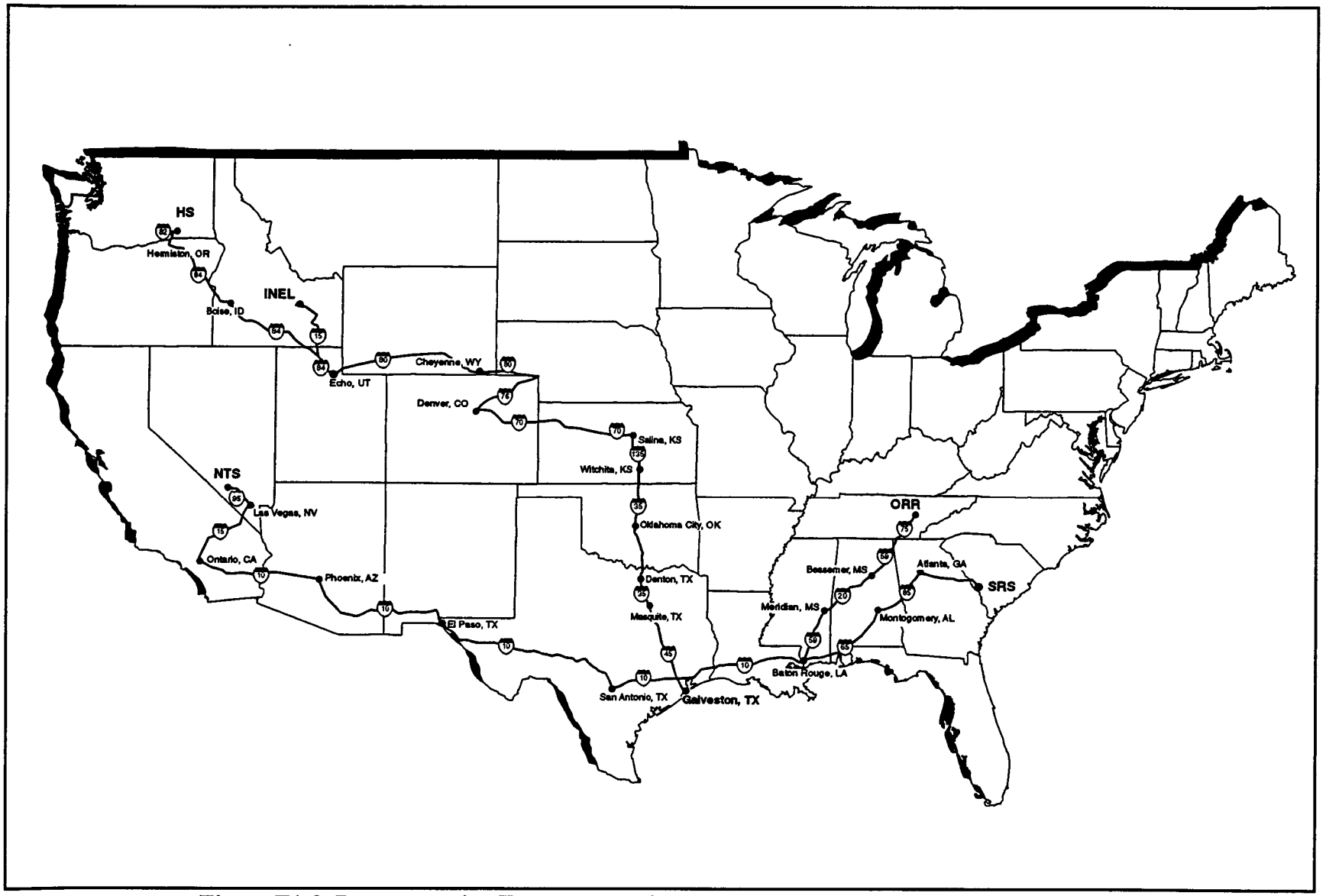

Figure E1-3 Representative Truck Routes from Galveston, TX to Department of Energy Management Sites

From: GALVESTON, TX
To : ID NATL ENG LAB

Routing through:

		GALVESTON				TX
I45		HOUSTON	SE	I45	I610	TX
I610		HOUSTON	N	I45	I610	TX
I45		DALLAS	SE	I45	I635	TX
I20	I635	MESQUITE	NW	I20	I635	TX
I635		DALLAS	NW	I35E	I635	TX
I35E		DENTON	S	I35E	I35W	TX
I35		OKLAHOMA CITY	S	I240	I35	OK
I240		OKLAHOMA CITY	SW	I240	I44	OK
I44		OKLAHOMA CITY	NE	I35	I44	OK
I35	I44	EDMOND	SE	I35	I44	OK
I35		SOUTH HAVEN	E	I35	U166	KS
I35 $	TKST$	WICHITA	S	I235	I35	KS
I235		WICHITA	N	I135	I235	KS
I135		SALINA	NW	I135	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: GALVESTON, TX
To : HANFORD, WA

Routing through:

		GALVESTON				TX
I45		HOUSTON	SE	I45	I610	TX
I610		HOUSTON	N	I45	I610	TX
I45		DALLAS	SE	I45	I635	TX
I20	I635	MESQUITE	NW	I20	I635	TX
I635		DALLAS	NW	I35E	I635	TX
I35E		DENTON	S	I35E	I35W	TX
I35		OKLAHOMA CITY	S	I240	I35	OK
I240		OKLAHOMA CITY	SW	I240	I44	OK
I44		OKLAHOMA CITY	NE	I35	I44	OK
I35	I44	EDMOND	SE	I35	I44	OK
I35		SOUTH HAVEN	E	I35	U166	KS
I35 $	TKST$	WICHITA	S	I235	I35	KS
I235		WICHITA	N	I135	I235	KS
I135		SALINA	NW	I135	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: GALVESTON, TX
To : K-25, TN

Routing through:

		GALVESTON				TX
I45		HOUSTON	SE	I45	I610	TX
I610		HOUSTON	E	I10	I610	TX
I10		BATON ROUGE	SE	I10	I12	LA
I12		SLIDELL	NE	I10	I12	LA
I59		MERIDIAN	W	I20	I59	MS
I20	I59	BESSEMER	SW	I20	I459	AL
yI459		CENTER POINT	SE	I459	I59	AL
I59		WILDWOOD	NW	I24	I59	GA
I24		EAST RIDGE	NE	I24	I75	TN
I75		OAK RIDGE	S	I40	I75	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: GALVESTON, TX
To : MERCURY, NV

Routing through:

		GALVESTON				TX
I45		HOUSTON	SE	I45	I610	TX
I610		HOUSTON	W	I10	I610	TX
I10		SAN ANTONIO	E	I10	I410	TX
I410		KIRBY	N	I35	I410	TX
I35	I410	SAN ANTONIO	NE	I35	I410	TX
I410		SAN ANTONIO	NW	I10	I410	TX
I10		PHOENIX	SE	I10	I17	AZ
I17		PHOENIX	W	I10	I17	AZ
I10		ONTARIO	E	I10	I15	CA
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

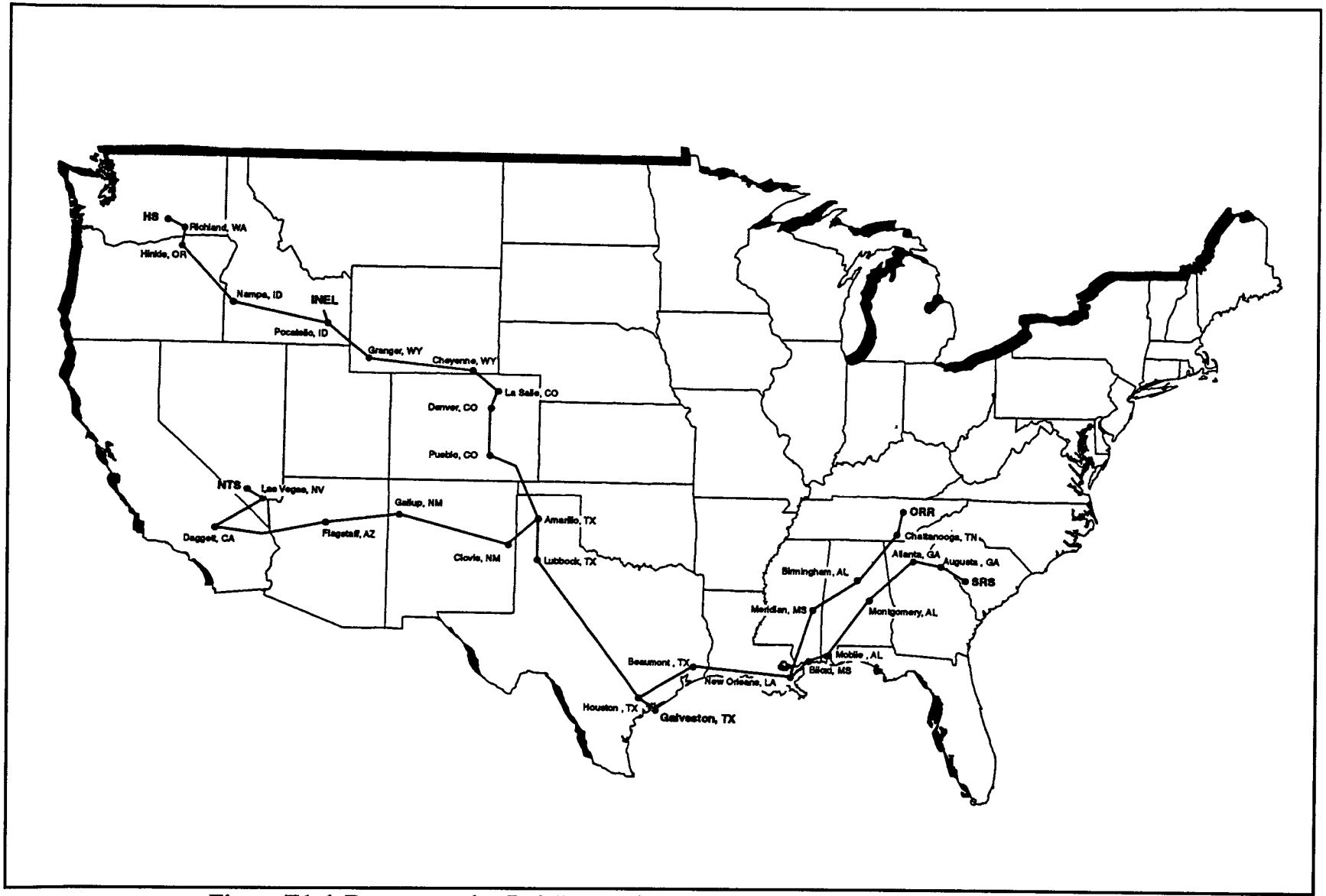

Figure E1-4 Representative Rail Routes from Galveston, TX to Department of Energy Management Sites

Route from: ATSF 13047-GALVESTON, TX
To: USG 15359-SRP, SC

RR	NODE	STATE	DIST
ATSF	13047-GALVESTON	TX	0.
ATSF	13054-TEXAS CITY JCT	TX	15.
ATSF	12392-ALVIN	TX	40.
ATSF	12399-HOUSTON	TX	68.
<TR>	12399-HOUSTON	TX	68.
UP	12399-HOUSTON	TX	68.
UP	12341-BEAUMONT	TX	156.
UP	9122-DE QUINCY	LA	203.
UP	9101-KINDER	LA	239.
UP	9112-LIVONIA	LA	317.
UP	8985-NEW ORLEANS	LA	446.
CSXT	8985-NEW ORLEANS	LA	446.
CSXT	8966-GULFPORT	MS	520.
CSXT	8926-BILOXI	MS	536.
CSXT	8967-PASCAGOULA	MS	553.
CSXT	8597-MOBILE	AL	592.
CSXT	8566-FLOMATON	AL	644.
CSXT	8657-MONTGOMERY	AL	769.
CSXT	8683-OPELIKA	AL	835.
CSXT	8142-LA GRANGE	GA	878.
CSXT	7914-ATLANTA	GA	954.
CSXT	7961-AUGUSTA	GA	1129.
CSXT	7732-ROBBINS	SC	1158.
CSXT	7717-DUNBARTON / WELL	SC	1167.
USG	7717-DUNBARTON / WELL	SC	1167.
USG	15359-SRP	SC	1175.

Route from: ATSF 13047-GALVESTON, TX
To: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
ATSF	13047-GALVESTON	TX	0.
ATSF	13054-TEXAS CITY JCT	TX	15.
ATSF	12392-ALVIN	TX	40.
ATSF	12466-SOMERVILLE	TX	153.
ATSF	12480-TEMPLE	TX	230.
ATSF	12414-KILLEEN	TX	260.
ATSF	12725-BROWNWOOD	TX	353.
ATSF	12830-SWEETWATER	TX	468.
ATSF	12812-LUBBOCK	TX	582.
ATSF	12793-CANYON	TX	686.
ATSF	12792-AMARILLO	TX	703.
ATSF	13753-LA JUNTA	CO	963.
ATSF	13764-PUEBLO	CO	1018.
ATSF	13760-COLORADO SPRINGS	CO	1061.
ATSF	13727-DENVER	CO	1138.
UP	13727-DENVER	CO	1138.
UP	13712-LA SALLE	CO	1181.
UP	13709-GREELEY	CO	1188.
UP	13465-CHEYENNE	WY	1247.
UP	13462-LARAMIE	WY	1299.
UP	13494-GRANGER	WY	1575.
UP	13369-MC CAMMON	ID	1767.
UP	13370-POCATELLO	ID	1790.
UP	13336-SCOVILLE	ID	1846.

Route from: ATSF 13047-GALVESTON, TX
To: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
ATSF	13047-GALVESTON	TX	0.
ATSF	13054-TEXAS CITY JCT	TX	15.
ATSF	12392-ALVIN	TX	40.
ATSF	12466-SOMERVILLE	TX	153.
ATSF	12480-TEMPLE	TX	230.
ATSF	12414-KILLEEN	TX	260.
ATSF	12725-BROWNWOOD	TX	353.
ATSF	12830-SWEETWATER	TX	468.
ATSF	12812-LUBBOCK	TX	582.
ATSF	12793-CANYON	TX	686.
ATSF	12792-AMARILLO	TX	703.
ATSF	13753-LA JUNTA	CO	963.
ATSF	13764-PUEBLO	CO	1018.
ATSF	13760-COLORADO SPRINGS	CO	1061.
ATSF	13727-DENVER	CO	1138.
UP	13727-DENVER	CO	1138.
UP	13712-LA SALLE	CO	1181.
UP	13709-GREELEY	CO	1188.
UP	13465-CHEYENNE	WY	1247.
UP	13462-LARAMIE	WY	1299.
UP	13494-GRANGER	WY	1575.
UP	13369-MC CAMMON	ID	1767.
UP	13370-POCATELLO	ID	1790.
UP	13412-NAMPA	ID	2032.
UP	14220-PENDLETON	OR	2301.
UP	14223-HINKLE	OR	2332.
UP	13894-WALLULA	WA	2361.
UP	13964-KENNEWICK	WA	2376.
UP	13941-RICHLAND	WA	2384.
USG	13941-RICHLAND	WA	2384.
USG	16212-HANFORD S 300	WA	2392.

Route From: ATSF 13047-GALVESTON, TX
To: NS 15316-K-25, TN

RR	NODE	STATE	DIST
ATSF	13047-GALVESTON	TX	0.
ATSF	13054-TEXAS CITY JCT	TX	15.
ATSF	12392-ALVIN	TX	40.
ATSF	12399-HOUSTON	TX	68.
<TR>	12399-HOUSTON	TX	68.
UP	12399-HOUSTON	TX	68.
UP	12341-BEAUMONT	TX	156.
UP	9122-DE QUINCY	LA	203.
UP	9101-KINDER	LA	239.
UP	9112-LIVONIA	LA	317.
UP	8985-NEW ORLEANS	LA	446.
NS	8985-NEW ORLEANS	LA	446.
NS	8986-SLIDELL	LA	476.
NS	8963-HATTIESBURG	MS	558.
NS	8887-MERIDIAN	MS	641.
NS	8640-BOLIGEE	AL	693.
NS	8754-TUSCALOOSA	AL	737.
NS	8739-BIRMINGHAM	AL	807.
NS	8797-GADSDEN	AL	869.
NS	7235-CHATTANOOGA	TN	957.
NS	7260-HARRIMAN	TN	1038.
NS	15316-K-25	TN	1053.

Route from: ATSF 13047-GALVESTON, TX
To: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
ATSF	13047-GALVESTON	TX	0.
ATSF	13054-TEXAS CITY JCT	TX	15.
ATSF	12392-ALVIN	TX	40.
ATSF	12466-SOMERVILLE	TX	153.
ATSF	12480-TEMPLE	TX	230.
ATSF	12414-KILLEEN	TX	260.
ATSF	12725-BROWNWOOD	TX	353.
ATSF	12830-SWEETWATER	TX	468.
ATSF	12812-LUBBOCK	TX	582.
ATSF	12806-FARWELL	TX	672.
ATSF	13025-CLOVIS	NM	683.
ATSF	12995-BELEN	NM	924.
ATSF	12996-DALIES	NM	933.
ATSF	16077-GRANTS	NM	993.
ATSF	12999-GALLUP	NM	1070.
ATSF	12949-HOLBROOK	AZ	1181.
ATSF	12959-FLAGSTAFF	AZ	1276.
ATSF	12964-WILLIAMS	AZ	1305.
ATSF	12963-KINGMAN	AZ	1458.
ATSF	14663-DAGGETT	CA	1677.
UP	14663-DAGGETT	CA	1677.
UP	14762-LAS VEGAS	NV	1841.
UP	14766-VALLEY	NV	1856.
USG	14766-VALLEY	NV	1856.
USG	16333-YUCCA MOUNTAIN	NV	1955.

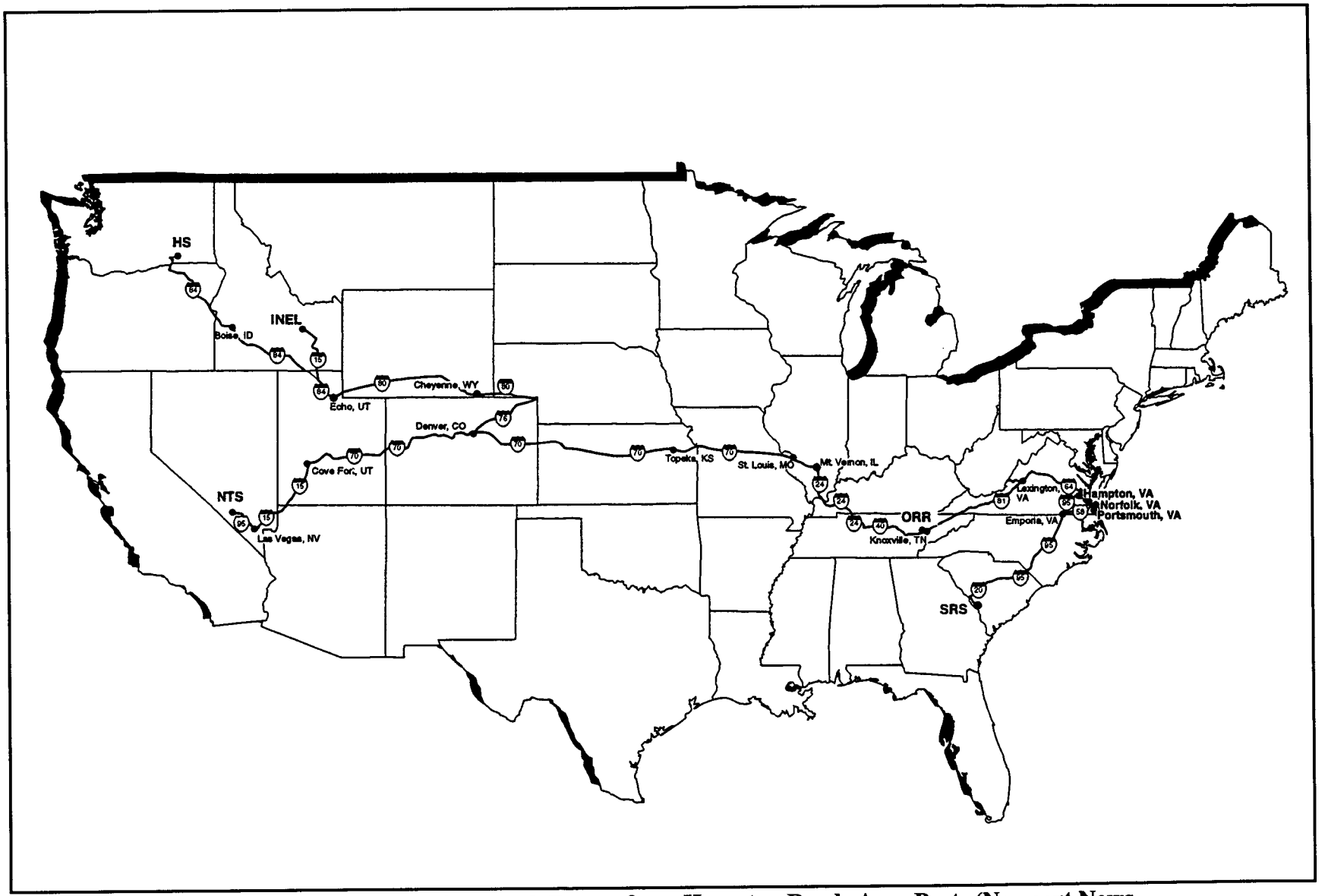

Figure E1-5 Representative Truck Routes from Hampton Roads Area Ports (Newport News, Norfolk, and Portsmouth, VA) to Department of Energy Management Sites

From: NEWPORT NEWS S I664 U60, VA
To : SRP, SC

Routing through:

		NEWPORT NEWS	S	I664	U60	VA
I664		HAMPTON		I64	I664	VA
I64		HAMPTON	SE	I64	BRDG	VA
I64 #		WILLOGHBY BCH				VA
I64		CHESAPEAKE	W	I264	I64	VA
U13	U460	SUFFOLK	E	U13	U460	VA
U460	U58	SUFFOLK	N	U460	U58	VA
U58		EMPORIA	N	I95	U58	VA
I95		FLORENCE	W	I20	I95	SC
I20		NORTH AUGUSTA	NW	I20	S230	SC
I230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRP				SC

From: NEWPORT NEWS S I664 U60 VA
To : ID NATL ENG LAB ID

Routing through:

		NEWPORT NEWS	S	I664	U60	VA
I664		HAMPTON		I64	I664	VA
I64		RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I64		BECKLEY	S	I64	I77	WV
I64 $	I77 $	CHARLESTON	SE	I64	U60	WV
I64	I77	CHARLESTON		I64	I77	WV
I64		LEXINGTON	E	I64	I75	KY
I64	I75	LEXINGTON	N	I64	I75	KY
I64		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: NEWPORT NEWS S I664 U60 VA
To : HANFORD, WA

Routing through:

		NEWPORT NEWS	S	I664	U60	VA
I664		HAMPTON		I64	I664	VA
I64		RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I64		BECKLEY	S	I64	I77	WV
I64 $	I77 $	CHARLESTON	SE	I64	U60	WV
I64	I77	CHARLESTON		I64	I77	WV
I64		LEXINGTON	E	I64	I75	KY
I64	I75	LEXINGTON	N	I64	I75	KY
I64		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: NEWPORT NEWS S I664 U60 VA
To : K-25, TN

Routing through:

		NEWPORT NEWS	S	I664	U60	VA
I664		HAMPTON		I64	I664	VA
I64		RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I81		FT CHISWELL	E	I77	I81	VA
I77	I81	WYTHEVILLE	E	I77	I81	VA
I81		DANDRIDGE	NE	I40	I81	TN
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	OAK RIDGE	S	I40	I75	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: NEWPORT NEWS S I664 U60 VA
To : MERCURY, NV

Routing through:

		NEWPORT NEWS	S	I664	U60	VA
I664		HAMPTON		I64	I664	VA
I64		RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I64		BECKLEY	S	I64	I77	WV
I64 $	I77 $	CHARLESTON	SE	I64	U60	WV
I64	I77	CHARLESTON		I64	I77	WV
I64		LEXINGTON	E	I64	I75	KY
I64	I75	LEXINGTON	N	I64	I75	KY
I64		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

From: NORFOLK E U13 U58 VA
To : SRP, SC

Routing through:

		NORFOLK	E	U13	U58	VA
U13		NORFOLK	NE	I64	U13	VA
I64		CHESAPEAKE	W	I264	I64	VA
U13	U460	SUFFOLK	E	U13	U460	VA
U460	U58	SUFFOLK	N	U460	U58	VA
U58		EMPORIA	N	I95	U58	VA
I95		FLORENCE	W	I20	I95	SC
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRP				SC

From: NORFOLK, E U13 U58 VA
To : ID NATL ENG LAB, ID

Routing through:

		NORFOLK	E	U13	U58	VA
U13		NORFOLK	NE	I64	U13	VA
I64		CHESAPEAKE	W	I264	I64	VA
U13	U460	SUFFOLK	E	U13	U460	VA
U460	U58	SUFFOLK	N	U460	U58	VA
U460		PETERSBURG				VA
I95 $	TRPT$	RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I95 $	TRPT$	RICHMOND	N	I95	U301	VA
I95		GLEN ALLEN	E	I295	I95	VA
I295		SHORT PUMP	NE	I295	I64	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I64		BECKLEY	S	I64	I77	WV
I64 $	I77 $	CHARLESTON	SE	I64	U60	WV
I64	I77	CHARLESTON		I64	I77	WV
I64		LEXINGTON	E	I64	I75	KY
I64	I75	LEXINGTON	N	I64	I75	KY
I64		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I270		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: NORFOLK N I564 I64 VA
To : HANFORD, WA

Routing through:

		NORFOLK	N	I564	I64	VA
I64		CHESAPEAKE	W	I264	I64	VA
U13	U460	SUFFOLK	E	U13	U460	VA
U460	U58	SUFFOLK	N	U460	U58	VA
U460		PETERSBURG				VA
I95 $	TRPT$	RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I95 $	TRPT$	RICHMOND	N	I95	U301	VA
I95		GLEN ALLEN	E	I295	I95	VA
I295		SHORT PUMP	NE	I295	I64	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I64		BECKLEY	S	I64	I77	WV
I64 $	I77 $	CHARLESTON	SE	I64	U60	WV
I64	I77	CHARLESTON		I64	I77	WV
I64		LEXINGTON	E	I64	I75	KY
I64	I75	LEXINGTON	N	I64	I75	KY
I64		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: NORFOLK E U13 U58 VA
To : K-25, TN

Routing through:

		NORFOLK	E	U13	U58	VA
U13		NORFOLK	NE	I64	U13	VA
I64		CHESAPEAKE	W	I264	I64	VA
U13	U460	SUFFOLK	E	U13	U460	VA
U460	U58	SUFFOLK	N	U460	U58	VA
U460		PETERSBURG				VA
I85 $		MATOACA	S	I85	U1	VA
I85		SUTHERLAND	E	I85	U460	VA
U460		BURKEVILLE	E	U360	U460	VA
U360	U460	BURKEVILLE	W	U360	U460	VA
U460		FARMVILLE	S	U15	U460	VA
U15	U460	FARMVILLE	W	U15	U460	VA
U460		BEDFORD				VA
U221	U460	BONSACK		U221	S220	VA
S220A		CLOVERDALE	N	I81	U220	VA
I81		FT CHISWELL	E	I77	I81	VA
I77	I81	WYTHEVILLE	E	I77	I81	VA
I81		DANDRIDGE	NE	I40	I81	TN
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	OAK RIDGE	S	I40	I75	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: NORFOLK E U13 U58 VA
To : MERCURY, NV

Routing through:

		NORFOLK	E	U13	U58	VA
U13		NORFOLK	NE	I64	U13	VA
I64		CHESAPEAKE	W	I264	I64	VA
U13	U460	SUFFOLK	E	U13	U460	VA
U460	U58	SUFFOLK	N	U460	U58	VA
U460		PETERSBURG				VA
I95 $	TRPT$	RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I95 $	TRPT$	RICHMOND	N	I95	U301	VA
I95		GLEN ALLEN	E	I295	I95	VA
I295		SHORT PUMP	NE	I295	I64	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I64		BECKLEY	S	I64	I77	WV
I64 $	I77 $	CHARLESTON	SE	I64	U60	WV
I64	I77	CHARLESTON		I64	I77	WV
I64		LEXINGTON	E	I64	I75	KY
I64	I75	LEXINGTON	N	I64	I75	KY
I64		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

From: PORTSMOUTH, VA
To : SRP, SC

Routing through:

		PORTSMOUTH				VA
U460		NORFOLK				VA
I264		NORFOLK	E	I264	I64	VA
I64		CHESAPEAKE	W	I264	I64	VA
U13	U460	SUFFOLK	E	U13	U460	VA
U460	U58	SUFFOLK	N	U460	U58	VA
U58		EMPORIA	N	I95	U58	VA
I95		FLORENCE	W	I20	I95	SC
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRP				SC

From: PORTSMOUTH, VA
To : ID NATL ENG LAB, ID

Routing through:

		PORTSMOUTH				VA
U460		NORFOLK				VA
I264		NORFOLK	E	I264	I64	VA
I64		WILLOGHBY BCH				VA
I64 #		HAMPTON	SE	I64	BRDG	VA
I64		RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I64		BECKLEY	S	I64	I77	WV
I64 $	I77 $	CHARLESTON	SE	I64	U60	WV
I64	I77	CHARLESTON		I64	I77	WV
I64		LEXINGTON	E	I64	I75	KY
I64	I75	LEXINGTON	N	I64	I75	KY
I64		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: PORTSMOUTH, VA
To : HANFORD, WA

Routing through:

		PORTSMOUTH				VA
U460		NORFOLK				VA
I264		NORFOLK	E	I264	I64	VA
I64		WILLOGHBY BCH				VA
I64 #		HAMPTON	SE	I64	BRDG	VA
I64		RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I64		BECKLEY	S	I64	I77	WV
I64 $	I77 $	CHARLESTON	SE	I64	U60	WV
I64	I77	CHARLESTON		I64	I77	WV
I64		LEXINGTON	E	I64	I75	KY
I64	I75	LEXINGTON	N	I64	I75	KY
I64		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: PORTSMOUTH, VA
To : K-25, TN

Routing through:

		PORTSMOUTH				VA
U460		NORFOLK				VA
I264		NORFOLK	E	I264	I64	VA
I64		WILLOGHBY BCH				VA
I64 #		HAMPTON	SE	I64	BRDG	VA
I64		RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I81		FT CHISWELL	E	I77	I81	VA
I77	I81	WYTHEVILLE	E	I77	I81	VA
I81		DANDRIDGE	NE	I40	I81	TN
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	OAK RIDGE	S	I40	I75	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: PORTSMOUTH, VA
To : MERCURY, NV

Routing through:

		PORTSMOUTH				VA
U460		NORFOLK				VA
I264		NORFOLK	E	I264	I64	VA
I64		WILLOGHBY BCH				VA
I64 #		HAMPTON	SE	I64	BRDG	VA
I64		RICHMOND	N	I64	I95	VA
I64 $	I95 $	RICHMOND	NW	I64	I95	VA
I64		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I64		BECKLEY	S	I64	I77	WV
I64 $	I77 $	CHARLESTON	SE	I64	U60	WV
I64	I77	CHARLESTON		I64	I77	WV
I64		LEXINGTON	E	I64	I75	KY
I64	I75	LEXINGTON	N	I64	I75	KY
I64		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

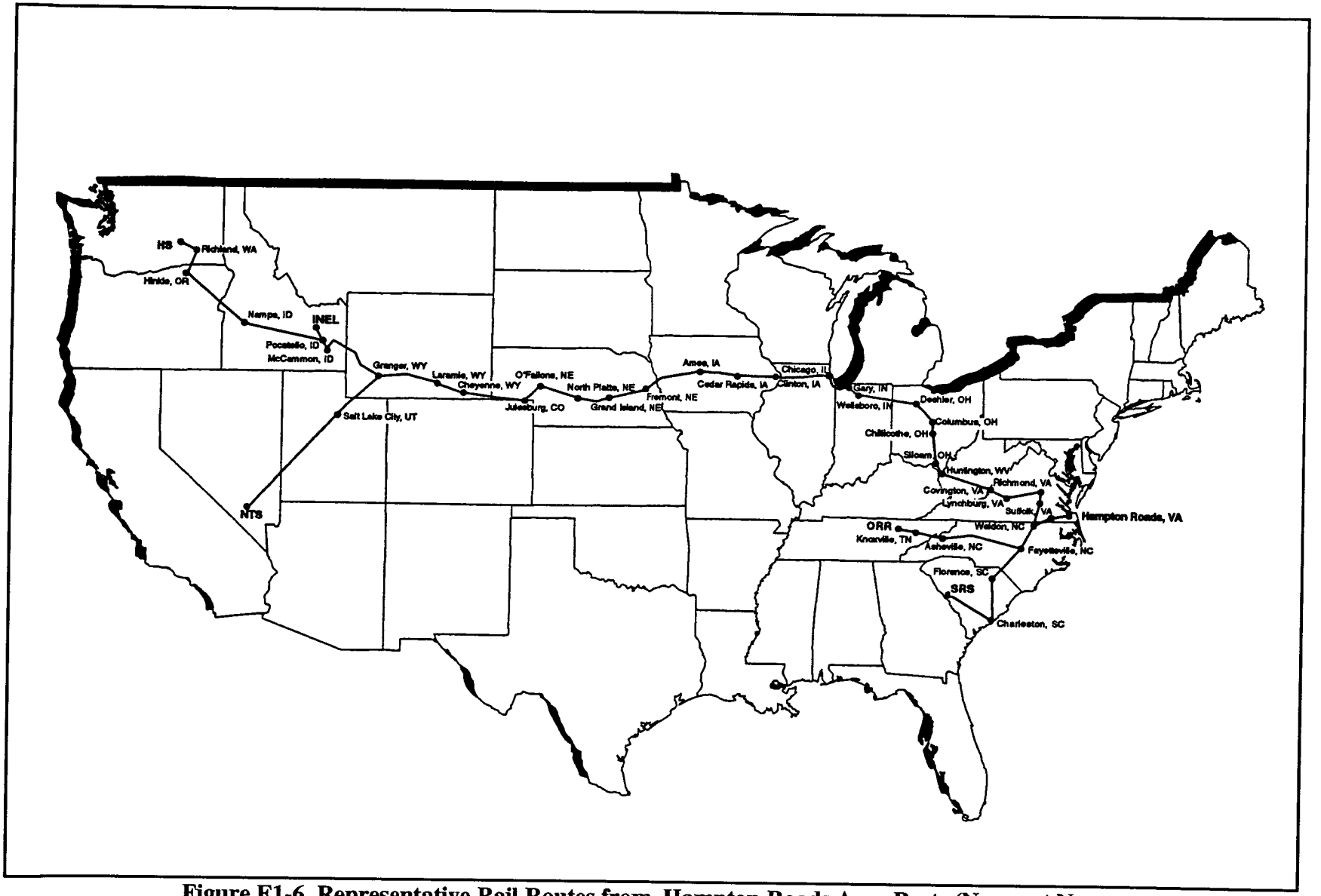

Figure E1-6 Representative Rail Routes from Hampton Roads Area Ports (Newport News, Norfolk, and Portsmouth, VA) to Department of Energy Management Sites

ROUTE FROM: CSXT 6024-NEWPORT NEWS, VA
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
CSXT	6024-NEWPORT NEWS	VA	0.
CSXT	6082-RICHMOND	VA	76.
CSXT	6087-COLONIAL HEIGHTS	VA	97.
CSXT	6064-PETERSBURG	VA	103.
CSXT	7563-WELDON	NC	163.
CSXT	7565-ROCKY MOUNT	NC	200.
CSXT	7566-WILSON	NC	214.
CSXT	7606-FAYETTEVILLE	NC	288.
CSXT	7620-PEMBROKE	NC	317.
CSXT	7671-DILLON	SC	337.
CSXT	7675-FLORENCE	SC	366.
CSXT	7690-CHARLESTON	SC	464.
CSXT	7739-FAIRFAX	SC	558.
CSXT	7732-ROBBINS	SC	587.
CSXT	7717-DUNBARTON / WELL	SC	596.
USG	7717-DUNBARTON / WELL	SC	596.
USG	15359-SRP	SC	604.

ROUTE FROM: CSXT 6024-NEWPORT NEWS, VA
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
CSXT	6024-NEWPORT NEWS	VA	0.
CSXT	6082-RICHMOND	VA	76.
CSXT	6220-LYNCHBURG	VA	209.
CSXT	6198-GLASGOW	VA	235.
CSXT	6200-CLIFTON FORGE	VA	290.
CSXT	6189-COVINGTON	VA	317.
CSXT	6517-PRINCE	WV	384.
CSXT	6794-WEST CHARLESTOWN	WV	460.
CSXT	6795-ST ALBANS	WV	468.
CSXT	6806-BARBOURSVILLE	WV	499.
CSXT	6811-HUNTINGTON	WV	510.
CSXT	6808-KENOVA	WV	516.
CSXT	6807-CATLETTSBURG	KY	518.
CSXT	6809-ASHLAND	KY	524.
CSXT	6846-SILOAM	KY	547.
CSXT	3162-CHILLICOTHE	OH	609.
CSXT	3095-COLUMBUS (BROAD	OH	651.
CSXT	3402-MARION	OH	696.
CSXT	3002-FOSTORIA	OH	739.
CSXT	3484-DESHLER	OH	768.
CSXT	3993-WELLSBORO	IN	916.
CSXT	4070-GARY	IN	950.
CSXT	4073-CLARKE	IN	954.
CSXT	4074-INDIANA HARBOR	IN	957.
CSXT	4232-SOUTH CHICAGO	IL	965.
CSXT	4231-BURNSIDE	IL	968.
CSXT	4217-CHICAGO	IL	980.
CNW	4217-CHICAGO	IL	980.
CNW	4234-PROVISO	IL	994.
CNW	4311-DE KALB	IL	1036.
CNW	4324-NELSON	IL	1081.
CNW	10304-CLINTON	IA	1114.
CNW	10289-CEDAR RAPIDS	IA	1195.
CNW	10265-MARSHALLTOWN	IA	1262.
CNW	10246-NEVADA	IA	1289.
CNW	10271-AMES	IA	1300.
CNW	10176-MISSOURI VALLEY	IA	1433.
CNW	10198-CALIFORNIA JCT	IA	1439.
CNW	11340-FREMONT	NE	1467.
UP	11340-FREMONT	NE	1467.
UP	11406-GRAND ISLAND	NE	1576.
UP	11410-GIBBON	NE	1602.
UP	11352-NORTH PLATTE	NE	1680.
UP	11358-O FALLONS	NE	1729.
UP	13703-JULESBURG	CO	1797.
UP	13465-CHEYENNE	WY	1943.
UP	13462-LARAMIE	WY	1995.
UP	13494-GRANGER	WY	2271.
UP	13369-MC CAMMON	ID	2463.
UP	13370-POCATELLO	ID	2486.
UP	13336-SCOVILLE	ID	2542.

ROUTE FROM: CSXT 6024-NEWPORT NEWS, VA
TO: USG 16212-HANFORD S 300 WA

RR	NODE	STATE	DIST
CSXT	6024-NEWPORT NEWS	VA	0.
CSXT	6082-RICHMOND	VA	76.
CSXT	6220-LYNCHBURG	VA	209.
CSXT	6198-GLASGOW	VA	235.
CSXT	6200-CLIFTON FORGE	VA	290.
CSXT	6189-COVINGTON	VA	317.
CSXT	6517-PRINCE	WV	384.
CSXT	6794-WEST CHARLESTOWN	WV	460.
CSXT	6795-ST ALBANS	WV	468.
CSXT	6806-BARBOURSVILLE	WV	499.
CSXT	6811-HUNTINGTON	WV	510.
CSXT	6808-KENOVA	WV	516.
CSXT	6807-CATLETTSBURG	KY	518.
CSXT	6809-ASHLAND	KY	524.
CSXT	6846-SILOAM	KY	547.
CSXT	3162-CHILLICOTHE	OH	609.
CSXT	3095-COLUMBUS (BROAD	OH	651.
CSXT	3402-MARION	OH	696.
CSXT	3002-FOSTORIA	OH	739.
CSXT	3484-DESHLER	OH	768.
CSXT	3993-WELLSBORO	IN	916.
CSXT	4070-GARY	IN	950.
CSXT	4073-CLARKE	IN	954.
CSXT	4074-INDIANA HARBOR	IN	957.
CSXT	4232-SOUTH CHICAGO	IL	965.
CSXT	4231-BURNSIDE	IL	968.
CSXT	4217-CHICAGO	IL	980.
CNW	4217-CHICAGO	IL	980.
CNW	4234-PROVISO	IL	994.
CNW	4311-DE KALB	IL	1036.
CNW	4324-NELSON	IL	1081.
CNW	10304-CLINTON	IA	1114.
CNW	10289-CEDAR RAPIDS	IA	1195.
CNW	10265-MARSHALLTOWN	IA	1262.
CNW	10246-NEVADA	IA	1289.
CNW	10271-AMES	IA	1300.
CNW	10176-MISSOURI VALLEY	IA	1433.
CNW	10198-CALIFORNIA JCT	IA	1439.
CNW	11340-FREMONT	NE	1467.
UP	11340-FREMONT	NE	1467.
UP	11406-GRAND ISLAND	NE	1576.
UP	11410-GIBBON	NE	1602.
UP	11352-NORTH PLATTE	NE	1680.
UP	11358-O FALLONS	NE	1729.
UP	13703-JULESBURG	CO	1797.
UP	13465-CHEYENNE	WY	1943.
UP	13462-LARAMIE	WY	1995.
UP	13494-GRANGER	WY	2271.
UP	13369-MC CAMMON	ID	2463.
UP	13370-POCATELLO	ID	2486.
UP	13412-NAMPA	ID	2728.
UP	14220-PENDLETON	OR	2997.
UP	14223-HINKLE	OR	3028.
UP	13894-WALLULA	WA	3057.
UP	13964-KENNEWICK	WA	3072.
UP	13941-RICHLAND	WA	3080.
USG	13941-RICHLAND	WA	3080.
USG	16212-HANFORD S 300	WA	3088.

ROUTE FROM: CSXT 6024-NEWPORT NEWS, VA
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
CSXT	6024-NEWPORT NEWS	VA	0.
CSXT	6082-RICHMOND	VA	76.
CSXT	6087-COLONIAL HEIGHTS	VA	97.
CSXT	6064-PETERSBURG	VA	103.
CSXT	7563-WELDON	NC	163.
CSXT	7565-ROCKY MOUNT	NC	200.
CSXT	7566-WILSON	NC	214.
CSXT	7606-FAYETTEVILLE	NC	288.
CSXT	7620-PEMBROKE	NC	317.
CSXT	7470-HAMLET	NC	348.
CSXT	7472-WADESBORO	NC	373.
WSS	7472-WADESBORO	NC	373.
WSS	7462-LEXINGTON	NC	441.
NS	7462-LEXINGTON	NC	441.
NS	7478-SALISBURY	NC	458.
NS	7394-HICKORY	NC	515.
NS	7387-MARION	NC	557.
NS	7343-ASHEVILLE	NC	597.
NS	7318-MORRISTOWN	TN	677.
NS	7286-KNOXVILLE	TN	718.
NS	7288-DOSSETT	TN	743.
NS	15316-K-25	TN	764.

ROUTE FROM: CSXT 6024-NEWPORT NEWS, VA
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
CSXT	6024-NEWPORT NEWS	VA	0.
CSXT	6082-RICHMOND	VA	76.
CSXT	6220-LYNCHBURG	VA	209.
CSXT	6198-GLASGOW	VA	235.
CSXT	6200-CLIFTON FORGE	VA	290.
CSXT	6189-COVINGTON	VA	317.
CSXT	6517-PRINCE	WV	384.
CSXT	6794-WEST CHARLESTOWN	WV	460.
CSXT	6795-ST ALBANS	WV	468.
CSXT	6806-BARBOURSVILLE	WV	499.
CSXT	6811-HUNTINGTON	WV	510.
CSXT	6808-KENOVA	WV	516.
CSXT	6807-CATLETTSBURG	KY	518.
CSXT	6809-ASHLAND	KY	524.
CSXT	6846-SILOAM	KY	547.
CSXT	3162-CHILLICOTHE	OH	609.
CSXT	3095-COLUMBUS (BROAD	OH	651.
CSXT	3402-MARION	OH	696.
CSXT	3002-FOSTORIA	OH	739.
CSXT	3484-DESHLER	OH	768.
CSXT	3993-WELLSBORO	IN	916.
CSXT	4070-GARY	IN	950.
CSXT	4073-CLARKE	IN	954.
CSXT	4074-INDIANA HARBOR	IN	957.
CSXT	4232-SOUTH CHICAGO	IL	965.
CSXT	4231-BURNSIDE	IL	968.
CSXT	4217-CHICAGO	IL	980.
CNW	4217-CHICAGO	IL	980.
CNW	4234-PROVISO	IL	994.
CNW	4311-DE KALB	IL	1036.
CNW	4324-NELSON	IL	1081.
CNW	10304-CLINTON	IA	1114.
CNW	10289-CEDAR RAPIDS	IA	1195.
CNW	10265-MARSHALLTOWN	IA	1262.
CNW	10246-NEVADA	IA	1289.
CNW	10271-AMES	IA	1300.

ROUTE FROM : CSXT 6024-NEWPORT NEWS, VA
TO : USG 16333-YUCCA MOUNTAIN, NV -
Continued from Column 1

CNW	10176-MISSOURI VALLEY	IA	1433.
CNW	10198-CALIFORNIA JCT	IA	1439.
CNW	11340-FREMONT	NE	1467.
UP	11340-FREMONT	NE	1467.
UP	11406-GRAND ISLAND	NE	1576.
UP	11410-GIBBON	NE	1602.
UP	11352-NORTH PLATTE	NE	1680.
UP	11358-O FALLONS	NE	1729.
UP	13703-JULESBURG	CO	1797.
UP	13465-CHEYENNE	WY	1943.
UP	13462-LARAMIE	WY	1995.
UP	13494-GRANGER	WY	2271.
UP	13568-OGDEN	UT	2410.
UP	13595-SALT LAKE CITY	UT	2445.
UP	13630-LYNNDYL	UT	2558.
UP	14766-VALLEY	NV	2875.
USG	14766-VALLEY	NV	2875.
USG	16333-YUCCA MOUNTAIN	NV	2974.

ROUTE FROM: CSXT 6003-NORFOLK, VA
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
CSXT	6003-NORFOLK	VA	0.
CSXT	6059-SUFFOLK	VA	30.
CSXT	7563-WELDON	NC	88.
CSXT	6064-PETERSBURG	VA	148.
CSXT	6087-COLONIAL HEIGHTS	VA	154.
CSXT	6082-RICHMOND	VA	175.
CSXT	6220-LYNCHBURG	VA	308.
CSXT	6198-GLASGOW	VA	334.
CSXT	6200-CLIFTON FORGE	VA	389.
CSXT	6189-COVINGTON	VA	416.
CSXT	6517-PRINCE	WV	483.
CSXT	6794-WEST CHARLESTOWN	WV	559.
CSXT	6795-ST ALBANS	WV	567.
CSXT	6806-BARBOURSVILLE	WV	598.
CSXT	6811-HUNTINGTON	WV	609.
CSXT	6808-KENOVA	WV	615.
CSXT	6807-CATLETTSBURG	KY	617.
CSXT	6809-ASHLAND	KY	623.
CSXT	6846-SILOAM	KY	646.
CSXT	3162-CHILLICOTHE	OH	709.
CSXT	3095-COLUMBUS (BROAD	OH	751.
CSXT	3402-MARION	OH	796.
CSXT	3002-FOSTORIA	OH	839.
CSXT	3484-DESHLER	OH	867.
CSXT	3993-WELLSBORO	IN	1015.
CSXT	4070-GARY	IN	1049.
CSXT	4073-CLARKE	IN	1053.
CSXT	4074-INDIANA HARBOR	IN	1056.
CSXT	4232-SOUTH CHICAGO	IL	1064.
CSXT	4231-BURNSIDE	IL	1067.
CSXT	4217-CHICAGO	IL	1079.
CNW	4217-CHICAGO	IL	1079.
CNW	4234-PROVISO	IL	1094.
CNW	4311-DE KALB	IL	1136.
CNW	4324-NELSON	IL	1181.
CNW	10304-CLINTON	IA	1213.
CNW	10289-CEDAR RAPIDS	IA	1294.
CNW	10265-MARSHALLTOWN	IA	1361.
CNW	10246-NEVADA	IA	1388.
CNW	10271-AMES	IA	1399.
CNW	10176-MISSOURI VALLEY	IA	1532.
CNW	10198-CALIFORNIA JCT	IA	1538.
CNW	11340-FREMONT	NE	1566.
UP	11340-FREMONT	NE	1566.
UP	11406-GRAND ISLAND	NE	1675.
UP	11410-GIBBON	NE	1701.
UP	11352-NORTH PLATTE	NE	1779.
UP	11358-O FALLONS	NE	1828.
UP	13703-JULESBURG	CO	1896.
UP	13465-CHEYENNE	WY	2042.
UP	13462-LARAMIE	WY	2094.
UP	13494-GRANGER	WY	2370.
UP	13369-MC CAMMON	ID	2562.
UP	13370-POCATELLO	ID	2585.
UP	13336-SCOVILLE	ID	2641.

ROUTE FROM: CSXT 6003-NORFOLK, VA
TO: USG 16212-HANFORD S 300 WA

RR	NODE	STATE	DIST
CSXT	6003-NORFOLK	VA	0.
CSXT	6059-SUFFOLK	VA	30.
CSXT	7563-WELDON	NC	88.
CSXT	6064-PETERSBURG	VA	148.
CSXT	6087-COLONIAL HEIGHTS	VA	154.
CSXT	6082-RICHMOND	VA	175.
CSXT	6220-LYNCHBURG	VA	308.
CSXT	6198-GLASGOW	VA	334.
CSXT	6200-CLIFTON FORGE	VA	389.
CSXT	6189-COVINGTON	VA	416.
CSXT	6517-PRINCE	WV	483.
CSXT	6794-WEST CHARLESTOWN	WV	559.
CSXT	6795-ST ALBANS	WV	567.
CSXT	6806-BARBOURSVILLE	WV	598.
CSXT	6811-HUNTINGTON	WV	609.
CSXT	6808-KENOVA	WV	615.
CSXT	6807-CATLETTSBURG	KY	617.
CSXT	6809-ASHLAND	KY	623.
CSXT	6846-SILOAM	KY	646.
CSXT	3162-CHILLICOTHE	OH	709.
CSXT	3095-COLUMBUS (BROAD	OH	751.
CSXT	3402-MARION	OH	796.
CSXT	3002-FOSTORIA	OH	839.
CSXT	3484-DESHLER	OH	867.
CSXT	3993-WELLSBORO	IN	1015.
CSXT	4070-GARY	IN	1049.
CSXT	4073-CLARKE	IN	1053.
CSXT	4074-INDIANA HARBOR	IN	1056.
CSXT	4232-SOUTH CHICAGO	IL	1064.
CSXT	4231-BURNSIDE	IL	1067.
CSXT	4217-CHICAGO	IL	1079.
CNW	4217-CHICAGO	IL	1079.
CNW	4234-PROVISO	IL	1094.
CNW	4311-DE KALB	IL	1136.
CNW	4324-NELSON	IL	1181.
CNW	10304-CLINTON	IA	1213.
CNW	10289-CEDAR RAPIDS	IA	1294.
CNW	10265-MARSHALLTOWN	IA	1361.
CNW	10246-NEVADA	IA	1388.
CNW	10271-AMES	IA	1399.
CNW	10176-MISSOURI VALLEY	IA	1532.
CNW	10198-CALIFORNIA JCT	IA	1538.
CNW	11340-FREMONT	NE	1566.
UP	11340-FREMONT	NE	1566.
UP	11406-GRAND ISLAND	NE	1675.
UP	11410-GIBBON	NE	1701.
UP	11352-NORTH PLATTE	NE	1779.
UP	11358-O FALLONS	NE	1828.
UP	13703-JULESBURG	CO	1896.
UP	13465-CHEYENNE	WY	2042.
UP	13462-LARAMIE	WY	2094.
UP	13494-GRANGER	WY	2370.
UP	13369-MC CAMMON	ID	2562.
UP	13370-POCATELLO	ID	2585.
UP	13412-NAMPA	ID	2827.
UP	14220-PENDLETON	OR	3096.
UP	14223-HINKLE	OR	3127.
UP	13894-WALLULA	WA	3156.
UP	13964-KENNEWICK	WA	3171.
UP	13941-RICHLAND	WA	3179.
USG	13941-RICHLAND	WA	3179.
USG	16212-HANFORD S 300	WA	3187.

ROUTE FROM: CSXT 6003-NORFOLK, VA
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
CSXT	6003-NORFOLK	VA	0.
CSXT	6059-SUFFOLK	VA	30.
CSXT	7563-WELDON	NC	88.
CSXT	7565-ROCKY MOUNT	NC	125.
CSXT	7566-WILSON	NC	139.
CSXT	7606-FAYETTEVILLE	NC	213.
CSXT	7620-PEMBROKE	NC	242.
CSXT	7470-HAMLET	NC	273.
CSXT	7472-WADESBORO	NC	298.
WSS	7472-WADESBORO	NC	298.
WSS	7462-LEXINGTON	NC	366.
NS	7462-LEXINGTON	NC	366.
NS	7478-SALISBURY	NC	383.
NS	7394-HICKORY	NC	440.
NS	7387-MARION	NC	482.
NS	7343-ASHEVILLE	NC	522.
NS	7318-MORRISTOWN	TN	602.
NS	7286-KNOXVILLE	TN	643.
NS	7288-DOSSETT	TN	668.
NS	15316-K-25	TN	689.

ROUTE FROM: CSXT 6003-NORFOLK, VA
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
CSXT	6003-NORFOLK	VA	0.
CSXT	6059-SUFFOLK	VA	30.
CSXT	7563-WELDON	NC	88.
CSXT	7565-ROCKY MOUNT	NC	125.
CSXT	7566-WILSON	NC	139.
CSXT	7606-FAYETTEVILLE	NC	213.
CSXT	7620-PEMBROKE	NC	242.
CSXT	7671-DILLON	SC	262.
CSXT	7675-FLORENCE	SC	291.
CSXT	7690-CHARLESTON	SC	389.
CSXT	7739-FAIRFAX	SC	483.
CSXT	7732-ROBBINS	SC	512.
CSXT	7717-DUNBARTON / WELL	SC	521.
USG	7717-DUNBARTON / WELL	SC	521.
USG	15359-SRP	SC	529.

ROUTE FROM: CSXT 6003-NORFOLK, VA
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
CSXT	6003-NORFOLK	VA	0.
CSXT	6059-SUFFOLK	VA	30.
CSXT	7563-WELDON	NC	88.
CSXT	6064-PETERSBURG	VA	148.
CSXT	6087-COLONIAL HEIGHTS	VA	154.
CSXT	6082-RICHMOND	VA	175.
CSXT	6220-LYNCHBURG	VA	308.
CSXT	6198-GLASGOW	VA	334.
CSXT	6200-CLIFTON FORGE	VA	389.
CSXT	6189-COVINGTON	VA	416.
CSXT	6517-PRINCE	WV	483.
CSXT	6794-WEST CHARLESTOWN	WV	559.
CSXT	6795-ST ALBANS	WV	567.
CSXT	6806-BARBOURSVILLE	WV	598.
CSXT	6811-HUNTINGTON	WV	609.
CSXT	6808-KENOVA	WV	615.
CSXT	6807-CATLETTSBURG	KY	617.
CSXT	6809-ASHLAND	KY	623.
CSXT	6846-SILOAM	KY	646.
CSXT	3162-CHILLICOTHE	OH	709.
CSXT	3095-COLUMBUS (BROAD	OH	751.
CSXT	3402-MARION	OH	796.
CSXT	3002-FOSTORIA	OH	839.
CSXT	3484-DESHLER	OH	867.
CSXT	3993-WELLSBORO	IN	1015.
CSXT	4070-GARY	IN	1049.
CSXT	4073-CLARKE	IN	1053.
CSXT	4074-INDIANA HARBOR	IN	1056.
CSXT	4232-SOUTH CHICAGO	IL	1064.
CSXT	4231-BURNSIDE	IL	1067.
CSXT	4217-CHICAGO	IL	1079.
CNW	4217-CHICAGO	IL	1079.
CNW	4234-PROVISO	IL	1094.
CNW	4311-DE KALB	IL	1136.
CNW	4324-NELSON	IL	1181.
CNW	10304-CLINTON	IA	1213.
CNW	10289-CEDAR RAPIDS	IA	1294.
CNW	10265-MARSHALLTOWN	IA	1361.
CNW	10246-NEVADA	IA	1388.
CNW	10271-AMES	IA	1399.
CNW	10176-MISSOURI VALLEY	IA	1532.
CNW	10198-CALIFORNIA JCT	IA	1538.
CNW	11340-FREMONT	NE	1566.
UP	11340-FREMONT	NE	1566.
UP	11406-GRAND ISLAND	NE	1675.
UP	11410-GIBBON	NE	1701.
UP	11352-NORTH PLATTE	NE	1779.
UP	11358-O FALLONS	NE	1828.
UP	13703-JULESBURG	CO	1896.
UP	13465-CHEYENNE	WY	2042.
UP	13462-LARAMIE	WY	2094.
UP	13494-GRANGER	WY	2370.
UP	13568-OGDEN	UT	2509.
UP	13595-SALT LAKE CITY	UT	2545.
UP	13630-LYNNDYL	UT	2657.
UP	14766-VALLEY	NV	2974.
USG	14766-VALLEY	NV	2974.
USG	16333-YUCCA MOUNTAIN	NV	3073.

ROUTE FROM: CSXT 6059-SUFFOLK, VA
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
CSXT	6059-SUFFOLK	VA	0.
CSXT	7563-WELDON	NC	58.
CSXT	7565-ROCKY MOUNT	NC	95.
CSXT	7566-WILSON	NC	109.
CSXT	7606-FAYETTEVILLE	NC	183.
CSXT	7620-PEMBROKE	NC	212.
CSXT	7671-DILLON	SC	232.
CSXT	7675-FLORENCE	SC	261.
CSXT	7690-CHARLESTON	SC	359.
CSXT	7739-FAIRFAX	SC	453.
CSXT	7732-ROBBINS	SC	482.
CSXT	7717-DUNBARTON / WELL	SC	491.
USG	7717-DUNBARTON / WELL	SC	491.
USG	15359-SRP	SC	499.

ROUTE FROM: CSXT 6059-SUFFOLK, VA
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
CSXT	6059-SUFFOLK	VA	0.
CSXT	7563-WELDON	NC	58.
CSXT	6064-PETERSBURG	VA	118.
CSXT	6087-COLONIAL HEIGHTS	VA	124.
CSXT	6082-RICHMOND	VA	145.
CSXT	6220-LYNCHBURG	VA	278.
CSXT	6198-GLASGOW	VA	304.
CSXT	6200-CLIFTON FORGE	VA	359.
CSXT	6189-COVINGTON	VA	386.
CSXT	6517-PRINCE	WV	453.
CSXT	6794-WEST CHARLESTOWN	WV	529.
CSXT	6795-ST ALBANS	WV	537.
CSXT	6806-BARBOURSVILLE	WV	568.
CSXT	6811-HUNTINGTON	WV	579.
CSXT	6808-KENOVA	WV	585.
CSXT	6807-CATLETTSBURG	KY	587.
CSXT	6809-ASHLAND	KY	593.
CSXT	6846-SILOAM	KY	616.
CSXT	3162-CHILLICOTHE	OH	679.
CSXT	3095-COLUMBUS (BROAD	OH	721.
CSXT	3402-MARION	OH	766.
CSXT	3002-FOSTORIA	OH	809.
CSXT	3484-DESHLER	OH	837.
CSXT	3993-WELLSBORO	IN	985.
CSXT	4070-GARY	IN	1019.
CSXT	4073-CLARKE	IN	1023.
CSXT	4074-INDIANA HARBOR	IN	1026.
CSXT	4232-SOUTH CHICAGO	IL	1034.
CSXT	4231-BURNSIDE	IL	1037.
CSXT	4217-CHICAGO	IL	1049.
CNW	4217-CHICAGO	IL	1049.
CNW	4234-PROVISO	IL	1064.
CNW	4311-DE KALB	IL	1106.
CNW	4324-NELSON	IL	1151.
CNW	10304-CLINTON	IA	1183.
CNW	10289-CEDAR RAPIDS	IA	1264.
CNW	10265-MARSHALLTOWN	IA	1331.
CNW	10246-NEVADA	IA	1358.
CNW	10271-AMES	IA	1369.
CNW	10176-MISSOURI VALLEY	IA	1502.
CNW	10198-CALIFORNIA JCT	IA	1508.
CNW	11340-FREMONT	NE	1536.
UP	11340-FREMONT	NE	1536.
UP	11406-GRAND ISLAND	NE	1645.
UP	11410-GIBBON	NE	1671.
UP	11352-NORTH PLATTE	NE	1749.
UP	11358-O FALLONS	NE	1798.
UP	13703-JULESBURG	CO	1866.
UP	13465-CHEYENNE	WY	2012.
UP	13462-LARAMIE	WY	2064.
UP	13494-GRANGER	WY	2340.
UP	13369-MC CAMMON	ID	2532.
UP	13370-POCATELLO	ID	2555.
UP	13336-SCOVILLE	ID	2611.

ROUTE FROM: CSXT 6059-SUFFOLK, VA
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
CSXT	6059-SUFFOLK	VA	0.
CSXT	7563-WELDON	NC	58.
CSXT	6064-PETERSBURG	VA	118.
CSXT	6087-COLONIAL HEIGHTS	VA	124.
CSXT	6082-RICHMOND	VA	145.
CSXT	6220-LYNCHBURG	VA	278.
CSXT	6198-GLASGOW	VA	304.
CSXT	6200-CLIFTON FORGE	VA	359.
CSXT	6189-COVINGTON	VA	386.
CSXT	6517-PRINCE	WV	453.
CSXT	6794-WEST CHARLESTOWN	WV	529.
CSXT	6795-ST ALBANS	WV	537.
CSXT	6806-BARBOURSVILLE	WV	568.
CSXT	6811-HUNTINGTON	WV	579.
CSXT	6808-KENOVA	WV	585.
CSXT	6807-CATLETTSBURG	KY	587.
CSXT	6809-ASHLAND	KY	593.
CSXT	6846-SILOAM	KY	616.
CSXT	3162-CHILLICOTHE	OH	679.
CSXT	3095-COLUMBUS (BROAD	OH	721.
CSXT	3402-MARION	OH	766.
CSXT	3002-FOSTORIA	OH	809.
CSXT	3484-DESHLER	OH	837.
CSXT	3993-WELLSBORO	IN	985.
CSXT	4070-GARY	IN	1019.
CSXT	4073-CLARKE	IN	1023.
CSXT	4074-INDIANA HARBOR	IN	1026.
CSXT	4232-SOUTH CHICAGO	IL	1034.
CSXT	4231-BURNSIDE	IL	1037.
CSXT	4217-CHICAGO	IL	1049.
CNW	4217-CHICAGO	IL	1049.
CNW	4234-PROVISO	IL	1064.
CNW	4311-DE KALB	IL	1106.
CNW	4324-NELSON	IL	1151.
CNW	10304-CLINTON	IA	1183.
CNW	10289-CEDAR RAPIDS	IA	1264.
CNW	10265-MARSHALLTOWN	IA	1331.
CNW	10246-NEVADA	IA	1358.
CNW	10271-AMES	IA	1369.
CNW	10176-MISSOURI VALLEY	IA	1502.
CNW	10198-CALIFORNIA JCT	IA	1508.
CNW	11340-FREMONT	NE	1536.
UP	11340-FREMONT	NE	1536.
UP	11406-GRAND ISLAND	NE	1645.
UP	11410-GIBBON	NE	1671.
UP	11352-NORTH PLATTE	NE	1749.
UP	11358-O FALLONS	NE	1798.
UP	13703-JULESBURG	CO	1866.
UP	13465-CHEYENNE	WY	2012.
UP	13462-LARAMIE	WY	2064.
UP	13494-GRANGER	WY	2340.
UP	13369-MC CAMMON	ID	2532.
UP	13370-POCATELLO	ID	2555.
UP	13412-NAMPA	ID	2797.
UP	14220-PENDLETON	OR	3066.
UP	14223-HINKLE	OR	3097.
UP	13894-WALLULA	WA	3126.
UP	13964-KENNEWICK	WA	3141.
UP	13941-RICHLAND	WA	3149.
USG	13941-RICHLAND	WA	3149.
USG	16212-HANFORD S 300	WA	3157.

ROUTE FROM: CSXT 6059-SUFFOLK, VA
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
CSXT	6059-SUFFOLK	VA	0.
CSXT	7563-WELDON	NC	58.
CSXT	7565-ROCKY MOUNT	NC	95.
CSXT	7566-WILSON	NC	109.
CSXT	7606-FAYETTEVILLE	NC	183.
CSXT	7620-PEMBROKE	NC	212.
CSXT	7470-HAMLET	NC	243.
CSXT	7472-WADESBORO	NC	268.
WSS	7472-WADESBORO	NC	268.
WSS	7462-LEXINGTON	NC	336.
NS	7462-LEXINGTON	NC	336.
NS	7478-SALISBURY	NC	353.
NS	7394-HICKORY	NC	410.
NS	7387-MARION	NC	452.
NS	7343-ASHEVILLE	NC	492.
NS	7318-MORRISTOWN	TN	572.
NS	7286-KNOXVILLE	TN	613.
NS	7288-DOSSETT	TN	638.
NS	15316-K-25	TN	659.

ROUTE FROM: CSXT 6059-SUFFOLK, VA
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
CSXT	6059-SUFFOLK	VA	0.
CSXT	7563-WELDON	NC	58.
CSXT	6064-PETERSBURG	VA	118.
CSXT	6087-COLONIAL HEIGHTS	VA	124.
CSXT	6082-RICHMOND	VA	145.
CSXT	6220-LYNCHBURG	VA	278.
CSXT	6198-GLASGOW	VA	304.
CSXT	6200-CLIFTON FORGE	VA	359.
CSXT	6189-COVINGTON	VA	386.
CSXT	6517-PRINCE	WV	453.
CSXT	6794-WEST CHARLESTOWN	WV	529.
CSXT	6795-ST ALBANS	WV	537.
CSXT	6806-BARBOURSVILLE	WV	568.
CSXT	6811-HUNTINGTON	WV	579.
CSXT	6808-KENOVA	WV	585.
CSXT	6807-CATLETTSBURG	KY	587.
CSXT	6809-ASHLAND	KY	593.
CSXT	6846-SILOAM	KY	616.
CSXT	3162-CHILLICOTHE	OH	679.
CSXT	3095-COLUMBUS (BROAD	OH	721.
CSXT	3402-MARION	OH	766.
CSXT	3002-FOSTORIA	OH	809.
CSXT	3484-DESHLER	OH	837.
CSXT	3993-WELLSBORO	IN	985.
CSXT	4070-GARY	IN	1019.
CSXT	4073-CLARKE	IN	1023.
CSXT	4074-INDIANA HARBOR	IN	1026.
CSXT	4232-SOUTH CHICAGO	IL	1034.
CSXT	4231-BURNSIDE	IL	1037.
CSXT	4217-CHICAGO	IL	1049.
CNW	4217-CHICAGO	IL	1049.
CNW	4234-PROVISO	IL	1064.
CNW	4311-DE KALB	IL	1106.
CNW	4324-NELSON	IL	1151.
CNW	10304-CLINTON	IA	1183.
CNW	10289-CEDAR RAPIDS	IA	1264.
CNW	10265-MARSHALLTOWN	IA	1331.
CNW	10246-NEVADA	IA	1358.
CNW	10271-AMES	IA	1369.
CNW	10176-MISSOURI VALLEY	IA	1502.
CNW	10198-CALIFORNIA JCT	IA	1508.
CNW	11340-FREMONT	NE	1536.
UP	11340-FREMONT	NE	1536.
UP	11406-GRAND ISLAND	NE	1645.
UP	11410-GIBBON	NE	1671.
UP	11352-NORTH PLATTE	NE	1749.
UP	11358-O FALLONS	NE	1798.
UP	13703-JULESBURG	CO	1866.
UP	13465-CHEYENNE	WY	2012.
UP	13462-LARAMIE	WY	2064.
UP	13494-GRANGER	WY	2340.
UP	13568-OGDEN	UT	2479.
UP	13595-SALT LAKE CITY	UT	2515.
UP	13630-LYNNDYL	UT	2627.
UP	14766-VALLEY	NV	2944.
USG	14766-VALLEY	NV	2944.
USG	16333-YUCCA MOUNTAIN	NV	3043.

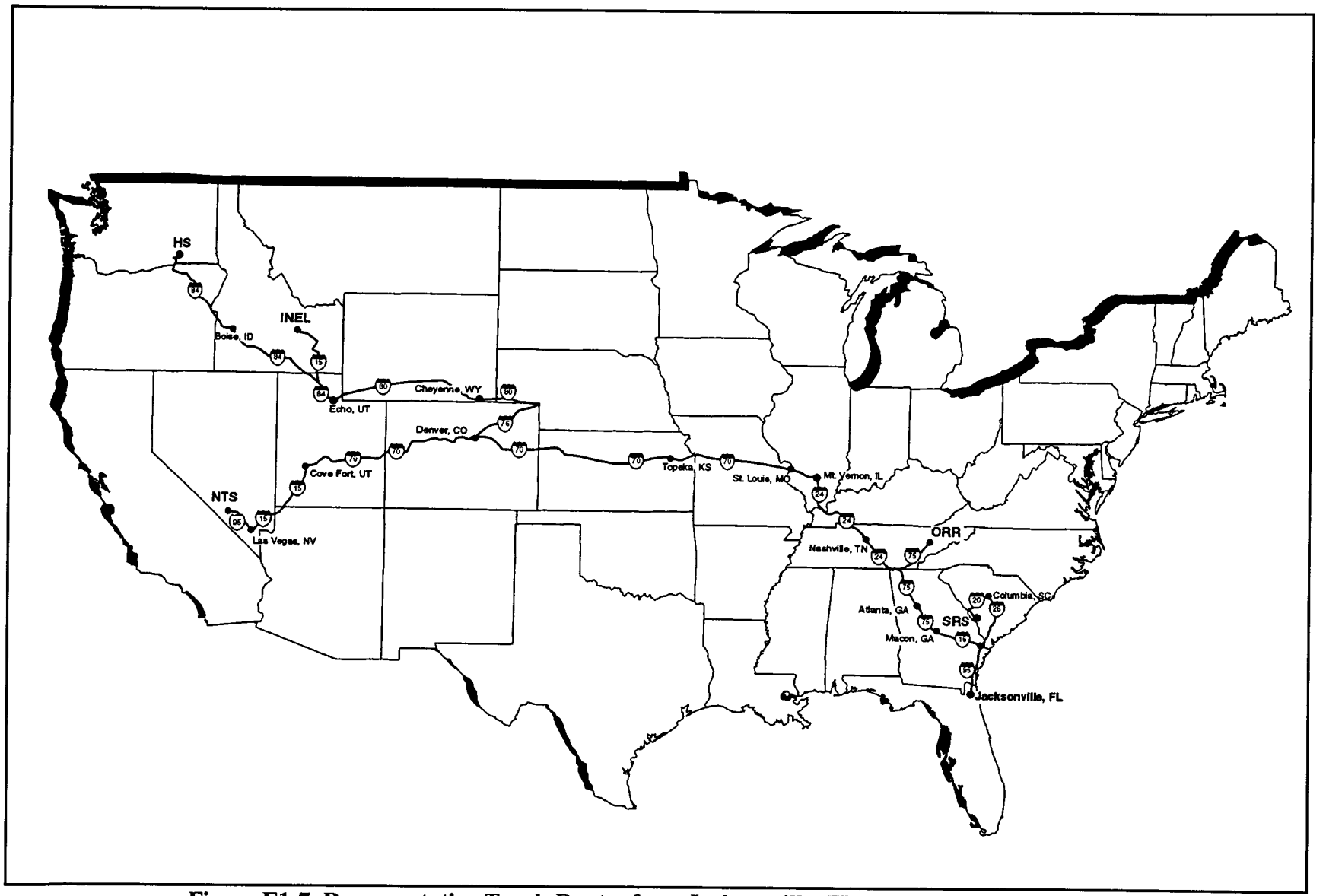

Figure E1-7 Representative Truck Routes from Jacksonville, FL to Department of Energy Management Sites

From: JACKSONVILLE, FL
To : SRP, SC

Routing through:

		JACKSONVILLE				FL
U23		JACKSONVILLE	W	I95	U23	FL
I95		JACKSONVILLE	NW	I95	U1	FL
I95 #		JACKSONVILLE	N	I295	I95	FL
I95		ROSINVILLE	N	I26	I95	SC
I26		COLUMBIA	NW	I20	I26	SC
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRP				SC

From: JACKSONVILLE, FL
To : ID NATL ENG LAB, ID

Routing through:

		JACKSONVILLE				FL
U23		JACKSONVILLE	W	I95	U23	FL
I95		JACKSONVILLE	NW	I95	U1	FL
I95 #		JACKSONVILLE	N	I295	I95	FL
I295		JACKSONVILLE	W	I10	I295	FL
I10		WINFIELD	W	I10	I75	FL
I75		MACON	S	I475	I75	GA
I475		SMARR	E	I475	I75	GA
I75		HAPEVILLE	S	I285	I75	GA
I285		COLLEGE PARK	S	I285	I85	GA
I285	I85	RED OAK	E	I285	I85	GA
I285		ATLANTA	NW	I285	I75	GA
I75		EAST RIDGE	NE	I24	I75	TN
I24		NASHVILLE	E	I24	I40	TN
I24	I40	NASHVILLE	SE	I24	I40	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: JACKSONVILLE, FL
To : HANFORD, WA

Routing through:

		JACKSONVILLE				FL
U23		JACKSONVILLE	W	I95	U23	FL
I95		JACKSONVILLE	NW	I95	U1	FL
I95 #		JACKSONVILLE	N	I295	I95	FL
I295		JACKSONVILLE	W	I10	I295	FL
I10		WINFIELD	W	I10	I75	FL
I75		MACON	S	I475	I75	GA
I475		SMARR	E	I475	I75	GA
I75		HAPEVILLE	S	I285	I75	GA
I285		COLLEGE PARK	S	I285	I85	GA
I285	I85	RED OAK	E	I285	I85	GA
I285		ATLANTA	NW	I285	I75	GA
I75		EAST RIDGE	NE	I24	I75	TN
I24		NASHVILLE	E	I24	I40	TN
I24	I40	NASHVILLE	SE	I24	I40	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: JACKSONVILLE, FL
To : K-25, TN

Routing through:

		JACKSONVILLE				FL
U23		JACKSONVILLE	W	I95	U23	FL
I95		JACKSONVILLE	NW	I95	U1	FL
I95 #		JACKSONVILLE	N	I295	I95	FL
I295		JACKSONVILLE	W	I10	I295	FL
I10		WINFIELD	W	I10	I75	FL
I75		MACON	S	I475	I75	GA
I475		SMARR	E	I475	I75	GA
I75		HAPEVILLE	S	I285	I75	GA
I285		COLLEGE PARK	S	I285	I85	GA
I285	I85	RED OAK	E	I285	I85	GA
I285		ATLANTA	NW	I285	I75	GA
I75		OAK RIDGE	S	I40	I75	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: JACKSONVILLE, FL
To : MERCURY, NV

Routing through:

		JACKSONVILLE				FL
U23		JACKSONVILLE	W	I95	U23	FL
I95		JACKSONVILLE	NW	I95	U1	FL
I95 #		JACKSONVILLE	N	I295	I95	FL
I295		JACKSONVILLE	W	I10	I295	FL
I10		WINFIELD	W	I10	I75	FL
I75		MACON	S	I475	I75	GA
I475		SMARR	E	I475	I75	GA
I75		HAPEVILLE	S	I285	I75	GA
I285		COLLEGE PARK	S	I285	I85	GA
I285	I85	RED OAK	E	I285	I85	GA
I285		ATLANTA	NW	I285	I75	GA
I75		EAST RIDGE	NE	I24	I75	TN
I24		NASHVILLE	E	I24	I40	TN
I24	I40	NASHVILLE	SE	I24	I40	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

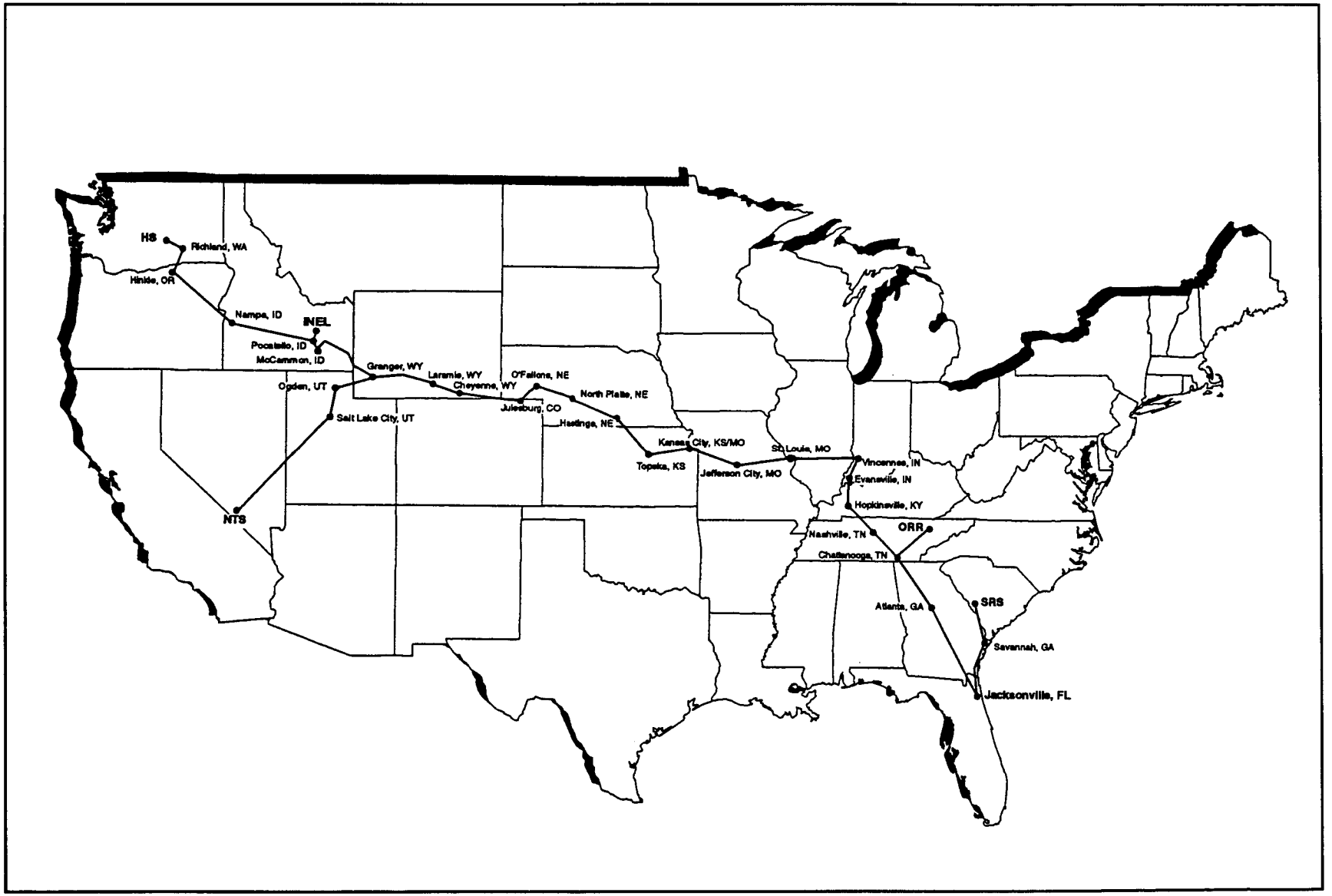

Figure E1-8 Representative Rail Routes from Jacksonville, FL to Department of Energy Management Sites

ROUTE FROM: CSXT 8269-JACKSONVILLE, FL
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
CSXT	8269-JACKSONVILLE	FL	0.
CSXT	8243-CALLAHAN	FL	17.
CSXT	8086-FOLKSTON	GA	39.
CSXT	8080-NAHUNTA	GA	64.
CSXT	8007-SAVANNAH	GA	145.
CSXT	7739-FAIRFAX	SC	213.
CSXT	7732-ROBBINS	SC	242.
CSXT	7717-DUNBARTON / WELL	SC	251.
USG	7717-DUNBARTON / WELL	SC	251.
USG	15359-SRP	SC	259.

ROUTE FROM: CSXT 8269-JACKSONVILLE, FL
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
CSXT	8269-JACKSONVILLE	FL	0.
CSXT	8243-CALLAHAN	FL	17.
CSXT	8086-FOLKSTON	GA	39.
CSXT	8079-WAYCROSS	GA	71.
CSXT	8069-CORDELE	GA	179.
CSXT	8144-MANCHESTER	GA	260.
CSXT	7914-ATLANTA	GA	337.
CSXT	7907-MARIETTA	GA	347.
CSXT	7889-CARTERSVILLE	GA	379.
CSXT	7888-DALTON	GA	430.
CSXT	7235-CHATTANOOGA	TN	468.
CSXT	7187-TULLAHOMA	TN	549.
CSXT	7202-NASHVILLE	TN	628.
CSXT	7201-MADISON	TN	638.
CSXT	7061-HOPKINSVILLE	KY	698.
CSXT	3839-HENDERSON	KY	785.
CSXT	3838-EVANSVILLE	IN	798.
CSXT	3812-VINCENNES	IN	848.
CSXT	4952-SALEM	IL	927.
CSXT	10859-EAST ST LOUIS	IL	992.
<TR>	10859-EAST ST LOUIS	IL	992.
<TR>	10858-ST LOUIS	MO	998.
UP	10858-ST LOUIS	MO	998.
UP	10656-JEFFERSON CITY	MO	1120.
UP	10616-KANSAS CITY	MO	1296.
UP	10617-KANSAS CITY	KS	1299.
UP	11823-LAWRENCE	KS	1338.
UP	11697-TOPEKA	KS	1368.
UP	11696-MENOKEN	KS	1373.
UP	11681-MARYSVILLE	KS	1448.
UP	11405-HASTINGS	NE	1558.
UP	11410-GIBBON	NE	1584.
UP	11352-NORTH PLATTE	NE	1662.
UP	11358-O FALLONS	NE	1711.
UP	13703-JULESBURG	CO	1779.
UP	13465-CHEYENNE	WY	1925.
UP	13462-LARAMIE	WY	1977.
UP	13494-GRANGER	WY	2253.
UP	13369-MC CAMMON	ID	2445.
UP	13370-POCATELLO	ID	2468.
UP	13336-SCOVILLE	ID	2524.

ROUTE FROM: CSXT 8269-JACKSONVILLE, FL
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
CSXT	8269-JACKSONVILLE	FL	0.
CSXT	8243-CALLAHAN	FL	17.
CSXT	8086-FOLKSTON	GA	39.
CSXT	8079-WAYCROSS	GA	71.
CSXT	8069-CORDELE	GA	179.
CSXT	8144-MANCHESTER	GA	260.
CSXT	7914-ATLANTA	GA	337.
CSXT	7907-MARIETTA	GA	347.
CSXT	7889-CARTERSVILLE	GA	379.
CSXT	7888-DALTON	GA	430.
CSXT	7235-CHATTANOOGA	TN	468.
CSXT	7187-TULLAHOMA	TN	549.
CSXT	7202-NASHVILLE	TN	628.
CSXT	7201-MADISON	TN	638.
CSXT	7061-HOPKINSVILLE	KY	698.
CSXT	3839-HENDERSON	KY	785.
CSXT	3838-EVANSVILLE	IN	798.
CSXT	3812-VINCENNES	IN	848.
CSXT	4952-SALEM	IL	927.
CSXT	10859-EAST ST LOUIS	IL	992.
<TR>	10859-EAST ST LOUIS	IL	992.
<TR>	10858-ST LOUIS	MO	998.
UP	10858-ST LOUIS	MO	998.
UP	10656-JEFFERSON CITY	MO	1120.
UP	10616-KANSAS CITY	MO	1296.
UP	10617-KANSAS CITY	KS	1299.
UP	11823-LAWRENCE	KS	1338.
UP	11697-TOPEKA	KS	1368.
UP	11696-MENOKEN	KS	1373.
UP	11681-MARYSVILLE	KS	1448.
UP	11405-HASTINGS	NE	1558.
UP	11410-GIBBON	NE	1584.
UP	11352-NORTH PLATTE	NE	1662.
UP	11358-O FALLONS	NE	1711.
UP	13703-JULESBURG	CO	1779.
UP	13465-CHEYENNE	WY	1925.
UP	13462-LARAMIE	WY	1977.
UP	13494-GRANGER	WY	2253.
UP	13369-MC CAMMON	ID	2445.
UP	13370-POCATELLO	ID	2468.
UP	13412-NAMPA	ID	2710.
UP	14220-PENDLETON	OR	2979.
UP	14223-HINKLE	OR	3010.
UP	13894-WALLULA	WA	3039.
UP	13964-KENNEWICK	WA	3054.
UP	13941-RICHLAND	WA	3062.
USG	13941-RICHLAND	WA	3062.
USG	16212-HANFORD S 300	WA	3070.

ROUTE FROM: CSXT 8269-JACKSONVILLE, FL
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
CSXT	8269-JACKSONVILLE	FL	0.
CSXT	8243-CALLAHAN	FL	17.
CSXT	8086-FOLKSTON	GA	39.
CSXT	8079-WAYCROSS	GA	71.
CSXT	8069-CORDELE	GA	179.
CSXT	8144-MANCHESTER	GA	260.
CSXT	7914-ATLANTA	GA	337.
CSXT	7907-MARIETTA	GA	347.
CSXT	7889-CARTERSVILLE	GA	379.
CSXT	7888-DALTON	GA	430.
CSXT	7235-CHATTANOOGA	TN	468.
NS	7235-CHATTANOOGA	TN	468.
NS	7260-HARRIMAN	TN	550.
NS	15316-K-25	TN	565.

ROUTE FROM: CSXT 8269-JACKSONVILLE, FL
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
CSXT	8269-JACKSONVILLE	FL	0.
CSXT	8243-CALLAHAN	FL	17.
CSXT	8086-FOLKSTON	GA	39.
CSXT	8079-WAYCROSS	GA	71.
CSXT	8069-CORDELE	GA	179.
CSXT	8144-MANCHESTER	GA	260.
CSXT	7914-ATLANTA	GA	337.
CSXT	7907-MARIETTA	GA	347.
CSXT	7889-CARTERSVILLE	GA	379.
CSXT	7888-DALTON	GA	430.
CSXT	7235-CHATTANOOGA	TN	468.
CSXT	7187-TULLAHOMA	TN	549.
CSXT	7202-NASHVILLE	TN	628.
CSXT	7201-MADISON	TN	638.
CSXT	7061-HOPKINSVILLE	KY	698.
CSXT	3839-HENDERSON	KY	785.
CSXT	3838-EVANSVILLE	IN	798.
CSXT	3812-VINCENNES	IN	848.
CSXT	4952-SALEM	IL	927.
CSXT	10859-EAST ST LOUIS	IL	992.
<TR>	10859-EAST ST LOUIS	IL	992.
<TR>	10858-ST LOUIS	MO	998.
UP	10858-ST LOUIS	MO	998.
UP	10656-JEFFERSON CITY	MO	1120.
UP	10616-KANSAS CITY	MO	1296.
UP	10617-KANSAS CITY	KS	1299.
UP	11823-LAWRENCE	KS	1338.
UP	11697-TOPEKA	KS	1368.
UP	11696-MENOKEN	KS	1373.
UP	11681-MARYSVILLE	KS	1448.
UP	11405-HASTINGS	NE	1558.
UP	11410-GIBBON	NE	1584.
UP	11352-NORTH PLATTE	NE	1662.
UP	11358-O FALLONS	NE	1711.
UP	13703-JULESBURG	CO	1779.
UP	13465-CHEYENNE	WY	1925.
UP	13462-LARAMIE	WY	1977.
UP	13494-GRANGER	WY	2253.
UP	13568-OGDEN	UT	2392.
UP	13595-SALT LAKE CITY	UT	2427.
UP	13630-LYNNDYL	UT	2540.
UP	14766-VALLEY	NV	2857.
USG	14766-VALLEY	NV	2857.
USG	16333-YUCCA MOUNTAIN	NV	2956.

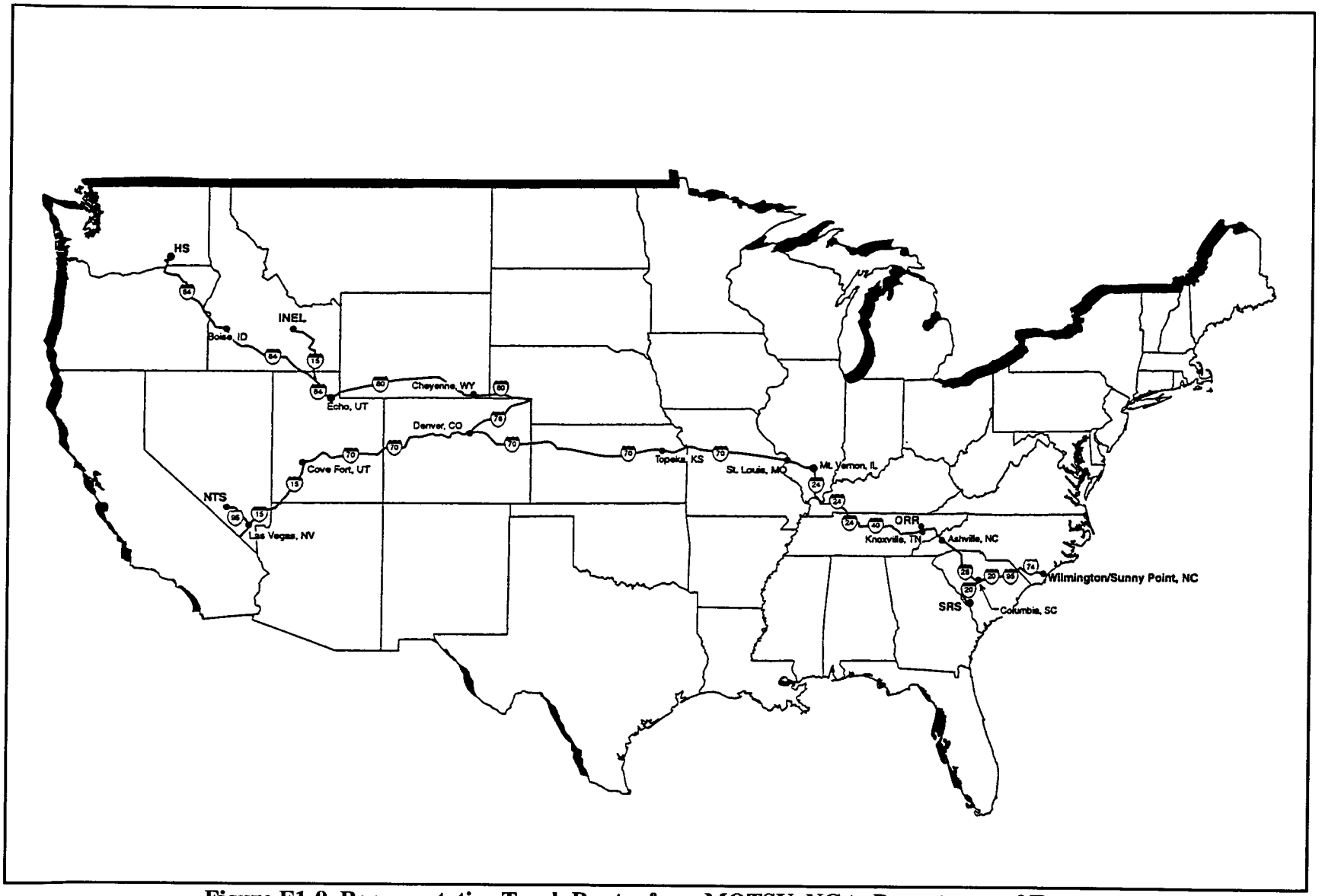

Figure E1-9 Representative Truck Routes from MOTSU, NC to Department of Energy Management Sites

From: SUNNY POINT TM, NC
To : SRP, SC

Routing through:

		SUNNY POINT TM				NC
LOCAL		SUNNY POINT	N	S133	LOCL	NC
S133		LELAND	SE	U17	S133	NC
U17	U74	WILMINGTON	W	U17	U421	NC
U17	U421	WILMINGTON		U117	U17	NC
U17	U74	WILMINGTON	E	U17	S132	NC
S132		WILMINGTON	NE	I40	X420	NC
I40		BENSON	NE	I40	I95	NC
I95		FLORENCE	W	I20	I95	SC
I20		MARTINEZ	E	I20	X65	GA
S28		BEECH ISLAND		U278	S125	SC
S125		SRP BARCD 1		S125	LC	SC

From: SUNNY POINT TM, NC
To : ID NATL ENG LAB, ID

Routing through:

		SUNNY POINT TM				NC
LOCAL		SUNNY POINT	N	S133	LOCL	NC
S133		LELAND	SE	U17	S133	NC
U17	U74	WILMINGTON	W	U17	U421	NC
U17	U421	WILMINGTON		U117	U17	NC
U17	U74	WILMINGTON	E	U17	S132	NC
S132		WILMINGTON	NE	I40	X420	NC
I40		RALEIGH	SE	I40	I440	NC
I40		HILLSBOROUGH	S	I40	I85	NC
I40	I85	GREENSBORO	S	I40	I85	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24		NASHVILLE	SE	I24	I440	TN
I440		NASHVILLE	W	I40	I440	TN
I40		NASHVILLE	W	I265	I40	TN
I265		NASHVILLE	N	I24	I265	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70		BONNER SPRINGS	N	I70	X224	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB		U20	LOCL	ID

From: SUNNY POINT TM, NC
To : HANFORD, WA

Routing through:

		SUNNY POINT TM				NC
LOCAL		SUNNY POINT	N	S133	LOCL	NC
S133		LELAND	SE	U17	S133	NC
U17	U74	WILMINGTON	W	U17	U421	NC
U17	U421	WILMINGTON		U117	U17	NC
U17	U74	WILMINGTON	E	U17	S132	NC
S132		WILMINGTON	NE	I40	X420	NC
I40		RALEIGH	SE	I40	I440	NC
I40	I440	RALEIGH	SW	I40	I440	NC
I40		HILLSBOROUGH	S	I40	I85	NC
I40	I85	GREENSBORO	S	I40	I85	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24		NASHVILLE	SE	I24	I440	TN
I440		NASHVILLE	W	I40	I440	TN
I40		NASHVILLE	W	I265	I40	TN
I265		NASHVILLE	N	I24	I265	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70		BONNER SPRINGS	N	I70	X224	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	X5	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: SUNNY POINT TM, NC
To : K-25, TN

Routing through:

		SUNNY POINT TM				NC
LOCAL		SUNNY POINT	N	S133	LOCL	NC
S133		LELAND	SE	U17	S133	NC
U17	U74	WILMINGTON	W	U17	U421	NC
U17	U421	WILMINGTON		U117	U17	NC
U17	U74	WILMINGTON	E	U17	S132	NC
S132		WILMINGTON	NE	I40	X420	NC
I40		RALEIGH	SE	I40	I440	NC
I40	I440	RALEIGH	SW	I40	I440	NC
I40		HILLSBOROUGH	S	I40	I85	NC
I40	I85	GREENSBORO	S	I40	I85	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		KINGSTON	E	I40	X356	TN
S58		K-25				TN

From: SUNNY POINT TM, NC
To : MERCURY, NV

Routing through:

		SUNNY POINT TM				NC
LOCAL		SUNNY POINT	N	S133	LOCL	NC
S133		LELAND	SE	U17	S133	NC
U17	U74	WILMINGTON	W	U17	U421	NC
U17	U421	WILMINGTON		U117	U17	NC
U17	U74	WILMINGTON	E	U17	S132	NC
S132		WILMINGTON	NE	I40	X420	NC
I40		RALEIGH	SE	I40	I440	NC
I40	I440	RALEIGH	SW	I40	I440	NC
I40		HILLSBOROUGH	S	I40	I85	NC
I40	I85	GREENSBORO	S	I40	I85	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	FARRAGUT	W	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24		NASHVILLE	SE	I24	I440	TN
I440		NASHVILLE	W	I40	I440	TN
I40		NASHVILLE	W	I265	I40	TN
I265		NASHVILLE	N	I24	I265	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70		BONNER SPRINGS	N	I70	X224	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		LAS VEGAS	W	U95	U95B	NV
U95BU		LAS VEGAS	NW	U95	U95B	NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

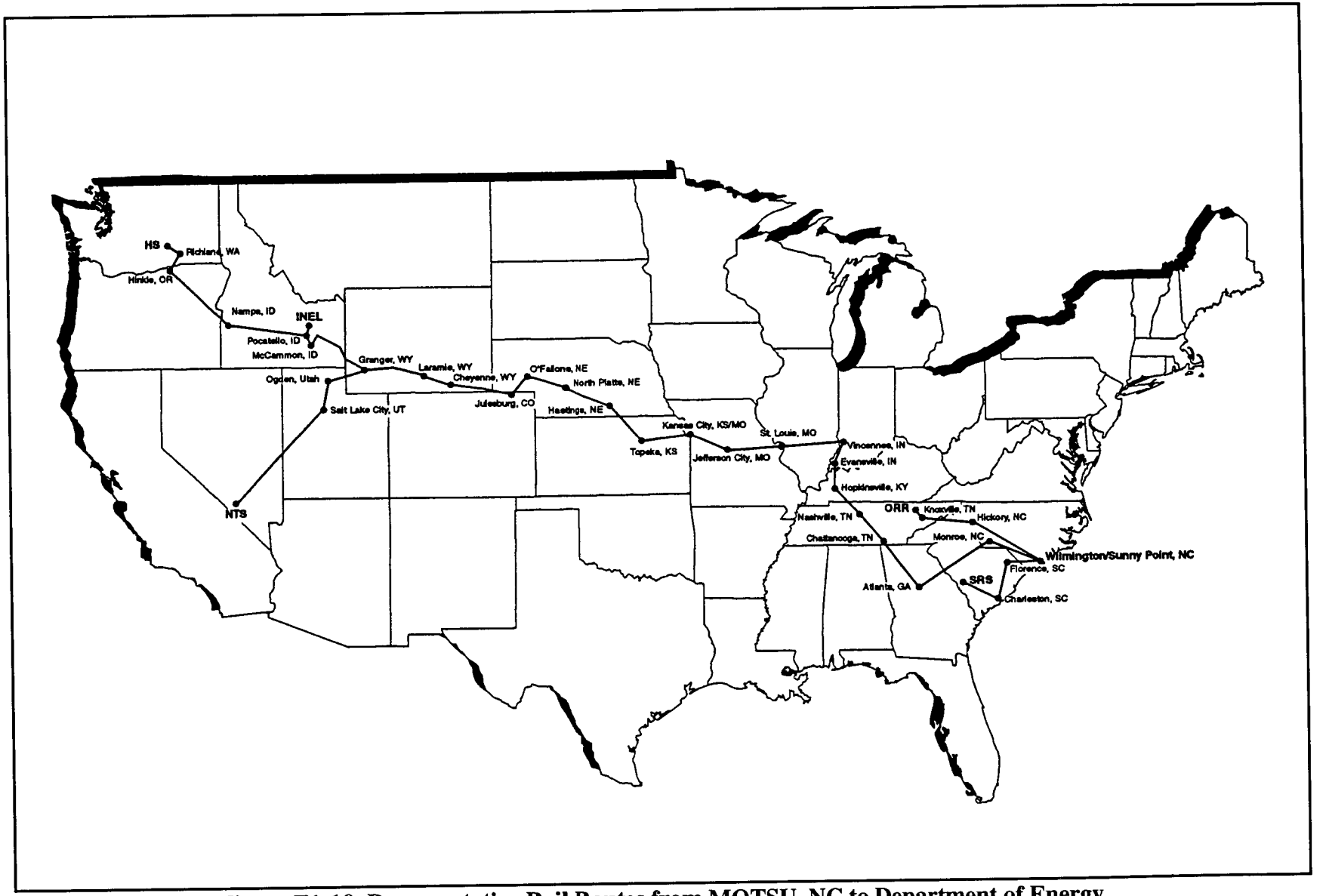

Figure E1-10 Representative Rail Routes from MOTSU, NC to Department of Energy Management Sites

ROUTE FROM: USG 7611-SUNNY POINT JCT, NC
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
USG	7611-SUNNY POINT JCT	NC	0.
CSXT	7611-SUNNY POINT JCT	NC	0.
CSXT	7625-WILMINGTON	NC	9.
CSXT	7620-PEMBROKE	NC	95.
CSXT	7671-DILLON	SC	115.
CSXT	7675-FLORENCE	SC	144.
CSXT	7690-CHARLESTON	SC	242.
CSXT	7739-FAIRFAX	SC	336.
CSXT	7732-ROBBINS	SC	365.
CSXT	7717-DUNBARTON / WELLS	SC	374.
USG	7717-DUNBARTON / WELLS	SC	374.
USG	15359-SRP	SC	382.

ROUTE FROM: USG 7611-SUNNY POINT JCT, NC
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
USG	7611-SUNNY POINT JCT	NC	0.
CSXT	7611-SUNNY POINT JCT	NC	0.
CSXT	7625-WILMINGTON	NC	9.
CSXT	7620-PEMBROKE	NC	95.
CSXT	7470-HAMLET	NC	126.
CSXT	7407-MONROE	NC	179.
CSXT	7834-CLINTON	SC	271.
CSXT	7838-GREENWOOD	SC	299.
CSXT	7956-ATHENS	GA	380.
CSXT	17420-ATLANTA BELT JCT	GA	442.
CSXT	17424-TILFORD YARD (S.	GA	450.
CSXT	7907-MARIETTA	GA	465.
CSXT	7889-CARTERSVILLE	GA	493.
CSXT	7888-DALTON	GA	544.
CSXT	7235-CHATTANOOGA	TN	581.
CSXT	7224-WAUHATCHIE	TN	587.
CSXT	7187-TULLAHOMA	TN	663.
CSXT	7201-MADISON	TN	751.
CSXT	7061-HOPKINSVILLE	KY	811.
CSXT	3839-HENDERSON	KY	876.
CSXT	3838-EVANSVILLE	IN	889.
CSXT	3812-VINCENNES	IN	939.
CSXT	4952-SALEM	IL	1017.
CSXT	10859-EAST ST LOUIS	IL	1084.
TRRA	10859-EAST ST LOUIS	IL	1084.
UP	10859-EAST ST LOUIS	IL	1084.
UP	10858-ST LOUIS	MO	1085.
UP	10860-PACIFIC	MO	1112.
UP	10656-JEFFERSON CITY	MO	1210.
UP	10616-KANSAS CITY	MO	1387.
UP	10617-KANSAS CITY	KS	1389.
UP	11823-LAWRENCE	KS	1428.
UP	11697-TOPEKA	KS	1458.
UP	11696-MENOKEN	KS	1463.
UP	11681-MARYSVILLE	KS	1538.
UP	11405-HASTINGS	NE	1646.
UP	11410-GIBBON	NE	1672.
UP	11352-NORTH PLATTE	NE	1791.
UP	11358-O FALLONS	NE	1802.
UP	13703-JULESBURG	CO	1870.
UP	13465-CHEYENNE	WY	2016.
UP	13462-LARAMIE	WY	2068.
UP	13494-GRANGER	WY	2344.
UP	13369-MC CAMMON	ID	2536.
UP	13370-POCATELLO	ID	2559.
UP	13336-SCOVILLE	ID	2615.

ROUTE FROM: USG 7611-SUNNY POINT JCT, NC
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
USG	7611-SUNNY POINT JCT	NC	0.
CSXT	7611-SUNNY POINT JCT	NC	0.
CSXT	7625-WILMINGTON	NC	9.
CSXT	7620-PEMBROKE	NC	95.
CSXT	7470-HAMLET	NC	126.
CSXT	7407-MONROE	NC	179.
CSXT	7406-CHARLOTTE	NC	202.
CSXT	7395-MOUNT HOLLY	NC	213.
CSXT	7388-BOSTIC	NC	276.
CSXT	7387-MARION	NC	303.
CSXT	7311-JOHNSON CITY	TN	407.
CSXT	7312-KINGSPORT	TN	438.
CSXT	7313-FRISCO	TN	444.
CSXT	6946-BEAVER JCT	KY	570.
CSXT	6807-CATLETTSBURG	KY	654.
CSXT	6809-ASHLAND	KY	660.
CSXT	6846-SILOAM	KY	684.
CSXT	3162-CHILLICOTHE	OH	746.
CSXT	3095-COLUMBUS (BROAD	OH	788.
CSXT	3402-MARION	OH	833.
CSXT	3002-FOSTORIA	OH	876.
CSXT	3484-DESHLER	OH	904.
CSXT	3993-WELLSBORO	IN	1053.
CSXT	4070-GARY	IN	1087.
CSXT	4073-CLARKE	IN	1091.
CSXT	4076-HAMMOND	IN	1097.
CSXT	4228-BURNHAM / CALUMET	IL	1099.
CSXT	4163-BLUE ISLAND	IL	1107.
IHB	4163-BLUE ISLAND	IL	1107.
IHB	4172-ARGO	IL	1119.
IHB	4170-LA GRANGE	IL	1123.
BN	4170-LA GRANGE	IL	1123.
BN	4190-AURORA	IL	1148.
BN	4317-SAVANNA	IL	1239.
BN	4327-EAST DUBUQUE	IL	1279.
BN	5736-LA CROSSE	WI	1390.
BN	9830-ST PAUL	MN	1511.
BN	9793-SOO LINE JCT	MN	1514.
BN	15603-EAST MINNEAPOLIS	MN	1521.
BN	9798-NORTHTOWN	MN	1527.
BN	9826-COON CREEK	MN	1532.
BN	9671-SAUK RAPIDS	MN	1582.
BN	9663-STAPLES	MN	1647.
BN	11131-MOORHEAD	MN	1761.
BN	11132-FARGO	ND	1764.
BN	11134-CASSELTON	ND	1784.
BN	10935-SURREY	ND	1999.
BN	10936-MINOT	ND	2005.
BN	15740-WILLISTON	ND	2117.
BN	13168-HAVRE	MT	2436.
BN	13089-SHELBY	MT	2537.
BN	13300-SANDPOINT	ID	2874.
BN	13828-SPOKANE	WA	2937.
BN	13890-PASCO	WA	3088.
BN	13964-KENNEWICK	WA	3090.
WCRC	13964-KENNEWICK	WA	3090.
UP	13964-KENNEWICK	WA	3090.
UP	13941-RICHLAND	WA	3098.
USG	13941-RICHLAND	WA	3098.
USG	16212-HANFORD S 300	WA	3106.

ROUTE FROM: USG 7611-SUNNY POINT JCT, NC
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
USG	7611-SUNNY POINT JCT	NC	0.
CSXT	7611-SUNNY POINT JCT	NC	0.
CSXT	7625-WILMINGTON	NC	9.
CSXT	7620-PEMBROKE	NC	95.
CSXT	7470-HAMLET	NC	126.
CSXT	7407-MONROE	NC	179.
CSXT	7406-CHARLOTTE	NC	202.
CSXT	7395-MOUNT HOLLY	NC	213.
CSXT	7388-BOSTIC	NC	276.
CSXT	7387-MARION	NC	303.
NS	7387-MARION	NC	303.
NS	7343-ASHEVILLE	NC	343.
NS	7318-MORRISTOWN	TN	423.
NS	16403-SEVIER YARD W ENT	TN	456.
NS	16401-COSTER	TN	464.
NS	7288-DOSSETT	TN	488.
NS	15316-K-25	TN	509.

ROUTE FROM: USG 7611-SUNNY POINT JCT, NC
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
USG	7611-SUNNY POINT JCT	NC	0.
CSXT	7611-SUNNY POINT JCT	NC	0.
CSXT	7625-WILMINGTON	NC	9.
CSXT	7620-PEMBROKE	NC	95.
CSXT	7470-HAMLET	NC	126.
CSXT	7407-MONROE	NC	179.
CSXT	7834-CLINTON	SC	271.
CSXT	7838-GREENWOOD	SC	299.
CSXT	7956-ATHENS	GA	380.
CSXT	17420-ATLANTA BELT JCT	GA	442.
CSXT	17424-TILFORD YARD (S.	GA	450.
CSXT	7907-MARIETTA	GA	465.
CSXT	7889-CARTERSVILLE	GA	493.
CSXT	7888-DALTON	GA	544.
CSXT	7235-CHATTANOOGA	TN	581.
CSXT	7224-WAUHATCHIE	TN	587.
CSXT	7187-TULLAHOMA	TN	663.
CSXT	7201-MADISON	TN	751.
CSXT	7061-HOPKINSVILLE	KY	811.
CSXT	3839-HENDERSON	KY	876.
CSXT	3838-EVANSVILLE	IN	889.
CSXT	3812-VINCENNES	IN	939.
CSXT	4952-SALEM	IL	1017.
CSXT	10859-EAST ST LOUIS	IL	1084.
TRRA	10859-EAST ST LOUIS	IL	1084.
UP	10859-EAST ST LOUIS	IL	1084.
UP	10858-ST LOUIS	MO	1085.
UP	10860-PACIFIC	MO	1112.
UP	10656-JEFFERSON CITY	MO	1210.
UP	10616-KANSAS CITY	MO	1387.
UP	10617-KANSAS CITY	KS	1389.
UP	11823-LAWRENCE	KS	1428.
UP	11697-TOPEKA	KS	1458.
UP	11696-MENOKEN	KS	1463.
UP	11681-MARYSVILLE	KS	1538.
UP	11405-HASTINGS	NE	1646.
UP	11410-GIBBON	NE	1672.
UP	11352-NORTH PLATTE	NE	1791.
UP	11358-O FALLONS	NE	1802.
UP	13703-JULESBURG	CO	1870.
UP	13465-CHEYENNE	WY	2016.
UP	13462-LARAMIE	WY	2068.
UP	13494-GRANGER	WY	2344.
UP	13568-OGDEN	UT	2487.
UP	13595-SALT LAKE CITY	UT	2523.
UP	13630-LYNNDYL	UT	2635.
UP	14766-VALLEY	NV	2952.
USG	14766-VALLEY	NV	2952.
USG	16333-YUCCA MOUNTAIN	NV	3051.

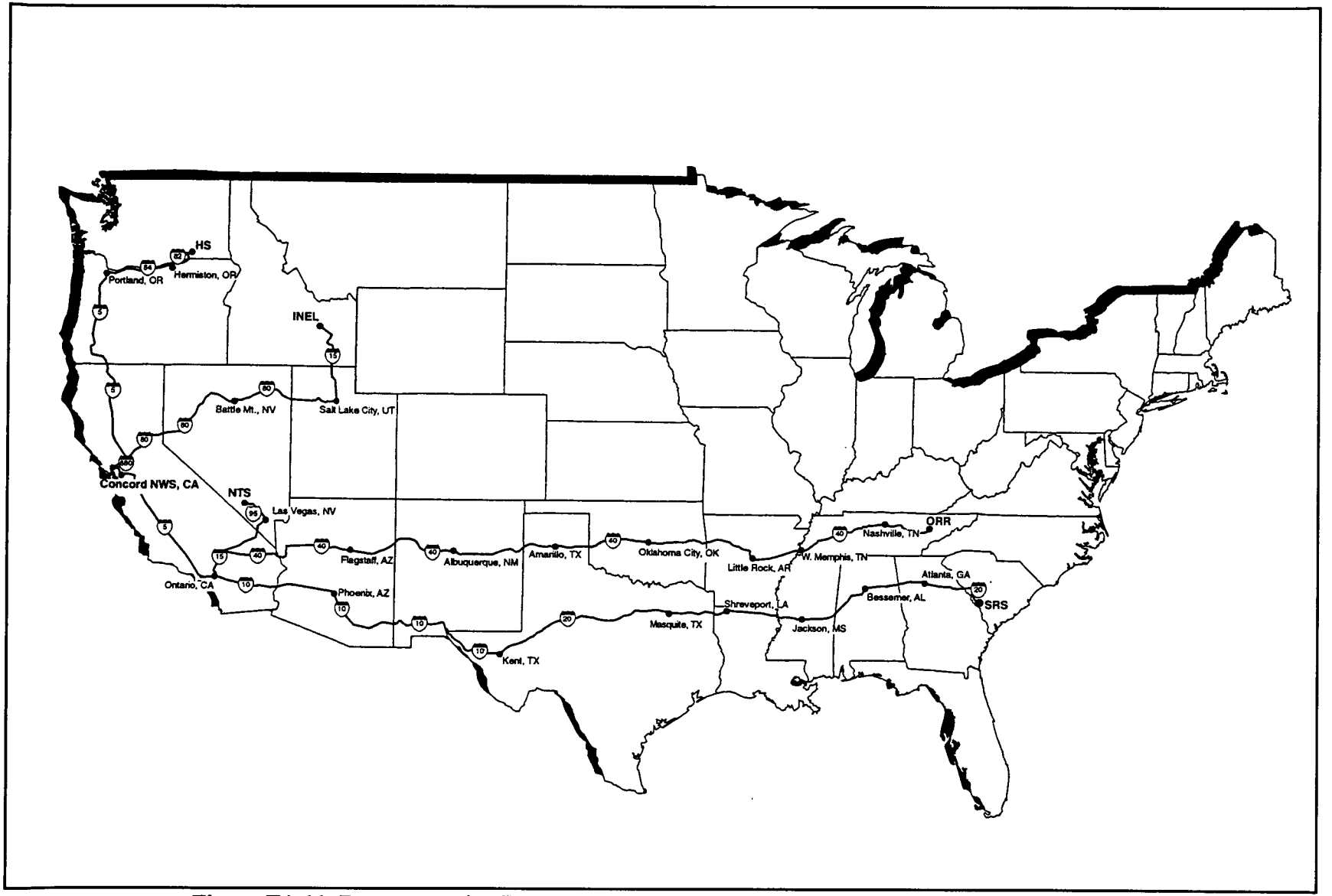

Figure E1-11 Representative Truck Routes from Naval Weapons Station, Concord, CA to Department of Energy Management Sites

From: CONCORD NW I680 S4 CA
To : SRL, SC

Routing through:

		CONCORD	NW	I680	S4	CA
I680		DUBLIN	SE	I580	I680	CA
I580		VERNALIS	W	I5	I580	CA
I5		SAN FERNANDO	NW	I210	I5	CA
I210		POMONA	NW	I10	I210	CA
I10		PHOENIX	W	I10	I17	AZ
I17		PHOENIX	SE	I10	I17	AZ
I10		KENT	E	I10	I20	TX
I20		DUNCANVILLE	NE	I20	U67	TX
I20	I635	MESQUITE	NW	I20	I635	TX
I20		SHREVEPORT	W	I20	I220	LA
I220		BOSSIER CITY	E	I20	I220	LA
I20		JACKSON	SW	I20	I55	MS
I20	I55	JACKSON	S	I20	I55	MS
I20		MERIDIAN	W	I20	I59	MS
I20	I59	BESSEMER	SW	I20	I459	AL
I459		IRONDALE	E	I20	I459	AL
I20		ATLANTA	W	I20	I285	GA
I285		RED OAK	E	I285	I85	GA
I285	I85	COLLEGE PARK	S	I285	I85	GA
I285		ATLANTA	E	I20	I285	GA
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRL				SC

From: CONCORD NW I680 S4 CA
To : ID NATL ENG LAB, ID

Routing through:

		CONCORD	NW	I680	S4	CA
I680		MARTINEZ	E	I680	LOCL	CA
I680#		BENICIA	E	I680	I780	CA
I680		ROCKVILLE	SW	I680	I80	CA
I80		SALT LAKE CITY	W	I215	I80	UT
I215		N SALT LAKE		I15	I215	UT
I15		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: CONCORD NW I680 S4 CA
To : HANFORD, WA

Routing through:

		CONCORD	NW	I680	S4	CA
I680		MARTINEZ	E	I680	LOCL	CA
I680#		BENICIA	E	I680	I780	CA
I680		ROCKVILLE	SW	I680	I80	CA
I80		VACAVILLE	E	I505	I80	CA
I505		DUNNIGAN	S	I5	I505	CA
I5		TUALATIN	S	I205	I5	OR
I205		PORTLAND	E	I205	I84	OR
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: CONCORD NW I680 S4 CA
To : K-25, TN

Routing through:

		CONCORD	NW	I680	S4	CA
I680		DUBLIN	SE	I580	I680	CA
I580		VERNALIS	W	I5	I580	CA
I5		SAN FERNANDO	NW	I210	I5	CA
I210		POMONA	NW	I10	I210	CA
I10		ONTARIO	E	I10	I15	CA
I15		BARSTOW		I15	I40	CA
I40		OKLAHOMA CITY	W	I40	I44	OK
I44		OKLAHOMA CITY	SW	I240	I44	OK
I240		OKLAHOMA CITY	SE	I240	I40	OK
I40		WEST MEMPHIS	N	I40	I55	AR
I40	I55	WEST MEMPHIS	E	I40	I55	AR
I40		NASHVILLE	W	I40	I440	TN
I440		NASHVILLE	SE	I24	I440	TN
I24		NASHVILLE	E	I24	I40	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: CONCORD NW I680 S4 CA
To : MERCURY, NV

Routing through:

		CONCORD	NW	I680	S4	CA
I680		DUBLIN	SE	I580	I680	CA
I580		VERNALIS	W	I5	I580	CA
I5		SAN FERNANDO	NW	I210	I5	CA
I210		POMONA	NW	I10	I210	CA
I10		ONTARIO	E	I10	I15	CA
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

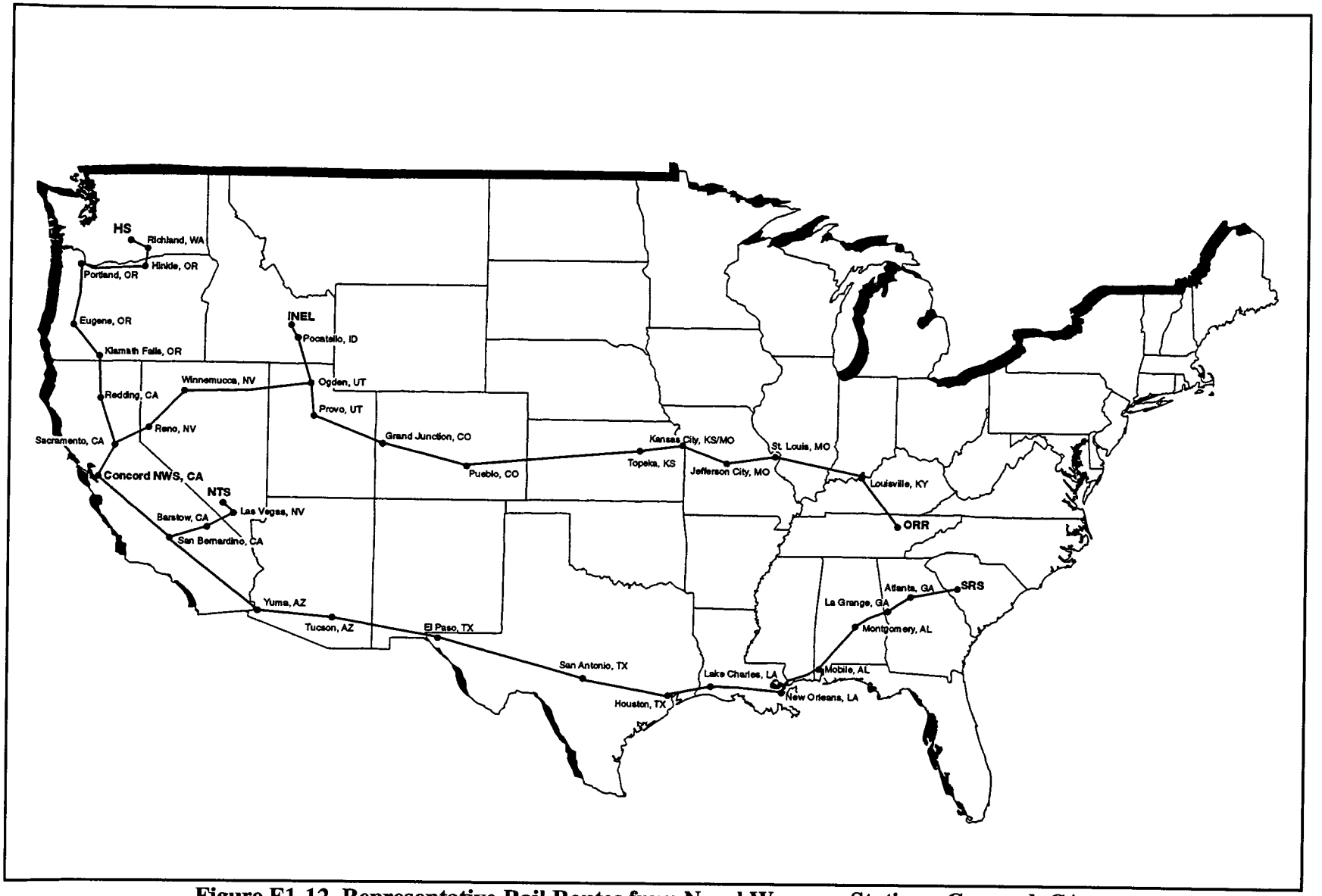

Figure E1-12 Representative Rail Routes from Naval Weapons Stations, Concord, CA to Department of Energy Management Sites

ROUTE FROM: SP 14467-MARTINEZ, CA
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
SP	14467-MARTINEZ	CA	0.
SP	14470-PITTSBURG	CA	14.
SP	14498-LATHRUP	CA	79.
SP	14529-MODESTO	CA	106.
SP	14570-FRESNO	CA	204.
SP	14622-BAKERSFIELD	CA	309.
SP	14621-MOJAVE	CA	374.
SP	14692-PALMDALE	CA	408.
SP	14666-SAN BERNARDINO	CA	485.
SP	12971-YUMA	AZ	679.
SP	12972-WELLTON	AZ	720.
SP	12938-PICACHO	AZ	889.
SP	12942-TUCSON	AZ	938.
SP	12877-EL PASO	TX	1248.
SP	12611-SAN ANTONIO	TX	1866.
SP	12538-FLATONIA	TX	1958.
SP	12536-EAGLE LAKE	TX	2009.
SP	12399-HOUSTON	TX	2078.
SP	12341-BEAUMONT	TX	2165.
SP	12348-ORANGE	TX	2188.
SP	9124-LAKE CHARLES	LA	2231.
SP	9113-LAFAYETTE	LA	2297.
SP	9038-THIBODAUX JCT	LA	2394.
SP	8985-NEW ORLEANS	LA	2454.
CSXT	8985-NEW ORLEANS	LA	2454.
CSXT	8966-GULFPORT	MS	2528.
CSXT	8926-BILOXI	MS	2545.
CSXT	8967-PASCAGOULA	MS	2561.
CSXT	8597-MOBILE	AL	2600.
CSXT	8566-FLOMATON	AL	2653.
CSXT	8657-MONTGOMERY	AL	2777.
CSXT	8683-OPELIKA	AL	2843.
CSXT	8142-LA GRANGE	GA	2886.
CSXT	7914-ATLANTA	GA	2962.
CSXT	7961-AUGUSTA	GA	3137.
CSXT	7732-ROBBINS	SC	3166.
CSXT	7717-DUNBARTON / WELL	SC	3175.
USG	7717-DUNBARTON / WELL	SC	3175.
USG	15359-SRP	SC	3183.

ROUTE FROM: SP 14467-MARTINEZ, CA
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
SP	14467-MARTINEZ	CA	0.
SP	14431-SUISUN-FAIRFIELD	CA	21.
SP	14409-DAVIS	CA	48.
SP	14411-SACRAMENTO	CA	62.
SP	14415-ROSEVILLE	CA	77.
SP	14821-RENO	NV	194.
SP	14816-SPARKS	NV	209.
SP	14812-HAZEN	NV	242.
SP	14813-WINNEMUCCA	NV	376.
SP	14793-ELKO	NV	500.
SP	13568-OGDEN	UT	723.
UP	13568-OGDEN	UT	723.
UP	13369-MC CAMMON	ID	836.
UP	13370-POCATELLO	ID	859.
UP	13336-SCOVILLE	ID	915.

ROUTE FROM: SP 14467-MARTINEZ, CA
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
SP	14467-MARTINEZ	CA	0.
SP	14431-SUISUN-FAIRFIELD	CA	21.
SP	14409-DAVIS	CA	48.
SP	14411-SACRAMENTO	CA	62.
SP	14415-ROSEVILLE	CA	77.
SP	14383-MARYSVILLE	CA	108.
SP	14385-CHICO	CA	145.
SP	14387-TEHAMA	CA	177.
SP	14313-REDDING	CA	224.
SP	14250-KLAMATH FALLS	OR	386.
SP	14271-EUGENE	OR	579.
SP	14287-ALBANY	OR	623.
SP	14141-SALEM	OR	651.
SP	14179-PORTLAND	OR	704.
UP	14179-PORTLAND	OR	704.
UP	14197-OREGON TRUNK JCT	OR	799.
UP	14223-HINKLE	OR	891.
UP	13894-WALLULA	WA	920.
UP	13964-KENNEWICK	WA	935.
UP	13941-RICHLAND	WA	944.
USG	13941-RICHLAND	WA	944.
USG	16212-HANFORD S 300	WA	951.

ROUTE FROM: SP 14467-MARTINEZ, CA
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
SP	14467-MARTINEZ	CA	0.
SP	14431-SUISUN-FAIRFIELD	CA	21.
SP	14409-DAVIS	CA	48.
SP	14411-SACRAMENTO	CA	62.
SP	14415-ROSEVILLE	CA	77.
SP	14821-RENO	NV	194.
SP	14816-SPARKS	NV	209.
SP	14812-HAZEN	NV	242.
SP	14813-WINNEMUCCA	NV	376.
SP	14793-ELKO	NV	500.
SP	13568-OGDEN	UT	723.
SP	13595-SALT LAKE CITY	UT	758.
SP	13610-PROVO	UT	803.
SP	13611-SPRINGVILLE	UT	808.
SP	13613-THISTLE	UT	822.
SP	13646-GRAND JCT	CO	1048.
SP	13645-GLENWOOD SPRINGS	CO	1138.
SP	13673-DOTSERO	CO	1153.
SP	13764-PUEBLO	CO	1377.
SP	11673-HERINGTON	KS	1837.
SP	11697-TOPEKA	KS	1914.
SP	11823-LAWRENCE	KS	1944.
SP	10617-KANSAS CITY	KS	1982.
SP	10616-KANSAS CITY	MO	1985.
SP	10627-PLEASANT HILL	MO	2017.
SP	10656-JEFFERSON CITY	MO	2133.
SP	10858-ST LOUIS	MO	2255.
SP	10859-EAST ST LOUIS	IL	2261.
<TR>	10859-EAST ST LOUIS	IL	2261.
NS	10859-EAST ST LOUIS	IL	2261.
NS	4953-CENTRALIA	IL	2319.
NS	4954-MOUNT VERNON	IL	2341.
NS	4797-MOUNT CARMEL	IL	2404.
NS	7009-JEFFERSONVILLE	IN	2529.
NS	7008-LOUISVILLE	KY	2533.
NS	6979-DANVILLE	KY	2633.
NS	7260-HARRIMAN	TN	2795.
NS	15316-K-25	TN	2810.

ROUTE FROM: SP 14467-MARTINEZ, CA
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
SP	14467-MARTINEZ	CA	0.
SP	14470-PITTSBURG	CA	14.
SP	14498-LATHRUP	CA	79.
SP	14529-MODESTO	CA	106.
SP	14570-FRESNO	CA	204.
SP	14622-BAKERSFIELD	CA	309.
SP	14621-MOJAVE	CA	374.
SP	14692-PALMDALE	CA	408.
SP	14666-SAN BERNARDINO	CA	485.
UP	14666-SAN BERNARDINO	CA	485.
UP	14664-BARSTOW	CA	563.
UP	14762-LAS VEGAS	NV	736.
UP	14766-VALLEY	NV	751.
USG	14766-VALLEY	NV	751.
USG	16333-YUCCA MOUNTAIN	NV	850.

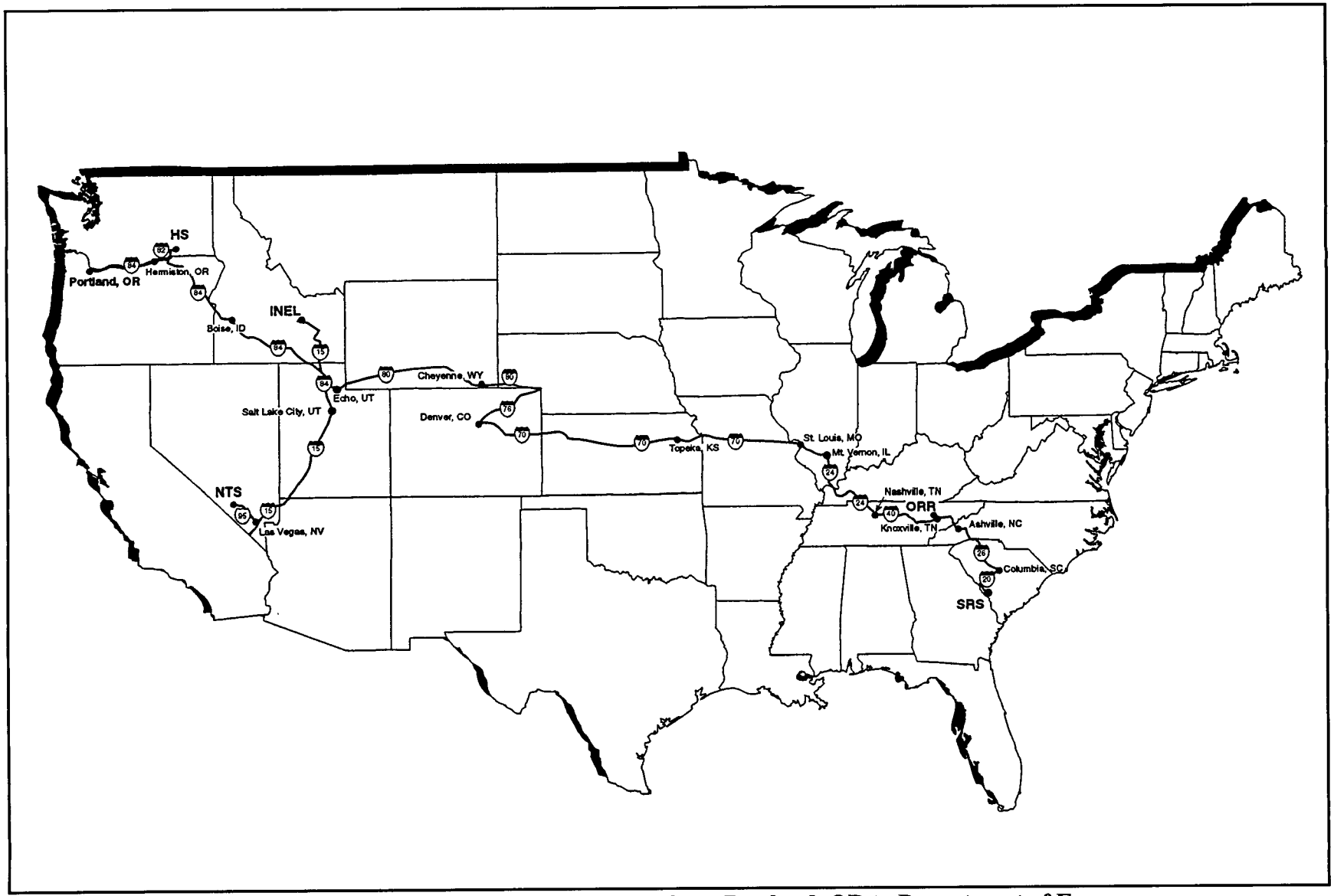

Figure E1-13 Representative Truck Routes from Portland, OR to Department of Energy Management Sites

From: PORTLAND, OR
To : SRL, SC

Routing through:

		PORTLAND				OR
I84		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I84		ECHO		I80	I84	UT
I80		CHEYENNE	SW	I25	I80	WY
I25		COMMERCE CITY	W	I25	I76	CO
I76		COMMERCE CITY	NW	I270	I76	CO
I270		DENVER	NE	I270	I70	CO
I70		TOPEKA	W	I470	I70	KS
I470		TOPEKA	S	I335	I470	KS
I470$	TKST$	TOPEKA	E	I470	I70	KS
I70 $	TKST$	KANSAS CITY	W	I435	I70	KS
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I24		EAST RIDGE	NE	I24	I75	TN
I75		ATLANTA	NW	I285	I75	GA
I285		ATLANTA	E	I20	I285	GA
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRL				SC

From: PORTLAND, OR
To : ID NATL ENG LAB, ID

Routing through:

		PORTLAND				OR
I84		RAFT RIVER	W	I84	I86	ID
I86		CHUBBUCK	E	I15	I86	ID
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: PORTLAND, OR
To : HANFORD, WA

Routing through:

	PORTLAND				OR
I84	HERMISTON	SW	I82	I84	OR
I82	WEST RICHLAND	S	I182	I82	WA
I182	RICHLAND	SE	I182	S240	WA
S240	RICHLAND	N	S240	LR4S	WA
LR4S	HANFORD				WA

From: PORTLAND, OR
To : K-25, TN

Routing through:

		PORTLAND				OR
I84		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I84		ECHO		I80	I84	UT
I80		CHEYENNE	SW	I25	I80	WY
I25		COMMERCE CITY	W	I25	I76	CO
I76		COMMERCE CITY	NW	I270	I76	CO
I270		DENVER	NE	I270	I70	CO
I70		TOPEKA	W	I470	I70	KS
I470		TOPEKA	S	I335	I470	KS
I470$	TKST$	TOPEKA	E	I470	I70	KS
I70 $	TKST$	KANSAS CITY	W	I435	I70	KS
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: PORTLAND, OR
To : MERCURY, NV

Routing through:

		PORTLAND				OR
I84		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I15		SALT LAKE CITY	W	I15	I80	UT
I15	I80	SALT LAKE CITY	S	I15	I80	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

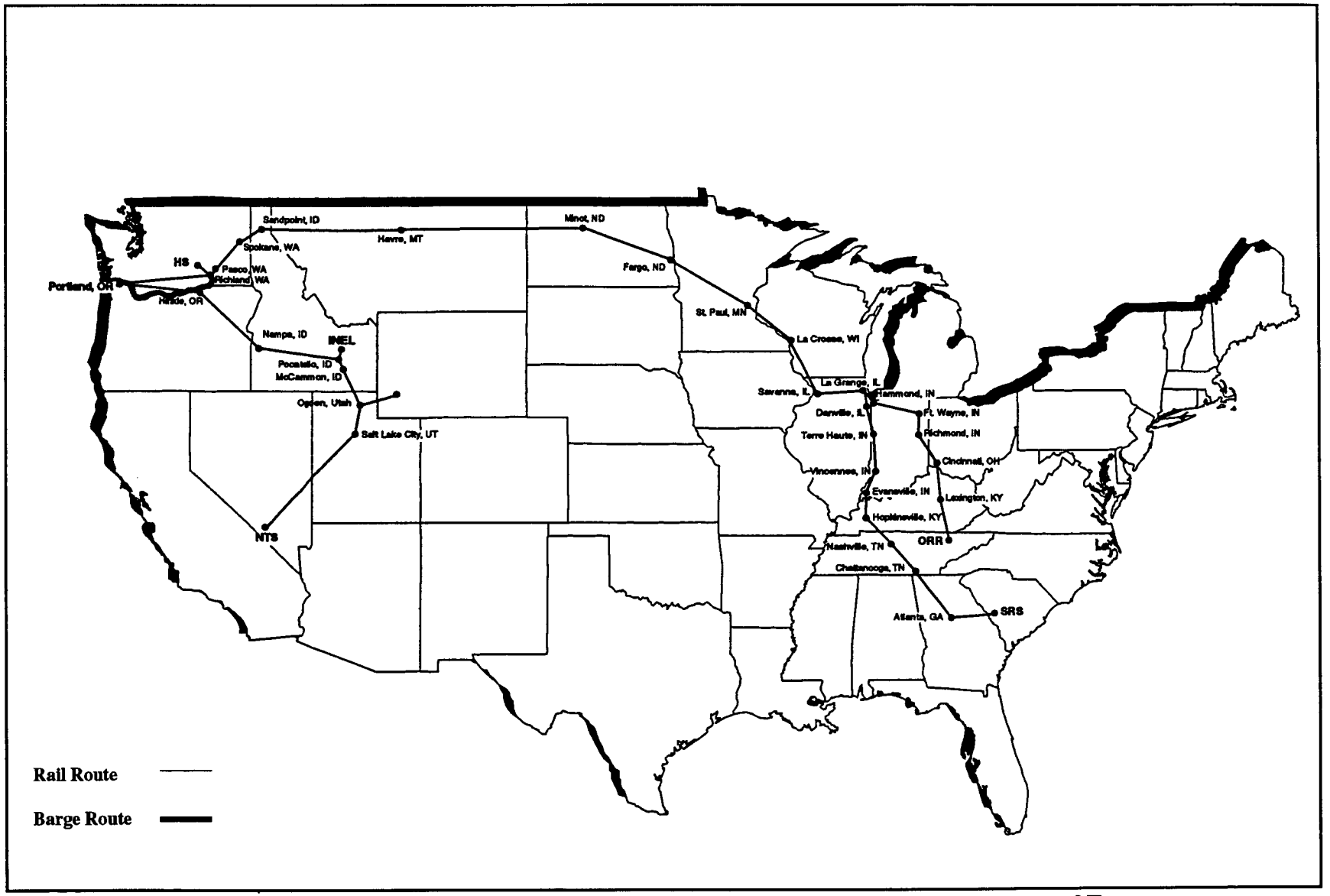

Figure E1-14 Representative Rail and Barge Routes from Portland, OR to Department of Energy Management Sites

ROUTE FROM: BN 14179-PORTLAND, OR
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
BN	14179-PORTLAND	OR	0.
BN	14180-VANCOUVER	WA	7.
BN	13964-KENNEWICK	WA	220.
BN	13890-PASCO	WA	222.
BN	13828-SPOKANE	WA	373.
BN	13300-SANDPOINT	ID	436.
BN	13089-SHELBY	MT	773.
BN	13168-HAVRE	MT	874.
BN	15740-WILLISTON	ND	1193.
BN	10936-MINOT	ND	1305.
BN	10935-SURREY	ND	1311.
BN	11134-CASSELTON	ND	1526.
BN	11132-FARGO	ND	1546.
BN	11131-MOORHEAD	MN	1549.
BN	9663-STAPLES	MN	1663.
BN	9671-SAUK RAPIDS	MN	1728.
BN	9826-COON CREEK	MN	1778.
BN	9798-NORTHTOWN	MN	1787.
BN	9830-ST PAUL	MN	1799.
BN	5736-LA CROSSE	WI	1920.
BN	4327-EAST DUBUQUE	IL	2031.
BN	4317-SAVANNA	IL	2071.
BN	4190-AURORA	IL	2162.
BN	4170-LA GRANGE	IL	2187.
IHB	4170-LA GRANGE	IL	2187.
IHB	4172-ARGO	IL	2191.
IHB	4163-BLUE ISLAND	IL	2203.
IHB	4223-DOLTON / RIVERDA	IL	2207.
CSXT	4223-DOLTON / RIVERDA	IL	2207.
CSXT	4206-CHICAGO HEIGHTS	IL	2217.
CSXT	4636-WATSEKA	IL	2268.
CSXT	4642-DANVILLE	IL	2313.
CSXT	3863-TERRE HAUTE	IN	2370.
CSXT	3812-VINCENNES	IN	2423.
CSXT	3838-EVANSVILLE	IN	2473.
CSXT	3839-HENDERSON	KY	2486.
CSXT	7061-HOPKINSVILLE	KY	2573.
CSXT	7201-MADISON	TN	2634.
CSXT	7202-NASHVILLE	TN	2644.
CSXT	7187-TULLAHOMA	TN	2723.
CSXT	7235-CHATTANOOGA	TN	2803.
CSXT	7888-DALTON	GA	2841.
CSXT	7889-CARTERSVILLE	GA	2892.
CSXT	7907-MARIETTA	GA	2924.
CSXT	7914-ATLANTA	GA	2934.
CSXT	7961-AUGUSTA	GA	3109.
CSXT	7732-ROBBINS	SC	3138.
CSXT	7717-DUNBARTON / WELL	SC	3147.
USG	7717-DUNBARTON / WELL	SC	3147.
USG	15359-SRP	SC	3155.

ROUTE FROM: BN 14179-PORTLAND, OR
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
BN	14179-PORTLAND	OR	0.
UP	14179-PORTLAND	OR	0.
UP	14197-OREGON TRUNK JCTOR		95.
UP	14223-HINKLE	OR	187.
UP	14220-PENDLETON	OR	218.
UP	13412-NAMPA	ID	487.
UP	13370-POCATELLO	ID	729.
UP	13336-SCOVILLE	ID	785.

ROUTE FROM: BN 14179-PORTLAND, OR
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
BN	14179-PORTLAND	OR	0.
BN	14180-VANCOUVER	WA	7.
BN	13964-KENNEWICK	WA	220.
BN	13890-PASCO	WA	222.
WCRC	13890-PASCO	WA	222.
WCRC	13964-KENNEWICK	WA	223.
WCRC	13941-RICHLAND	WA	231.
USG	13941-RICHLAND	WA	231.
USG	16212-HANFORD S 300	WA	239.

ROUTE FROM: BN 14179-PORTLAND, OR
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
BN	14179-PORTLAND	OR	0.
BN	14180-VANCOUVER	WA	7.
BN	13964-KENNEWICK	WA	220.
BN	13890-PASCO	WA	222.
BN	13828-SPOKANE	WA	373.
BN	13300-SANDPOINT	ID	436.
BN	13089-SHELBY	MT	773.
BN	13168-HAVRE	MT	874.
BN	15740-WILLISTON	ND	1193.
BN	10936-MINOT	ND	1305.
BN	10935-SURREY	ND	1311.
BN	11134-CASSELTON	ND	1526.
BN	11132-FARGO	ND	1546.
BN	11131-MOORHEAD	MN	1549.
BN	9663-STAPLES	MN	1663.
BN	9671-SAUK RAPIDS	MN	1728.
BN	9826-COON CREEK	MN	1778.
BN	9798-NORTHTOWN	MN	1787.
BN	9830-ST PAUL	MN	1799.
BN	5736-LA CROSSE	WI	1920.
BN	4327-EAST DUBUQUE	IL	2031.
BN	4317-SAVANNA	IL	2071.
BN	4190-AURORA	IL	2162.
BN	4170-LA GRANGE	IL	2187.
IHB	4170-LA GRANGE	IL	2187.
IHB	4172-ARGO	IL	2191.
IHB	4163-BLUE ISLAND	IL	2203.
IHB	4228-BURNHAM / CALUME	IL	2211.
NS	4228-BURNHAM / CALUME	IL	2211.
NS	4076-HAMMOND	IN	2213.
NS	4064-HOBART	IN	2229.
NS	4020-ARGOS	IN	2292.
NS	3548-FORT WAYNE	IN	2351.
NS	3650-MUNCIE	IN	2415.
NS	3688-RICHMOND	IN	2460.
NS	3251-HAMILTON	OH	2515.
NS	3234-IVORYDALE	OH	2532.
NS	3228-CINCINNATI	OH	2539.
NS	6850-LEXINGTON	KY	2613.
NS	6979-DANVILLE	KY	2650.
NS	7260-HARRIMAN	TN	2812.
NS	15316-K-25	TN	2827.

ROUTE FROM: BN 14179-PORTLAND, OR
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
BN	14179-PORTLAND	OR	0.
UP	14179-PORTLAND	OR	0.
UP	14197-OREGON TRUNK JCT	OR	95.
UP	14223-HINKLE	OR	187.
UP	14220-PENDLETON	OR	218.
UP	13412-NAMPA	ID	487.
UP	13370-POCATELLO	ID	729.
UP	13369-MC CAMMON	ID	752.
UP	13568-OGDEN	UT	865.
UP	13595-SALT LAKE CITY	UT	901.
UP	13630-LYNNDYL	UT	1013.
UP	14766-VALLEY	NV	1330.
USG	14766-VALLEY	NV	1330.
USG	16333-YUCCA MOUNTAIN	NV	1429.

ROUTE FROM: BRG 16859-PORTLAND; PORT OF OR
TO: BRG 16851-RICHLAND; PORT OF WA

RR	NODE	STATE	DIST
BRG	16859-PORTLAND; PORT	OR	0.
BRG	16852-COLUMBIA/WILLAM	WA	10.
BRG	16853-VANCOUVER; PORT	WA	14.
BRG	16848-COLUMBIA/SNAKE	WA	231.
BRG	16851-RICHLAND; PORT	WA	243.

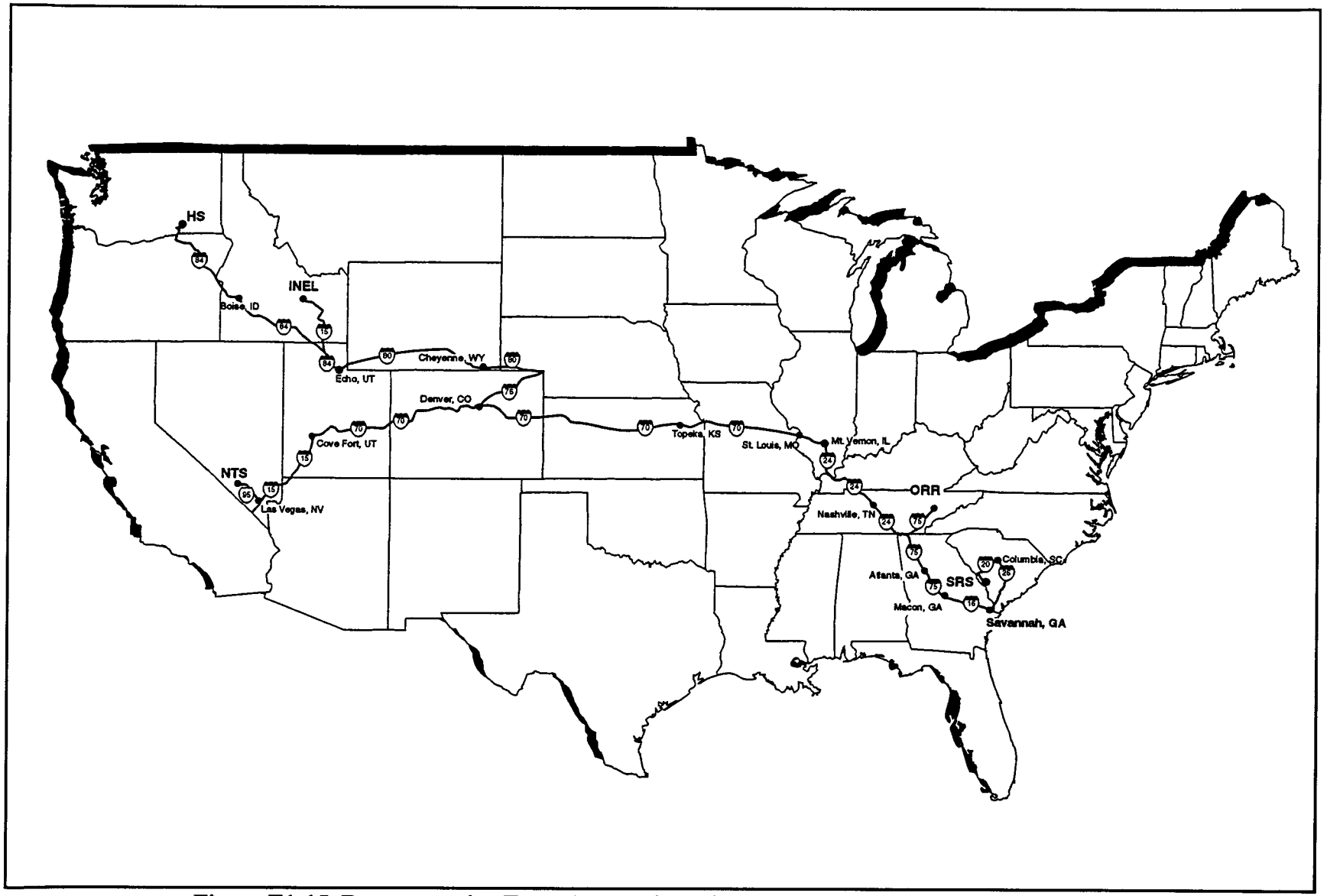

Figure E1-15 Representative Truck Routes from Savannah, GA to Department of Energy Management Sites

From: SAVANNAH, GA
To : SRP, SC

Routing through:

		SAVANNAH				GA
I16		POOLER	S	I16	I95	GA
I95		ROSINVILLE	N	I26	I95	SC
I26		COLUMBIA	NW	I20	I26	SC
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRP				SC

From: SAVANNAH, GA
To : ID NATL ENG LAB, ID

Routing through:

		SAVANNAH				GA
I16		MACON	NW	I16	I75	GA
I75		HAPEVILLE	S	I285	I75	GA
I285		COLLEGE PARK	S	I285	I85	GA
I285	I85	RED OAK	E	I285	I85	GA
I285		ATLANTA	NW	I285	I75	GA
I75		EAST RIDGE	NE	I24	I75	TN
I24		NASHVILLE	E	I24	I40	TN
I24	I40	NASHVILLE	SE	I24	I40	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: SAVANNAH, GA
To : HANFORD, WA

Routing through:

		SAVANNAH				GA
I16		MACON	NW	I16	I75	GA
I75		HAPEVILLE	S	I285	I75	GA
I285		COLLEGE PARK	S	I285	I85	GA
I285	I85	RED OAK	E	I285	I85	GA
I285		ATLANTA	NW	I285	I75	GA
I75		EAST RIDGE	NE	I24	I75	TN
I24		NASHVILLE	E	I24	I40	TN
I24	I40	NASHVILLE	SE	I24	I40	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: SAVANNAH, GA
To : K-25, TN

Routing through:

		SAVANNAH				GA
I16		MACON	NW	I16	I75	GA
I75		HAPEVILLE	S	I285	I75	GA
I285		COLLEGE PARK	S	I285	I85	GA
I285	I85	RED OAK	E	I285	I85	GA
I285		ATLANTA	NW	I285	I75	GA
I75		OAK RIDGE	S	I40	I75	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: SAVANNAH, GA
To : MERCURY, NV

Routing through:

		SAVANNAH				GA
I16		MACON	NW	I16	I75	GA
I75		HAPEVILLE	S	I285	I75	GA
I285		COLLEGE PARK	S	I285	I85	GA
I285	I85	RED OAK	E	I285	I85	GA
I285		ATLANTA	NW	I285	I75	GA
I75		EAST RIDGE	NE	I24	I75	TN
I24		NASHVILLE	E	I24	I40	TN
I24	I40	NASHVILLE	SE	I24	I40	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

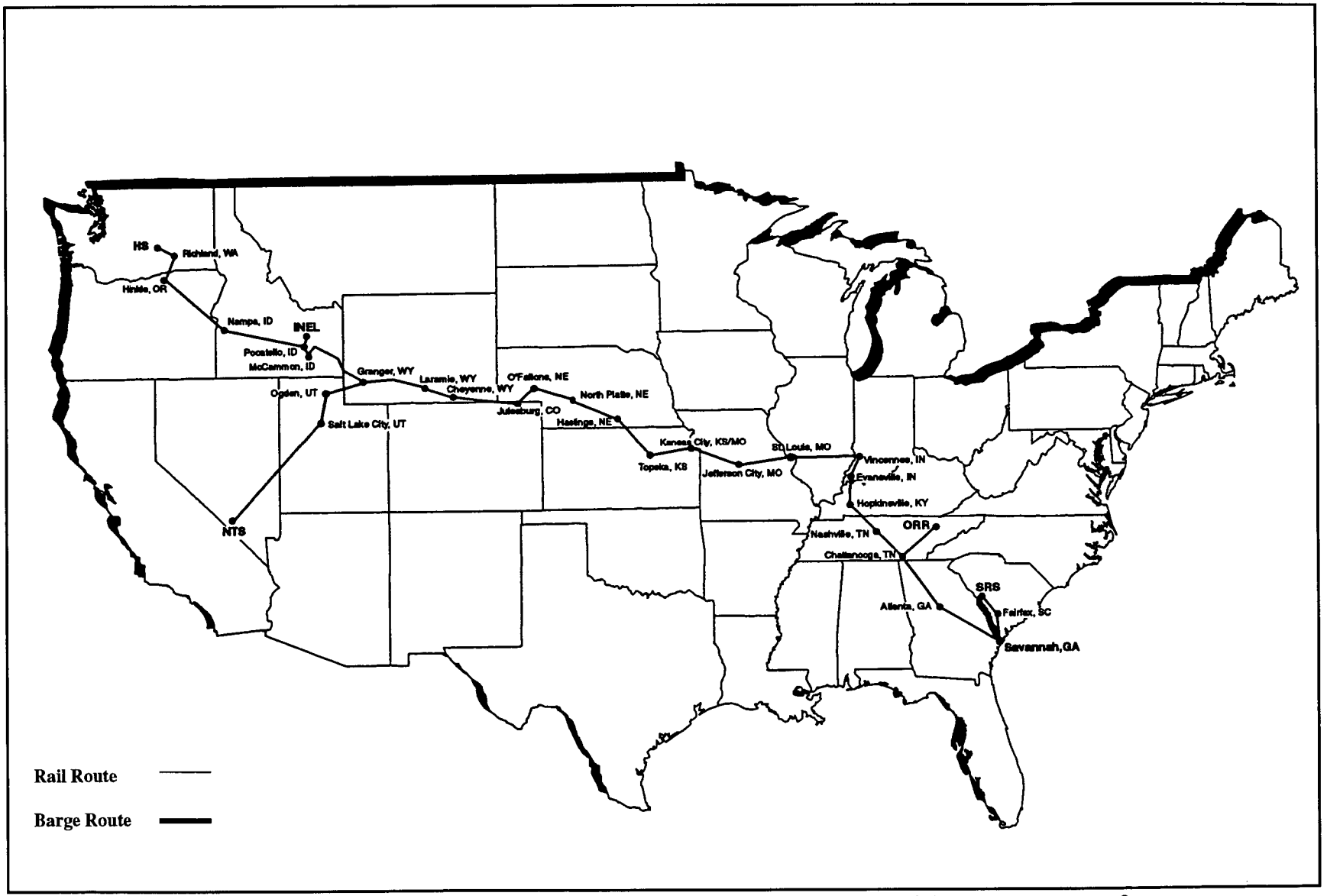

Figure E1-16 Representative Rail and Barge Routes from Savannah, GA to Department of Energy Management Sites

ROUTE FROM: CSXT 8007-SAVANNAH, GA
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
CSXT	8007-SAVANNAH	GA	0.
CSXT	7739-FAIRFAX	SC	68.
CSXT	7732-ROBBINS	SC	97.
CSXT	7717-DUNBARTON / WELLSC		106.
USG	7717-DUNBARTON / WELLSC		106.
USG	15359-SRP	SC	114.

ROUTE FROM: CSXT 8007-SAVANNAH, GA
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
CSXT	8007-SAVANNAH	GA	0.
CSXT	8079-WAYCROSS	GA	93.
CSXT	8069-CORDELE	GA	201.
CSXT	8144-MANCHESTER	GA	282.
CSXT	7914-ATLANTA	GA	359.
CSXT	7907-MARIETTA	GA	369.
CSXT	7889-CARTERSVILLE	GA	401.
CSXT	7888-DALTON	GA	452.
CSXT	7235-CHATTANOOGA	TN	490.
CSXT	7187-TULLAHOMA	TN	571.
CSXT	7202-NASHVILLE	TN	650.
CSXT	7201-MADISON	TN	660.
CSXT	7061-HOPKINSVILLE	KY	720.
CSXT	3839-HENDERSON	KY	807.
CSXT	3838-EVANSVILLE	IN	820.
CSXT	3812-VINCENNES	IN	870.
CSXT	4952-SALEM	IL	949.
CSXT	10859-EAST ST LOUIS	IL	1014.
<TR>	10859-EAST ST LOUIS	IL	1014.
<TR>	10858-ST LOUIS	MO	1020.
UP	10858-ST LOUIS	MO	1020.
UP	10656-JEFFERSON CITY	MO	1142.
UP	10616-KANSAS CITY	MO	1318.
UP	10617-KANSAS CITY	KS	1321.
UP	11823-LAWRENCE	KS	1360.
UP	11697-TOPEKA	KS	1390.
UP	11696-MENOKEN	KS	1395.
UP	11681-MARYSVILLE	KS	1470.
UP	11405-HASTINGS	NE	1580.
UP	11410-GIBBON	NE	1606.
UP	11352-NORTH PLATTE	NE	1684.
UP	11358-O FALLONS	NE	1733.
UP	13703-JULESBURG	CO	1801.
UP	13465-CHEYENNE	WY	1947.
UP	13462-LARAMIE	WY	1999.
UP	13494-GRANGER	WY	2275.
UP	13369-MC CAMMON	ID	2467.
UP	13370-POCATELLO	ID	2490.
UP	13336-SCOVILLE	ID	2546.

ROUTE FROM: CSXT 8007-SAVANNAH, GA
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
CSXT	8007-SAVANNAH	GA	0.
CSXT	8079-WAYCROSS	GA	93.
CSXT	8069-CORDELE	GA	201.
CSXT	8144-MANCHESTER	GA	282.
CSXT	7914-ATLANTA	GA	359.
CSXT	7907-MARIETTA	GA	369.
CSXT	7889-CARTERSVILLE	GA	401.
CSXT	7888-DALTON	GA	452.
CSXT	7235-CHATTANOOGA	TN	490.
CSXT	7187-TULLAHOMA	TN	571.
CSXT	7202-NASHVILLE	TN	650.
CSXT	7201-MADISON	TN	660.
CSXT	7061-HOPKINSVILLE	KY	720.
CSXT	3839-HENDERSON	KY	807.
CSXT	3838-EVANSVILLE	IN	820.
CSXT	3812-VINCENNES	IN	870.
CSXT	4952-SALEM	IL	949.
CSXT	10859-EAST ST LOUIS	IL	1014.
<TR>	10859-EAST ST LOUIS	IL	1014.
<TR>	10858-ST LOUIS	MO	1020.
UP	10858-ST LOUIS	MO	1020.
UP	10656-JEFFERSON CITY	MO	1142.
UP	10616-KANSAS CITY	MO	1318.
UP	10617-KANSAS CITY	KS	1321.
UP	11823-LAWRENCE	KS	1360.
UP	11697-TOPEKA	KS	1390.
UP	11696-MENOKEN	KS	1395.
UP	11681-MARYSVILLE	KS	1470.
UP	11405-HASTINGS	NE	1580.
UP	11410-GIBBON	NE	1606.
UP	11352-NORTH PLATTE	NE	1684.
UP	11358-O FALLONS	NE	1733.
UP	13703-JULESBURG	CO	1801.
UP	13465-CHEYENNE	WY	1947.
UP	13462-LARAMIE	WY	1999.
UP	13494-GRANGER	WY	2275.
UP	13369-MC CAMMON	ID	2467.
UP	13370-POCATELLO	ID	2490.
UP	13412-NAMPA	ID	2732.
UP	14220-PENDLETON	OR	3000.
UP	14223-HINKLE	OR	3031.
UP	13894-WALLULA	WA	3060.
UP	13964-KENNEWICK	WA	3075.
UP	13941-RICHLAND	WA	3084.
USG	13941-RICHLAND	WA	3084.
USG	16212-HANFORD S 300	WA	3092.

ROUTE FROM: CSXT 8007-SAVANNAH, GA
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
CSXT	8007-SAVANNAH	GA	0.
CSXT	8079-WAYCROSS	GA	93.
CSXT	8069-CORDELE	GA	201.
CSXT	8144-MANCHESTER	GA	282.
CSXT	7914-ATLANTA	GA	359.
CSXT	7907-MARIETTA	GA	369.
CSXT	7889-CARTERSVILLE	GA	401.
CSXT	7888-DALTON	GA	452.
CSXT	7235-CHATTANOOGA	TN	490.
NS	7235-CHATTANOOGA	TN	490.
NS	7260-HARRIMAN	TN	572.
NS	15316-K-25	TN	587.

ROUTE FROM: CSXT 8007-SAVANNAH, GA
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
CSXT	8007-SAVANNAH	GA	0.
CSXT	8079-WAYCROSS	GA	93.
CSXT	8069-CORDELE	GA	201.
CSXT	8144-MANCHESTER	GA	282.
CSXT	7914-ATLANTA	GA	359.
CSXT	7907-MARIETTA	GA	369.
CSXT	7889-CARTERSVILLE	GA	401.
CSXT	7888-DALTON	GA	452.
CSXT	7235-CHATTANOOGA	TN	490.
CSXT	7187-TULLAHOMA	TN	571.
CSXT	7202-NASHVILLE	TN	650.
CSXT	7201-MADISON	TN	660.
CSXT	7061-HOPKINSVILLE	KY	720.
CSXT	3839-HENDERSON	KY	807.
CSXT	3838-EVANSVILLE	IN	820.
CSXT	3812-VINCENNES	IN	870.
CSXT	4952-SALEM	IL	949.
CSXT	10859-EAST ST LOUIS	IL	1014.
<TR>	10859-EAST ST LOUIS	IL	1014.
<TR>	10858-ST LOUIS	MO	1020.
UP	10858-ST LOUIS	MO	1020.
UP	10656-JEFFERSON CITY	MO	1142.
UP	10616-KANSAS CITY	MO	1318.
UP	10617-KANSAS CITY	KS	1321.
UP	11823-LAWRENCE	KS	1360.
UP	11697-TOPEKA	KS	1390.
UP	11696-MENOKEN	KS	1395.
UP	11681-MARYSVILLE	KS	1470.
UP	11405-HASTINGS	NE	1580.
UP	11410-GIBBON	NE	1606.
UP	11352-NORTH PLATTE	NE	1684.
UP	11358-O FALLONS	NE	1733.
UP	13703-JULESBURG	CO	1801.
UP	13465-CHEYENNE	WY	1947.
UP	13462-LARAMIE	WY	1999.
UP	13494-GRANGER	WY	2275.
UP	13568-OGDEN	UT	2414.
UP	13595-SALT LAKE CITY	UT	2449.
UP	13630-LYNNDYL	UT	2561.
UP	14766-VALLEY	NV	2878.
USG	14766-VALLEY	NV	2878.
USG	16333-YUCCA MOUNTAIN	NV	2977.

ROUTE FROM: BRG 16923-SAVANNAH RIV/ICWW, GA
TO: BRG 16932-SAVANNAH BLF L/D, GA

RR	NODE	STATE	DIST
BRG	16923-SAVANNAH RIV/ICW	GA	0.
BRG	16929-SAVANNAH PORT O	GA	10.
BRG	16932-SAVANNAH BLF L/D	GA	146.

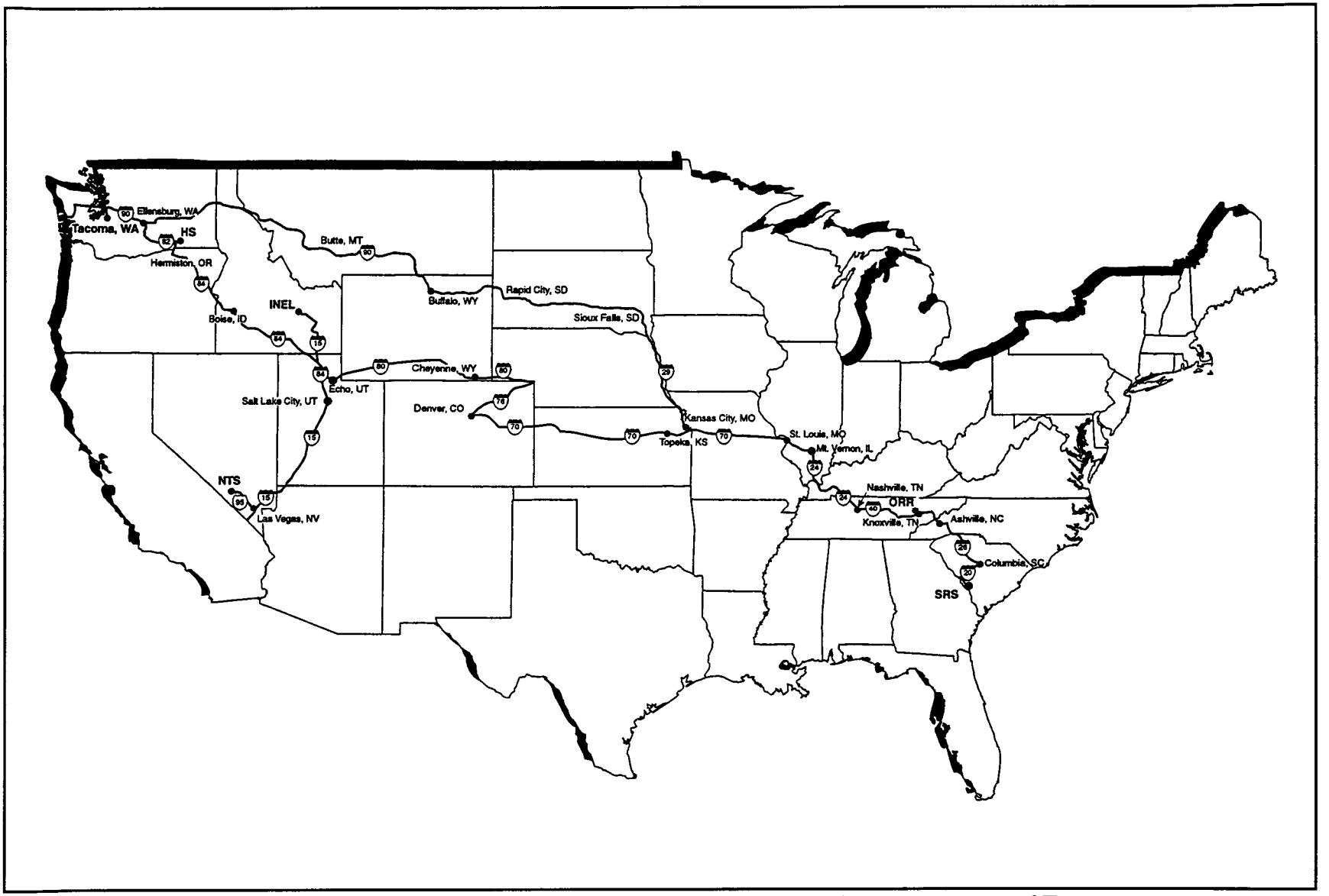

Figure E1-17 Representative Truck Routes from Tacoma, WA to Department of Energy Management Sites

From: TACOMA E I5 X135 WA
To : SRP, SC

Routing through:

		TACOMA	E	I5	X135	WA
I5		RENTON	W	I405	I5	WA
I405		BELLEVUE	S	I405	I90	WA
I90		BUTTE	W	I15	I90	MT
I15	I90	BUTTE	E	I15	I90	MT
I90		SIOUX FALLS	NW	I29	I90	SD
I29		LOVELAND	SW	I29	I680	IA
I680		MINDEN	NW	I680	I80	IA
I80		COUNCIL BLUFFS	SE	I29	I80	IA
I29		KANSAS CITY	NW	I29	I435	MO
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I24		EAST RIDGE	NE	I24	I75	TN
I75		ATLANTA	NW	I285	I75	GA
I285		ATLANTA	E	I20	I285	GA
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRP				SC

From: TACOMA E I5 X135 WA
To : ID NATL ENG LAB, ID

Routing through:

		TACOMA	E	I5	X135	WA
I5		RENTON	W	I405	I5	WA
I405		BELLEVUE	S	I405	I90	WA
I90		ELLENSBURG	SE	I82	I90	WA
I82		HERMISTON	SW	I82	I84	OR
I84		RAFT RIVER	W	I84	I86	ID
I86		CHUBBUCK	E	I15	I86	ID
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: TACOMA E I5 X135 WA
To : HANFORD, WA

Routing through:

		TACOMA	E	I5	X135	WA
I5		RENTON	W	I405	I5	WA
I405		BELLEVUE	S	I405	I90	WA
I90		ELLENSBURG	SE	I82	I90	WA
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: TACOMA E I5 X135 WA
To : K-25, TN

Routing through:

		TACOMA	E	I5	X135	WA
I5		RENTON	W	I405	I5	WA
I405		BELLEVUE	S	I405	I90	WA
I90		BUTTE	W	I15	I90	MT
I15	I90	BUTTE	E	I15	I90	MT
I90		SIOUX FALLS	NW	I29	I90	SD
I29		LOVELAND	SW	I29	I680	IA
I680		MINDEN	NW	I680	I80	IA
I80		COUNCIL BLUFFS	SE	I29	I80	IA
I29		KANSAS CITY	NW	I29	I435	MO
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: TACOMA E I5 X135 WA
To : MERCURY, NV

Routing through:

		TACOMA	E	I5	X135	WA
I5		RENTON	W	I405	I5	WA
I405		BELLEVUE	S	I405	I90	WA
I90		ELLENSBURG	SE	I82	I90	WA
I82		HERMISTON	SW	I82	I84	OR
I84		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I15		SALT LAKE CITY	W	I15	I80	UT
I15	I80	SALT LAKE CITY	S	I15	I80	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

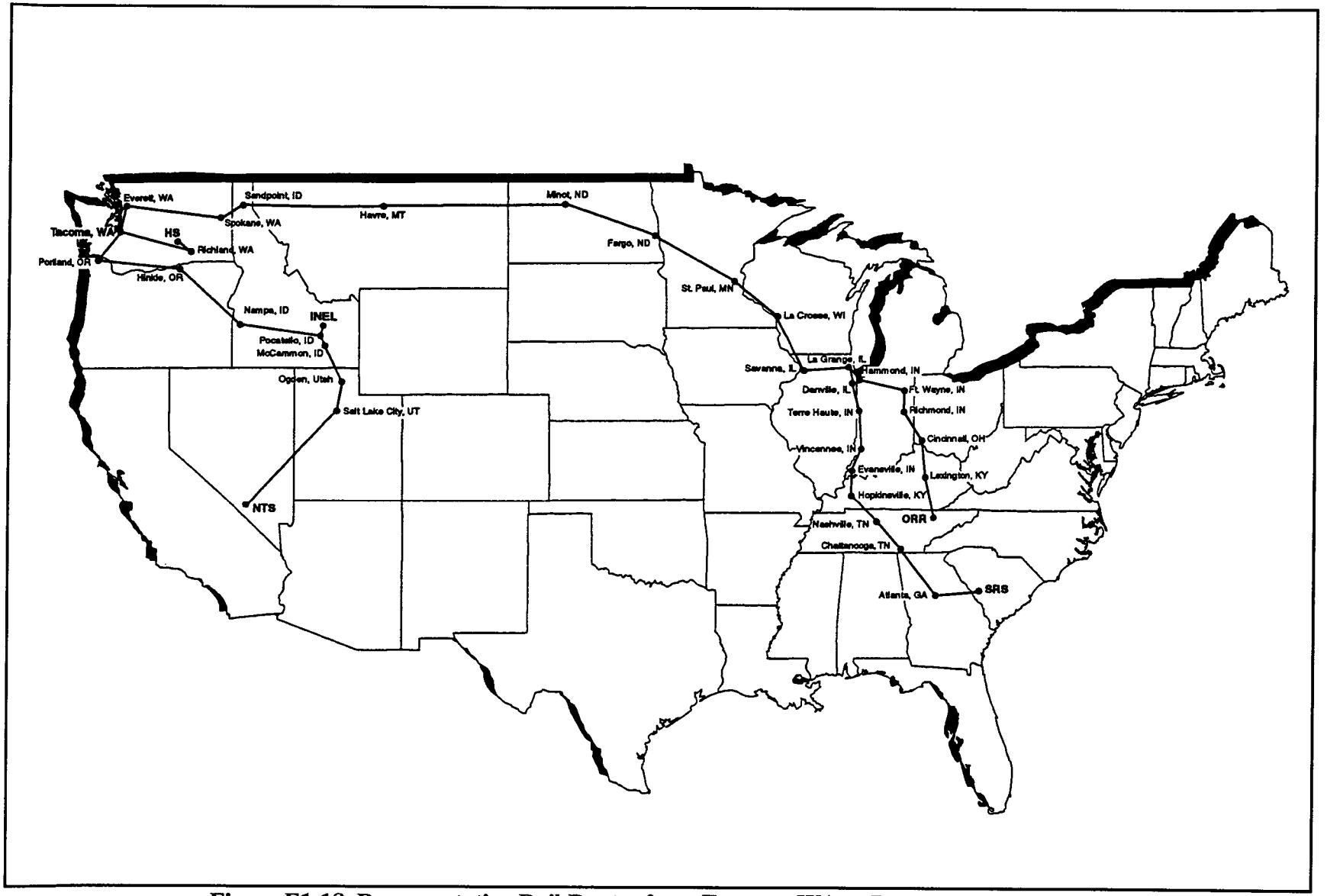

Figure E1-18 Representative Rail Routes from Tacoma, WA to Department of Energy Management Sites

ROUTE FROM: BN 14100-TACOMA, WA
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
BN	14100-TACOMA	WA	0.
BN	14011-SEATTLE	WA	42.
BN	14008-EVERETT	WA	74.
BN	13828-SPOKANE	WA	383.
BN	13300-SANDPOINT	ID	447.
BN	13089-SHELBY	MT	784.
BN	13168-HAVRE	MT	885.
BN	15740-WILLISTON	ND	1204.
BN	10936-MINOT	ND	1316.
BN	10935-SURREY	ND	1322.
BN	11134-CASSELTON	ND	1537.
BN	11132-FARGO	ND	1557.
BN	11131-MOORHEAD	MN	1560.
BN	9663-STAPLES	MN	1674.
BN	9671-SAUK RAPIDS	MN	1739.
BN	9826-COON CREEK	MN	1789.
BN	9798-NORTHTOWN	MN	1797.
BN	9830-ST PAUL	MN	1809.
BN	5736-LA CROSSE	WI	1930.
BN	4327-EAST DUBUQUE	IL	2041.
BN	4317-SAVANNA	IL	2081.
BN	4190-AURORA	IL	2172.
BN	4170-LA GRANGE	IL	2197.
IHB	4170-LA GRANGE	IL	2197.
IHB	4172-ARGO	IL	2201.
IHB	4163-BLUE ISLAND	IL	2213.
IHB	4223-DOLTON / RIVERDA	IL	2217.
CSXT	4223-DOLTON / RIVERDA	IL	2217.
CSXT	4206-CHICAGO HEIGHTS	IL	2227.
CSXT	4636-WATSEKA	IL	2278.
CSXT	4642-DANVILLE	IL	2323.
CSXT	3863-TERRE HAUTE	IN	2380.
CSXT	3812-VINCENNES	IN	2433.
CSXT	3838-EVANSVILLE	IN	2483.
CSXT	3839-HENDERSON	KY	2496.
CSXT	7061-HOPKINSVILLE	KY	2584.
CSXT	7201-MADISON	TN	2644.
CSXT	7202-NASHVILLE	TN	2654.
CSXT	7187-TULLAHOMA	TN	2733.
CSXT	7235-CHATTANOOGA	TN	2813.
CSXT	7888-DALTON	GA	2851.
CSXT	7889-CARTERSVILLE	GA	2902.
CSXT	7907-MARIETTA	GA	2935.
CSXT	7914-ATLANTA	GA	2944.
CSXT	7961-AUGUSTA	GA	3119.
CSXT	7732-ROBBINS	SC	3148.
CSXT	7717-DUNBARTON / WELL	SC	3157.
USG	7717-DUNBARTON / WELL	SC	3157.
USG	15359-SRP	SC	3165.

ROUTE FROM: BN 14100-TACOMA, WA
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
BN	14100-TACOMA	WA	0.
BN	14180-VANCOUVER	WA	142.
BN	14179-PORTLAND	OR	150.
UP	14179-PORTLAND	OR	150.
UP	14197-OREGON TRUNK JCT	OR	245.
UP	14223-HINKLE	OR	337.
UP	14220-PENDLETON	OR	368.
UP	13412-NAMPA	ID	636.
UP	13370-POCATELLO	ID	878.
UP	13336-SCOVILLE	ID	934.

ROUTE FROM: BN 14100-TACOMA, WA
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
BN	14100-TACOMA	WA	0.
BN	14180-VANCOUVER	WA	142.
BN	13964-KENNEWICK	WA	355.
BN	13890-PASCO	WA	357.
WCRC	13890-PASCO	WA	357.
WCRC	13964-KENNEWICK	WA	358.
WCRC	13941-RICHLAND	WA	366.
USG	13941-RICHLAND	WA	366.
USG	16212-HANFORD S 300	WA	374.

ROUTE FROM: BN 14100-TACOMA, WA
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
BN	14100-TACOMA	WA	0.
BN	14011-SEATTLE	WA	42.
BN	14008-EVERETT	WA	74.
BN	13828-SPOKANE	WA	383.
BN	13300-SANDPOINT	ID	447.
BN	13089-SHELBY	MT	784.
BN	13168-HAVRE	MT	885.
BN	15740-WILLISTON	ND	1204.
BN	10936-MINOT	ND	1316.
BN	10935-SURREY	ND	1322.
BN	11134-CASSELTON	ND	1537.
BN	11132-FARGO	ND	1557.
BN	11131-MOORHEAD	MN	1560.
BN	9663-STAPLES	MN	1674.
BN	9671-SAUK RAPIDS	MN	1739.
BN	9826-COON CREEK	MN	1789.
BN	9798-NORTHTOWN	MN	1797.
BN	9830-ST PAUL	MN	1809.
BN	5736-LA CROSSE	WI	1930.
BN	4327-EAST DUBUQUE	IL	2041.
BN	4317-SAVANNA	IL	2081.
BN	4190-AURORA	IL	2172.
BN	4170-LA GRANGE	IL	2197.
IHB	4170-LA GRANGE	IL	2197.
IHB	4172-ARGO	IL	2201.
IHB	4163-BLUE ISLAND	IL	2213.
IHB	4228-BURNHAM / CALUME	IL	2221.
NS	4228-BURNHAM / CALUME	IL	2221.
NS	4076-HAMMOND	IN	2223.
NS	4064-HOBART	IN	2240.
NS	4020-ARGOS	IN	2303.
NS	3548-FORT WAYNE	IN	2362.
NS	3650-MUNCIE	IN	2426.
NS	3688-RICHMOND	IN	2471.
NS	3251-HAMILTON	OH	2525.
NS	3234-IVORYDALE	OH	2542.
NS	3228-CINCINNATI	OH	2549.
NS	6850-LEXINGTON	KY	2623.
NS	6979-DANVILLE	KY	2660.
NS	7260-HARRIMAN	TN	2822.
NS	15316-K-25	TN	2837.

ROUTE FROM: BN 14100-TACOMA, WA
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
BN	14100-TACOMA	WA	0.
BN	14180-VANCOUVER	WA	142.
BN	14179-PORTLAND	OR	150.
UP	14179-PORTLAND	OR	150.
UP	14197-OREGON TRUNK JCT	OR	245.
UP	14223-HINKLE	OR	337.
UP	14220-PENDLETON	OR	368.
UP	13412-NAMPA	ID	636.
UP	13370-POCATELLO	ID	878.
UP	13369-MC CAMMON	ID	901.
UP	13568-OGDEN	UT	1015.
UP	13595-SALT LAKE CITY	UT	1050.
UP	13630-LYNNDYL	UT	1162.
UP	14766-VALLEY	NV	1479.
USG	14766-VALLEY	NV	1479.
USG	16333-YUCCA MOUNTAIN	NV	1578.

Figure E1-19 Representative Truck Routes from Wilmington, NC to Department of Energy Management Sites

From: WILMINGTON, NC
To : SRP, SC

Routing through:

		WILMINGTON				NC
LOCAL		WILMINGTON	N	U117	LOCL	NC
U117		WILMINGTON	NW	U117	U421	NC
U421		WILMINGTON	W	U17	U421	NC
U17	U74	LELAND	SE	U17	U74	NC
U74	U76	CHADBOURN	NE	U74	U76	NC
U74		LUMBERTON	SW	I95	U74	NC
I95		FLORENCE	W	I20	I95	SC
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRP				SC

From: WILMINGTON, NC
To : ID NATL ENG LAB, ID

Routing through:

		WILMINGTON				NC
LOCAL		WILMINGTON	N	U117	LOCL	NC
U117		WILMINGTON	NW	U117	U421	NC
U421		WILMINGTON	W	U17	U421	NC
U17	U74	LELAND	SE	U17	U74	NC
U74	U76	CHADBOURN	NE	U74	U76	NC
U74		LUMBERTON	SW	I95	U74	NC
I95		FLORENCE	W	I20	I95	SC
I20		COLUMBIA	NW	I20	I26	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	OAK RIDGE	S	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24	I40	NASHVILLE	SE	I24	I40	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: WILMINGTON, NC
To : HANFORD, WA

Routing through:

		WILMINGTON				NC
LOCAL		WILMINGTON	N	U117	LOCL	NC
U117		WILMINGTON	NW	U117	U421	NC
U421		WILMINGTON	W	U17	U421	NC
U17	U74	LELAND	SE	U17	U74	NC
U74	U76	CHADBOURN	NE	U74	U76	NC
U74		LUMBERTON	SW	I95	U74	NC
I95		FLORENCE	W	I20	I95	SC
I20		COLUMBIA	NW	I20	I26	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	OAK RIDGE	S	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24	I40	NASHVILLE	SE	I24	I40	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		DENVER	NE	I270	I70	CO
I270		COMMERCE CITY	NW	I270	I76	CO
I76		COMMERCE CITY	W	I25	I76	CO
I25		CHEYENNE	SW	I25	I80	WY
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: WILMINGTON, NC
To : K-25, TN

Routing through:

		WILMINGTON				NC
LOCAL		WILMINGTON	N	U117	LOCL	NC
U117		WILMINGTON	NW	U117	U421	NC
U421		WILMINGTON	W	U17	U421	NC
U17	U74	LELAND	SE	U17	U74	NC
U74	U76	CHADBOURN	NE	U74	U76	NC
U74		LUMBERTON	SW	I95	U74	NC
I95		FLORENCE	W	I20	I95	SC
I20		COLUMBIA	NW	I20	I26	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	OAK RIDGE	S	I40	I75	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: WILMINGTON, NC
To : MERCURY, NV

Routing through:

		WILMINGTON				NC
LOCAL		WILMINGTON	N	U117	LOCL	NC
U117		WILMINGTON	NW	U117	U421	NC
U421		WILMINGTON	W	U17	U421	NC
U17	U74	LELAND	SE	U17	U74	NC
U74	U76	CHADBOURN	NE	U74	U76	NC
U74		LUMBERTON	SW	I95	U74	NC
I95		FLORENCE	W	I20	I95	SC
I20		COLUMBIA	NW	I20	I26	SC
I26		ASHEVILLE	SW	I26	I40	NC
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	OAK RIDGE	S	I40	I75	TN
I40		NASHVILLE	E	I24	I40	TN
I24	I40	NASHVILLE	SE	I24	I40	TN
I24	I65	INGLEWOOD	W	I24	I65	TN
I24		PULLEYS MILL	W	I24	I57	IL
I57		MT VERNON	SW	I57	I64	IL
I57	I64	MT VERNON	NW	I57	I64	IL
I64		WASHINGTON PK	SE	I255	I64	IL
I255		EDWARDSVILLE	SW	I255	I270	IL
I270		ST LOUIS	NW	I270	I70	MO
I70		KANSAS CITY	SE	I435	I70	MO
I435		KANSAS CITY	W	I435	I70	KS
I70 $	TKST$	TOPEKA	E	I470	I70	KS
I470$	TKST$	TOPEKA	S	I335	I470	KS
I470		TOPEKA	W	I470	I70	KS
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

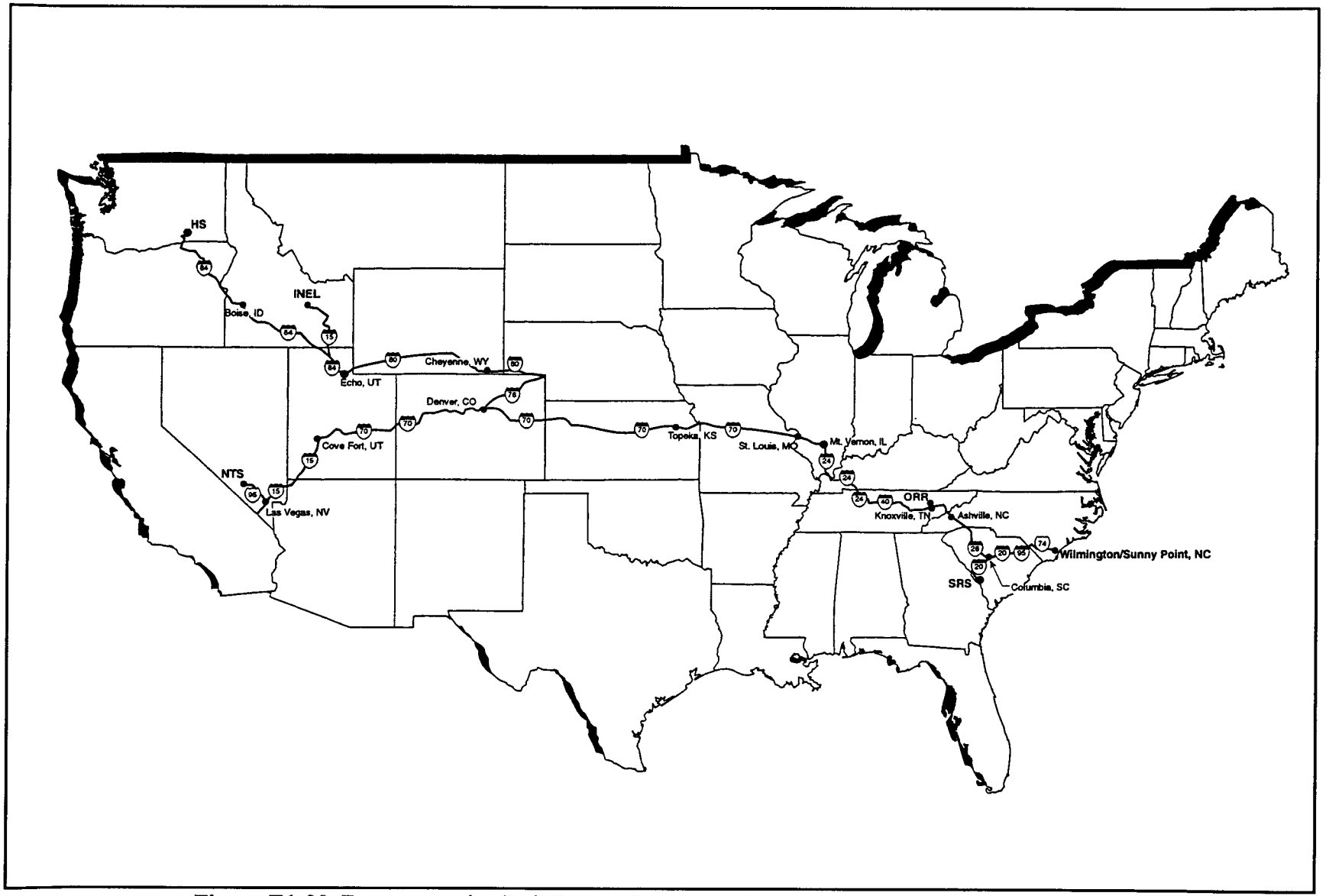

Figure E1-20 Representative Rail Routes from Wilmington, NC to Department of Energy Management Sites

ROUTE FROM: CSXT 7625-WILMINGTON, NC
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
CSXT	7625-WILMINGTON	NC	0.
CSXT	7620-PEMBROKE	NC	86.
CSXT	7671-DILLON	SC	106.
CSXT	7675-FLORENCE	SC	135.
CSXT	7690-CHARLESTON	SC	233.
CSXT	7739-FAIRFAX	SC	327.
CSXT	7732-ROBBINS	SC	356.
CSXT	7717-DUNBARTON / WELL	SC	365.
USG	7717-DUNBARTON / WELL	SC	365.
USG	15359-SRP	SC	373.

ROUTE FROM: CSXT 7625-WILMINGTON, NC
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
CSXT	7625-WILMINGTON	NC	0.
CSXT	7620-PEMBROKE	NC	86.
CSXT	7470-HAMLET	NC	117.
CSXT	7407-MONROE	NC	170.
CSXT	7834-CLINTON	SC	262.
CSXT	7838-GREENWOOD	SC	290.
CSXT	7956-ATHENS	GA	371.
CSXT	7914-ATLANTA	GA	462.
CSXT	7907-MARIETTA	GA	472.
CSXT	7889-CARTERSVILLE	GA	504.
CSXT	7888-DALTON	GA	555.
CSXT	7235-CHATTANOOGA	TN	593.
CSXT	7187-TULLAHOMA	TN	674.
CSXT	7202-NASHVILLE	TN	753.
CSXT	7201-MADISON	TN	763.
CSXT	7061-HOPKINSVILLE	KY	823.
CSXT	3839-HENDERSON	KY	910.
CSXT	3838-EVANSVILLE	IN	923.
CSXT	3812-VINCENNES	IN	973.
CSXT	4952-SALEM	IL	1052.
CSXT	10859-EAST ST LOUIS	IL	1117.
TRRA	10859-EAST ST LOUIS	IL	1117.
TRRA	10858-ST LOUIS	MO	1123.
UP	10858-ST LOUIS	MO	1123.
UP	10656-JEFFERSON CITY	MO	1245.
UP	10616-KANSAS CITY	MO	1421.
UP	10617-KANSAS CITY	KS	1424.
UP	11823-LAWRENCE	KS	1463.
UP	11697-TOPEKA	KS	1493.
UP	11696-MENOKEN	KS	1498.
UP	11681-MARYSVILLE	KS	1573.
UP	11405-HASTINGS	NE	1683.
UP	11410-GIBBON	NE	1709.
UP	11352-NORTH PLATTE	NE	1787.
UP	11358-O FALLONS	NE	1836.
UP	13703-JULESBURG	CO	1904.
UP	13465-CHEYENNE	WY	2050.
UP	13462-LARAMIE	WY	2102.
UP	13494-GRANGER	WY	2378.
UP	13369-MC CAMMON	ID	2570.
UP	13370-POCATELLO	ID	2593.
UP	13336-SCOVILLE	ID	2649.

ROUTE FROM: CSXT 7625-WILMINGTON, NC
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
CSXT	7625-WILMINGTON	NC	0.
CSXT	7620-PEMBROKE	NC	86.
CSXT	7470-HAMLET	NC	117.
CSXT	7407-MONROE	NC	170.
CSXT	7834-CLINTON	SC	262.
CSXT	7838-GREENWOOD	SC	290.
CSXT	7956-ATHENS	GA	371.
CSXT	7914-ATLANTA	GA	462.
CSXT	7907-MARIETTA	GA	472.
CSXT	7889-CARTERSVILLE	GA	504.
CSXT	7888-DALTON	GA	555.
CSXT	7235-CHATTANOOGA	TN	593.
CSXT	7187-TULLAHOMA	TN	674.
CSXT	7202-NASHVILLE	TN	753.
CSXT	7201-MADISON	TN	763.
CSXT	7061-HOPKINSVILLE	KY	823.
CSXT	3839-HENDERSON	KY	910.
CSXT	3838-EVANSVILLE	IN	923.
CSXT	3812-VINCENNES	IN	973.
CSXT	4952-SALEM	IL	1052.
CSXT	10859-EAST ST LOUIS	IL	1117.
TRRA	10859-EAST ST LOUIS	IL	1117.
TRRA	10858-ST LOUIS	MO	1123.
UP	10858-ST LOUIS	MO	1123.
UP	10656-JEFFERSON CITY	MO	1245.
UP	10616-KANSAS CITY	MO	1421.
UP	10617-KANSAS CITY	KS	1424.
UP	11823-LAWRENCE	KS	1463.
UP	11697-TOPEKA	KS	1493.
UP	11696-MENOKEN	KS	1498.
UP	11681-MARYSVILLE	KS	1573.
UP	11405-HASTINGS	NE	1683.
UP	11410-GIBBON	NE	1709.
UP	11352-NORTH PLATTE	NE	1787.
UP	11358-O FALLONS	NE	1836.
UP	13703-JULESBURG	CO	1904.
UP	13465-CHEYENNE	WY	2050.
UP	13462-LARAMIE	WY	2102.
UP	13494-GRANGER	WY	2378.
UP	13369-MC CAMMON	ID	2570.
UP	13370-POCATELLO	ID	2593.
UP	13412-NAMPA	ID	2835.
UP	14220-PENDLETON	OR	3103.
UP	14223-HINKLE	OR	3134.
UP	13894-WALLULA	WA	3163.
UP	13964-KENNEWICK	WA	3178.
UP	13941-RICHLAND	WA	3187.
USG	13941-RICHLAND	WA	3187.
USG	16212-HANFORD S 300	WA	3195.

ROUTE FROM: CSXT 7625-WILMINGTON, NC
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
CSXT	7625-WILMINGTON	NC	0.
CSXT	7620-PEMBROKE	NC	86.
CSXT	7470-HAMLET	NC	117.
CSXT	7472-WADESBORO	NC	142.
WSS	7472-WADESBORO	NC	142.
WSS	7462-LEXINGTON	NC	210.
NS	7462-LEXINGTON	NC	210.
NS	7478-SALISBURY	NC	227.
NS	7394-HICKORY	NC	284.
NS	7387-MARION	NC	326.
NS	7343-ASHEVILLE	NC	366.
NS	7318-MORRISTOWN	TN	446.
NS	7286-KNOXVILLE	TN	487.
NS	7288-DOSSETT	TN	512.
NS	15316-K-25	TN	533.

ROUTE FROM: CSXT 7625-WILMINGTON, NC
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
CSXT	7625-WILMINGTON	NC	0.
CSXT	7620-PEMBROKE	NC	86.
CSXT	7470-HAMLET	NC	117.
CSXT	7407-MONROE	NC	170.
CSXT	7834-CLINTON	SC	262.
CSXT	7838-GREENWOOD	SC	290.
CSXT	7956-ATHENS	GA	371.
CSXT	7914-ATLANTA	GA	462.
CSXT	7907-MARIETTA	GA	472.
CSXT	7889-CARTERSVILLE	GA	504.
CSXT	7888-DALTON	GA	555.
CSXT	7235-CHATTANOOGA	TN	593.
CSXT	7187-TULLAHOMA	TN	674.
CSXT	7202-NASHVILLE	TN	753.
CSXT	7201-MADISON	TN	763.
CSXT	7061-HOPKINSVILLE	KY	823.
CSXT	3839-HENDERSON	KY	910.
CSXT	3838-EVANSVILLE	IN	923.
CSXT	3812-VINCENNES	IN	973.
CSXT	4952-SALEM	IL	1052.
CSXT	10859-EAST ST LOUIS	IL	1117.
TRRA	10859-EAST ST LOUIS	IL	1117.
TRRA	10858-ST LOUIS	MO	1123.
UP	10858-ST LOUIS	MO	1123.
UP	10656-JEFFERSON CITY	MO	1245.
UP	10616-KANSAS CITY	MO	1421.
UP	10617-KANSAS CITY	KS	1424.
UP	11823-LAWRENCE	KS	1463.
UP	11697-TOPEKA	KS	1493.
UP	11696-MENOKEN	KS	1498.
UP	11681-MARYSVILLE	KS	1573.
UP	11405-HASTINGS	NE	1683.
UP	11410-GIBBON	NE	1709.
UP	11352-NORTH PLATTE	NE	1787.
UP	11358-O FALLONS	NE	1836.
UP	13703-JULESBURG	CO	1904.
UP	13465-CHEYENNE	WY	2050.
UP	13462-LARAMIE	WY	2102.
UP	13494-GRANGER	WY	2378.
UP	13568-OGDEN	UT	2517.
UP	13595-SALT LAKE CITY	UT	2552.
UP	13630-LYNNDYL	UT	2664.
UP	14766-VALLEY	NV	2981.
USG	14766-VALLEY	NV	2981.
USG	16333-YUCCA MOUNTAIN	NV	3080.

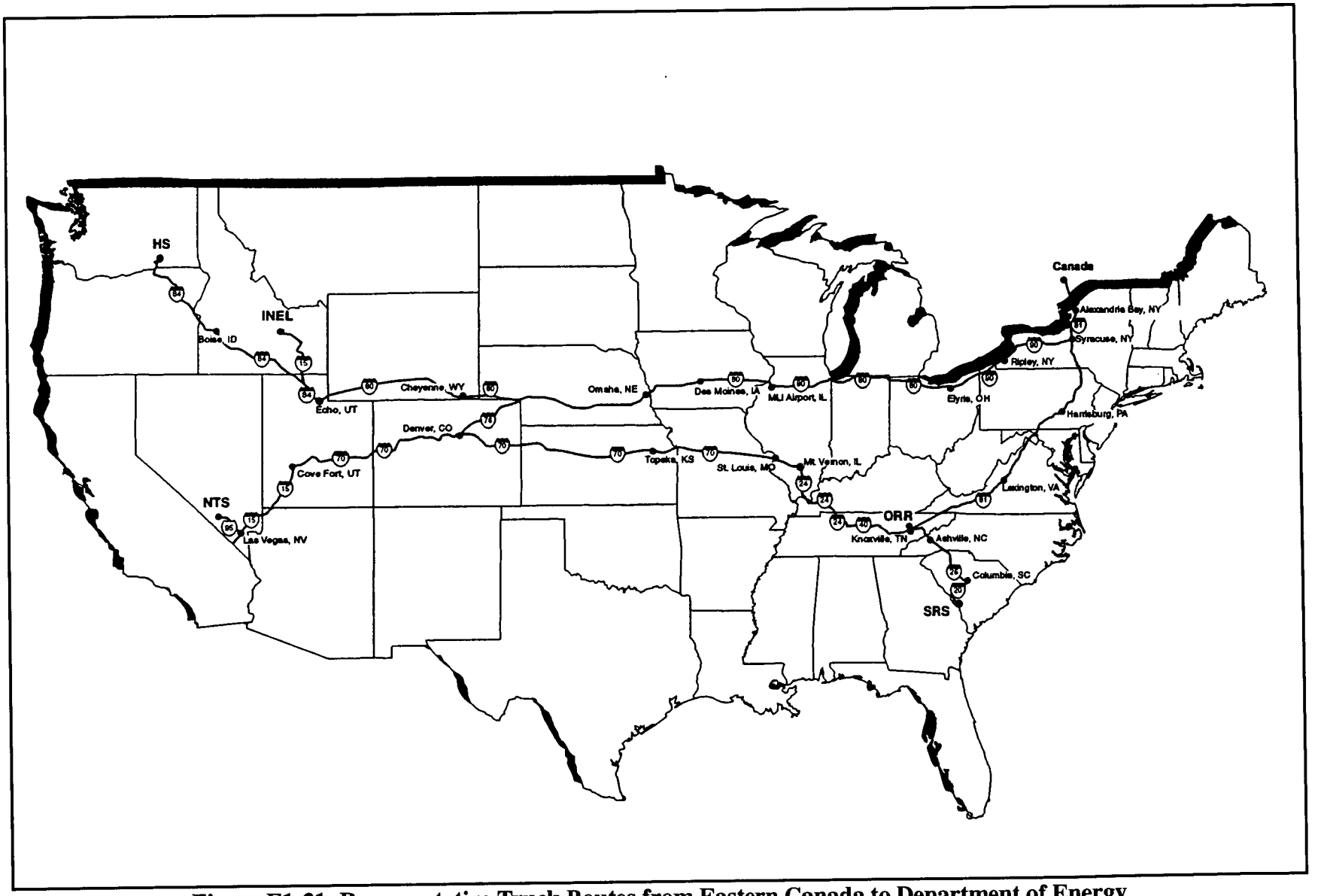

Figure E1-21 Representative Truck Routes from Eastern Canada to Department of Energy Management Sites

From: ALEXANDRIA BAY SW I81 S12, NY
To : SRP, SC

Routing through:

		ALEXANDRIA BAY	SW	I81	S12	NY
I81		CICERO	S	I481	I81	NY
I481		SYRACUSE	S	I481	I81	NY
I81		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I81		FT CHISWELL	E	I77	I81	VA
I77		COLUMBIA	NE	I20	I77	SC
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRP				SC

From: ALEXANDRIA BAY SW I81 S12, NY
To : ID NATL ENG LAB, ID

Routing through:

		ALEXANDRIA BAY	SW	I81	S12	NY
I81		SYRACUSE	N	I81	I90	NY
I90 $	TNYT$	BUFFALO	NE	I290	I90	NY
I90	TNYT	LACKAWANNA	E	I90	X55	NY
I90 $	TNYT$	RIPLEY	W	I90	X61	NY
I90		WILLOUGHBY HLS	W	I271	I90	OH
I271		BEDFORD	NE	I271	I480	OH
I480		N RIDGEVILLE	S	I80	X9A	OH
I80 $		ELYRIA	NW	I80	I90	OH
I80 $	I90 $	PORTAGE	W	I80	I90	IN
I80	I94	LANSING	W	I294	I80	IL
I294$	I80 $	HOMEWOOD	NW	I294	I80	IL
I80		GREEN ROCK	SE	I74	I80	IL
I280	I74	MLI AIRPORT		I280	I74	IL
I280		DAVENPORT	NW	I280	I80	IA
I80		DES MOINES	N	I235	I35	IA
I35	I80	DES MOINES	W	I235	I35	IA
I80		MINDEN	NW	I680	I80	IA
I680		LOVELAND	SW	I29	I680	IA
I29	I680	CRESCENT	W	I29	I680	IA
I680		OMAHA	SW	I680	I80	NE
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: ALEXANDRIA BAY SW I81 S12, NY
To : HANFORD, WA

Routing through:

		ALEXANDRIA BAY	SW	I81	S12	NY
I81		SYRACUSE	N	I81	I90	NY
I90 $	TNYT$	BUFFALO	NE	I290	I90	NY
I90	TNYT	LACKAWANNA	E	I90	X55	NY
I90 $	TNYT$	RIPLEY	W	I90	X61	NY
I90		WILLOUGHBY HLS	W	I271	I90	OH
I271		BEDFORD	NE	I271	I480	OH
I480		N RIDGEVILLE	S	I80	X9A	OH
I80 $		ELYRIA	NW	I80	I90	OH
I80 $	I90 $	PORTAGE	W	I80	I90	IN
I80	I94	LANSING	W	I294	I80	IL
I294$	I80 $	HOMEWOOD	NW	I294	I80	IL
I80		GREEN ROCK	SE	I74	I80	IL
I280	I74	MLI AIRPORT		I280	I74	IL
I280		DAVENPORT	NW	I280	I80	IA
I80		DES MOINES	N	I235	I35	IA
I35	I80	DES MOINES	W	I235	I35	IA
I80		MINDEN	NW	I680	I80	IA
I680		LOVELAND	SW	I29	I680	IA
I29	I680	CRESCENT	W	I29	I680	IA
I680		OMAHA	SW	I680	I80	NE
I80		ECHO		I80	I84	UT
I84		OGDEN	S	I15	I84	UT
I15	I84	TREMONTON	W	I15	I84	UT
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: ALEXANDRIA BAY SW I81 S12, NY
To : K-25, TN

Routing through:

		ALEXANDRIA BAY	SW	I81	S12	NY
I81		CICERO	S	I481	I81	NY
I481		SYRACUSE	S	I481	I81	NY
I81		STAUNTON	SE	I64	I81	VA
I64	I81	LEXINGTON	E	I64	I81	VA
I81		FT CHISWELL	E	I77	I81	VA
I77	I81	WYTHEVILLE	E	I77	I81	VA
I81		DANDRIDGE	NE	I40	I81	TN
I40		KNOXVILLE	NE	I40	I640	TN
I640		KNOXVILLE	NW	I640	I75	TN
I640	I75	KNOXVILLE	W	I40	I640	TN
I40	I75	OAK RIDGE	S	I40	I75	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: ALEXANDRIA BAY SW I81 S12, NY
To : YUCCA MOUNTAIN, NV

Routing through:

		ALEXANDRIA BAY	SW	I81	S12	NY
I81		SYRACUSE	N	I81	I90	NY
I90 $	TNYT$	BUFFALO	NE	I290	I90	NY
I90	TNYT	LACKAWANNA	E	I90	X55	NY
I90 $	TNYT$	RIPLEY	W	I90	X61	NY
I90		WILLOUGHBY HLS	W	I271	I90	OH
I271		BEDFORD	NE	I271	I480	OH
I480		N RIDGEVILLE	S	I80	X9A	OH
I80 $		ELYRIA	NW	I80	I90	OH
I80 $	I90 $	PORTAGE	W	I80	I90	IN
I80	I94	LANSING	W	I294	I80	IL
I294$	I80 $	HOMEWOOD	NW	I294	I80	IL
I80		GREEN ROCK	SE	I74	I80	IL
I280	I74	MLI AIRPORT		I280	I74	IL
I280		DAVENPORT	NW	I280	I80	IA
I80		DES MOINES	N	I235	I35	IA
I35	I80	DES MOINES	W	I235	I35	IA
I80		MINDEN	NW	I680	I80	IA
I680		LOVELAND	SW	I29	I680	IA
I29	I680	CRESCENT	W	I29	I680	IA
I680		OMAHA	SW	I680	I80	NE
I80		BIG SPRINGS	SW	I76	I80	NE
I76		COMMERCE CITY	W	I25	I76	CO
I25		DENVER	N	I25	I70	CO
I70		COVE FORT	W	I15	I70	UT
I15		LAS VEGAS				NV
U95		AMARGOSA VALLY		U95	S373	NV
LOCAL		YUCCA MOUNTAIN				NV

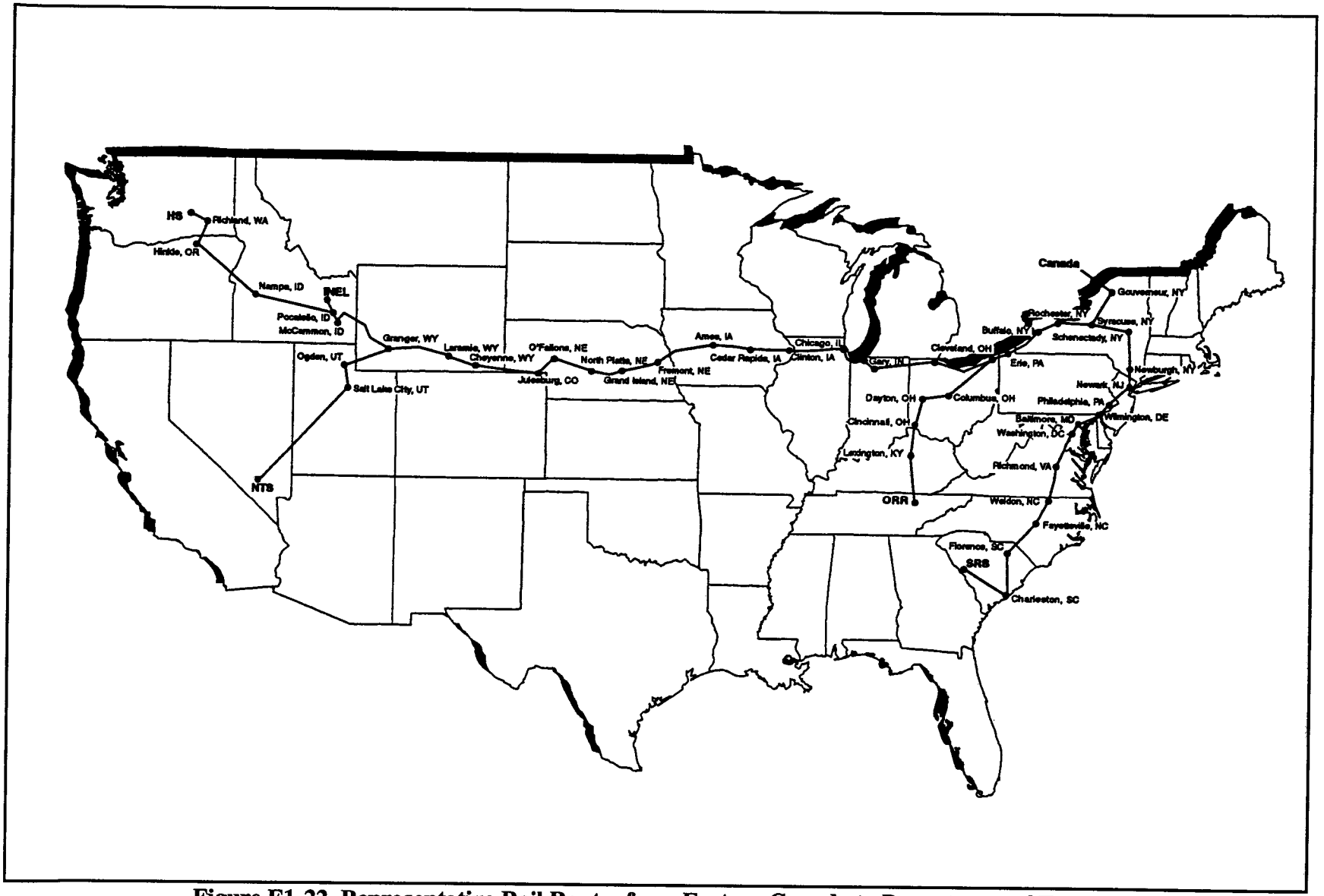

Figure E1-22 Representative Rail Routes from Eastern Canada to Department of Energy Management Sites

ROUTE FROM: CR 738-GOUVERNEUR, NY
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
CR	738-GOUVERNEUR	NY	0.
CR	777-SYRACUSE	NY	100.
CR	755-ROME	NY	145.
CR	756-UTICA	NY	159.
CR	706-SCHENECTADY	NY	237.
CR	700-SELKIRK	NY	259.
CR	1094-NEWBURGH	NY	334.
CR	1215-JERSEY CITY	NJ	400.
CR	1183-NEWARK	NJ	405.
CR	1230-ALDENE	NJ	411.
CR	1311-BOUND BROOK	NJ	430.
CR	1447-PHILADELPHIA	PA	492.
CR	2456-WILMINGTON	DE	529.
CR	2516-BALTIMORE	MD	593.
CR	2596-WASHINGTON	DC	627.
CR	2595-ALEXANDRIA	VA	637.
CSXT	2595-ALEXANDRIA	VA	637.
CSXT	6082-RICHMOND	VA	752.
CSXT	6087-COLONIAL HEIGHTS	VA	774.
CSXT	6064-PETERSBURG	VA	779.
CSXT	7563-WELDON	NC	839.
CSXT	7565-ROCKY MOUNT	NC	876.
CSXT	7566-WILSON	NC	890.
CSXT	7606-FAYETTEVILLE	NC	964.
CSXT	7620-PEMBROKE	NC	993.
CSXT	7671-DILLON	SC	1013.
CSXT	7675-FLORENCE	SC	1042.
CSXT	7690-CHARLESTON	SC	1140.
CSXT	7739-FAIRFAX	SC	1234.
CSXT	7732-ROBBINS	SC	1263.
CSXT	7717-DUNBARTON / WELLS	SC	1272.
USG	7717-DUNBARTON / WELLS	SC	1272.
USG	15359-SRP	SC	1280.

ROUTE FROM: CR 738-GOUVERNEUR, NY
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
CR	738-GOUVERNEUR	NY	0.
CR	777-SYRACUSE	NY	100.
CR	780-SOLVAY	NY	103.
CR	817-ROCHESTER	NY	179.
CR	880-BUFFALO	NY	241.
CR	968-ERIE	PA	333.
CR	2649-ASHTABULA	OH	372.
CR	2728-CLEVELAND	OH	429.
CR	2633-ELYRIA	OH	456.
CR	3442-TOLEDO	OH	535.
CR	3526-GOSHEN	IN	657.
CR	3525-ELKHART	IN	667.
CR	4022-SOUTH BEND	IN	682.
CR	4067-PORTER	IN	727.
CR	4070-GARY	IN	742.
CR	4073-CLARKE	IN	746.
CR	4074-INDIANA HARBOR	IN	749.
CR	4232-SOUTH CHICAGO	IL	757.
CR	4217-CHICAGO	IL	770.
CNW	4217-CHICAGO	IL	770.
CNW	4234-PROVISO	IL	784.
CNW	4311-DE KALB	IL	826.
CNW	4324-NELSON	IL	871.
CNW	10304-CLINTON	IA	903.
CNW	10289-CEDAR RAPIDS	IA	984.
CNW	10265-MARSHALLTOWN	IA	1051.
CNW	10246-NEVADA	IA	1078.
CNW	10271-AMES	IA	1089.
CNW	10176-MISSOURI VALLEY	IA	1222.
CNW	10198-CALIFORNIA JCT	IA	1228.
CNW	11340-FREMONT	NE	1256.
UP	11340-FREMONT	NE	1256.
UP	11406-GRAND ISLAND	NE	1365.
UP	11410-GIBBON	NE	1391.
UP	11352-NORTH PLATTE	NE	1469.
UP	11358-O FALLONS	NE	1518.
UP	13703-JULESBURG	CO	1586.
UP	13465-CHEYENNE	WY	1732.
UP	13462-LARAMIE	WY	1784.
UP	13494-GRANGER	WY	2060.
UP	13369-MC CAMMON	ID	2252.
UP	13370-POCATELLO	ID	2275.
UP	13336-SCOVILLE	ID	2331.

ROUTE FROM: CR 738-GOUVERNEUR, NY
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
CR	738-GOUVERNEUR	NY	0.
CR	777-SYRACUSE	NY	100.
CR	780-SOLVAY	NY	103.
CR	817-ROCHESTER	NY	179.
CR	880-BUFFALO	NY	241.
CR	968-ERIE	PA	333.
CR	2649-ASHTABULA	OH	372.
CR	2728-CLEVELAND	OH	429.
CR	2633-ELYRIA	OH	456.
CR	3442-TOLEDO	OH	535.
CR	3526-GOSHEN	IN	657.
CR	3525-ELKHART	IN	667.
CR	4022-SOUTH BEND	IN	682.
CR	4067-PORTER	IN	727.
CR	4070-GARY	IN	742.
CR	4073-CLARKE	IN	746.
CR	4074-INDIANA HARBOR	IN	749.
CR	4232-SOUTH CHICAGO	IL	757.
CR	4217-CHICAGO	IL	770.
CNW	4217-CHICAGO	IL	770.
CNW	4234-PROVISO	IL	784.
CNW	4311-DE KALB	IL	826.
CNW	4324-NELSON	IL	871.
CNW	10304-CLINTON	IA	903.
CNW	10289-CEDAR RAPIDS	IA	984.
CNW	10265-MARSHALLTOWN	IA	1051.
CNW	10246-NEVADA	IA	1078.
CNW	10271-AMES	IA	1089.
CNW	10176-MISSOURI VALLEY	IA	1222.
CNW	10198-CALIFORNIA JCT	IA	1228.
CNW	11340-FREMONT	NE	1256.
UP	11340-FREMONT	NE	1256.
UP	11406-GRAND ISLAND	NE	1365.
UP	11410-GIBBON	NE	1391.
UP	11352-NORTH PLATTE	NE	1469.
UP	11358-O FALLONS	NE	1518.
UP	13703-JULESBURG	CO	1586.
UP	13465-CHEYENNE	WY	1732.
UP	13462-LARAMIE	WY	1784.
UP	13494-GRANGER	WY	2060.
UP	13369-MC CAMMON	ID	2252.
UP	13370-POCATELLO	ID	2275.
UP	13412-NAMPA	ID	2517.
UP	14220-PENDLETON	OR	2786.
UP	14223-HINKLE	OR	2817.
UP	13894-WALLULA	WA	2846.
UP	13964-KENNEWICK	WA	2861.
UP	13941-RICHLAND	WA	2870.
USG	13941-RICHLAND	WA	2870.
USG	16212-HANFORD S 300	WA	2877.

ROUTE FROM: CR 738-GOUVERNEUR, NY
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
CR	738-GOUVERNEUR	NY	0.
CR	777-SYRACUSE	NY	100.
CR	780-SOLVAY	NY	103.
CR	817-ROCHESTER	NY	179.
CR	880-BUFFALO	NY	241.
CR	968-ERIE	PA	333.
CR	2649-ASHTABULA	OH	372.
CR	2728-CLEVELAND	OH	429.
CR	2629-WELLINGTON	OH	466.
CR	3399-CRESTLINE	OH	504.
CR	3094-COLUMBUS (4TH ST	OH	566.
CR	3095-COLUMBUS (BROAD	OH	567.
CR	14993-COLUMBUS (BUCKEYE	OH	569.
CR	3300-SPRINGFIELD	OH	611.
CR	3282-DAYTON	OH	632.
CR	3250-MIDDLETOWN	OH	652.
CR	3234-IVORYDALE	OH	677.
CR	3228-CINCINNATI	OH	684.
NS	3228-CINCINNATI	OH	684.
NS	6850-LEXINGTON	KY	758.
NS	6979-DANVILLE	KY	795.
NS	7260-HARRIMAN	TN	957.
NS	15316-K-25	TN	972.

ROUTE FROM: CR 738-GOUVERNEUR, NY
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
CR	738-GOUVERNEUR	NY	0.
CR	777-SYRACUSE	NY	100.
CR	780-SOLVAY	NY	103.
CR	817-ROCHESTER	NY	179.
CR	880-BUFFALO	NY	241.
CR	968-ERIE	PA	333.
CR	2649-ASHTABULA	OH	372.
CR	2728-CLEVELAND	OH	429.
CR	2633-ELYRIA	OH	456.
CR	3442-TOLEDO	OH	535.
CR	3526-GOSHEN	IN	657.
CR	3525-ELKHART	IN	667.
CR	4022-SOUTH BEND	IN	682.
CR	4067-PORTER	IN	727.
CR	4070-GARY	IN	742.
CR	4073-CLARKE	IN	746.
CR	4074-INDIANA HARBOR	IN	749.
CR	4232-SOUTH CHICAGO	IL	757.
CR	4217-CHICAGO	IL	770.
CNW	4217-CHICAGO	IL	770.
CNW	4234-PROVISO	IL	784.
CNW	4311-DE KALB	IL	826.
CNW	4324-NELSON	IL	871.
CNW	10304-CLINTON	IA	903.
CNW	10289-CEDAR RAPIDS	IA	984.
CNW	10265-MARSHALLTOWN	IA	1051.
CNW	10246-NEVADA	IA	1078.
CNW	10271-AMES	IA	1089.
CNW	10176-MISSOURI VALLEY	IA	1222.
CNW	10198-CALIFORNIA JCT	IA	1228.
CNW	11340-FREMONT	NE	1256.
UP	11340-FREMONT	NE	1256.
UP	11406-GRAND ISLAND	NE	1365.
UP	11410-GIBBON	NE	1391.
UP	11352-NORTH PLATTE	NE	1469.
UP	11358-O FALLONS	NE	1518.
UP	13703-JULESBURG	CO	1586.
UP	13465-CHEYENNE	WY	1732.
UP	13462-LARAMIE	WY	1784.
UP	13494-GRANGER	WY	2060.
UP	13568-OGDEN	UT	2199.
UP	13595-SALT LAKE CITY	UT	2235.
UP	13630-LYNNDYL	UT	2347.
UP	14766-VALLEY	NV	2664.
USG	14766-VALLEY	NV	2664.
USG	16333-YUCCA MOUNTAIN	NV	2763.

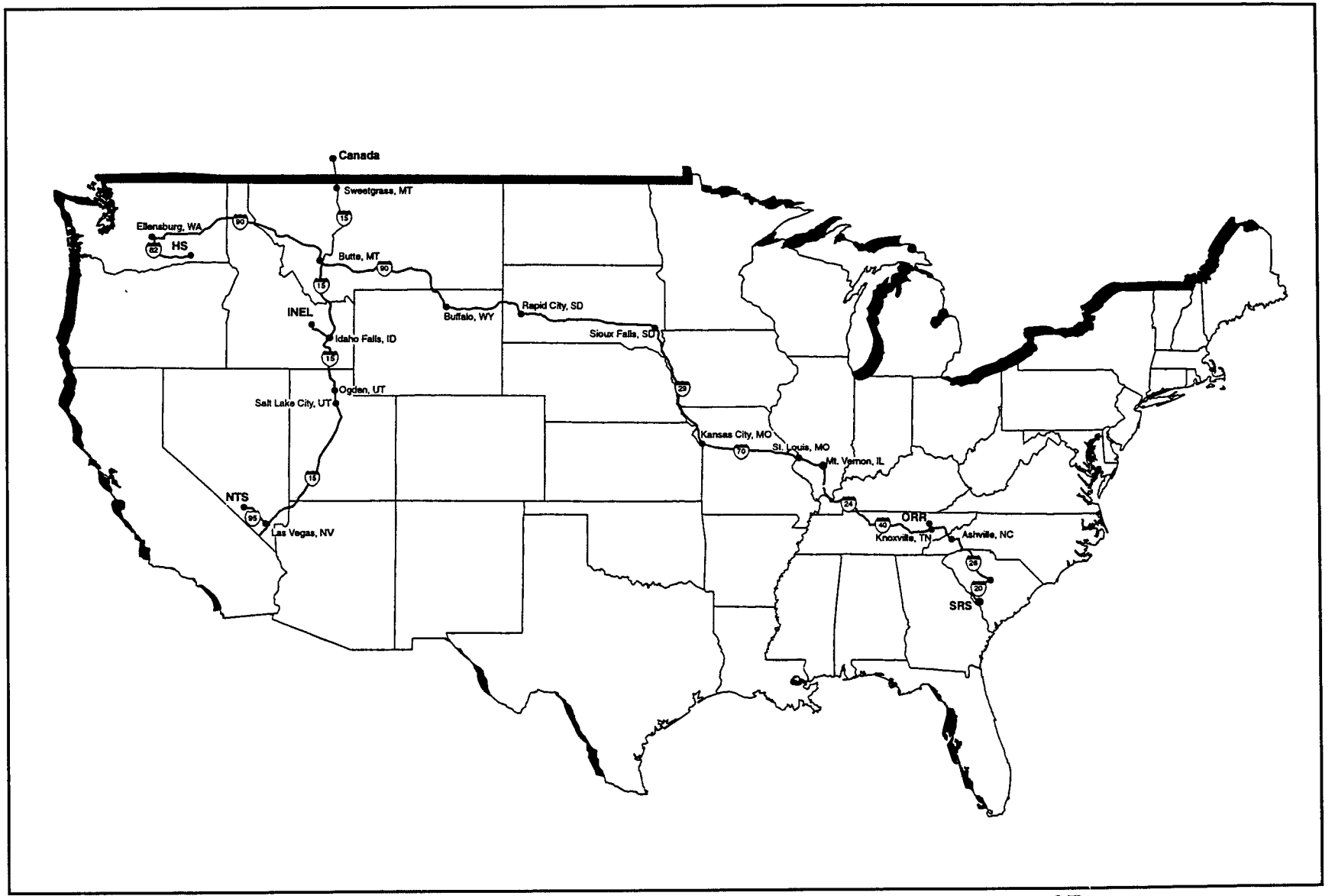

Figure E1-23 Representative Truck Routes from Western Canada to Department of Energy Management Sites

From: SWEETGRASS I15 X394 MT
To : SRL, SC

Routing through:

		SWEETGRASS		I15	X394	MT
I15		BUTTE	E	I15	I90	MT
I90		SIOUX FALLS	NW	I29	I90	SD
I29		LOVELAND	SW	I29	I680	IA
I680		MINDEN	NW	I680	I80	IA
I80		COUNCIL BLUFFS	SE	I29	I80	IA
I29		KANSAS CITY	NW	I29	I435	MO
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	N	I24	I265	TN
I265		NASHVILLE	W	I265	I40	TN
I40		NASHVILLE	W	I40	I440	TN
I440		NASHVILLE	SE	I24	I440	TN
I24		EAST RIDGE	NE	I24	I75	TN
I75		ATLANTA	NW	I285	I75	GA
I285		ATLANTA	E	I20	I285	GA
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRL				SC

From: SWEETGRASS I15 X394 MT
To : ID NATL ENG LAB, ID

Routing through:

		SWEETGRASS		I15	X394	MT
I15		BUTTE	E	I15	I90	MT
I15	I90	BUTTE	W	I15	I90	MT
I15		BLACKFOOT	NW	I15	X92	ID
U26		ATOMIC CITY	NW	U20	U26	ID
U20	U26	ID NATL ENG LAB				ID

From: SWEETGRASS I15 X394 MT
To : HANFORD, WA

Routing through:

		SWEETGRASS		I15	X394	MT
I15		BUTTE	E	I15	I90	MT
I15	I90	BUTTE	W	I15	I90	MT
I90		ELLENSBURG	SE	I82	I90	WA
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: SWEETGRASS I15 X394 MT
To : K-25, TN

Routing through:

		SWEETGRASS		I15	X394	MT
I15		BUTTE	E	I15	I90	MT
I90		SIOUX FALLS	NW	I29	I90	SD
I29		LOVELAND	SW	I29	I680	IA
I680		MINDEN	NW	I680	I80	IA
I80		COUNCIL BLUFFS	SE	I29	I80	IA
I29		KANSAS CITY	NW	I29	I435	MO
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	N	I24	I265	TN
I265		NASHVILLE	W	I265	I40	TN
I40		NASHVILLE	W	I40	I440	TN
I440		NASHVILLE	SE	I24	I440	TN
I24		NASHVILLE	E	I24	I40	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: SWEETGRASS I15 X394 MT
To : MERCURY, NV

Routing through:

		SWEETGRASS		I15	X394	MT
I15		BUTTE	E	I15	I90	MT
I15	I90	BUTTE	W	I15	I90	MT
I15		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I15		N SALT LAKE		I15	I215	UT
I215		MIDVALE		I15	I215	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

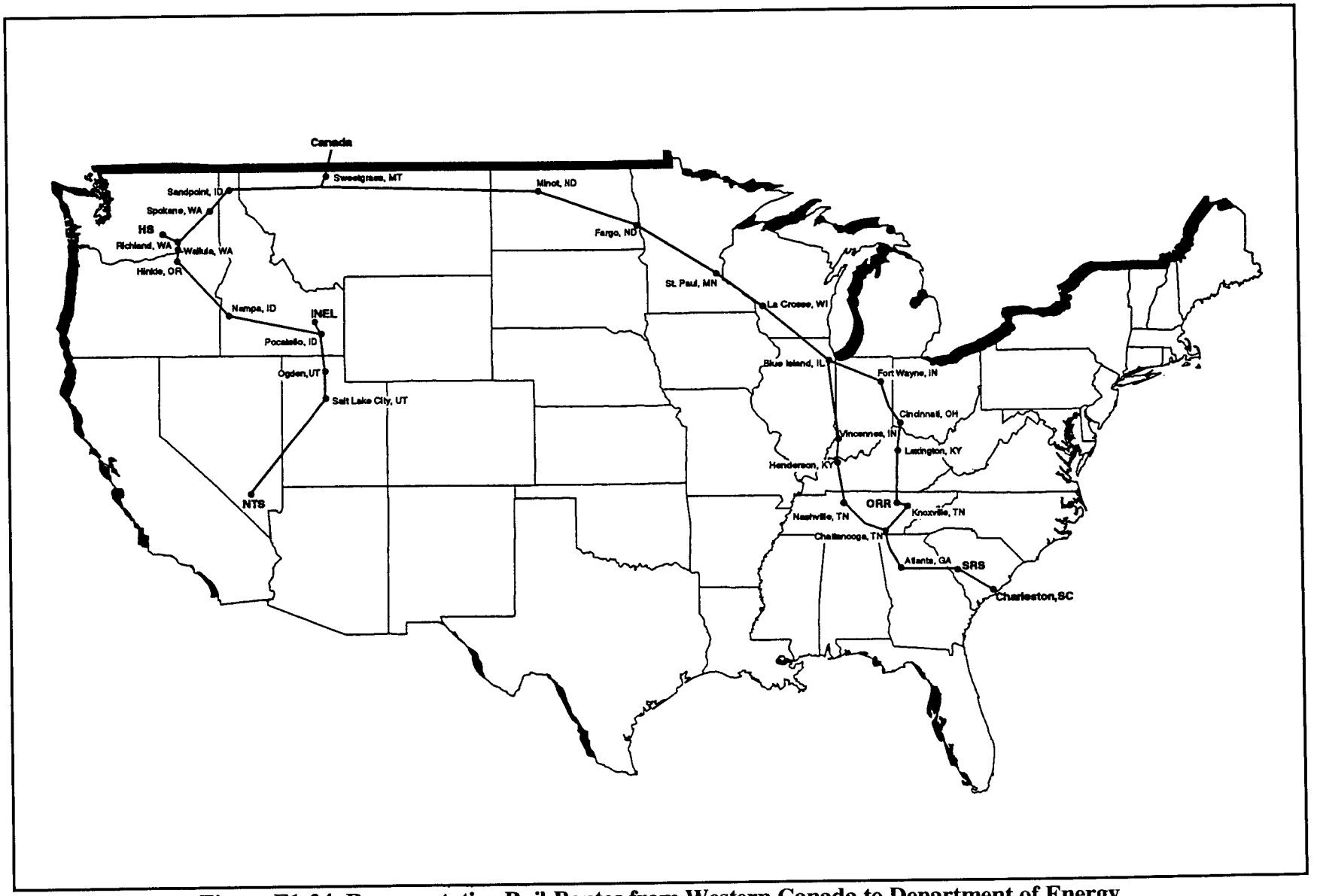

Figure E1-24 Representative Rail Routes from Western Canada to Department of Energy Management Sites

ROUTE FROM: BN 13066-SWEET GRASS, MT
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
BN	13066-SWEET GRASS	MT	0.
BN	13089-SHELBY	MT	43.
BN	13168-HAVRE	MT	144.
BN	15740-WILLISTON	ND	463.
BN	10936-MINOT	ND	575.
BN	10935-SURREY	ND	581.
BN	11134-CASSELTON	ND	796.
BN	11132-FARGO	ND	816.
BN	11131-MOORHEAD	MN	819.
BN	9663-STAPLES	MN	933.
BN	9671-SAUK RAPIDS	MN	998.
BN	9826-COON CREEK	MN	1048.
BN	9798-NORTHTOWN	MN	1056.
BN	9830-ST PAUL	MN	1069.
BN	5736-LA CROSSE	WI	1190.
BN	4327-EAST DUBUQUE	IL	1301.
BN	4317-SAVANNA	IL	1341.
BN	4190-AURORA	IL	1432.
BN	4170-LA GRANGE	IL	1457.
IHB	4170-LA GRANGE	IL	1457.
IHB	4172-ARGO	IL	1461.
IHB	4163-BLUE ISLAND	IL	1473.
IHB	4223-DOLTON / RIVERDAIL		1477.
CSXT	4223-DOLTON / RIVERDAIL		1477.
CSXT	4206-CHICAGO HEIGHTS	IL	1487.
CSXT	4636-WATSEKA	IL	1538.
CSXT	4642-DANVILLE	IL	1583.
CSXT	3863-TERRE HAUTE	IN	1640.
CSXT	3812-VINCENNES	IN	1693.
CSXT	3838-EVANSVILLE	IN	1743.
CSXT	3839-HENDERSON	KY	1756.
CSXT	7061-HOPKINSVILLE	KY	1843.
CSXT	7201-MADISON	TN	1903.
CSXT	7202-NASHVILLE	TN	1913.
CSXT	7187-TULLAHOMA	TN	1992.
CSXT	7235-CHATTANOOGA	TN	2073.
CSXT	7888-DALTON	GA	2111.
CSXT	7889-CARTERSVILLE	GA	2162.
CSXT	7907-MARIETTA	GA	2194.
CSXT	7914-ATLANTA	GA	2204.
CSXT	7961-AUGUSTA	GA	2379.
CSXT	7732-ROBBINS	SC	2408.
CSXT	7717-DUNBARTON / WELL	SC	2417.
USG	7717-DUNBARTON / WELL	SC	2417.
USG	15359-SRP	SC	2425.

ROUTE FROM: BN 13066-SWEET GRASS, MT
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
BN	13066-SWEET GRASS	MT	0.
BN	13300-SANDPOINT	ID	374.
BN	13828-SPOKANE	WA	437.
BN	13890-PASCO	WA	589.
BN	13894-WALLULA	WA	605.
UP	13894-WALLULA	WA	605.
UP	14223-HINKLE	OR	634.
UP	14220-PENDLETON	OR	665.
UP	13412-NAMPA	ID	933.
UP	13370-POCATELLO	ID	1175.
UP	13336-SCOVILLE	ID	1231.

ROUTE FROM: BN 13066-SWEET GRASS, MT
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
BN	13066-SWEET GRASS	MT	0.
BN	13300-SANDPOINT	ID	374.
BN	13828-SPOKANE	WA	437.
BN	13890-PASCO	WA	589.
WCRC	13890-PASCO	WA	589.
WCRC	13964-KENNEWICK	WA	590.
WCRC	13941-RICHLAND	WA	598.
USG	13941-RICHLAND	WA	598.
USG	16212-HANFORD S 300	WA	606.

ROUTE FROM: BN 13066-SWEET GRASS, MT
TO: NS 15316-K-25, TN

RR	NODE	STATE	DIST
BN	13066-SWEET GRASS	MT	0.
BN	13089-SHELBY	MT	43.
BN	13168-HAVRE	MT	144.
BN	15740-WILLISTON	ND	463.
BN	10936-MINOT	ND	575.
BN	10935-SURREY	ND	581.
BN	11134-CASSELTON	ND	796.
BN	11132-FARGO	ND	816.
BN	11131-MOORHEAD	MN	819.
BN	9663-STAPLES	MN	933.
BN	9671-SAUK RAPIDS	MN	998.
BN	9826-COON CREEK	MN	1048.
BN	9798-NORTHTOWN	MN	1056.
BN	9830-ST PAUL	MN	1069.
BN	5736-LA CROSSE	WI	1190.
BN	4327-EAST DUBUQUE	IL	1301.
BN	4317-SAVANNA	IL	1341.
BN	4190-AURORA	IL	1432.
BN	4170-LA GRANGE	IL	1457.
IHB	4170-LA GRANGE	IL	1457.
IHB	4172-ARGO	IL	1461.
IHB	4163-BLUE ISLAND	IL	1473.
IHB	4228-BURNHAM / CALUME	IL	1481.
NS	4228-BURNHAM / CALUME	IL	1481.
NS	4076-HAMMOND	IN	1483.
NS	4064-HOBART	IN	1499.
NS	4020-ARGOS	IN	1562.
NS	3548-FORT WAYNE	IN	1621.
NS	3650-MUNCIE	IN	1685.
NS	3688-RICHMOND	IN	1730.
NS	3251-HAMILTON	OH	1785.
NS	3234-IVORYDALE	OH	1802.
NS	3228-CINCINNATI	OH	1809.
NS	6850-LEXINGTON	KY	1883.
NS	6979-DANVILLE	KY	1920.
NS	7260-HARRIMAN	TN	2082.
NS	15316-K-25	TN	2097.

ROUTE FROM: BN 13066-SWEET GRASS, MT
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
BN	13066-SWEET GRASS	MT	0.
BN	13300-SANDPOINT	ID	374.
BN	13828-SPOKANE	WA	437.
BN	13890-PASCO	WA	589.
BN	13894-WALLULA	WA	605.
UP	13894-WALLULA	WA	605.
UP	14223-HINKLE	OR	634.
UP	14220-PENDLETON	OR	665.
UP	13412-NAMPA	ID	933.
UP	13370-POCATELLO	ID	1175.
UP	13369-MC CAMMON	ID	1198.
UP	13568-OGDEN	UT	1312.
UP	13595-SALT LAKE CITY	UT	1347.
UP	13630-LYNNDYL	UT	1459.
UP	14766-VALLEY	NV	1776.
USG	14766-VALLEY	NV	1776.
USG	16333-YUCCA MOUNTAIN	NV	1875.

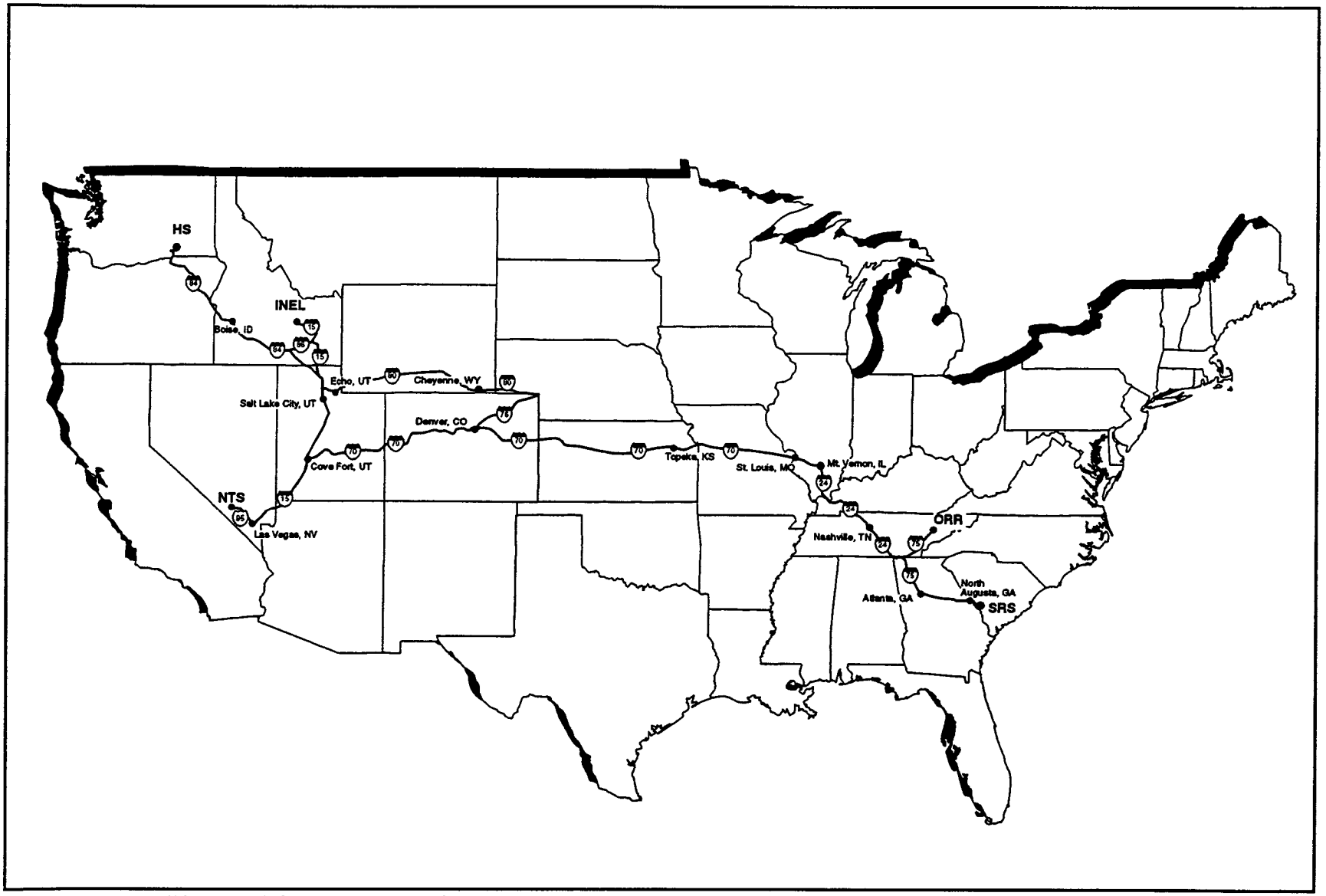

Figure E1-25 Representative Truck Routes Between Department of Energy Management Sites

From: ID NATL ENG LAB, ID
To : HANFORD, WA

Routing through:

		ID NATL ENG LAB				ID
U20	U26	ATOMIC CITY	NW	U20	U26	ID
U26		BLACKFOOT	NW	I15	X92	ID
I15		CHUBBUCK	E	I15	I86	ID
I86		RAFT RIVER	W	I84	I86	ID
I84		HERMISTON	SW	I82	I84	OR
I82		WEST RICHLAND	S	I182	I82	WA
I182		RICHLAND	SE	I182	S240	WA
S240		RICHLAND	N	S240	LR4S	WA
LR4S		HANFORD				WA

From: ID NATL ENG LAB, ID
To : MERCURY, NV

Routing through:

		ID NATL ENG LAB				ID
U20	U26	ATOMIC CITY	NW	U20	U26	ID
U26		BLACKFOOT	NW	I15	X92	ID
I15		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I15		SALT LAKE CITY	W	I15	I80	UT
I15	I80	SALT LAKE CITY	S	I15	I80	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

From: ID NATL ENG LAB, ID
To : SRL, SC

Routing through:

		ID NATL ENG LAB				ID
U20	U26	ATOMIC CITY	NW	U20	U26	ID
U26		BLACKFOOT	NW	I15	X92	ID
I15		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I84		ECHO		I80	I84	UT
I80		CHEYENNE	SW	I25	I80	WY
I25		COMMERCE CITY	W	I25	I76	CO
I76		COMMERCE CITY	NW	I270	I76	CO
I270		DENVER	NE	I270	I70	CO
I70		TOPEKA	W	I470	I70	KS
I470		TOPEKA	S	I335	I470	KS
I470$	TKST$	TOPEKA	E	I470	I70	KS
I70 $	TKST$	KANSAS CITY	W	I435	I70	KS
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I24		EAST RIDGE	NE	I24	I75	TN
I75		ATLANTA	NW	I285	I75	GA
I285		ATLANTA	E	I20	I285	GA
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRL				SC

From: ID NATL ENG LAB, ID
To : K-25, TN

Routing through:

		ID NATL ENG LAB				ID
U20	U26	ATOMIC CITY	NW	U20	U26	ID
U26		BLACKFOOT	NW	I15	X92	ID
I15		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I84		ECHO		I80	I84	UT
I80		CHEYENNE	SW	I25	I80	WY
I25		COMMERCE CITY	W	I25	I76	CO
I76		COMMERCE CITY	NW	I270	I76	CO
I270		DENVER	NE	I270	I70	CO
I70		TOPEKA	W	I470	I70	KS
I470		TOPEKA	S	I335	I470	KS
I470$	TKST$	TOPEKA	E	I470	I70	KS
I70 $	TKST$	KANSAS CITY	W	I435	I70	KS
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: HANFORD, WA
To : MERCURY, NV

Routing through:

		HANFORD				WA
LR4S		RICHLAND	N	S240	LR4S	WA
S240		RICHLAND	SE	I182	S240	WA
I182		WEST RICHLAND	S	I182	I82	WA
I82		HERMISTON	SW	I82	I84	OR
I84		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I15		SALT LAKE CITY	W	I15	I80	UT
I15	I80	SALT LAKE CITY	S	I15	I80	UT
I15		LAS VEGAS				NV
U95		MERCURY	S	U95	LOCL	NV
LOCAL		MERCURY				NV

From: HANFORD, WA
To : SRL, SC

Routing through:

		HANFORD				WA
LR4S		RICHLAND	N	S240	LR4S	WA
S240		RICHLAND	SE	I182	S240	WA
I182		WEST RICHLAND	S	I182	I82	WA
I82		HERMISTON	SW	I82	I84	OR
I84		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I84		ECHO		I80	I84	UT
I80		CHEYENNE	SW	I25	I80	WY
I25		COMMERCE CITY	W	I25	I76	CO
I76		COMMERCE CITY	NW	I270	I76	CO
I270		DENVER	NE	I270	I70	CO
I70		TOPEKA	W	I470	I70	KS
I470		TOPEKA	S	I335	I470	KS
I470$	TKST$	TOPEKA	E	I470	I70	KS
I70 $	TKST$	KANSAS CITY	W	I435	I70	KS
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I24		EAST RIDGE	NE	I24	I75	TN
I75		ATLANTA	NW	I285	I75	GA
I285		ATLANTA	E	I20	I285	GA
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRL				SC

From: HANFORD, WA
To : K-25, TN

Routing through:

		HANFORD				WA
LR4S		RICHLAND	N	S240	LR4S	WA
S240		RICHLAND	SE	I182	S240	WA
I182		WEST RICHLAND	S	I182	I82	WA
I82		HERMISTON	SW	I82	I84	OR
I84		TREMONTON	W	I15	I84	UT
I15	I84	OGDEN	S	I15	I84	UT
I84		ECHO		I80	I84	UT
I80		CHEYENNE	SW	I25	I80	WY
I25		COMMERCE CITY	W	I25	I76	CO
I76		COMMERCE CITY	NW	I270	I76	CO
I270		DENVER	NE	I270	I70	CO
I70		TOPEKA	W	I470	I70	KS
I470		TOPEKA	S	I335	I470	KS
I470$	TKST$	TOPEKA	E	I470	I70	KS
I70 $	TKST$	KANSAS CITY	W	I435	I70	KS
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

From: K-25, TN
To : SRL, SC

Routing through:

	K-25				TN
S58	KINGSTON	E	I40	S58	TN
I40	OAK RIDGE	S	I40	I75	TN
I75	ATLANTA	NW	I285	I75	GA
I285	ATLANTA	E	I20	I285	GA
I20	NORTH AUGUSTA	NW	I20	S230	SC
S230	NORTH AUGUSTA				SC
S125	CLEARWATER	W	U1	U278	SC
U278	BEECH ISLAND		U278	S125	SC
S125	JACKSON	SE	S125	LSRP	SC
LSRP	SRL				SC

From: MERCURY, NV
To : SRL, SC

Routing through:

		MERCURY				NV
LOCAL		MERCURY	S	U95	LOCL	NV
U95		LAS VEGAS				NV
I15		COVE FORT	W	I15	I70	UT
I70		TOPEKA	W	I470	I70	KS
I470		TOPEKA	S	I335	I470	KS
I470$	TKST$	TOPEKA	E	I470	I70	KS
I70 $	TKST$	KANSAS CITY	W	I435	I70	KS
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I24		EAST RIDGE	NE	I24	I75	TN
I75		ATLANTA	NW	I285	I75	GA
I285		ATLANTA	E	I20	I285	GA
I20		NORTH AUGUSTA	NW	I20	S230	SC
S230		NORTH AUGUSTA				SC
S125		CLEARWATER	W	U1	U278	SC
U278		BEECH ISLAND		U278	S125	SC
S125		JACKSON	SE	S125	LSRP	SC
LSRP		SRL				SC

From: MERCURY, NV
To : K-25, TN

Routing through:

		MERCURY				NV
LOCAL		MERCURY	S	U95	LOCL	NV
U95		LAS VEGAS				NV
I15		COVE FORT	W	I15	I70	UT
I70		TOPEKA	W	I470	I70	KS
I470		TOPEKA	S	I335	I470	KS
I470$	TKST$	TOPEKA	E	I470	I70	KS
I70 $	TKST$	KANSAS CITY	W	I435	I70	KS
I435		KANSAS CITY	SE	I435	I70	MO
I70		ST LOUIS	NW	I270	I70	MO
I270		EDWARDSVILLE	SW	I255	I270	IL
I255		WASHINGTON PK	SE	I255	I64	IL
I64		MT VERNON	NW	I57	I64	IL
I57	I64	MT VERNON	SW	I57	I64	IL
I57		PULLEYS MILL	W	I24	I57	IL
I24		INGLEWOOD	W	I24	I65	TN
I24	I65	NASHVILLE	SE	I24	I40	TN
I24	I40	NASHVILLE	E	I24	I40	TN
I40		KINGSTON	E	I40	S58	TN
S58		K-25				TN

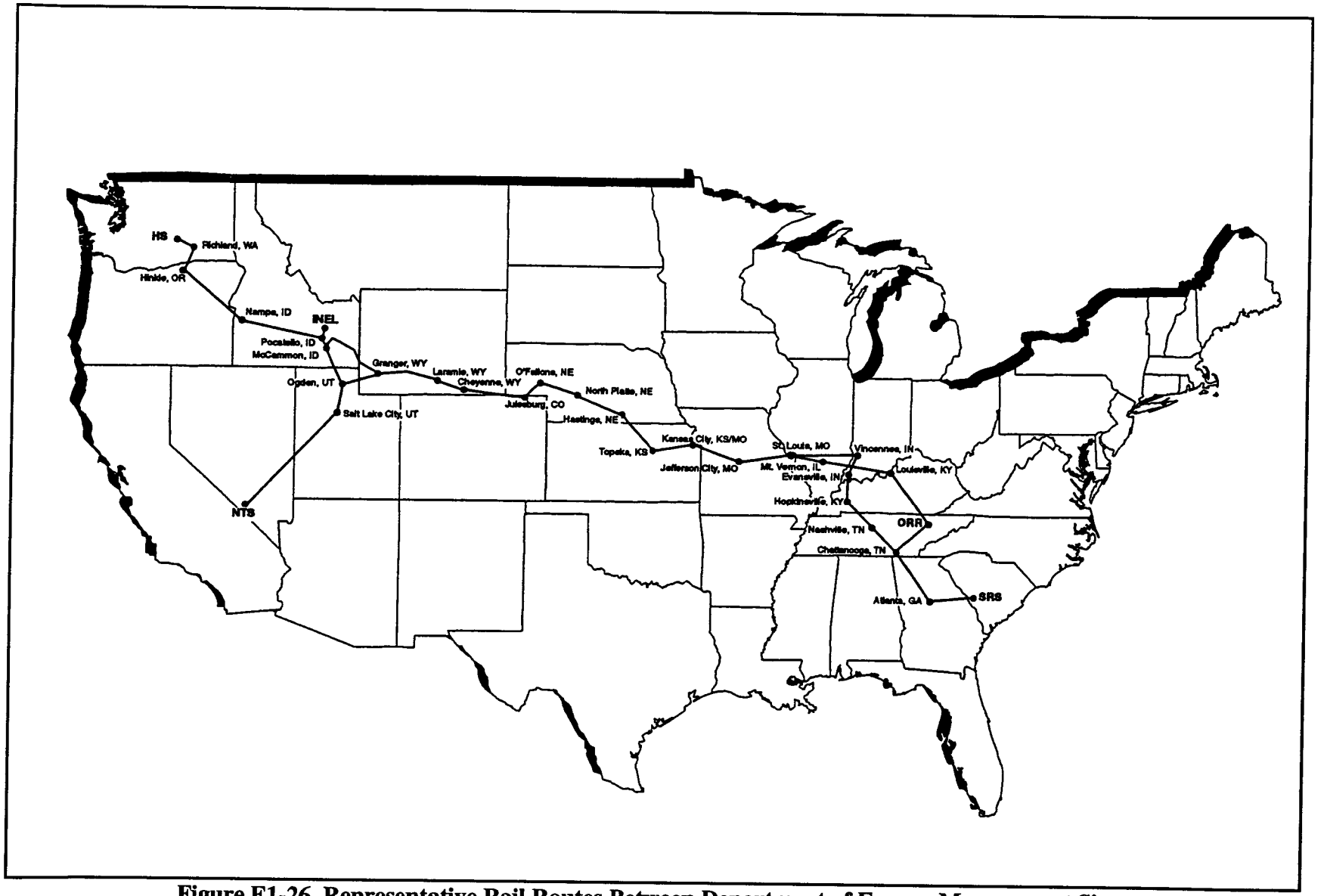

Figure E1-26 Representative Rail Routes Between Department of Energy Management Sites

ROUTE FROM: USG 15359-SRP, SC
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
USG	15359-SRP	SC	0.
USG	7717-DUNBARTON / WELL	SC	8.
CSXT	7717-DUNBARTON / WELL	SC	8.
CSXT	7732-ROBBINS	SC	17.
CSXT	7961-AUGUSTA	GA	46.
CSXT	7914-ATLANTA	GA	221.
CSXT	7907-MARIETTA	GA	231.
CSXT	7889-CARTERSVILLE	GA	263.
CSXT	7888-DALTON	GA	314.
CSXT	7235-CHATTANOOGA	TN	352.
CSXT	7187-TULLAHOMA	TN	433.
CSXT	7202-NASHVILLE	TN	512.
CSXT	7201-MADISON	TN	522.
CSXT	7061-HOPKINSVILLE	KY	582.
CSXT	3839-HENDERSON	KY	669.
CSXT	3838-EVANSVILLE	IN	682.
CSXT	3812-VINCENNES	IN	732.
CSXT	4952-SALEM	IL	811.
CSXT	10859-EAST ST LOUIS	IL	876.
<TR>	10859-EAST ST LOUIS	IL	876.
<TR>	10858-ST LOUIS	MO	882.
UP	10858-ST LOUIS	MO	882.
UP	10656-JEFFERSON CITY	MO	1004.
UP	10616-KANSAS CITY	MO	1180.
UP	10617-KANSAS CITY	KS	1183.
UP	11823-LAWRENCE	KS	1222.
UP	11697-TOPEKA	KS	1252.
UP	11696-MENOKEN	KS	1257.
UP	11681-MARYSVILLE	KS	1332.
UP	11405-HASTINGS	NE	1442.
UP	11410-GIBBON	NE	1468.
UP	11352-NORTH PLATTE	NE	1546.
UP	11358-O FALLONS	NE	1595.
UP	13703-JULESBURG	CO	1663.
UP	13465-CHEYENNE	WY	1809.
UP	13462-LARAMIE	WY	1861.
UP	13494-GRANGER	WY	2137.
UP	13369-MC CAMMON	ID	2329.
UP	13370-POCATELLO	ID	2352.
UP	13412-NAMPA	ID	2594.
UP	14220-PENDLETON	OR	2862.
UP	14223-HINKLE	OR	2893.
UP	13894-WALLULA	WA	2922.
UP	13964-KENNEWICK	WA	2937.
UP	13941-RICHLAND	WA	2946.
USG	13941-RICHLAND	WA	2946.
USG	16212-HANFORD S 300	WA	2954.

ROUTE FROM: USG 15359-SRP, SC
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
USG	15359-SRP	SC	0.
USG	7717-DUNBARTON / WELL	SC	8.
CSXT	7717-DUNBARTON / WELL	SC	8.
CSXT	7732-ROBBINS	SC	17.
CSXT	7961-AUGUSTA	GA	46.
CSXT	7914-ATLANTA	GA	221.
CSXT	7907-MARIETTA	GA	231.
CSXT	7889-CARTERSVILLE	GA	263.
CSXT	7888-DALTON	GA	314.
CSXT	7235-CHATTANOOGA	TN	352.
CSXT	7187-TULLAHOMA	TN	433.
CSXT	7202-NASHVILLE	TN	512.
CSXT	7201-MADISON	TN	522.
CSXT	7061-HOPKINSVILLE	KY	582.
CSXT	3839-HENDERSON	KY	669.
CSXT	3838-EVANSVILLE	IN	682.
CSXT	3812-VINCENNES	IN	732.
CSXT	4952-SALEM	IL	811.
CSXT	10859-EAST ST LOUIS	IL	876.
<TR>	10859-EAST ST LOUIS	IL	876.
<TR>	10858-ST LOUIS	MO	882.
UP	10858-ST LOUIS	MO	882.
UP	10656-JEFFERSON CITY	MO	1004.
UP	10616-KANSAS CITY	MO	1180.
UP	10617-KANSAS CITY	KS	1183.
UP	11823-LAWRENCE	KS	1222.
UP	11697-TOPEKA	KS	1252.
UP	11696-MENOKEN	KS	1257.
UP	11681-MARYSVILLE	KS	1332.
UP	11405-HASTINGS	NE	1442.
UP	11410-GIBBON	NE	1468.
UP	11352-NORTH PLATTE	NE	1546.
UP	11358-O FALLONS	NE	1595.
UP	13703-JULESBURG	CO	1663.
UP	13465-CHEYENNE	WY	1809.
UP	13462-LARAMIE	WY	1861.
UP	13494-GRANGER	WY	2137.
UP	13369-MC CAMMON	ID	2329.
UP	13370-POCATELLO	ID	2352.
UP	13336-SCOVILLE	ID	2408.

ROUTE FROM: USG 15359-SRP, SC
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
USG	15359-SRP	SC	0.
USG	7717-DUNBARTON / WELL	SC	8.
CSXT	7717-DUNBARTON / WELL	SC	8.
CSXT	7732-ROBBINS	SC	17.
CSXT	7961-AUGUSTA	GA	46.
CSXT	7914-ATLANTA	GA	221.
CSXT	7907-MARIETTA	GA	231.
CSXT	7889-CARTERSVILLE	GA	263.
CSXT	7888-DALTON	GA	314.
CSXT	7235-CHATTANOOGA	TN	352.
CSXT	7187-TULLAHOMA	TN	433.
CSXT	7202-NASHVILLE	TN	512.
CSXT	7201-MADISON	TN	522.
CSXT	7061-HOPKINSVILLE	KY	582.
CSXT	3839-HENDERSON	KY	669.
CSXT	3838-EVANSVILLE	IN	682.
CSXT	3812-VINCENNES	IN	732.
CSXT	4952-SALEM	IL	811.
CSXT	10859-EAST ST LOUIS	IL	876.
<TR>	10859-EAST ST LOUIS	IL	876.
<TR>	10858-ST LOUIS	MO	882.
UP	10858-ST LOUIS	MO	882.
UP	10656-JEFFERSON CITY	MO	1004.
UP	10616-KANSAS CITY	MO	1180.
UP	10617-KANSAS CITY	KS	1183.
UP	11823-LAWRENCE	KS	1222.
UP	11697-TOPEKA	KS	1252.
UP	11696-MENOKEN	KS	1257.
UP	11681-MARYSVILLE	KS	1332.
UP	11405-HASTINGS	NE	1442.
UP	11410-GIBBON	NE	1468.
UP	11352-NORTH PLATTE	NE	1546.
UP	11358-O FALLONS	NE	1595.
UP	13703-JULESBURG	CO	1663.
UP	13465-CHEYENNE	WY	1809.
UP	13462-LARAMIE	WY	1861.
UP	13494-GRANGER	WY	2137.
UP	13568-OGDEN	UT	2276.
UP	13595-SALT LAKE CITY	UT	2311.
UP	13630-LYNNDYL	UT	2423.
UP	14766-VALLEY	NV	2740.
USG	14766-VALLEY	NV	2740.
USG	16333-YUCCA MOUNTAIN	NV	2839.

ROUTE FROM: UP 13336-SCOVILLE, ID
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
UP	13336-SCOVILLE	ID	0.
UP	13370-POCATELLO	ID	56.
UP	13412-NAMPA	ID	298.
UP	14220-PENDLETON	OR	567.
UP	14223-HINKLE	OR	598.
UP	13894-WALLULA	WA	627.
UP	13964-KENNEWICK	WA	642.
UP	13941-RICHLAND	WA	650.
USG	13941-RICHLAND	WA	650.
USG	16212-HANFORD S 300	WA	658.

ROUTE FROM: UP 13336-SCOVILLE, ID
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
UP	13336-SCOVILLE	ID	0.
UP	13370-POCATELLO	ID	56.
UP	13369-MC CAMMON	ID	79.
UP	13568-OGDEN	UT	193.
UP	13595-SALT LAKE CITY	UT	228.
UP	13630-LYNNDYL	UT	340.
UP	14766-VALLEY	NV	657.
USG	14766-VALLEY	NV	657.
USG	16333-YUCCA MOUNTAIN	NV	756.

ROUTE FROM: USG 16212-HANFORD S 300, WA
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
USG	16212-HANFORD S 300	WA	0.
USG	13941-RICHLAND	WA	8.
UP	13941-RICHLAND	WA	8.
UP	13964-KENNEWICK	WA	16.
UP	13894-WALLULA	WA	31.
UP	14223-HINKLE	OR	60.
UP	14220-PENDLETON	OR	91.
UP	13412-NAMPA	ID	360.
UP	13370-POCATELLO	ID	602.
UP	13369-MC CAMMON	ID	625.
UP	13568-OGDEN	UT	738.
UP	13595-SALT LAKE CITY	UT	774.
UP	13630-LYNNDYL	UT	886.
UP	14766-VALLEY	NV	1203.
USG	14766-VALLEY	NV	1203.
USG	16333-YUCCA MOUNTAIN	NV	1302.

ROUTE FROM: NS 15316-K-25, TN
TO: USG 16212-HANFORD S 300, WA

RR	NODE	STATE	DIST
NS	15316-K-25	TN	0.
NS	7260-HARRIMAN	TN	15.
NS	6979-DANVILLE	KY	177.
NS	7008-LOUISVILLE	KY	277.
NS	7009-JEFFERSONVILLE	IN	281.
NS	4797-MOUNT CARMEL	IL	406.
NS	4954-MOUNT VERNON	IL	469.
NS	4953-CENTRALIA	IL	491.
NS	10859-EAST ST LOUIS	IL	549.
NS	10858-ST LOUIS	MO	555.
NS	10494-CENTRALIA	MO	674.
NS	10498-MOBERLY	MO	697.
NS	10616-KANSAS CITY	MO	828.
UP	10616-KANSAS CITY	MO	828.
UP	10617-KANSAS CITY	KS	831.
UP	11823-LAWRENCE	KS	869.
UP	11697-TOPEKA	KS	899.
UP	11696-MENOKEN	KS	904.
UP	11681-MARYSVILLE	KS	979.
UP	11405-HASTINGS	NE	1089.
UP	11410-GIBBON	NE	1115.
UP	11352-NORTH PLATTE	NE	1193.
UP	11358-O FALLONS	NE	1242.
UP	13703-JULESBURG	CO	1310.
UP	13465-CHEYENNE	WY	1456.
UP	13462-LARAMIE	WY	1508.
UP	13494-GRANGER	WY	1784.
UP	13369-MC CAMMON	ID	1976.
UP	13370-POCATELLO	ID	1999.
UP	13412-NAMPA	ID	2241.
UP	14220-PENDLETON	OR	2510.
UP	14223-HINKLE	OR	2541.
UP	13894-WALLULA	WA	2570.
UP	13964-KENNEWICK	WA	2585.
UP	13941-RICHLAND	WA	2594.
USG	13941-RICHLAND	WA	2594.
USG	16212-HANFORD S 300	WA	2601.

ROUTE FROM: NS 15316-K-25, TN
TO: UP 13336-SCOVILLE, ID

RR	NODE	STATE	DIST
NS	15316-K-25	TN	0.
NS	7260-HARRIMAN	TN	15.
NS	6979-DANVILLE	KY	177.
NS	7008-LOUISVILLE	KY	277.
NS	7009-JEFFERSONVILLE	IN	281.
NS	4797-MOUNT CARMEL	IL	406.
NS	4954-MOUNT VERNON	IL	469.
NS	4953-CENTRALIA	IL	491.
NS	10859-EAST ST LOUIS	IL	549.
NS	10858-ST LOUIS	MO	555.
NS	10494-CENTRALIA	MO	674.
NS	10498-MOBERLY	MO	697.
NS	10616-KANSAS CITY	MO	828.
UP	10616-KANSAS CITY	MO	828.
UP	10617-KANSAS CITY	KS	831.
UP	11823-LAWRENCE	KS	869.
UP	11697-TOPEKA	KS	899.
UP	11696-MENOKEN	KS	904.
UP	11681-MARYSVILLE	KS	979.
UP	11405-HASTINGS	NE	1089.
UP	11410-GIBBON	NE	1115.
UP	11352-NORTH PLATTE	NE	1193.
UP	11358-O FALLONS	NE	1242.
UP	13703-JULESBURG	CO	1310.
UP	13465-CHEYENNE	WY	1456.
UP	13462-LARAMIE	WY	1508.
UP	13494-GRANGER	WY	1784.
UP	13369-MC CAMMON	ID	1976.
UP	13370-POCATELLO	ID	1999.
UP	13336-SCOVILLE	ID	2055.

ROUTE FROM: NS 15316-K-25, TN
TO: USG 16333-YUCCA MOUNTAIN, NV

RR	NODE	STATE	DIST
NS	15316-K-25	TN	0.
NS	7260-HARRIMAN	TN	15.
NS	6979-DANVILLE	KY	177.
NS	7008-LOUISVILLE	KY	277.
NS	7009-JEFFERSONVILLE	IN	281.
NS	4797-MOUNT CARMEL	IL	406.
NS	4954-MOUNT VERNON	IL	469.
NS	4953-CENTRALIA	IL	491.
NS	10859-EAST ST LOUIS	IL	549.
NS	10858-ST LOUIS	MO	555.
NS	10494-CENTRALIA	MO	674.
NS	10498-MOBERLY	MO	697.
NS	10616-KANSAS CITY	MO	828.
UP	10616-KANSAS CITY	MO	828.
UP	10617-KANSAS CITY	KS	831.
UP	11823-LAWRENCE	KS	869.
UP	11697-TOPEKA	KS	899.
UP	11696-MENOKEN	KS	904.
UP	11681-MARYSVILLE	KS	979.
UP	11405-HASTINGS	NE	1089.
UP	11410-GIBBON	NE	1115.
UP	11352-NORTH PLATTE	NE	1193.
UP	11358-O FALLONS	NE	1242.
UP	13703-JULESBURG	CO	1310.
UP	13465-CHEYENNE	WY	1456.
UP	13462-LARAMIE	WY	1508.
UP	13494-GRANGER	WY	1784.
UP	13568-OGDEN	UT	1923.
UP	13595-SALT LAKE CITY	UT	1959.
UP	13630-LYNNDYL	UT	2071.
UP	14766-VALLEY	NV	2388.
USG	14766-VALLEY	NV	2388.
USG	16333-YUCCA MOUNTAIN	NV	2487.

ROUTE FROM: NS 15316-K-25, TN
TO: USG 15359-SRP, SC

RR	NODE	STATE	DIST
NS	15316-K-25	TN	0.
NS	7288-DOSSETT	TN	21.
NS	7286-KNOXVILLE	TN	46.
NS	7318-MORRISTOWN	TN	87.
NS	7343-ASHEVILLE	NC	167.
NS	7814-SPARTANBURG	SC	234.
CSXT	7814-SPARTANBURG	SC	234.
CSXT	7838-GREENWOOD	SC	300.
CSXT	7961-AUGUSTA	GA	371.
CSXT	7732-ROBBINS	SC	400.
CSXT	7717-DUNBARTON / WELL	SC	409.
USG	7717-DUNBARTON / WELL	SC	409.
USG	15359-SRP	SC	417.

NEPA TEAM

DOE/EIS-0218F
February 1996

Volume 2

FINAL ENVIRONMENTAL IMPACT STATEMENT

on a

Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Appendix F
Description and Impacts of Storage Technology Alternatives

United States Department of Energy
Assistant Secretary for Environmental Management
Washington, DC 20585

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Appendix F
Description and Impacts of Storage Technology Alternatives

Summary

This appendix presents a description and evaluation of currently available spent nuclear fuel storage technologies, and their applicability to foreign research reactor spent nuclear fuel. These technologies represent the range of alternatives that would be available to implement the proposed action. Some of these technologies are currently in use at U.S. Department of Energy (DOE) facilities. Several dry storage cask and/or building designs have been licensed by the U.S. Nuclear Regulatory Commission (NRC) and are operational with commercial nuclear power plant spent fuel at several locations.

This appendix also discusses potential storage sites and impacts of foreign research reactor spent nuclear fuel storage at these locations. The major sections in this appendix are:

Section F.1 Description of Existing and Proposed Technologies for Storage of Spent Nuclear Fuel

Section F.2 Storage Technology Evaluation Methodology

Section F.3 Selection of Storage Technologies for Further Evaluation

Section F.4 Environmental Impacts at Foreign Research Reactor Spent Nuclear Fuel Management Sites

Section F.5 Occupational Radiation Impacts from Receipt and Handling of Foreign Research Reactor Spent Nuclear Fuel

Section F.6 Evaluation Methodologies and Assumptions for Incident-Free Operations and Hypothetical Accidents at Management Sites

Section F.7 Economic Evaluation of Foreign Research Reactor Spent Nuclear Fuel Storage and Related Management Alternatives

Figure F-1 presents the different spent nuclear fuel storage technologies, which are divided into wet and dry systems and further classified by their materials of construction (i.e., concrete, metal), location (i.e., aboveground or belowground), and size (i.e., cask versus vault building or pool). The final level of detail is the specific design with 12 specific vendors' designs displayed in this figure. The following specific designs are of U.S. origin: Nuclear Assurance Corporation, MC-10, NUHOMS, and Ventilated Storage Cask-24 (Section F.1 describes these in more detail). The others are designed by foreign companies, but many of these companies, such as Transnuclear Inc., have U.S. affiliates. The principal categories of spent nuclear fuel storage technology are dry vault (building), dry cask, and wet pool.

This appendix discusses the aforementioned designs in terms of their shielding, criticality, thermal, structural, cost, and ease of use features. Some numerical design parameters are presented for comparison. Advantages and vulnerabilities of each design are also presented. Since none of these designs have been specifically designed or licensed for foreign research reactor spent nuclear fuel and related research reactor type fuel, some extrapolation has been made in this comparative assessment. All of the existing commercial designs and proposed new designs appear to be adaptable to foreign research reactor spent

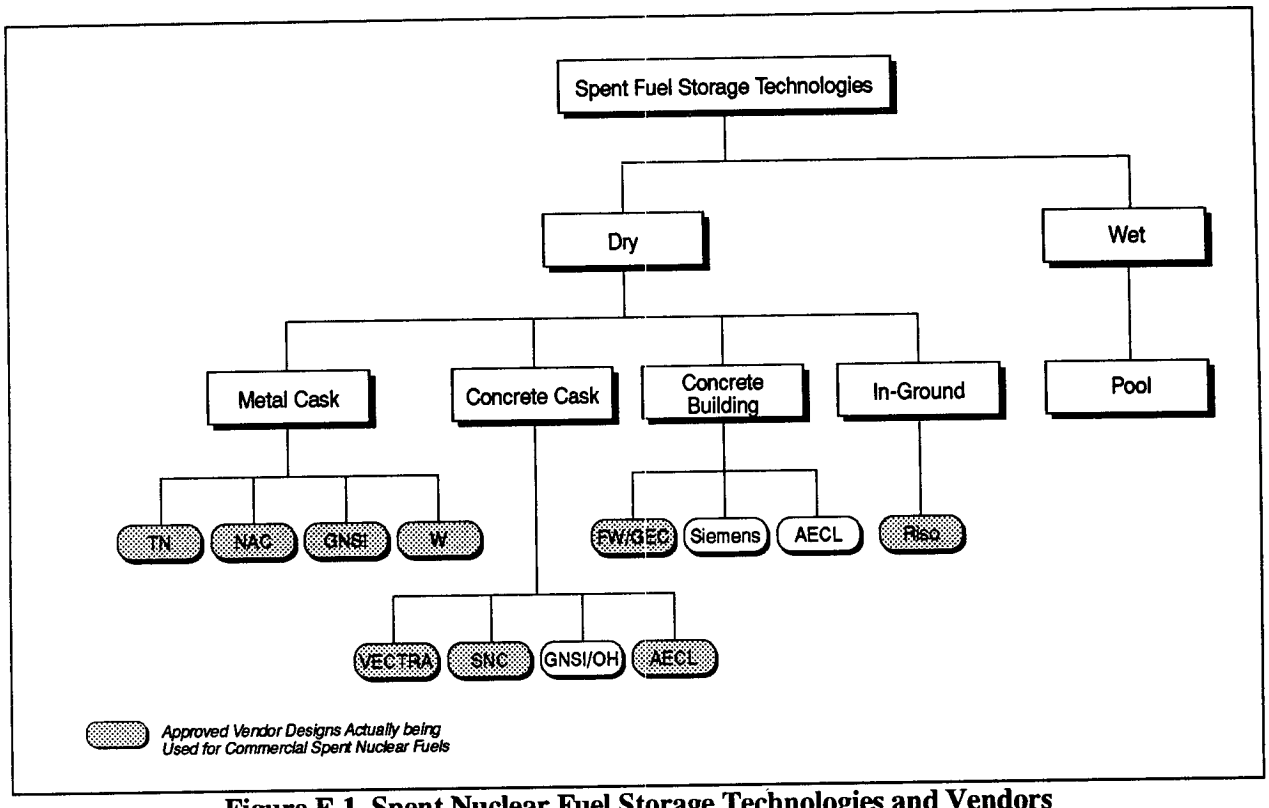


Figure F-1 Spent Nuclear Fuel Storage Technologies and Vendors

nuclear fuel with only minor, easily implemented modifications, such as interior baskets for holding the spent nuclear fuel. Use of existing facilities at a site for staging and characterization favors a cask storage approach, while a stand-alone, separate spent nuclear fuel storage approach requires a vault and other support facilities. Schedule and monetary considerations favor casks over the vault for sites with existing facilities, and this is why most domestic utilities are pursuing dry casks for long-term storage of spent nuclear fuel. Casks are the only independent spent nuclear fuel storage installation designs that have received certification by the NRC in accordance with 10 Code of Federal Regulations (CFR) 72 Appendix K.

The evaluation indicates that both wet and dry storage of foreign research reactor spent nuclear fuel appear acceptable for the time periods envisioned for the proposed action (i.e., through 2036). Commercial spent nuclear fuel dry storage systems require a minimum wet pool storage time or cooldown period of approximately 5 years after discharge from the nuclear reactor prior to emplacement into dry storage. In actual practice, this usually averages around an 8-year average cooldown period and, frequently, the commercial spent nuclear fuel has had over a 10-year cooldown period in a wet pool prior to emplacement into dry storage. This cooldown period ensures that licensed conditions for cladding temperatures (based upon potential corrosion, and usually around 350°C, or 630°F) are not exceeded. Foreign research reactor spent nuclear fuel has a lower cladding temperature limit based upon a phase transition in the aluminum metal cladding; this aluminum cladding limit has been identified as 175°C (315°F). Thus, a maximum cooldown period of 3 years of wet pool storage after irradiation has been identified for the foreign research reactor spent nuclear fuel prior to emplacement into dry storage. This would ensure that all foreign research reactor spent nuclear fuel elements were below a heat load of 40 Watts each, and most elements would be 10 Watts or less. The majority of the currently available foreign research reactor spent nuclear fuel already meets this requirement. Most of the existing dry storage designs appear acceptable for foreign

research reactor spent nuclear fuel, without any clear preference. It should be noted that a research and development project to examine the applicability of aluminum-clad spent nuclear fuel dry storage at the Savannah River Site was initiated in Fiscal Year (FY) 1994.

The utilization of dry storage methods for foreign research reactor spent nuclear fuel requires the acquisition of racks, baskets, storage canisters, and/or casks. New construction would be required for dry vaults, except for several existing facilities at the Nevada Test Site and Idaho National Engineering Laboratory.

The utilization of wet storage methods requires a lined basin within a seismically qualified facility with the ability to maintain water chemistry and handle liquid radioactive waste. Currently, there are few existing DOE facilities in this category, and none have sufficient capacity to accommodate all of the foreign research reactor spent nuclear fuel. Thus, the selection of wet storage would require DOE acquisition of a facility, either by new construction or purchase of an existing facility such as the Barnwell Nuclear Fuels Plant (BNFP) that is owned by Allied General Nuclear Services. A summary of storage technology characteristics is given Table F-1. Sections F.4, F.5, and F.6 address environmental impacts, occupational dose, and accident consequences for storage. Section F.7 discusses costs in detail.

Table F-1 Summary of Storage Technology Characteristics for Commercial and Foreign Research Reactor Spent Nuclear Fuel

Storage Technology	*DOE Site Status (New or Existing)*	*Land Use Ha (Ac)*	*Annual Low-level Waste (m^3)[a]*	*Potential Annual Spent Nuclear Fuel Storage Public Impact (LCFs)*	*Lead Time until Spent Nuclear Fuel Storage (Years)*
Dry Vault - Utility Fuel	New	4 (5)	1-4	NA	2-3
Dry Cask (Concrete) - Utility Fuel	New	4 (5)	1-4	NA	2-3
Wet Pool - Utility Fuel	New	2 (3)	1-4	NA	3-5
Dry Vault - Savannah River Site Research Reactor Fuel	New	4 (8)	16	0	5-10[b]
Dry Cask - Savannah River Site Research Reactor Fuel	New	4 (5)	16	0	3-5[b]
Wet Pool - Idaho National Engineering Laboratory Research Reactor Fuel	New	2 (3)	12	2.4×10^{-12} to 2.5×10^{-10}	5-10[b]

NA = Not Available; LCF = Latent Cancer Fatality

[a] *Low-Level Waste generation decreases significantly if spent nuclear fuel is only being stored, without additional spent nuclear fuel receipts. To convert to ft^3, multiply by 35.3.*

[b] *To allow for extended periodic examination and characterization of fuel.*

DOE currently has pilot-scale experience with dry storage of spent nuclear fuel, and there are no identified technical constraints that would prevent dry storage of foreign research reactor spent nuclear fuel. There would be some need, however, for characterization, canning, and periodic inspection and monitoring. Both NRC-licensed and not yet licensed dry storage designs are readily available from commercial vendors. NRC-licensed designs have the following advantages:

- specific NRC requirements have been met that are equivalent to DOE requirements and guidance,
- extensive, interactive technical safety reviews have already been conducted between the supplier and the regulator,
- peer and public review has occurred as part of the licensing process,
- proven applications are in operation at commercial nuclear power plant sites, and
- documentation and quality assurance requirements have been satisfied.

For sites with an existing spent nuclear fuel infrastructure that includes facilities for spent nuclear fuel receipt, examination, and loading, a modular approach based upon casks can be implemented rapidly to meet Phase 1 requirements using standard funding and procurement capital appropriation methods. The casks could also be used for Phase 2, and their usage would avoid additional procurement. A modular dry vault approach represents an integrated self-contained, stand-alone facility, and can be used at any of the proposed management sites. However, construction of the vault could represent a major project or major systems acquisition under DOE management requirements, which may require a 7 to 10 year period for completion. Thus, a vault dry storage approach probably could not be available immediately. Metal cask development programs, such as dual- and multi-purpose casks, eliminate many storage site handling requirements and may provide future improvements.

Section F.7 evaluates the economics of the entire (40-year plus) foreign research reactor spent nuclear fuel program, including transportation, receipt/handling/inspection, storage, preparation for disposal, transportation to the repository, and disposal for the storage/disposal and chemical separation/vitrification alternatives. Costs are presented as rough-order-of-magnitude net present values, using a 4.9 percent real discount rate. In 1996 dollars, minimum total program costs for the storage alternative are about $800 million. This total divides into four very roughly equal parts: shipping to the United States and program management; receiving and storage at existing facilities; receiving, storage, and fuels qualification at not-yet existing facilities; and repository disposal. Other cost factors would be expected to add as much as $500 million to the program costs. Among the other cost factors are systems integration and logistics contingencies ($75 to $100 million), risks associated with limited characterization of the spent nuclear fuel ($100 million), risks associated with direct disposal of HEU ($50 to $100 million) and the probability that future discount rates will be lower than the current 4.9 percent rate ($200 million or more). Total costs, including all contingencies and risks could thus be in the $1.3 billion range.

For chemical separation alternatives, minimum total program costs are about $700 million. Savings in chemical separation and disposal of high-level waste versus storage and disposal of spent nuclear fuel account for the bulk of the difference between the costs in the chemical separation case and the storage case. Other cost factors would be expected to add as much as $250 million to the program costs. The key cost factors are systems integration and logistics contingencies ($75 to $100 million) and the probability that future discount rates will be lower than the current 4.9 percent rate ($100 million or more). If part of the material shipped to the Savannah River Site was chemically separated and part was stored, costs would typically be between the boundaries for all-separation and all-storage.

Hybrid alternatives that ship about 1/4 of the foreign research reactor spent nuclear fuel to the United Kingdom Atomic Energy Authority's Dounreay facility and manage the remainder as in the U.S. chemical separation case generate minimum total program costs of about $650 million. Other cost factors would be about the same as in the chemical separation case.

At the level of accuracy in the costs presented here, alternatives based on chemical separation of aluminum-based spent nuclear fuel in the United States are likely to cost about the same as alternatives that divert a significant fraction of the spent nuclear fuel (aluminum-based and TRIGA) to Dounreay. Alternatives based on storage and direct disposal of spent nuclear fuel or some non-separation processing approach (e.g., melt and dilute) are likely to cost several hundred million dollars more.

F.1 Description of Existing and Proposed Technologies for Storage of Spent Nuclear Fuel

In this section, two major generic technologies will be presented. International and domestic types of each technology will be addressed. Section F.1.1 will discuss the dry storage designs available. Section F.1.2 will address wet storage technology types. The range of alternatives available to each site for the implementation of the proposed action is presented in Section F.1.3.

F.1.1 Dry Storage Designs

F.1.1.1 Overview of Dry Storage Approaches

There are several types of dry storage technology currently in use or proposed by various vendors at DOE sites as well as at commercial nuclear power facilities. These include:

- aboveground free-standing metal casks,
- aboveground free-standing concrete casks,
- aboveground free-standing dry storage buildings (vaults),
- inground lined and unlined holes or wells with or without casks,
- hot cells (buildings), and
- aboveground free-standing multi-purpose or dual-purpose casks.

It should be noted that additional support facilities for transfer and staging operations may be required in order to use the aforementioned dry storage technologies. A short discussion of the advantages and disadvantages of all dry storage technologies is given in the following sections.

It is important to appreciate the different approaches to handling weight and shielding. Today, most spent nuclear fuel facilities utilize a wet pool environment for handling, storing, and transferring spent nuclear fuel to transportation casks. The pool water provides shielding [usually a 3-meter (m) or 10-ft water cover is the minimum requirement], confinement of contamination, decay heat removal, and thermal capacity. All spent nuclear fuel elements weigh less than 0.9 metric tons (1 ton) and are readily moved within the pool by a crane of that capacity. Transportation containers (casks) for highway transport weigh between 18 and 36 metric tons (20 and 40 tons), and rail casks can weigh up to 91 metric tons (100 tons). Thus, most wet pool facilities have a bridge crane spanning the storage areas and the receiving bay(s) with a capacity of 45 to 91 metric tons (50 to 100 tons). Economical dry storage requires that a large number of elements be stored in each cask. Cask weights exceeding 91 metric tons (100 tons) are possible.

Dry storage manufacturers have overcome this problem by using metallic "transfer" canisters. These transfer canisters are considerably lighter than transportation casks, and usually weigh in the 9 to 27 metric tons (10 to 30 ton) range before loading. The transfer canister provides some shielding, but is principally for confinement of the spent nuclear fuel. They are loaded in the same manner as transportation casks.

For dry cask storage, the canister is loaded onto a truck and transferred to a previously constructed, shielded concrete cask away from the wet pool. With a vault, the canister is moved by a crane within a concrete shielded facility and placed in a storage tube within concrete shielding.

Radioactive materials in spent nuclear fuel require two levels of confinement for dry storage. These are usually the cladding material and the metal container (or transfer canister) within the metal cask or concrete structure (cask or vault). Leaking fuel elements can be dry stored provided they are placed within a separate metal container (i.e., "can") within the canister. This is relatively easy to accomplish, but can consume additional storage space. For foreign research reactor spent nuclear fuel, the impacts of canned fuel upon storage capacity should be minimal. The amount of canning expected for foreign research reactor spent nuclear fuel is not yet determined.

F.1.1.1.1 Aboveground Free-Standing Metal Casks

Metal storage casks are generally robust and some may even have been originally designed to meet transportation requirements. They are resistant to seismic loads, high winds, design basis tornado missiles, and accidental drops. The mechanism for heat removal is simple, using direct metal conduction to the external surface which is cooled by natural convection. They are not subject to air pathway blockage by snow, ice, or flooding. The shielding is accomplished by various means, primarily thick steel, lead, or cast iron wall sections. The dry metal casks are passive, requiring minimal surveillance. There are no high-temperature thermal limits on cask material; however, if the material is cast iron or ferritic steel, there may be low-temperature thermal limits to prevent brittle fracture. Brittle fracture is a phenomenon that occurs in some materials such as glass at normal temperatures, or in cast iron or some steels (ferritic) at low temperatures. Fracture requires a stress to initiate. Thermal limits always apply to the fuel cladding. This type of dry storage has a proven track record in the United States and overseas.

The disadvantages of the metal cask designs are the following. Frequently, metal cask designs are more expensive than concrete/metal hybrid designs or dry vault storage designs. The current metal cask designs use dual compressible "O" rings with a pressure gauge to monitor the confinement seal. "O" rings are gaskets which, when compressed, form a gas-tight seal. Seal leakage is a possible event which must be considered for this design. The metal cask may be very heavy, thus imposing a limiting factor for cranes at existing facilities.

F.1.1.1.2 Aboveground Free-Standing Concrete Casks

The advantages of concrete casks, as compared to all other storage technologies, are given below. Concrete cask systems are inexpensive relative to metal casks. The concrete casks require no active systems because they are totally passive. They consist of a welded cylindrical container or basket enclosing the spent nuclear fuel which is then placed inside either a vertical or horizontal concrete structure. The concrete shielding structure may be fabricated onsite. This type of dry storage has been utilized at commercial nuclear power plant facilities, for example: H.B. Robinson, Oconee, Calvert Cliffs, and Palisades. Concrete casks have also been licensed for use at the Brunswick plant. Many other utilities are already committed to taking this route for the interim storage of their commercial spent nuclear fuel.

The disadvantages for concrete cask systems are: (1) more surveillance is needed than with metal casks to verify no blockage of air passages, (2) they are not licensed for transportation over public roads, (3) they require a special purpose onsite shielded transportation cask, and (4) the long-term concrete temperature limit restricts the heat load of the spent fuel. However, for the foreign research reactor spent nuclear fuel, heat loads and fuel cladding temperature limits are a small fraction of the commercial spent nuclear fuel values. Therefore, high concrete temperatures are expected to be avoided.

F.1.1.1.3 Aboveground Free-Standing Dry Storage Building (Vault)

Vault storage consists of a large concrete aboveground building enclosing a vertical or horizontal array of spent nuclear fuel storage metal tubes and support systems, The advantages for the vault type of dry storage, as compared to all other storage technologies, are the following. For large quantities of spent nuclear fuel assemblies, the vault may have economic advantages when compared with either type of cask system. The heat removal is passive. The heat removal capacity for a properly designed vault is large, and therefore, there should be little concern for thermal limits being imposed (although there may be individual fuel decay heat limits). The vault which is licensed in the United States and abroad, has no high temperature limit associated with concrete. However, there is a low temperature limit because the secondary fuel confinement barrier is ferritic steel. To comply with current NRC 10 CFR 72 regulations, all spent nuclear fuel storage systems must have two confinement barriers. The intact fuel cladding is considered the first confinement barrier, and the cask or vessel is considered the secondary confinement barrier. The vault has a major advantage over all other types of dry storage because it provides a shielded means for loading the spent nuclear fuel on the vault premises. Another important advantage of the vault is the ease of spent nuclear fuel retrieval and monitoring while in storage. The vault includes facilities for inspection, placement in containers, and drying of wet fuel. The weight/volume of stored fuel is not a limiting factor. This type of system is currently in use at Fort St. Vrain in Colorado, at Wylfa, Wales, and is under construction at the PAKs nuclear power plant in Hungary.

The disadvantage is that, for small quantities of spent nuclear fuel, the cost may be higher than either the metal or concrete cask systems since a vault requires greater capital outlays.

F.1.1.1.4 Inground Lined and Unlined Wells With or Without Casks

The RISO National Laboratory's inground concrete block design relies on forced air convection heat transfer from the existing handling bay ventilation system, which includes High Efficiency Particulate Air filters and an air humidity monitoring system. Forced air heat removal is accomplished by directing the air around spent nuclear fuel containers and out through tubes embedded in the concrete. Like the pool storage systems, the RISO National Laboratory's system relies on active heat removal systems.

F.1.1.1.5 Hot Cell Facilities

Although hot cells are available at many facilities, including the Savannah River Site, the Idaho National Engineering Laboratory, and the Nevada Test Site, they can best be considered for small quantities of spent nuclear fuel for very short periods of time. Hot cells are basically set up to perform various operations on hazardous materials, and are generally not spacious enough to store materials on an indefinite or long-term basis. Furthermore, hot cells are frequently contaminated; this contamination may pose problems when it is time to transfer the foreign research reactor spent nuclear fuel to the repository. It is important to note that DOE possesses several unique hot cells that may be capable of foreign research reactor spent nuclear fuel storage due to their large, vault-like design.

F.1.1.1.6 Aboveground Free-Standing Multi-Purpose or Dual-Purpose Casks

The dual-purpose cask combines the functions of interim storage at a designated site and transportation on public roads, rail systems, or waterways. A multi-purpose cask may also add a third function of a repository canister; i.e., the cask and its contents need no further processing, characterization or identification in order to be compatible with the final repository. A dual-purpose or multi-purpose cask has attractive possibilities for the storage of spent nuclear fuel, regardless of the type of reactor (i.e., commercial or research reactor). Dual-purpose designs would satisfy the two functions of storage and

transportation. For commercial utilities, this implies satisfaction of 10 CFR 71 requirements for transportation and 10 CFR 72 requirements for storage. By minimizing fuel handling operations, the dose for workers can be reduced, and the number of additional low-level waste products can be reduced. Minimization of fuel handling may also result in cost reductions, although this case has not been made. For a multi-purpose cask, satisfaction of 10 CFR 60 requirements is also necessary. DOE's Office of Civilian Radioactive Waste Management was actively pursuing a program to develop multi-purpose canister for domestic use (EG&G, 1994b; DOE, 1994f; DOE, 1994b; DOE, 1994c). However, DOE has decided in November 1995 to withdraw its proposal to prepare the EIS for this project.

The dual-purpose cask systems that are currently proposed offer a reduction in handling of the spent nuclear fuel in the storage to transportation operations, and multi-purpose cask systems offer an even greater reduction in handling in the operations involved at the repository site. However, no detailed cost/benefit analyses have been undertaken for foreign research reactor spent nuclear fuel. Furthermore, there is no basis at this time for concluding that either the "waste form" (intact spent nuclear fuel assemblies) or the sealed container will be compatible with the repository requirements. It is premature to draw any conclusion on the desirability to proceed with a multi-purpose cask system for foreign research reactor spent nuclear fuel use.

F.1.1.2 Specific Dry Storage Designs

There are no currently licensed dry storage systems specifically for foreign research reactor spent nuclear fuel in the United States. There are, however, many examples of dry spent nuclear fuel systems licensed by the NRC for commercial fuel. Table F-2 provides an overview of current manufacturers of dry storage systems. Table F-3 is a listing of dry storage systems currently licensed in the United States.

Dry storage systems must meet many design criteria, such as protection of fuel from degradation, shielding, thermal, criticality safety, structural integrity of confinement vessel, structural integrity of shielding, mechanical handling of fuel assemblies or canisters, containment and operational aspects. Some of these criteria are interrelated. For example, thermal criteria are designed to maintain fuel and cladding structural integrity. Shielding, thermal, and criticality parameters are the most important and are discussed in the following sections.

F.1.1.2.1 Shielding Design Comparisons

A spent nuclear fuel storage system must provide for adequate shielding of both the gamma and neutron radiation that emanate from irradiated nuclear fuel. The shielding must be designed to reduce the combined gamma and neutron dose rate to values that are below the limits for the public at the site boundary, collocated workers, and workers at the fuel storage facility. These limits are determined by Federal regulations such as 10 CFR 72 and 10 CFR 20. Shielding is designed for the maximum expected gamma and neutron source term, which is determined by performing computer code analyses of the nuclear fuel that account for the initial fuel fissile material inventory, its burnup in the reactor core, and the time after removal from the reactor (i.e., decay time) prior to its anticipated placement in the storage facility. The selection of a bounding and conservative set of these parameters results in the calculation of the highest possible gamma and neutron source term to be used in shielding design and analyses.

Shielding for gamma radiation relies on the use of high atomic weight or density materials, which attenuate and absorb gamma rays. The material selection depends on design limitations regarding shield thickness, cost, strength, and weight. The five materials which are almost always used in spent nuclear fuel storage facilities for gamma shielding are water, lead, steel, ductile iron or concrete. Lead and steel, having much higher densities and atomic weights than concrete and water, can provide relatively more

Table F-2 Dry Storage Technology Systems

Company	Metal Cask	Concrete Cask	Building (Vault)
AECL/Transnuclear	---	SILO	MACSTOR/CANSTOR
FW/GEC	---	---	MDV
GNS/GNSI	CASTOR	---	---
GNSI/OH	---	HDC	---
Nuclear Assurance Corp.	NAC	---	---
VECTRA	---	NUHOMS	---
Sierra Nuclear Corporation	---	VSC	---
RISO National Laboratory	---	DR3	---
Siemens Power Corporation	---	---	FUELSTOR
Transnuclear, Inc.	TN	---	---
Westinghouse Electric Corporation	MC-10	---	---
Atomic Energy of Canada, Ltd.	---	SILO	CANSTOR
Total Design:	**4**	**6**	**4**

FUELSTOR = Fuel Encapsulation and Lag Storage; FW/GEC = Foster Wheeler/GEC Alsthom Engineering Systems, Ltd. (United Kingdom); GNSI = General Nuclear Systems, Inc.; GNSI/OH = GNSI of Ontario Hydro; VSC = Ventilated Storage Cask; MDV = Modular Dry Vault

Table F-3 Dry Storage Systems Currently Licensed in the United States

Manufacturer	System	Location
General Nuclear Systems, Inc. (Chem-Nuclear)	CASTOR V/21	Surry
VECTRA	NUHOMS-7P, NUHOMS-24P, & NUHOMS-52B	Robinson, Oconee, & Calvert Cliffs
Westinghouse Electric Corporation	MC-10	Surry
Foster Wheeler/GEC Alsthom Engineering Systems, Ltd. (United Kingdom)	MDV	Wylfa, Wales UK PAKS (Hungary) Fort St. Vrain (USA)
Transnuclear	TN-24 & TN-40	Surry, Prairie Island
Sierra Nuclear Corporation	Ventilated Storage Cask-24	Palisades
Nuclear Assurance Corporation	NAC-C28, NAC-I28, NAC S/T, & NAC S/TC	Surry

effective gamma shielding with a smaller thickness of material. However, using steel and/or lead imposes a design penalty of increased cost. Concrete and water are much less expensive and may reduce overall shielding costs. It should also be noted that lead can be categorized as a Resource Conservation and Recovery Act waste, which restricts future decommissioning and disposal options. Concrete and water may also present unique safety problems, such as leakage (for water) or cracking (for concrete) during postulated accidents.

Neutron shielding requires low atomic weight materials because the uncharged neutron can only be absorbed by reducing its energy in collisions with nuclei similar in mass. Since the mass of a neutron is approximately one atomic mass unit, low atomic mass elements such as hydrogen, inert gas, lithium, carbon, and boron are suitable shields. Hydrogenous materials such as concrete and water are typically used in neutron shielding. It should be noted, however, that a sufficient thickness of heavier materials (such as high carbon steels) can provide neutron shielding. Also, shielding manufacturers offer products that have been artificially fortified in their hydrogen content, such as special forms of concrete, borated

resin, and polyethylene. As in the case for gamma shielding, design factors in material selection include cost, density, weight, and safety.

The design of spent nuclear fuel storage facility shielding must also incorporate other factors along with cost, density, weight, and safety. Shielding usually performs a second function as a heat transfer medium from the spent nuclear fuel decay heat to the environment, and must therefore be able to effectively remove heat without exceeding fuel and shielding storage temperature limits. In some instances, the shielding also performs a structural function, either in handling or support.

Table F-4 shows a comparison of specific designs with a view toward shielding considerations. All of these designs will be discussed in more detail in subsequent sections of this appendix.

F.1.1.2.2 Thermal Design Comparisons

Spent nuclear fuel storage facilities are designed to effectively remove spent nuclear fuel decay heat during both incident-free operation and postulated accident conditions. Thermal design limits include long-term fuel storage cladding temperature to maintain cladding integrity and, in some cases, temperature limits of structural and/or shielding materials. Unlike pool storage systems, most of the dry storage systems emphasize passive heat removal. In contrast, active systems in wet pools include pumps, make-up water systems, filtration and water treatment systems, and heat exchangers.

All dry storage designs encapsulate the fuel, after it is dried, in a metal canister or tube that is evacuated (vacuum dried) and then filled with an inert gas such as helium. Helium is frequently used for its relatively high thermal conductivity that enhances heat conduction and heat transfer from the fuel to the encapsulating metal canister. Helium's inert properties also inhibit cladding corrosion. Since all the dry fuel storage technologies utilize a metal canister to enclose spent nuclear fuel, the first modes of heat transfer from the fuel to this canister's walls are heat conduction and radiation from the fuel cladding surface through the inert gas to the inside wall of the metal canister. Decay heat transfer from the encapsulating canister to the environment is accomplished by several different mechanisms dependent upon the specific storage design technology.

The dry metal cask design relies on its solid thick metal wall for conduction heat transfer from the fuel storage cavity to the atmosphere. Metal cask conduction heat transfer is not susceptible to any accident or degradation. This thermal design is inherently easy to analyze because conduction is a well-known heat transfer mechanism, and the thermal conductivity of such metal cask materials as carbon steel, stainless steel, and ductile cast iron is well known over the range of temperatures and conditions that are expected in the cask while storing spent nuclear fuel. With known design fuel decay heat, cask geometry (i.e., cask wall thickness), conduction material composition, and suitably conservative heat transfer assumptions from the cask metal surface to the ambient air, the temperature distribution within the cask and maximum fuel cladding temperature can be calculated with a high degree of certainty.

The dry concrete cask design uses a combination of conduction, natural convection, and radiation heat transfer to remove decay heat from the stored spent nuclear fuel and maintain acceptable operating temperatures. An air passageway around the storage canister is provided in this design because the relatively low thermal conductivity and allowable operating temperature limit of concrete, as compared to metal, prevent the concrete shield walls from serving as the primary means of decay heat removal. Radiation streaming requires that the inlet and outlet air passages to the cavity surrounding the canister be designed as a geometric labyrinth with suitable bends. One concrete cask design, the Atomic Energy of Canada, Ltd. SILO, does not have air passages but instead relies solely on conduction through solid

Table F-4 Comparison of Shield Design Parameters for Spent Nuclear Fuel Dry Storage Systems Currently Licensed in the United States

Manufacturer	Model	Shield Material	Shield Thickness	Design Limit Surface Dose Rate[a]
Nuclear Assurance Corporation	S/T	S.S., Lead, NS4FR	Radial: 20.3 cm (8 in) S.S. & 17.8 cm (7 in) NS4FR Axial: 12.7 cm (5 in) S.S.-PB & 7.6 cm (3 in) NS4FR	1 milliSievert/hr (100 mrem/hr)
Transnuclear, Inc.	TN-24	Borated Resin, C.S.	NA	Side: 0.57 milliSievert/hr (57 mrem/hr) Top: 0.11 milliSievert/hr (11 mrem/hr) Bottom: 0.45 milliSievert/hr (45 mrem/hr)
	TN-40	Borated Resin, C.S.	Radial: 21.6 cm (8.5 in) C.S. 11.4 cm (4.5 in) Resin Bottom: 22.2 cm (8.75 in) C.S. Top: 15.9 cm (6.25 in) Cast Iron	Side: 0.58 milliSievert/hr (58 mrem/hr) Top: 0.26 milliSievert/hr (26 mrem/hr) Bottom: 12.75 milliSievert/hr (1,275 mrem/hr)
Westinghouse Electric Corporation	MC-10	NS-3, C.S.	Radial: 25.4 cm (10 in) Steel, 7.6 cm (3 in) NS-3 Bottom: 25.4 cm (10 in) steel	2 milliSievert/hr (200 mrem/hr)
General Nuclear Systems, Inc.	CASTOR V21	Cast Iron, S.S., Polyethylene Rods	Radial: 30.5 cm (12 in) Bottom: 27.9 cm (11 in) Top: 39.1 cm (15.4 in) Rods Radial: 72-6.1 cm (2.4 in) Diameter	2 milliSievert/hr (200 mrem/hr)
VECTRA	NUHOMS 7P , 24P, and 52B	Concrete, S.S.	Side: 45.7/60.1 cm (18/24 in) Rear: 60.1 cm (24 in) Roof: 91.4 cm (36 in)	2 milliSievert/hr (200 mrem/hr) (at air inlet)
Sierra Nuclear Corporation	Ventilated Storage Cask-24	Concrete RX-277, Hydrogenated Concrete, C.S.	Radial: Steel & Concrete Top: RX-277 & Steel Bottom: Steel & Concrete	Side: 0.20 milliSievert/hr (20 mrem/hr) Top: 0.50 milliSievert/hr (50 mrem/hr) Air Inlet or Outlet: 1 milliSievert/hr (100 mrem/hr)
FW/GEC	MDV	Concrete	106.7 cm (42 in)	0.21 milliSievert/hr (21 mrem/hr)

NA = Not Available; C.S. = Carbon Steel; Pb = Lead; S.S. = Stainless Steel; NS-3 = Concrete; NS4FR = Special Fire-Resistant Castable Resin; RX-277 = Special Concrete with Extra Hydrogen; FW/GEC = Foster Wheeler/GEC Alsthom Engineering Systems, Ltd. (United Kingdom); MDV = Modular Dry Vault

[a] *These are limits established for commercial spent nuclear fuel assemblies. The dose rate expected from storage of foreign research reactor spent nuclear fuel is likely to be lower.*

concrete. The SILO's thermal design is acceptable only because it is limited to a much smaller total decay heat power than the air passage concrete casks.

Since a passive design is an underlying requirement of all dry concrete cask designs, the total airflow path from the cask air inlet to its outlet must include a sufficient elevation change to ensure natural convection airflow under all expected meteorological and heat load conditions.

The heat transfer from the canister follows two parallel paths: (1) convection from the surface of the canister to the naturally-induced airflow through the canister cavity, and (2) radiation and conduction heat transfer from the canister across the air in the cavity to the concrete shield and then conduction through the

concrete shield wall thickness to the ambient air outside the concrete. Natural convection air heat removal is greater than the radiation and conduction through the air layer and concrete shield.

The heat transfer design of the concrete cask is vulnerable to accidents in which significant blockage of the air inlets and/or outlets restricts or prevents sufficient airflow into the canister cavity. Multiple inlets and outlets at different, and sometimes diametrically opposed, locations around the cask are used to reduce the likelihood of such an accident. Conservative adiabatic heatup analyses for these designs with commercial spent nuclear fuel have shown that temperature limits are not approached in more than 24 hours, even if the airflow inlets and outlets are completely blocked. Therefore, concrete cask sites have included a daily visual surveillance frequency for inspection of air inlets and outlets to ensure that they are not blocked. The adiabatic heatup for foreign research reactor spent nuclear fuel and its concomitant surveillance frequency may be different.

The concrete cask thermal design also requires more complex analyses for temperature distribution in both the fuel and the concrete due to the complex multidimensional and combined conduction-radiation-convection modes of heat transfer. An important thermal design issue for the concrete casks is proof that natural convection buoyancy-driven airflow will be induced through the inlet-cavity-outlet path under the entire range of expected wind and decay heat conditions, including the possibility of partial blockage that may be obscured from outside visual inspections. Unlike metal casks, which only have the fuel cladding temperature as a thermal limit, concrete casks are also limited by both the absolute magnitude and gradients of temperature within the concrete.

The concrete vault storage building represents a larger version of the concrete cask design in the realm of heat transfer. An array of vertically or horizontally oriented metal canisters enclosing spent nuclear fuel is surrounded by a concrete building with labyrinth air inlet and outlet passages. With the exception of size, this design utilizes the same modes of heat transfer as the concrete cask. Its inherently larger flow areas for inlets and outlets and typically larger elevation from inlet to outlet provide a greater natural convection airflow and reduce vulnerability to airflow passage blockage.

Specific Thermal Features

Thermal design performance parameters of specific manufacturers' dry storage technologies are presented in Table F-5. This table shows that all dry spent nuclear fuel storage technologies use radiation and conduction as heat transfer mechanisms, and that concrete-based systems also rely on internal air passage natural convection heat transfer. All the systems have fuel cladding temperature limits, but systems relying on concrete also have concrete temperature limits.

Pool storage systems utilize an active cooling system with pumps and heat exchangers that remove decay heat transferred to the pool water from stored fuel via conduction and natural convection. The relatively large mass and heat capacity of the pool water provide a significant margin of time before the pool water reaches its boiling temperature in the event of a cooling system failure.

The RISO National Laboratory's inground concrete block design relies on forced air convection heat transfer from the existing handling bay ventilation system, which includes High Efficiency Particulate Air filters and an air humidity monitoring system. Forced-air heat removal is accomplished by directing the heating, ventilation, and air conditioning air around the stored fuel, and then out through separate tubes embedded in the concrete. Like the pool, the RISO National Laboratory's system relies on active heat removal systems.

The Atomic Energy of Canada, Ltd., SILO is an exception to the previously discussed concrete cask designs because it relies solely on conduction through a solid concrete structure for decay heat removal,

Table F-5 Comparison of Thermal Design Parameters for Spent Nuclear Fuel Dry Storage Systems Currently Licensed in the United States

Manufacturer	*Model*	*Design Heat Load (KW)*	*Thermal Limits[a] (°C)*	*Heat Transfer Mode(s)[b]*
Nuclear Assurance Corp.	S/T	26	NA	Conduction, Radiation
	S/TC	22	NA	Conduction, Radiation
Transnuclear, Inc.	TN 24	24	149 - Resin	Conduction, Radiation
	TN 40		NA	Conduction, Radiation
Westinghouse Electric Corp.	MC-10	13.5	340 - LWR Cladding	Conduction, Radiation
GNSI	CASTOR V21	21	370 - LWR Cladding	Conduction, Radiation
VECTRA	NUHOMS 7P and 24P	24	340 - Fuel Clad Normal 570 - Fuel Clad Accident	Conduction, Radiation, Natural Convection
	Standardized 24P and 52B	24 and 19	225 - Concrete Accident 177 - Concrete Normal 578 - Fuel Clad Accident 378 - Fuel Clad Normal	Conduction, Radiation, Natural Convection
Sierra Nuclear Corporation	Ventilated Storage Cask-24	24	93 - Concrete Normal 177 - Concrete Accident 570 - Fuel Clad Accident 378 - Fuel Clad Normal	Conduction, Radiation, Natural Convection
FW/GEC	Modular Dry Vault	0.15 per HTGR[c] Canister	399 - for Fort St. Vrain Type Fuel	Conduction, Radiation, Natural Convection

NA = Not Available; LWR = Light Water Reactor; FW/GEC = Foster Wheeler/GEC Alsthom Engineering Systems, Ltd. (United Kingdom); GNSI = General Nuclear Systems, Inc.

[a] *Fuel Limits are for Commercial Light Water Reactor Zircaloy Clad Fuel Type or for HTGR fuel.*

[b] *Heat transfer modes are for commercial spent nuclear fuel.*

[c] *HTGR= High Temperature Gas Reactor Type Fuel from Fort St. Vrain.*

without internal natural convection airflow around the canister. The SILO can maintain acceptable concrete and fuel cladding temperatures without internal airflow passages by limiting its contained total fuel heat load to about 4 kilowatts, as compared to the 24 kilowatts typical of other concrete casks with airflow passages. This lower heat load may not be limiting for the storage of foreign research reactor spent nuclear fuel since it does not produce decay heat as high as that for commercial nuclear power plant fuel for the same decay time.

F.1.1.2.3 Criticality Prevention Design of Spent Nuclear Fuel Storage Technology

A self-sustaining nuclear fission process is called criticality. Unlike the previously discussed thermal and shielding designs, criticality prevention design for spent nuclear fuel storage facilities does not rely on materials outside of the fuel storage basket or canister. Instead, the canister interior fuel support structure and fuel specifications for storage are the determining factors in criticality control.

Spent nuclear fuel storage facilities are shown to meet specific regulatory subcriticality requirements by conservative criticality analyses. These analyses conservatively assume that the spent nuclear fuel has its original enrichment of fissile material [e.g., fresh unirradiated fuel weight percent uranium-235 (^{235}U)]. In reality, the fuel has been irradiated and the initial concentration of fissile material is reduced from its original value through fission reactions producing numerous fission products.

Suitable criteria for establishing nuclear criticality safety have been documented (ANSI, 1984b, 1983, and 1975b). These documents deal specifically with, respectively, the storage of commercial spent nuclear fuel outside of the reactor and in dry storage installations.

Another conservative aspect of these criticality analyses is the requirement that a sensitivity study be performed that varies the water concentration within the canister free volume from no water to 100 percent water, to optimize moderation density. These analyses usually show that the most reactive (i.e., closest to critical conditions) configuration occurs with a water density less than that equivalent to a fully flooded canister (related to enrichment).

The criticality analyses explicitly model the fuel geometry, all materials present in the fuel, and the structural spacer design within the canister. Center-to-center distance for the fuel in the canister is another important parameter in determining the reactivity of the stored fuel.

In summary, the criticality prevention design of spent nuclear fuel storage facilities ensures that each canister will remain subcritical throughout the entire operation, during both incident-free and accident conditions. The criticality prevention design incorporates the following features:

- fuel specifications, including type of fuel, maximum initial fresh fuel ^{235}U enrichment, and number of fuel assemblies to be stored in a single canister,
- fuel assembly spacing inside the canister as set by the presence of structural support and spacing members, and
- the presence and composition of any neutron absorbing material between adjacent fuel assemblies inside the canister.

F.1.1.2.4 Current NRC-Licensed, Dry Storage Technologies for Commercial Spent Nuclear Fuel

The technologies discussed in this section are described in terms of their use for storage of commercial spent nuclear fuel. Foreign research reactor spent nuclear fuel storage design parameters will be different for each technology.

F.1.1.2.4.1 Nuclear Assurance Corporation S/T, NAC-C28 S/T, NAC-I28

Description of Nuclear Assurance Corporation S/T, NAC-C28 S/T and NAC-I28

Two of the Nuclear Assurance Corporation metal casks for the storage of spent nuclear fuel are in use at the Surry Nuclear Power Plant in Virginia. The Nuclear Assurance Corporation S/T design uses a combination of stainless steel and lead for gamma shielding and NS4FR, which is a fire-resistant castable resin, for neutron shielding (NRC, 1988a). To ensure a surface contact dose rate of less than 100 mrem/hr, 20.3 cm (8 in) of stainless steel and lead and 17.8 cm (7 in) of NS4FR are used in the cylindrical wall, while the top and bottom shields are composed of 7.6 cm (3 in) of NS4FR and about 12 cm (5 in) of steel and lead. Total weight of the loaded cask is either 91 metric tons (100 tons) for 26 intact Pressurized Water Reactor fuel assemblies, or 112 metric tons (124 tons), which is just under the 125-ton limit of many loading cranes for the 56 consolidated fuel assembly model. The Nuclear Assurance Corporation S/T models have been licensed by the NRC. The Nuclear Assurance Corporation S/T is shown in Figure F-2.

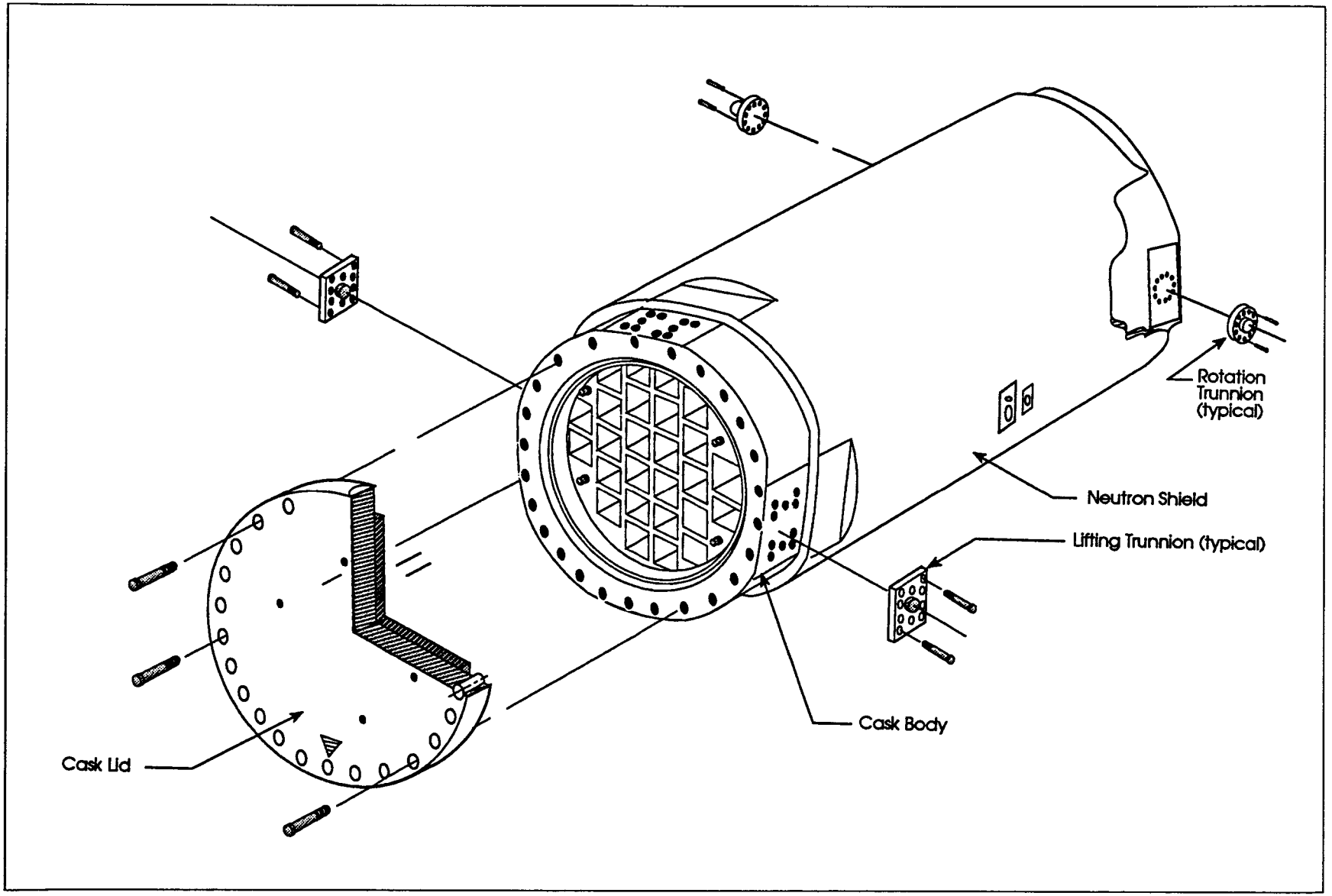


Figure F-2 Nuclear Assurance Corporation Spent Nuclear Fuel Storage Cask Body NAC S/T

NRC Certification or Basis for License

The NRC has granted a Certificate of Compliance to Model Nuclear Assurance Corporation S/T (Certificate Number 1002). Nuclear Assurance Corporation Model NAC-C28 S/T is also certified with Certificate Number 1003. The basis for these certificates is 10 CFR 72 Subparts K and L. Nuclear Assurance Corporation model NAC-I28 is currently licensed on a site-specific basis at Surry Nuclear Power Plant based on 10 CFR 72 Subparts A through I.

F.1.1.2.4.2 General Nuclear Systems, Inc. CASTOR V/21

Description of General Nuclear Systems, Inc. CASTOR V/21

In the United States, the General Nuclear Systems, Inc. CASTOR V/21 has been approved by the NRC and is in use at the Surry Nuclear Power Plant. This design relies on thick ductile cast iron and polyethylene as both its gamma and neutron shields. Ductile cast iron contains significant quantities of nodular graphite, which is essentially carbon, a good neutron shield. Polyethylene is a form of plastic that is high in hydrogen. The ductile cast iron shield is 30.5 cm (12 in) thick. Additional neutron shielding is provided by seventy-two 6.1 cm (2.4 in) diameter polyethylene rods placed in axial holes in the cast iron wall. The top lid shielding is 39.1 cm (15.4 in) of stainless steel, and the bottom lid shielding is 27.9 cm (11 in) of ductile cast iron. The V/21, holding 21 Pressurized Water Reactor fuel assemblies at Surry, weighs 96 metric tons (106 tons) fully loaded. A sketch of the CASTOR V/21 is presented in Figure F-3. The shielding design basis is for a surface contact dose rate less than 200 mrem/hr. There is a wide range of CASTOR designs for a variety of fuel types, including test reactor fuel. A conceptual design [CASTOR Material Test Reactor (MTR) 2] for a dual-purpose, transport/storage cask for research reactor fuel has been developed. This cask uses the same basic ductile cast iron body for shielding.

NRC Certification or Basis for License

The NRC has granted Certificate of Compliance Number 1000 for the General Nuclear Systems, Inc. model CASTOR V/21 under the terms of 10 CFR 72 Subparts L and K (Models X/28 and X/33 are not currently licensed, but are being reviewed by the NRC).

F.1.1.2.4.3 Westinghouse Electric Corporation MC-10

Description of Westinghouse Electric Corporation MC-10

The Westinghouse Electric Corporation MC-10 metal cask has been approved by the NRC and is in use at the Surry Nuclear Power Plant site (NRC, 1987). This cask design utilizes thick carbon steel and BISCO NS-3 hydrogenated concrete for shielding. The NS-3 provides neutron shielding, while the carbon steel is used for gamma shielding. Total radial neutron and gamma shielding is approximately 33 cm (13 in), while axial shielding is about 25.4 cm (10 in). The design surface contact dose rate is 200 mrem/hr, which bounds the actual vendor-calculated maximum surface contact dose rates of 7, 38, and 57 mrem/hr at the top, side, and bottom of the cask. The MC-10 was designed to hold 24 Pressurized Water Reactor fuel assemblies and weighs 103 metric tons (113.3 tons) fully loaded.

NRC Certification or Basis for License

The NRC has issued Certificate of Compliance Number 1001 for the metal cask model MC-10 in accordance with the terms of 10 CFR 72 Subparts L and K.

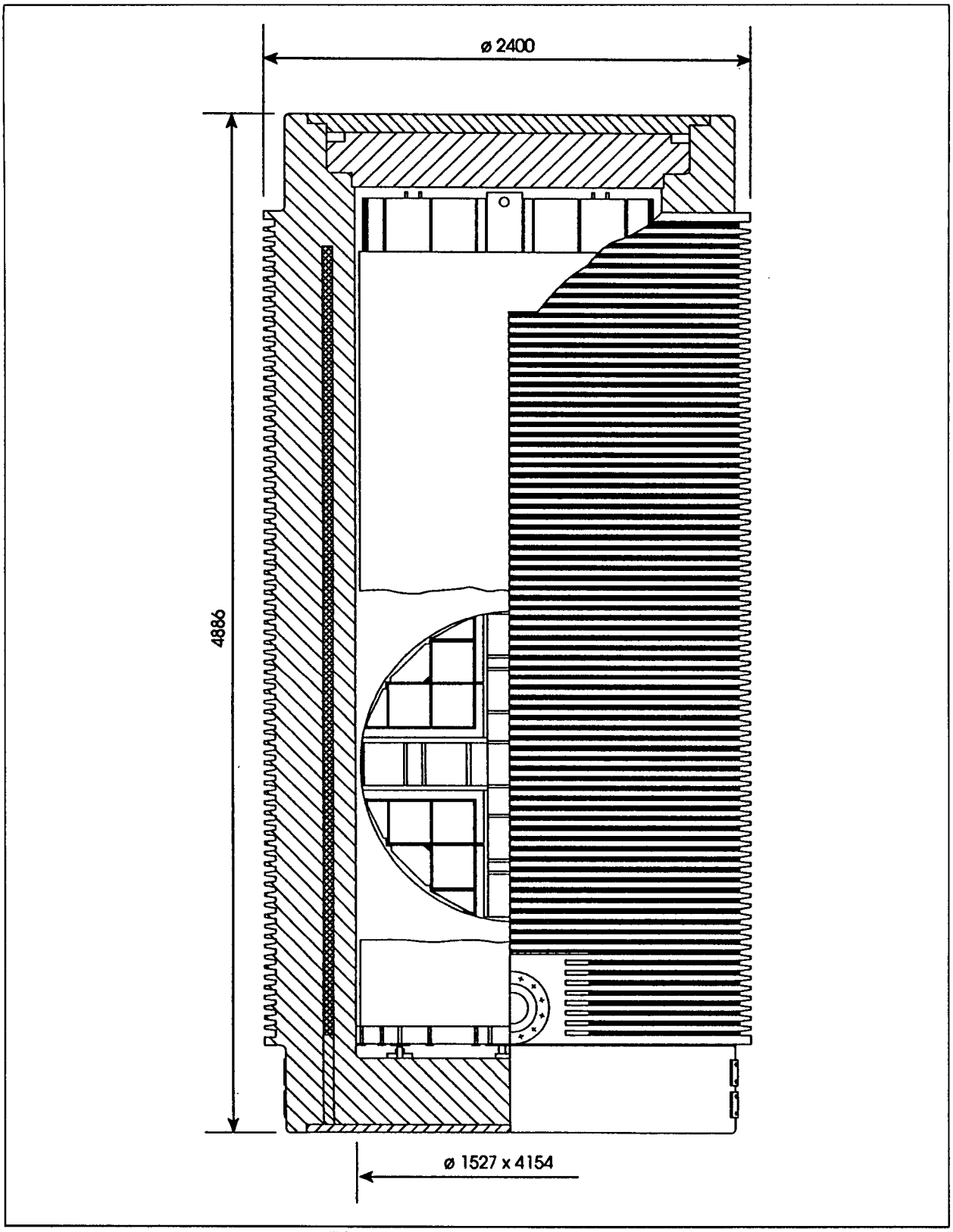


Figure F-3 The CASTOR V/21

F.1.1.2.4.4 Transnuclear, Inc. TN-24 and TN-40

Description of Transnuclear, Inc. TN-24, TN-40

The Transnuclear, Inc. design has been developed and produced for a large number of storage and transportation systems for radioactive materials, including spent nuclear fuel. The TN-24 and TN-40 models store 24 and 40 spent Pressurized Water Reactor fuel assemblies, respectively. TN systems feature metal casks for both transportation and storage of spent fuel. The TN-24 is an NRC-licensed storage cask that uses carbon steel for gamma shielding and a borated resin for neutron shielding (NRC, 1989). The TN-40 is a newer model that uses a two-metal shell design, with the inner shell consisting of high quality carbon steel for containment and the outer shell providing shielding and heat transfer, but of a lower quality steel. For the two models, top and side contact dose rate limits are less than 100 mrem per hour, but the bottom of the cask may have a contact dose rate limit as high as 1,275 mrem/hr. It should be noted that the normal configuration for these casks is to be standing upright on their bottoms, thereby precluding exposure to this relatively higher dose rate. A sketch of a Transnuclear, Inc. TN cask is shown in Figure F-4.

NRC Certification or Basis for License

The TN-24 model has been issued NRC Certificate of Compliance Number 1005 and is licensed according to 10 CFR 72 Subparts L and K. The TN-40 model is licensed on a site-specific basis at the Prairie Island Nuclear Power Plant in Minnesota (owned by Northern States Power) under the provisions of 10 CFR 72 Subparts A through I. The Transnuclear, Inc. Model TN-32 is not yet approved.

F.1.1.2.4.5 VECTRA Design NUHOMS-7P, -24P, and -52B

Description of VECTRA NUHOMS-7P, -24P, and -52B

VECTRA's NUHOMS designs utilize a horizontal concrete dry storage system for spent nuclear fuel (NUTECH, 1988). The NUHOMS-7P and NUHOMS-24P designs have been approved by the NRC for Pressurized Water Reactor spent nuclear fuel and are in use at the Robinson, Oconee, and Calvert Cliffs Nuclear Power Plant sites. The NRC approved the use of NUHOMS-52B for the Brunswick power plant, but the utility shipped this spent nuclear fuel to its Robinson plant. The NUHOMS design uses concrete as both gamma and neutron shielding. The requirement for internal air passages to allow natural convection heat removal from the metal storage canister placed within the concrete structure required 90 degree bends in the concrete shield for air passages to avoid radiation streaming and more detailed shielding analyses. The reinforced side wall concrete shield thickness is 45.7 or 61 cm (18 or 24 in) depending on location in the array, while the rear wall is 61 cm (24 in) thick and the roof is 91.4 cm (36 in) thick. The maximum surface contact dose rate limit at the air inlet is 200 mrem/hr. A sketch of the NUHOMS-24P system is shown in Figure F-5.

NRC Certification or Basis for License

NUHOMS models 7P and 24P are licensed at specific sites under the provisions of 10 CFR 72. Vectra has also received a license from the NRC for their standardized NUHOMS-24P and -52B models for use by the light water reactor utilities.

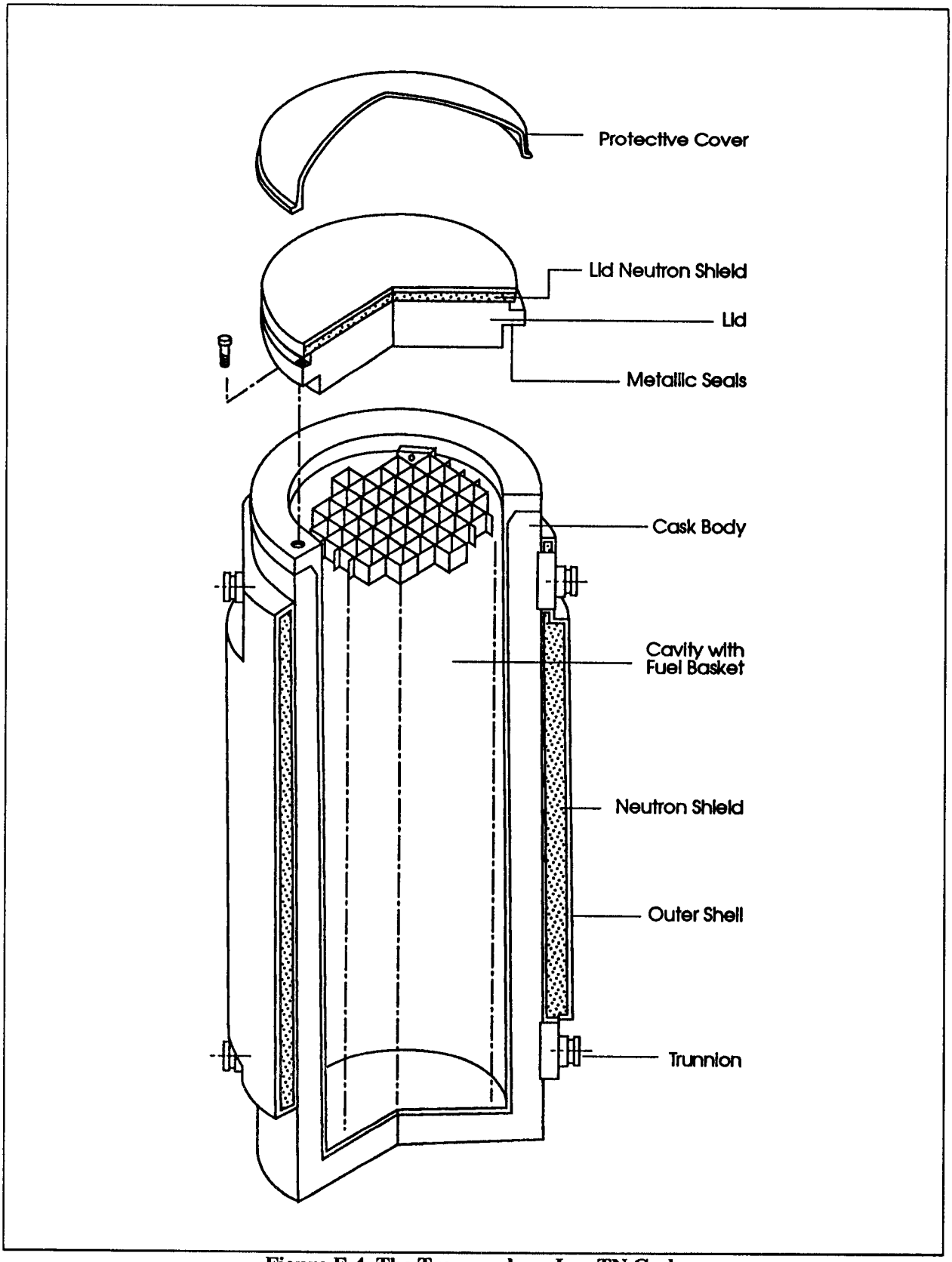


Figure F-4 The Transnuclear, Inc. TN Cask

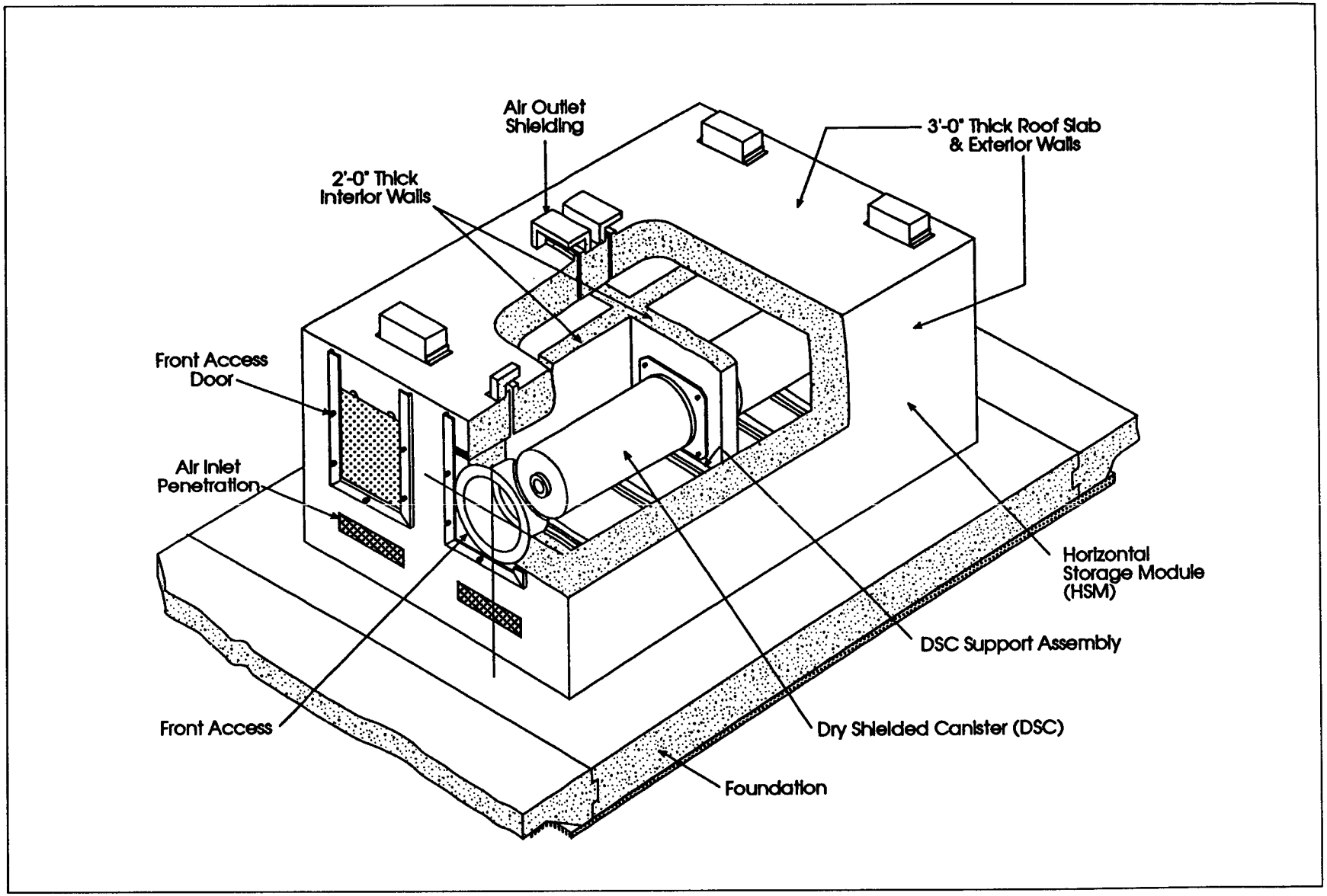


Figure F-5 The NUHOMS-24P Horizontal Storage Module Components

F.1.1.2.4.6 Modular Dry Vault

Description of Modular Dry Vault

The modular dry vault spent nuclear fuel storage system [designed by Foster Wheeler/GEC Alsthom Engineering Systems, Ltd. (United Kingdom)] is the only vault system in the United States that has been approved by the NRC and is in operation at the Fort St. Vrain nuclear power plant site. The modular dry vault places spent nuclear fuel in vertically oriented cylindrical steel fuel storage containers which are then inserted into a steel charge face structure within the thick concrete structure. A labyrinth airflow passage system provides natural convection airflow for decay heat removal. The shielding is provided by the 106.7 cm (42 in) thick concrete walls and the labyrinth airflow passages. For the Fort St. Vrain fuel, maximum design modular dry vault surface dose rate is 21 mrem/hr. A picture of the cross section of the modular dry vault is shown in Figure F-6.

NRC Certification or Basis for License

The modular dry vault model has been approved by the NRC for the site-specific application at Fort St. Vrain. The basis for the license is 10 CFR 72.

F.1.1.2.4.7 Ventilated Storage Cask System (VSC-24)

Description of VSC-24

The Ventilated Storage Cask, designed by Sierra Nuclear Corporation, is a vertical concrete cask design that has been approved by the NRC and is in use at the Palisades nuclear power plant site. As with the NUHOMS design, this system relies on concrete for both neutron and gamma shielding and incorporates internal airflow passages requiring detailed shielding analyses to demonstrate acceptable streaming doses. The Ventilated Storage Cask design dose rates are 20 mrem/hr side contact and 50 mrem/hr top contact. A sketch of the Ventilated Storage Cask is shown in Figure F-7.

NRC Certification or Basis for License

The Sierra Nuclear Corporation's Model VSC-24 has been granted Certificate of Compliance Number 1004 by the NRC. The basis for this certificate is 10 CFR 72 Subparts L and K.

F.1.1.2.5 Manufacturers of Commercial Nuclear Fuel Dry Storage Systems Not Currently Licensed by the NRC in the United States

In addition to the above examples of dry cask storage systems licensed in the United States, there are other systems either licensed outside the United States or in the design and/or licensing stage (Table F-6). Tables F-7 and F-8 show shielding and thermal related parameters of the various dry cask models that are not currently licensed in the United States.

F.1.1.2.5.1 Description of MACSTOR

The MACSTOR system (designed by Atomic Energy of Canada, Ltd. and Transnuclear, Inc.), representing a synthesis of both metal and concrete casks in a modular dry vault, is being reviewed for use in Canada (AECLT, 1994). Spent nuclear fuel is placed in 0.95 cm (0.375 in) thick carbon steel canisters or baskets that are then placed (in a vertical position) in concrete modules. Air labyrinth passages into and

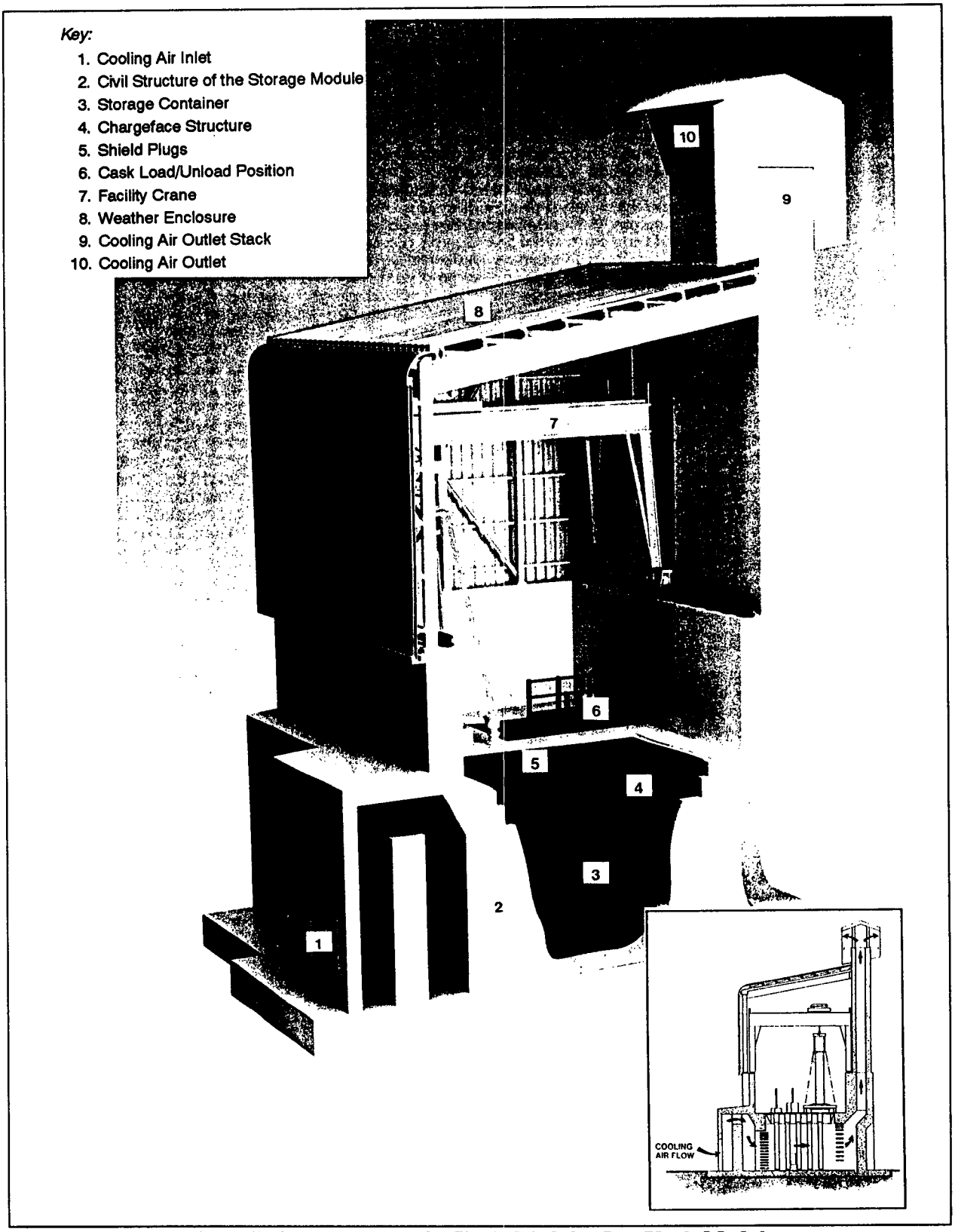


Figure F-6 Photograph of a Single Modular Dry Vault Module

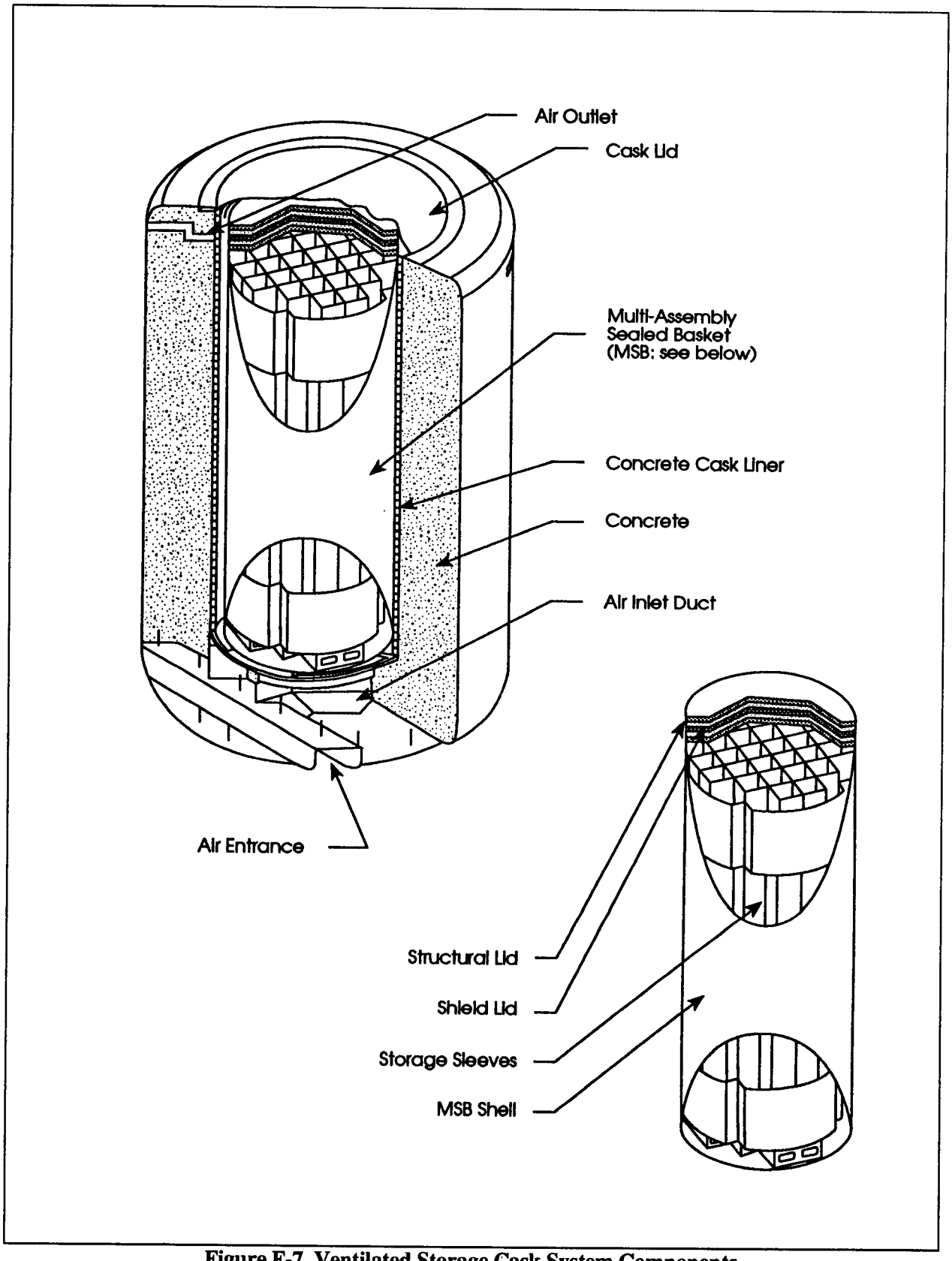


Figure F-7 Ventilated Storage Cask System Components

Table F-6 Manufacturers of Dry Storage Systems Not Currently Licensed in the United States

Manufacturer	*Facility or Model*	*Location or Status*
General Nuclear Systems, Inc. of Ontario Hydro	HDC	Canada
Atomic Energy of Canada, Ltd./Transnuclear Inc.	MACSTOR	Canada
Siemens Power Corporation	FUELSTOR	Germany
RISO National Laboratory	DR3	Denmark
Atomic Energy of Canada, Ltd.	SILO, Canister	Canada
Nuclear Assurance Corporation	NAC-26	10 CFR 72 License Pending
General Nuclear Systems, Inc.	X28 and X33	10 CFR 72 License Pending
Transnuclear, Inc.	TN-32	10 CFR 72 License Pending

FUELSTOR = Fuel Encapsulation and Lag Storage

Table F-7 Comparison of Shield Design Parameters for Spent Nuclear Fuel Dry Storage Systems Not Currently Licensed in the United States

Manufacturer	*Model*	*Shield Material*	*Shield Thickness in cm (in)*	*Design Limit Surface Dose Rate milliSievert/hr (mrem/hr)*
GNSI/OH	HDC-36	High Density Carbon Steel, Concrete	2.5 (1) CS, 45.7 (18) High-Density Concrete	NA
Siemens Power Corporation	FUELSTOR	Concrete	304.8 (120)	0.00001 (0.001)
Transnuclear/Atomic Energy of Canada Ltd.	MACSTOR	Concrete	96.5 (38)	0.025 (2.5)
RISO National Laboratory	DR3	Carbon Steel, Concrete, Earth	76.2 (30) Carbon Steel, Axial 15.2 (6) Concrete, Radial	NA
Atomic Energy of Canada Ltd.	SILO	Concrete	91.4 (36) Concrete	0.025 (2.5)
Atomic Energy of Canada Ltd.	CANSTOR	Concrete	NA	NA
Transnuclear	TN-32	Borated Resin Carbon Steel	Radial: 21.6 (8.5) 11.4 (4.5) Resin Bottom: 22.2 (8.75) Carbon Steel Top: 15.9 (6.25) Cast Iron	Side: 0.86 (86) Top: 0.18 (18) Bottom: 3.15 (315)
General Nuclear Systems, Inc.	CASTOR X28 and X33	Cast Iron, Stainless Steel Polyethylene Rods	Radial: 30.5 (12) Bottom: 27.9 (11) Top: 39.1 (15.4) Rods Radial: 72- 6.1 (2.4) Dia.	2 (200)

NA = Not Available; FUELSTOR = Fuel Encapsulation and Lag Storage ; GNSI/OH = General Nuclear Systems, Inc. of Ontario Hydro; Transnuclear = Transnuclear, Inc.

out of the module provide a flow path for natural convection airflow to remove decay heat. The vault concrete walls are 96.5 cm (38 in) thick and designed to reduce dose rates to less than 2.5 mrem/hr on contact. This concrete thickness is maintained even where the airflow passage labyrinth is located. A cross section of the MACSTOR is given in Figure F-8.

F.1.1.2.5.2 Description of a Fuel Encapsulation and Lag Storage Facility

The Fuel Encapsulation and Lag Storage system is similar to the modular dry vault and MACSTOR/CANSTOR in that it is a stand-alone concrete building with interior steel storage containers. Unlike the modular dry vault and CANSTOR/MACSTOR, the Fuel Encapsulation and Lag Storage system

Table F-8 Comparison of Thermal Design Parameters for Spent Nuclear Fuel Dry Storage Systems Not Currently Licensed in the United States

Manufacturer	*Model*	*Design Heat Load (KW)*	*Thermal Limits (°C)*	*Heat Transfer Mode(s)*
GNSI/OH	HDC	---	---	Conduction, Radiation
Siemens Power Corporation	FUELSTOR	Up to 2 KW Per Canister	380/2 KW 250-1KW-Clad	Conduction, Radiation, Natural Convection
Transnuclear Inc./Atomic Energy of Canada Ltd.	MACSTOR CANSTOR	240 (20 Canisters at 12 each)	93 Concrete 340 LWR Clad	Conduction, Radiation
RISO National Laboratory	DR3	---	NA	Conduction, Radiation, Forced Convection
Atomic Energy of Canada Ltd.	SILO	4	NA	Convection
Transnuclear Inc.	TN-32	---	NA	Conduction, Radiation
General Nuclear Systems, Inc.	CASTOR X28 and X33	19.2 and 20.9	370 LWR Cladding	Conduction, Radiation

NA = Not Available; LWR = Light Water Reactor; FUELSTOR = Fuel Encapsulation and Lag Storage; GNSI/OH = General Nuclear Systems, Inc. of Ontario Hydro

stores spent nuclear fuel containers in a horizontal position. The Fuel Encapsulation and Lag Storage system is designed for a surface contact dose rate of 0.001 mrem/hr, and relies on its combined 304.8 cm (120 in) thick inner and outer shield concrete walls and labyrinth airflow passages for shielding. The Fuel Encapsulation and Lag Storage system is not licensed by the NRC or in use in the United States A cross section of the Fuel Encapsulation and Lag Storage system is shown in Figure F-9.

F.1.1.2.5.3 Description of a RISO National Laboratory Facility

In Denmark, the RISO National Laboratory has designed and constructed a dry storage facility at its DR3 PLUTO type research reactor to store MTR spent nuclear fuel from this reactor. This facility was installed under the floor of the active handling bay at the reactor and consists of four prefabricated octagonal concrete blocks placed in a vertical position into steel lined holes in the earth. Each block contains 12 storage holes in a triangular mesh, with a carbon steel form forming each hole and a separate stainless steel tube containing the spent nuclear fuel. Axial shielding is provided by a 76.2 cm (30 in) thick carbon steel plug. Radial shielding is provided by the surrounding earth and concrete of the octagonal block with the minimum concrete thickness of 15.2 cm (6 in). A sketch of the RISO National Laboratory's design is shown in Figure F-10.

F.1.1.2.5.4 Description of SILO

The SILO has been designed and licensed in Canada, and over 180 concrete SILOs have been built for the storage of Canadian research reactor and CANDU-commercial reactor spent fuel (AECLT, 1994). The SILO consists of a carbon steel-lined cylindrical hole inside a 91.4 cm (36 in) thick vertical concrete cylinder without any labyrinth airflow passage for heat removal. Carbon or stainless steel canisters containing the spent nuclear fuel are placed inside the SILO and stacked up to nine high before being covered by a steel and concrete plug. The surface SILO dose rate limit is 2.5 mrem/hr. The unique design aspect of the SILO is that it is the only concrete cask without airflow passages for natural convection heat removal. It has been used for short-length low decay heat fuel which is dimensionally similar to foreign

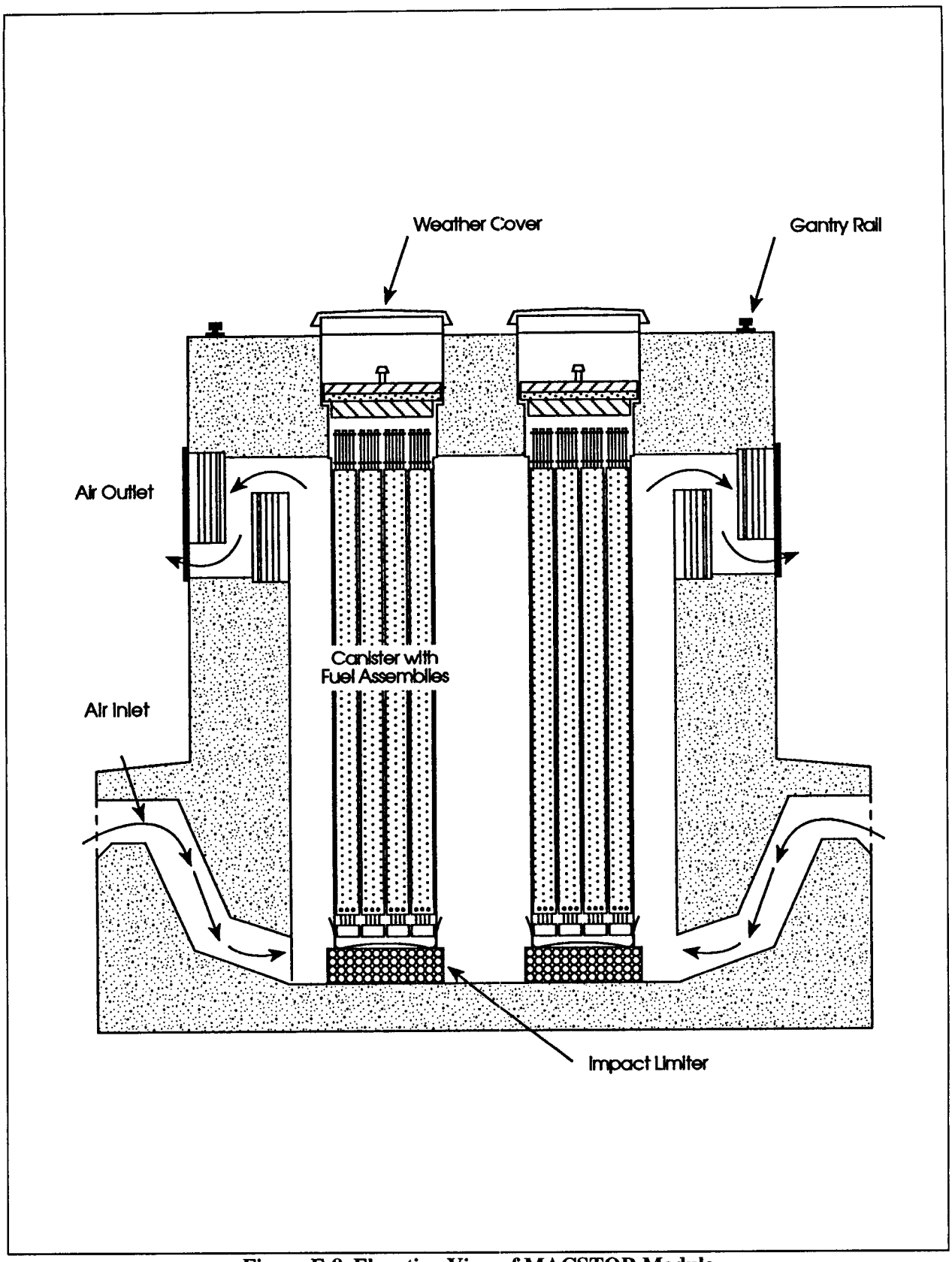


Figure F-8 Elevation View of MACSTOR Module

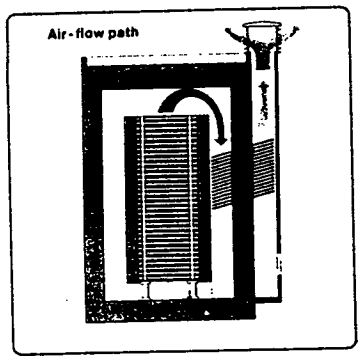
FUELSTOR

FUEL ENCAPSULATION AND LAG STORAGE FACILITY

For at-reactor dry storage of spent fuel

Main technical features:

- Closed-cycle vault resulting in triple barrier system
- Passive cooling by natural convection ensuring low fuel temperatures
- Low initial storage temperature resulting in no restrictions regarding the length of the storage period
- Sealed canister storage
- Horizontal placement of helium-filled canisters in storage vault
- Reinforced concrete construction for safe shielding resulting in radiation levels outside the building below permissible dose of unrestricted area (ALARA)
- Reinforced concrete construction to withstand the effects of natural phenomena and man-induced events such as earthquakes, tornado missiles and aircraft crashes
- Nuclear criticality safety is ensured by the building design as well as spent fuel canister arrangement
- Store is easily expandable by modules
- Low land consumption due to compact spent fuel storage
- Nuclear safeguard provisions



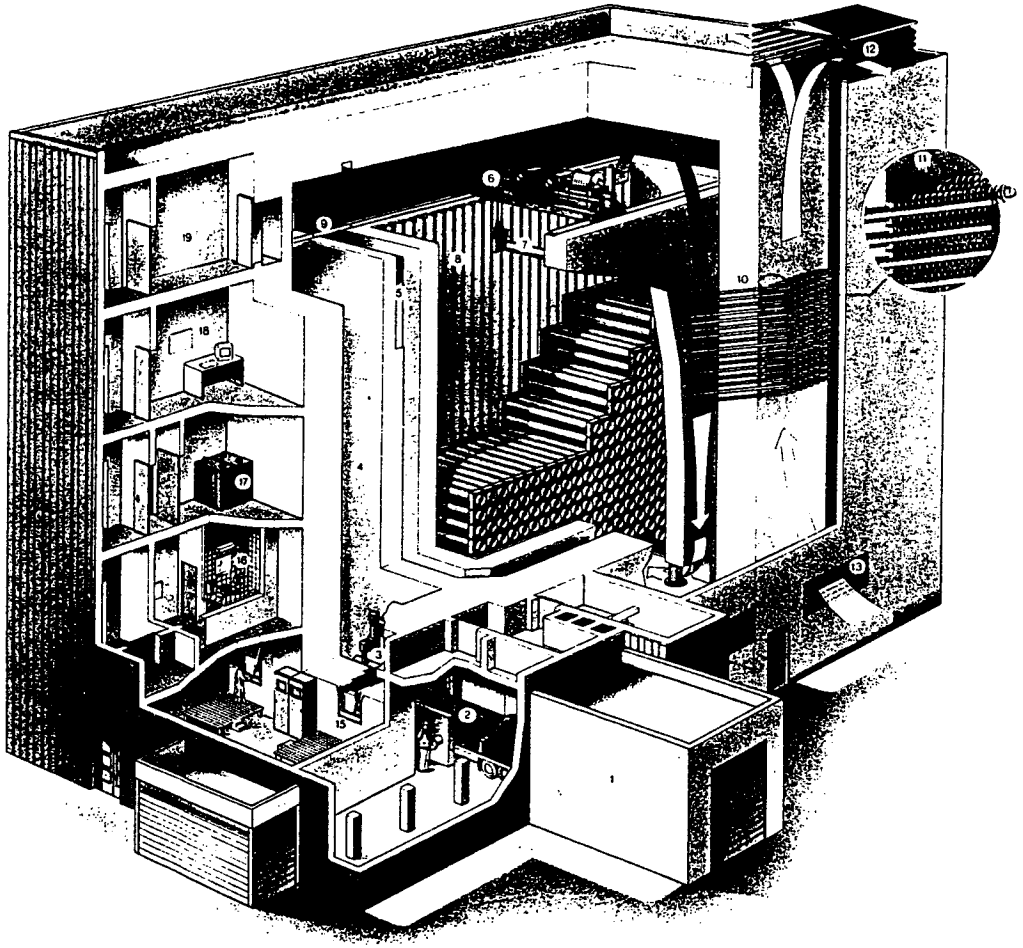


Figure F-9 Fuel Encapsulation and Lag Storage System Cross Section

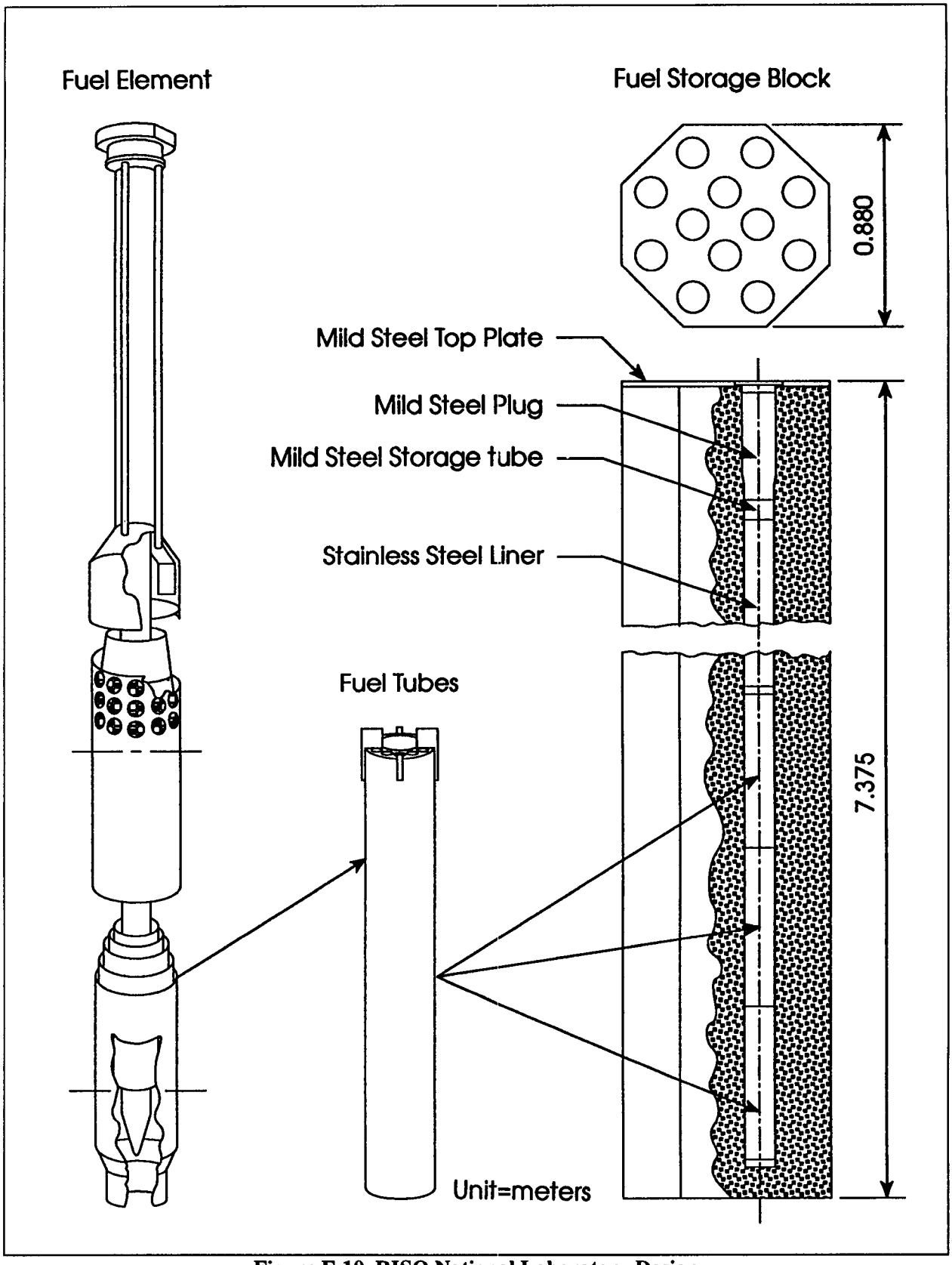


Figure F-10 RISO National Laboratory Design

research reactor spent nuclear fuel. The SILO has been licensed in Canada and is currently undergoing license approval in South Korea, which uses the same regulations as the NRC. A sketch of the SILO is given in Figure F-11.

F.1.1.2.5.5 Dual-Purpose Cask and Canister Systems

Dual-purpose designs must satisfy NRC requirements for both storage and transportation (10 CFR Parts 72 and 71, respectively). It is believed that such dual-purpose designs would reduce incident-free handling of individual spent nuclear fuel assemblies, reduce the volume of low-level radioactive waste that would otherwise be generated from using a single-purpose cask system (one cask for storage with subsequent transfer of individual assemblies to transport casks and disposal packages), and may play a role in reducing overall worker radiation exposures over a single-purpose cask system.

At the present time, there are two dual-purpose casks for light water reactor fuel use: Nuclear Assurance Corporation's Storage/Transport Cask and Vectra's dual-purpose canister system (MP-187). Nuclear Assurance Corporation's Storage/Transport Cask has received NRC approval. The NRC is expected to approve Vectra's MP-187 in the near future.

The VECTRA MP-187 is a derivative of a design approved earlier by the NRC. The MP-187 design includes a stainless steel confinement canister, a horizontal reinforced concrete module for storing the canister, and a special onsite/offsite transportation cask system that may also be used to store the canister in a vertical orientation. This system is currently being evaluated by the NRC for the Rancho Seco nuclear power plant. The applicant also has a variation for the canister design to accommodate canned spent nuclear fuel for damaged spent nuclear fuel assemblies, and which cannot be stored without a second confinement barrier.

DOE had proposed expanding the role of a dual-purpose system to that of a multi-purpose canister-based system (DOE, 1994f; DOE, 1994b; DOE, 1994c). Fuel would be loaded into a canister at the reactor site. The canister could then be placed into unique, specially designed overpacks for storage at the reactor site, transportation to a federal facility, or disposal in a repository. Final NRC approval for use of the multi-purpose canister as a component of the disposal package requires that the multi-purpose canister and its surrounding overpack meet 10 CFR Part 60 requirements. The fact that no site has been chosen yet for a repository adds an element of uncertainty to the third function: disposal. DOE has decided in November 1995 to withdraw its proposal to prepare the EIS for this canister. The Department of the Navy, however, will complete this EIS and will limit its scope to the storage and transport of Navy spent nuclear fuel.

F.1.2 Wet Storage Designs

In addition to the previous examples of dry storage technology, there are several types of wet storage systems currently in use at DOE sites and at commercial nuclear power facilities. These include aboveground pools (lined or unlined), inground pools (lined or unlined), and shutdown reactor vessels. For the purposes of this appendix, a pool refers to a canal or a basin.

Description of Wet Pool Spent Nuclear Fuel Storage Technology

The storage of spent nuclear fuel in pools (i.e., wet storage technology) has been in use for over 40 years (since the early water-cooled reactors began operating). The basic concept underlying wet storage is analogous to the development of light water-cooled nuclear reactors for defense, research, and electric power production purposes.

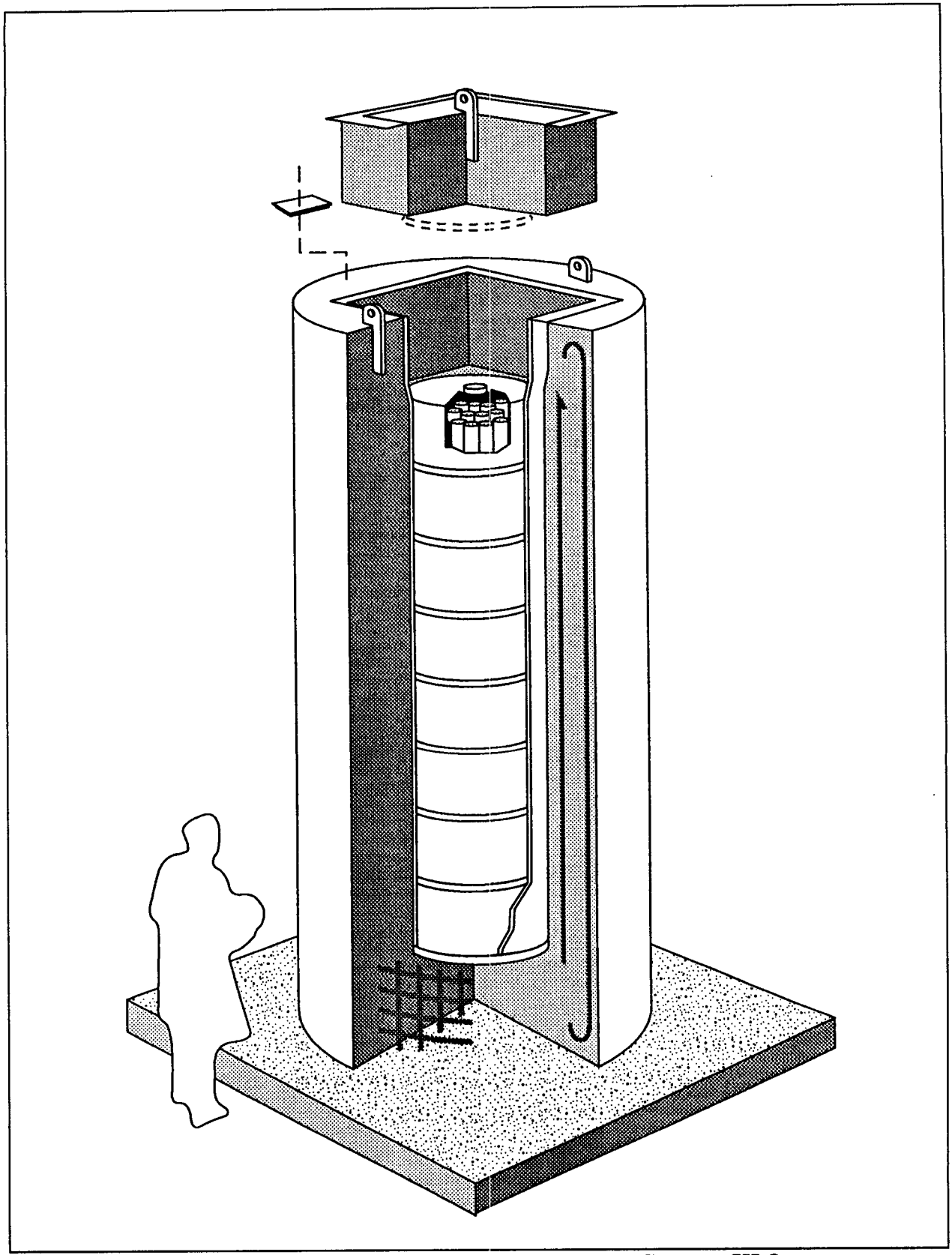


Figure F-11 The Atomic Energy of Canada, Ltd. Concrete SILO

In terms of spent nuclear fuel storage, water offers several distinct advantages, which can be summarized as:

- low cost for shielding and coolant medium,
- visual confirmation of fuel location and ease of handling,
- high heat capacity allowing for a large time period before thermal limits are exceeded,
- multi-purpose shield for both neutrons and gamma rays,
- inherent ability to retain many fission products which could leak from failed spent nuclear fuel, and
- insusceptibility to degradation from spent nuclear fuel radiation.

Water pool storage also has some shortcomings. These are:

- the need to maintain high purity water to prevent corrosion,
- the requirement for active safety systems connected to the water for heat removal, purity control, and water makeup,
- extensive lined and reinforced concrete walls for ensuring no leakage of water under all accident conditions,
- generation of radioactive waste from degraded fuel which is collected by the water purification systems, and
- groundwater monitoring to detect any leakage of radioactive pool water into the environment.

For every water-cooled reactor in the world, the decision has always been made to construct an adjoining or integral spent nuclear fuel storage pool. Currently, over 600 water cooled electric power-, research-, and defense-related reactors are operating in the world, each with its own wet storage pool for spent nuclear fuel (Nuclear Engineering International, 1993). Experience has shown that this technology is safe and effective.

At commercial nuclear power plants, the pool storage is located in a structure adjacent to a containment building that is capable of direct hydraulic connection to the reactor core through a system of canals, gates, and pools. The spent nuclear fuel pool building is designed and built to withstand all the accidents and dynamic loads required of other safety-related structures at nuclear power plants. It has its own crane and fuel handling equipment, and a separate heating, ventilation, and air conditioning system to mitigate radioactive releases to the environment. The nuclear power plant control room includes monitors and controls for the spent nuclear fuel pool. Redundant separate trains of equipment are used to fulfill the requirements of heat removal from the spent nuclear fuel pool water, removal of impurities and radioactive materials from the water, and maintenance of the water level to ensure adequate shielding above the spent nuclear fuel. At commercial power plants, such parameters as water level, water temperature, flow and temperature difference across heat exchangers used to cool the water, water purity, activity levels, and radiation dose rates are all monitored and measured.

All U.S. commercial nuclear power plant pools are stainless steel lined and use racks made of stainless steel to store spent nuclear fuel. Stainless steel is used to line the pool walls and floor to help maintain high water purity by preventing the release of chemicals from unlined concrete and to simplify decontamination at the end of the facility's life. The racks provide support and spacing for each fuel assembly, thus controlling criticality and maintaining fuel structural integrity.

Detailed criticality and thermal-hydraulic analyses are performed to demonstrate to the licensing authorities (the NRC in the United States) that fuel can never become critical, and that the assembly spacing in the racks allows for adequate cooling so as to prevent nucleate and bulk boiling in the pool or on any fuel surfaces. Shielding analyses substantiate the adequacy of the water depth above the fuel in the pool (usually at least 6.1 m or 20 ft), and the thickness of concrete pool walls and piping routing for systems connected to the pool water. This piping may contain pool water that is contaminated with radioisotopes released from spent nuclear fuel in the pool, and must be considered in dose rate evaluations. The shielding analyses provide assurances that the dose rate levels are acceptably low to workers around the spent nuclear fuel pool. Accident analyses are performed to show that the most conservative effects to the public of a postulated release of failed spent nuclear fuel fission products in the pool meet all regulatory dose rate limits.

One difference between nuclear power plant spent nuclear fuel wet storage and that which would be used for foreign research reactor spent nuclear fuel is that at nuclear plants, the pools include soluble boron in the water as a means of controlling criticality. Boron is a powerful neutron absorber, and as such prevents the approach to criticality since neutrons are needed to initiate and maintain a uranium fission chain reaction. Soluble boron would not be used in a wet storage facility for foreign research reactor spent nuclear fuel because it would corrode the aluminum cladding materials present in most foreign research reactor spent nuclear fuel. If neutron-absorbing materials were deemed desirable for foreign research reactor spent nuclear fuel wet storage, they could be incorporated as solid boron-aluminum alloy plates encased in aluminum or stainless steel that are integral to the storage rack design so that boron is physically present between each fuel assembly. This design has been successfully licensed and operated at many commercial nuclear power plants to allow for a higher density or tighter packing of the spent nuclear fuel assemblies.

Figure F-12 illustrates a typical wet pool storage facility for spent nuclear fuel. The operational experience of wet storage facilities is excellent, with no significant accidents or events. In the few instances when fuel was damaged while being moved into or out of the pool, the water mitigated any radiological consequences to workers, the public, or the environment. Some events involved temporary loss of pool water heat-removal systems. The large heat capacity of the water in the pool reduced any increase in fuel temperature so that no harmful effects resulted from such a loss in cooling capacity. These two types of wet storage facility events emphasize the principal benefit of water as a coolant and shielding medium, namely its very large thermal inertia and shielding/radionuclide retention capacity.

There is a long and successful history of safe operation for wet storage of spent nuclear fuel in the commercial power, research, and defense sectors of the nuclear industry. The technology is well known, licensed, and offers extensive operational experience.

The same arguments that apply to dry storage of spent nuclear fuel also apply to wet storage facilities. 10 CFR 72 applies to both dry and wet storage facilities for spent nuclear fuel at commercial licensees. DOE Order 6430.1A (DOE, 1989a) applies to the general design of nuclear facilities on DOE sites, including those for spent nuclear fuel storage. This DOE order references 10 CFR 72 for most of the specific details on spent nuclear fuel storage.

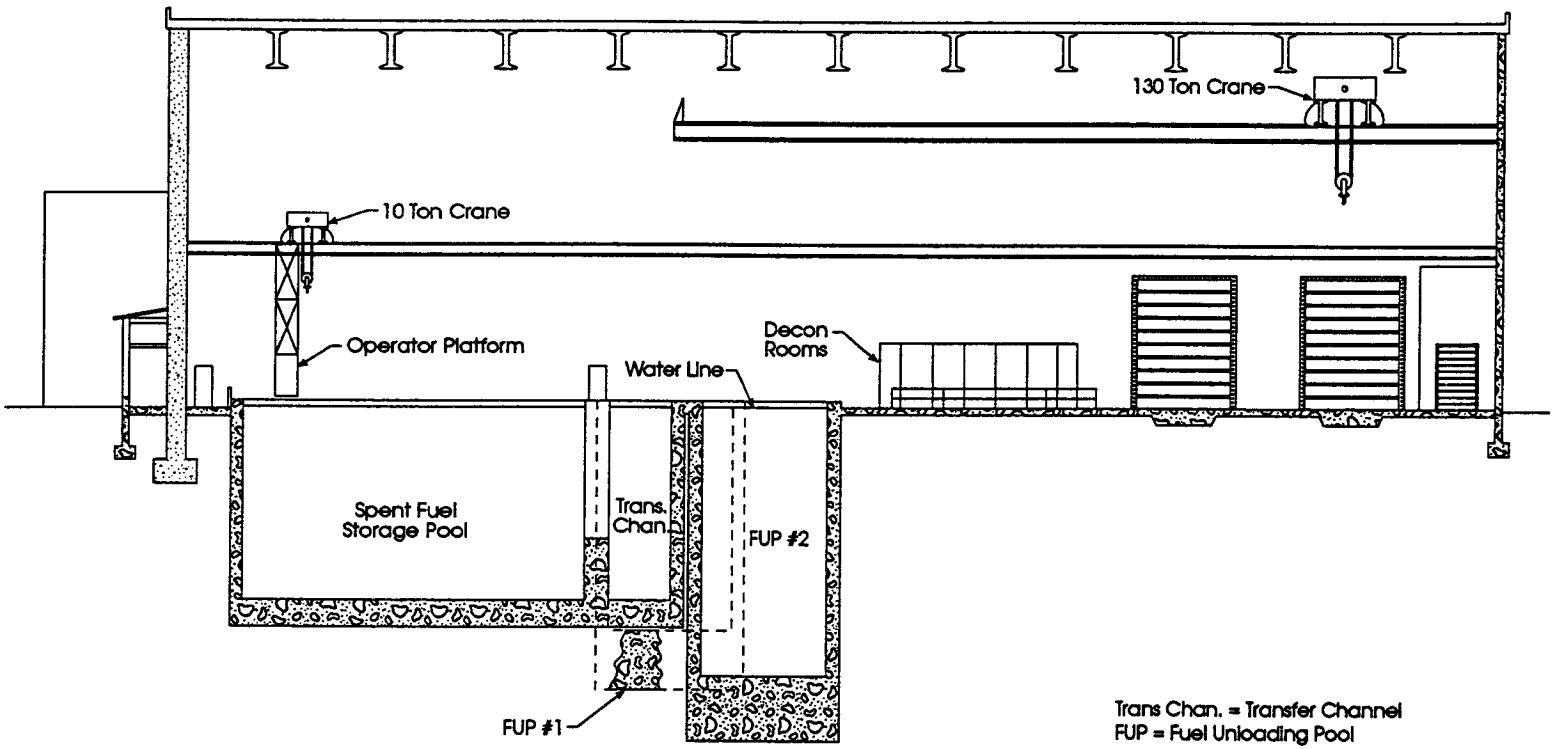


Figure F-12 Typical Wet Pool Storage Facility for Spent Nuclear Fuel

F.1.3 Summary of DOE Spent Nuclear Fuel Locations and Activities

DOE currently has about 2,700 MTHM of spent nuclear fuel in its storage facilities across the DOE complex (DOE, 1994h). Additional generation of about only 100 MTHM is anticipated during the next 40 years. Most of the spent nuclear fuel storage occurs at three sites: Hanford Site (77 percent), Idaho National Engineering Laboratory (10.9 percent), and Savannah River Site (7.3 percent) (Table F-9). Note that the quantities of DOE spent nuclear fuel completely dwarf the expected amount of foreign research reactor spent nuclear fuel (about 19 MTHM) on an MTHM basis (i.e., foreign research reactor spent nuclear fuel is less than 1 percent of the total). However, on a volume basis, foreign research reactor spent nuclear fuel represents about 10 percent of the total and, thus, their storage facilities would be of a significant size. Predominantly wet storage is used at DOE sites, although some limited experience exists with dry storage (e.g., Los Alamos National Laboratory and Idaho National Engineering Laboratory).

Table F-9 DOE Spent Nuclear Fuel Inventory[a, b]

Generator or Storage Site[c]	*Existing (1995)*		*Future Increases (through 2035)*		*Total (2035)*	
	MTHM[d]	*Percent*	*MTHM*[d]	*Percent*	*MTHM*[d]	*Percent*
Hanford Site	2,132.44	80.6	0.00	0.0	2,132.44	77.8
Idaho National Engineering Laboratory[e]	261.23	9.9	12.92	13.5	274.14	10.0
Savannah River Site	206.27	7.8	0.00	0.0	206.27	7.5
Naval Nuclear Propulsion Reactors	0.00[f]	0.0	55.00	57.6	55.0	2.0
Oak Ridge Reservation	0.65	<0.1	1.13	1.2	1.78	<0.1
Other DOE Sites	0.78	<0.1	1.50	1.6	2.28	<0.1
Non-DOE Domestic Research Reactors[g]	2.22	<0.1	3.28	3.4	5.50	0.2
Special-Case Commercial Reactors[h]	42.69	1.6	0	0	42.69	1.6
Foreign Research Reactors[i]	0	0	21.7	22.7	21.70	0.8
Total	**2,646.27**		**95.53**		**2,741.80**	
Percent of 2035 Total	**96.5**		**3.5**		**100.00**	

[a] *Source: DOE, 1995g*

[b] *Numbers may not sum due to rounding.*

[c] *The Nevada Test Site does not currently store or generate spent nuclear fuel and is not expected to generate spent nuclear fuel through 2035. However, in the 2010-2020 timeframe, a repository may open, with annual capacity over 1,000 MTHM.*

[d] *One MTHM equals approximately 2,200 pounds.*

[e] *Sum of fuel located at the Idaho National Engineering Laboratory.*

[f] *Existing inventory of Naval spent nuclear fuel is included in the Idaho National Engineering Laboratory totals (9.95 MTHM).*

[g] *Includes research reactors at commercial, university, and Government facilities.*

[h] *This total is just that stored at non-DOE facilities (Babcock & Wilcox Research Center and Fort St. Vrain). The total inventory of spent nuclear fuel from special-case commercial reactors is 186.41 MTHM. This fuel is also stored at the Idaho National Engineering Laboratory, the Oak Ridge Reservation, the Hanford Site, the Savannah River Site, and the West Valley Demonstration Project.*

[i] *At the Savannah River Site and the Idaho National Engineering Laboratory.*

Wet Storage

DOE spent nuclear fuel pools are in many cases more than 20 years old and were originally unlined, due to simplicity and the relatively short planned duration (3 to 6 months) of spent nuclear fuel storage prior to reprocessing. The spent nuclear fuel storage basins are concrete with 30 to 90 cm (1 to 3 ft) thick walls, and the bottom is usually thicker than the sides. For shielding purposes, the pool maintains a minimum of 3 m (10 ft) of water over the spent nuclear fuel at all times. Thus, total water depth typically ranges between 4.5 to 6.1 m (15 to 20 ft), although some facilities extend to 9.1 m (30 ft). Steel, stainless steel, or aluminum racks are affixed to the bottom of the pool for holding the spent nuclear fuel in a vertical configuration. The spent nuclear fuel basins provide for recirculation and heat removal capabilities, but limited water clarification and purification. Chemicals from the exposed concrete increase pool turbidity and tend to accelerate corrosion phenomena, particularly for aluminum-clad fuels. Some of the DOE spent nuclear fuel wet storage facilities do not meet the present construction requirements.

Wet storage still remains the predominant technology for storing irradiated materials (DOE, 1993b; Taylor et al., 1994). Currently, there are some 29 DOE spent nuclear fuel storage pool facilities in the complex, ranging in age from 10 years to more than 40 years. Facilities built more than 30 years ago were constructed to standards far less rigorous than exist today. Several DOE orders address spent nuclear fuel storage facilities indirectly, while DOE Order 6430.1A specifically sets the design criteria that addresses storage facilities (spent nuclear fuel facilities that are part of a reactor facility are covered by DOE Order 5480.6). Most DOE storage pools were not designed for long-term storage of spent nuclear fuel and targets and have very limited space available for consolidation.

Most of the storage pool surfaces are bare concrete A few are lined with stainless steel, and some are coated with epoxy or vinyl. The unlined pools are more susceptible to leakage and to increased contamination by soluble radionuclides. The unlined bare concrete storage pools do not have effective leak-detection systems to detect and capture potential leaks. To help identify pool leakage, more than 50 percent of DOE storage pools have had groundwater monitoring wells installed.

Severe corrosion of materials within many of the DOE storage pools has occurred. Corrosion has been generally attributed to poor water quality control and material incompatibilities, which has led to pitting and galvanic corrosion of spent nuclear fuel and storage equipment. This could potentially create a problem when the spent nuclear fuel materials have to be moved. In some cases, equipment failure could cause fissile material reconfiguration, which could increase nuclear criticality concerns. As a result of corrosion, release of radionuclides and fissile material to the pools has occurred. Corrosion also creates handling, packaging, inventory control, waste generation, and cleanup problems with the storage pools.

Savannah River Site and DOE (Taylor et al., 1994) consider the following facilities potentially suitable for near-term future wet spent nuclear fuel storage (in some cases with facility upgrades):

- Idaho National Engineering Laboratory
  - Power Burst Facility Canal
  - Idaho Chemical Processing Plant (ICPP)-666 Pool
  - Expended Core Facility
- Savannah River Site
  - 105-K Disassembly Basin

- 105-L Disassembly Basin
- 105-C Disassembly Basin
- 105-P Disassembly Basin
- Receiving Basin for Offsite Fuels (RBOF) Facility (244-H)
- BNFP (acquisition required).

However, only the ICPP-666 pool and the BNFP were found to meet all current standards, and, thus, be considered suitable for long-term storage.

DOE has improved some of its spent nuclear fuel facilities and has plans for additional upgrades (DOE, 1993b; DOE, 1995g). Typical upgrades include:

- installation and operation of water purification equipment, such as demineralizer columns and filters,
- reracking and fuel consolidation to increase fuel storage space, and
- improving seismic resistance (where possible, via additional supports).

These upgrades would extend the life of existing facilities and allow safe storage of spent nuclear fuel until new facilities are constructed or the spent nuclear fuel is chemically separated. In addition, spent nuclear fuel suspect of leaking during this interim period would be removed and canned to extend its safe storage.

Dry Storage

DOE has fewer dry storage facilities, and these range from approximately 1 to 50 years in age. There are many different types and applications of dry storage used throughout the DOE complex. Spent nuclear fuel is sorted in steel structures; lined and unlined concrete hot cells; steel-lined; concrete; below-grade vaults; reprocessing canyon dissolver cells; cans contained in steel wells; and large, above-grade storage casks. Spent nuclear fuel has been characterized and stored in dry configurations within hot cell facilities since the 1950s. Most DOE hot cells were not designed and built for long-term storage of spent nuclear fuel. Their primary mission was to conduct tests and basic research on irradiated fuels resulting in very limited capacity for storage of spent nuclear fuel.

Since the 1970s, spent nuclear fuel has been stored in facilities specifically engineered for longer-term dry storage. Modern dry storage methods in newer facilities provide low corrosion environments within sealed barriers for monitored interim retrievable storage. A few examples of dry storage confinement methods include sealed canisters in wells surrounded by concrete and extensive release protection incorporating High Efficiency Particulate Air-filtered ventilation systems. By using current dry storage technology, dry storage facilities could be engineered to withstand severe natural phenomena hazards, fires, and explosions without damage to the fuel or release of radionuclides. Dry storage technologies can be adapted to store many types of damaged and undamaged DOE-owned spent nuclear fuel.

The application of dry storage technologies generally results in fewer environmental, safety, and health issues as compared with wet storage. However, DOE has limited experience with aluminum-clad, high decay heat fuels in dry storage facilities.

Some quantities of spent nuclear fuel may be in dry storage facilities for much longer than originally anticipated. Over the years, several inground steel-lined storage well barriers have had the potential for severe corrosion, which could result in undetected releases to the environment. This is particularly important, because of the inaccessibility of these facilities for inspection and characterization (e.g., Argonne National Laboratory Radioactive Scrap and Waste Facility).

The Savannah River Site and DOE (Taylor et al., 1994) consider the following facilities suitable for near-term dry storage of spent nuclear fuel.[1]

- Argonne National Laboratory-West
  - Hot Fuel Examination Facility
  - Radioactive Scrap and Waste Facility
- Idaho National Engineering Laboratory
  - Test Area North Test Pad
  - ICPP Irradiated Fuel Storage Facility (IFSF)
  - ICPP-749 (Drywells, Second Generation)
- Savannah River Site
  - 221-H (Extensive modification required)
  - 221-F (Extensive modification required).

However, certain DOE requirements, such as DOE Orders 6430.1A and 5480.6, make it likely that these facilities could not qualify for future, long-term, dry storage of spent nuclear fuel. Excluding the Savannah River Site facilities (because of the extensive required modifications), none of these facilities appear to be very useful for long-term spent nuclear fuel storage. Extensive modifications to the facilities would be required to meet seismic criteria and increase the storage capacity or convert existing facilities (e.g., F- and H-Canyons at the Savannah River Site) into suitable dry storage facilities. However, facilities such as the Hot Fuel Examination Facility and Test Area North appear suitable as possible staging and characterization facilities in a dry cask storage approach, based upon the presented information (Taylor et al., 1994).

F.1.3.1 Savannah River Site

The Savannah River Site occupies an area of approximately 800 km^2 (310 mi^2) in South Carolina, in a generally rural area about 40 km (25 mi) southeast of Augusta, Georgia (DOE, 1995g). The Savannah River forms the southwestern border of the Savannah River Site. The Savannah River Site consists primarily of managed upland forest with some wetland areas, and facilities and railways occupy approximately five percent of the Savannah River Site land area. Figure F-13 presents a map of the Savannah River Site with spent nuclear fuel facilities displayed.

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1 Existing facilities in Nevada were not included in the analysis.

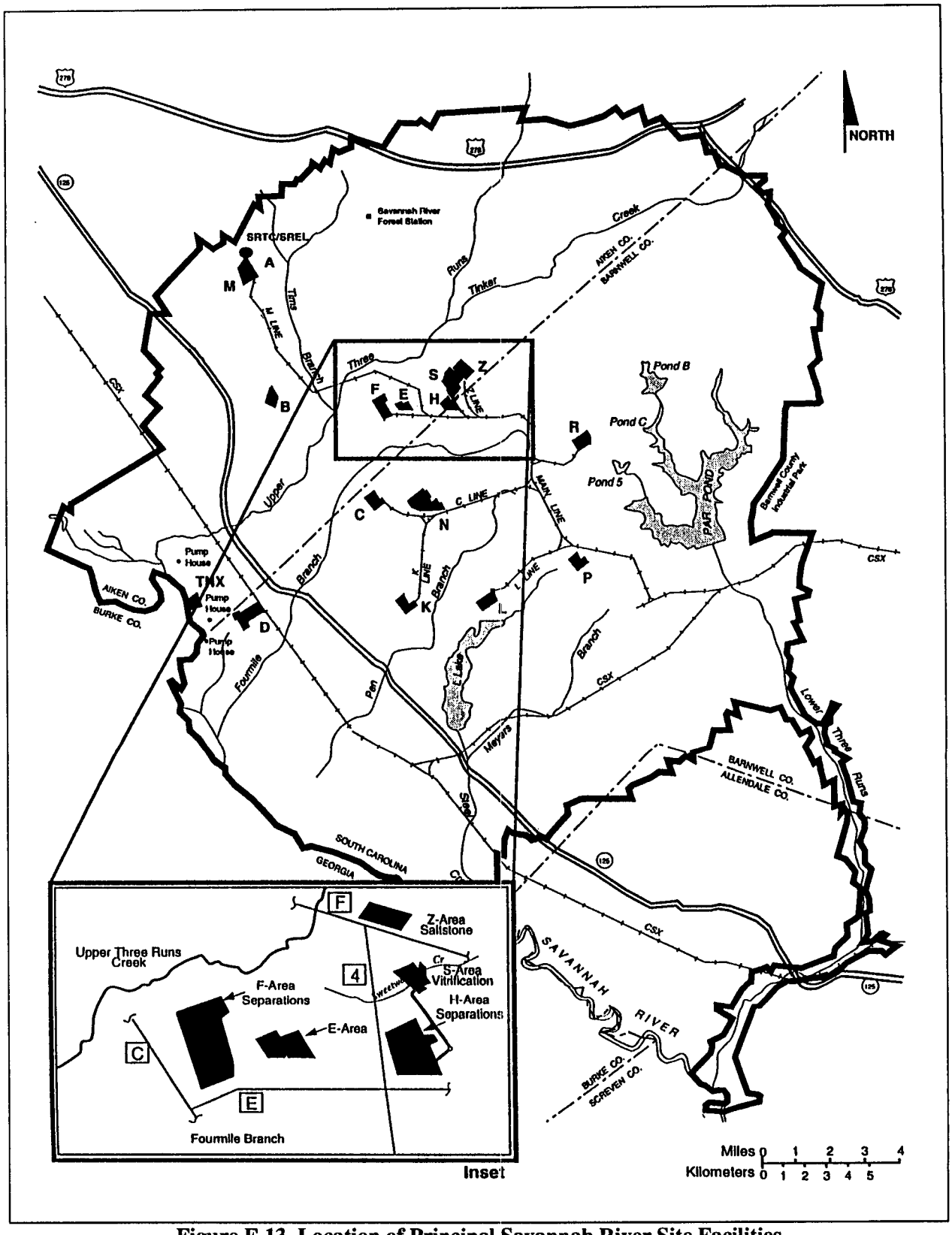


Figure F-13 Location of Principal Savannah River Site Facilities

The primary Savannah River Site facilities were used for the production of nuclear materials. Currently, the production reactor facilities are not operating and are in either shutdown or standby mode. Several large waste management projects are now underway at the site, including the Defense Waste Processing Facility for the vitrification of high-level waste.

F.1.3.1.1 Spent Nuclear Fuel Activities at the Savannah River Site

The Savannah River Site currently stores approximately 201 MTHM of spent nuclear fuel (DOE, 1995g), or approximately 7 percent of the DOE total, including the following:

- 184.4 MTHM of aluminum-based spent nuclear fuel, including plutonium target material,
- 4.6 MTHM of commercial spent nuclear fuel (zircaloy-clad),
- 11.9 MTHM of test and experimental reactor, zircaloy-clad fuel, and
- 5.4 MTHM of test and experimental reactor, stainless steel-clad fuel.

This fuel is stored in several basins onsite. The F- and H-Area Canyons are the processing and separations facilities at the Savannah River Site, and each has a small associated wet storage basin. Three reactor disassembly basins (K, L, and P) contain the reactor fuel and target materials. A fourth reactor disassembly basin (C) currently is the only basin without security upgrades necessary for any storage activities. These basins consist of unlined concrete with inadequate water purification equipment for extended storage of aluminum-clad spent nuclear fuels. These reactor basins were built in the 1950s and were not intended for the long-term storage ("years") of radioactive materials. Furthermore, poor water chemistry has corroded some of the spent nuclear fuel in the K- and L-Reactor disassembly basins, resulting in the release of fissile materials to the pool water. Also, these reactor basins are not seismically qualified and lack modern earthquake resistant features. Ongoing facility upgrades of the L-Reactor disassembly basin are intended to correct the conditions of the basin. Deionization of the basin has lowered the conductivity to acceptable levels for corrosion control. Lower conductivity would greatly reduce the probability of new corrosion and reduce the rate of progression of existing corrosion. The control of the conductivity after the completion of the deionization would be accomplished using the Disassembly Basin Upgrade Project which was initiated to address near term activities and vulnerabilities associated with storing fuel in the L-Reactor disassembly basin. With the upgrades to be completed by mid-1996 (Miller et al., 1995), the L-Reactor basin can be expected to safely store spent nuclear fuel for as long as 10 to 20 years. These upgrades include the following:

- A continuous on-line deionization system to improve water chemistry. The continuous deionization system will lower and control the conductivity levels of the basin thereby minimizing corrosion. The continuous deionizer system also removes ionic radionuclide concentrations, specifically Cesium-137.
- A makeup water deionizer to improve the quality of makeup water supplied to the basin. This action will mitigate any additional load on the continuous deionization system.
- New equipment and systems for alternative packaging and removal of waste.

A Basis for Interim Operation document for the L-Reactor in cold standby conditions was prepared by the Westinghouse Savannah River Company (WSRC, 1995b). The Basis for Interim Operation addressed the effects of process events on the facility worker and the effects of process and natural phenomena hazards events on the public and the environment. The Basis for Interim Operation document concluded that the

facility could continue to operate within the safety envelope, identified in the Basis for Interim Operation, without undue risk to the public or the environment.

The RBOF is the other major facility for spent nuclear fuel storage. The RBOF is more suitable than the reactor basins because it is lined (epoxy sides, stainless steel bottom) and has a water purification system. The BNFP, after refurbishing, would be suitable for foreign research reactor spent nuclear fuel storage because it is fully lined with stainless steel, has water purification systems, and has active heat removal systems. Major spent nuclear fuel storage facilities are summarized in Table F-10.

Table F-10 Major Savannah River Site Spent Nuclear Fuel Storage Facilities

Facility	*Characteristics*	*Capacity for Foreign Research Reactor Spent Nuclear Fuel Elements*	*Access*
105-K Disassembly Basin	Basin Dimensions: 46.9 x 65.8 x 5.2m (154'W x 216'L x ~17'D) Basin Water: 13.2 million l (3.5 million gal)	None initially 20,000 after upgrades	Truck/Rail
105-L Disassembly Basin	Basin Dimensions: 46.9 x 65.8 x 5.2m (154'W x 216'L x ~17'D) Basin Water: 13.2 million l (3.5 million gal)	None initially 20,000 after upgrades	Truck/Rail
105-C Disassembly Basin	Basin Dimensions: 39.6 x 58.2 x 5.2m (130'W x 191'L x ~17'D) Basin Water: 13.6 million l (3.6 million gal)	None initially 20,000 after upgrades	Truck/Rail
105-P Disassembly Basin	Basin Dimensions: 55.5 x 68.2 x 5.2m (182'W x 223'L x ~17'D) Basin Water: 18.2 million l (4.8 million gal)	None initially 20,000 after upgrades	Truck/Rail
RBOF (244-H)	Basin 1: 8.2 x 12.1 x 6.7m depth over two-thirds of floor space 8.8m depth over one-third of area Basin 2: 8.2 x 3.9 x 8.8m depth Basin Water: 1.7 million l (450,000 gal)	~1000 initially, plus 1,425 after rearranging[b]	Truck/Rail
BNFP[a]	Several Pools: Main Pool: 14.6 x 14.6.x 9.3m (48'L x 48' x 32'D) Basin Water: 2.1 million l (550,000 gal)	None initially 25,000 after acquisition and reactivation[b]	Truck/Rail

[a] *Discussed in more detail in Section F.1.3.1.3; rail spur not currently active but would be included in reactivation.*

[b] *Difference in capacity between RBOF and BNFP is due to greater pool depth of BNFP and different fuel packing density assumptions for the two facilities.*

F.1.3.1.2 Spent Nuclear Fuel Storage Facilities Available for Foreign Research Reactor Spent Nuclear Fuel at the Savannah River Site

The RBOF is the principal facility applicable for foreign research reactor spent nuclear fuel. This basin has been operating and receiving spent nuclear fuel, including foreign research reactor spent nuclear fuel, since 1964, and is located in H-Area, near the center of the Savannah River Site. The 1,393 m^2 (15,000 ft^2) facility consists of an unloading basin, two storage basins, a repackaging basin, a disassembly basin, and an inspection basin. The basins and their interconnecting canals hold approximately 1,893,000 l (500,000 gal) of water. Spent nuclear fuel elements arrive in lead-lined casks weighing from 22 to 64 metric tons (24 to 70 tons), which a crane lifts from a railroad car or a truck trailer and places in the unloading basin. About 30 percent of the fuels in the RBOF consist of uranium clad in stainless steel or zircaloy, which the Savannah River Site facilities cannot process without modifications. The RBOF is discussed in more detail in Section F.3.

In March 1995, the Savannah River Site estimated that the RBOF has the capacity for approximately an additional 1,000 spent nuclear fuel elements (O'Rear, 1995). However, the Savannah River Site has

determined that 1,425 additional spaces can be made available by rearranging fuel in the pools and moving spent nuclear fuel to other storage areas, such as one of the reactor disassembly basins. If empty, the total RBOF capacity would be 6,500 foreign research reactor spent nuclear fuel elements.

F.1.3.1.3 Planned or Potential Spent Nuclear Fuel Storage Facilities at the Savannah River Site for Foreign Research Reactor Spent Nuclear Fuel

The Savannah River Site is evaluating the use of several new planned or potential facilities for foreign research reactor spent nuclear fuel management. These include:

- a modular dry vault storage building,
- dry cask storage, or
- wet pool storage.

These technologies may require additional support facilities for such functions as: spent nuclear fuel examination, spent nuclear fuel characterization, cask loading and unloading, spent nuclear fuel repackaging, and cask maintenance. The Savannah River Site is also evaluating the use of one or more of the reactor disassembly basins for near-term wet storage of foreign research reactor spent nuclear fuel. These facilities are discussed in more detail in Section F.3.

The Savannah River Site is also evaluating the potential storage of spent nuclear fuel at the BNFP facility. Allied General Nuclear Services constructed a large reprocessing facility for commercial spent nuclear fuel in Barnwell, South Carolina, adjacent to the Savannah River Site (Fields, 1994; Matthews, 1994 and 1991; Taylor et al., 1994; Williams, 1994; WSRC, 1992a-d). This plant was never operated due to a change in Government policy, and was mothballed in the 1980's. The BNFP includes a wet fuel storage basin that is approximately twice the area and potentially has over four times the spent nuclear fuel capacity of the RBOF facility at the Savannah River Site. The wet storage basin is fully lined and seismically qualified and would be capable of storing all of the currently identified foreign research reactor spent nuclear fuel (Jackson, 1994). Facility acquisition, replacement of removed equipment, reactivation, installation of suitable storage racks, and checkout at the facility would be required prior to its use.

Figure F-14 displays the location of the BNFP in relation to the Savannah River Site. This land was originally part of the Savannah River Site. The BNFP site consists of approximately 680 hectares (ha) (1,680 acres).

Allied General Nuclear Services designates the fuel pool area of the plant as the "Fuel Receiving and Storage Stations." Considerable documentation exists for the facility, including the engineering designs, the Environmental Impact Statement (EIS), and the Final Safety Analysis Report submitted to the NRC. The pools and attendant cranes are fully seismically qualified structures. The pool section includes ion exchange systems for pool water purification and a separate radwaste system (solidification may need to be added). The section incorporates capabilities for receipt of either truck or railcarried casks. The main crane is rated at 122 metric tons (135 tons).

The Fuel Receiving and Storage Station facility is shown in Figure F-15 and was designed and constructed to receive, store, and handle spent (irradiated) light water reactor fuel. Spent nuclear fuel assemblies are received in shielded casks by either truck or rail. The assemblies are unloaded underwater and stored underwater to provide cooling and shielding. Stored fuel can be remotely transferred to the adjacent Remote Process Cell and Remote Maintenance and Scrap Cell for mechanical processing. After fuel assemblies are unloaded from the shielded casks, the empty casks are prepared for return shipment.

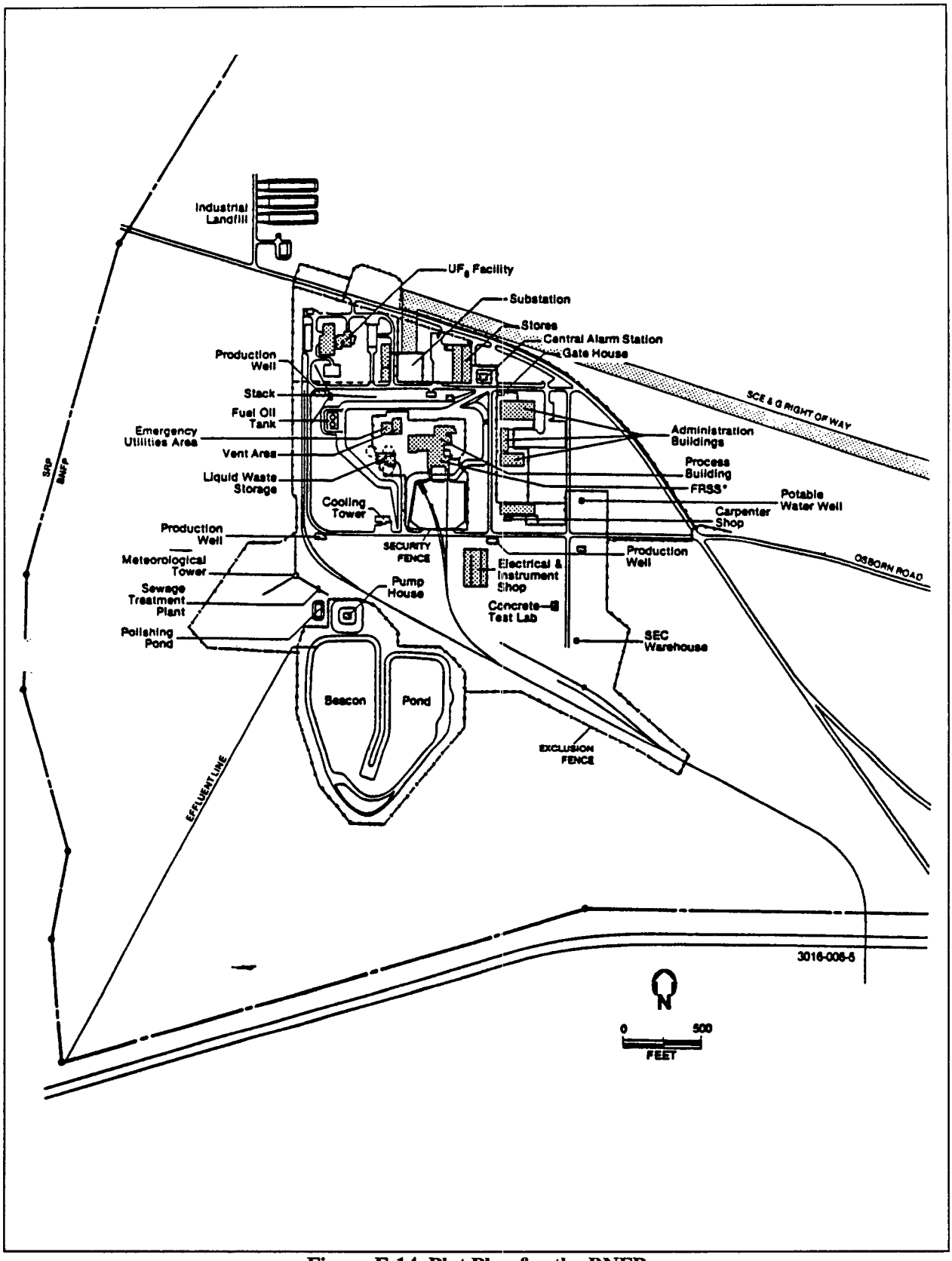


Figure F-14 Plot Plan for the BNFP

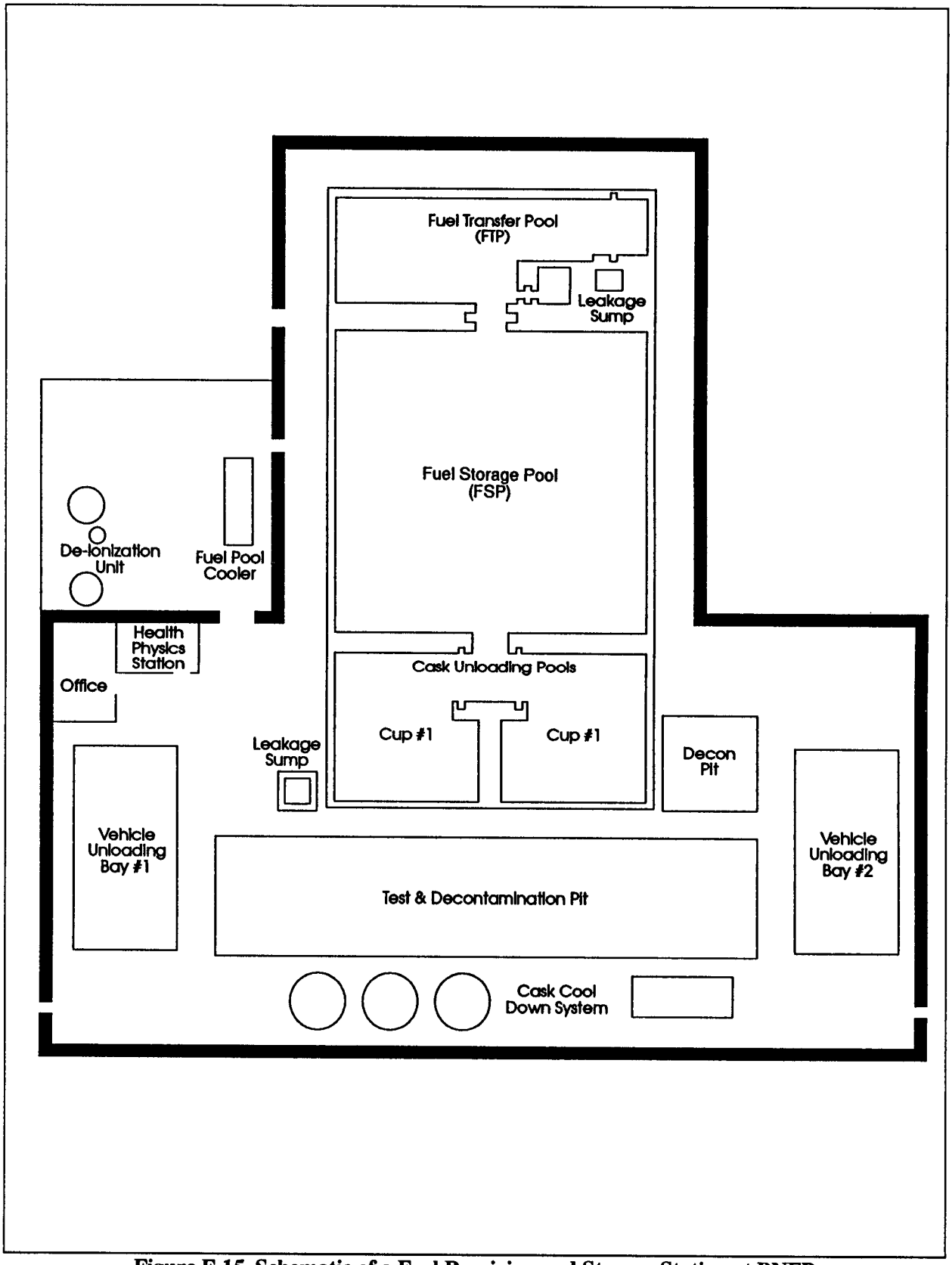


Figure F-15 Schematic of a Fuel Receiving and Storage Station at BNFP

The following areas of the Fuel Receiving and Storage Station are safety class structures:

- pool concrete structure,
- pool and crane column foundations,
- embedments for the fuel storage racks,
- crane rails, rail supports, and restrainer bars which retain the cranes on their rails and prevent their falling into the pools,
- cask barrier beams and embedments,
- energy absorbing pads in the Cask Unloading Pools,
- emergency water supply line, and
- Fuel Receiving and Storage Station walls to the 7.6 m (25 ft) level above grade. Clean spent nuclear fuel casks are moved to the Fuel Receiving and Storage Station water pool area. This area is divided into six pools consisting of two Cask Unloading Pools, one Fuel Storage Pool, one Failed Fuel Pool, one Fuel Transfer Pool, and an examination cell/pool.

Water shielding of 3.7 m (12 ft) is provided in the Fuel Receiving and Storage Station pools. This limits surface dose rates to a calculated 0.08 mrem/hr, assuming design basis Light Water Reactor fuel, and permitting at least 40 hours per week working time for an operator. Handling systems are designed with special limit switches and mechanical stops to prevent raising fuel higher than the design depth of the shielding water.

The water in the five pools of the Fuel Receiving and Storage Station is channeled and treated to promote maximum clarity, to control temperature, and to minimize corrosion and radioactivity. This is accomplished by continuous filtration through 95 percent efficient 5 micron pore size filter elements, cooling in heat exchangers to hold the pool water temperature below 41°C (105°F), and demineralization.

Demineralizing water treatment is designed to maintain radioactivity levels below 0.0005 µCi/ml. Pool water is pumped from the Fuel Storage Pool at 7,570 l/min (2,000 gal/min), directed through the heat exchangers, and returned to the Fuel Storage Pool. A second stream is pumped at 1,135 l/min (300 gal/min) from a pool and is filtered. After filtration, one-half of this stream is treated by ion exchange. The combined filtered and purified solution is then returned to the Fuel Storage Pool. The pool piping system is arranged so that the cleanup stream can be removed from or returned to any of the pool areas, permitting cleanup of contaminated water.

The cooling system is designed to remove heat at a rate of 4,000 kilowatts (14 million Btu/hr). The cooling capacity can be increased by expanding the capacity of the heat exchanger system in the Fuel Receiving and Storage Station. The estimated life for the structure is 50 years (Fields, 1994; Matthews, 1994; Taylor et al., 1994).

The Fuel Receiving and Storage Station has the following six pools:

- two cask pools, each 18.3 m (60 ft) deep,
- failed fuel pool (for degraded fuel),
- fuel transfer pool, 18.3 m (60 ft) deep,

- examination cell/pool, and
- main pool, 14.6 m x 14.6 m x 9.8 m deep (48 ft by 48 ft by 32 ft deep).

All of the pools are lined with stainless steel and are designed to maintain a minimum of 3.7 m (12 ft) of water above the fuel for shielding. The pools include detectors and flow channels for managing potential leaks. The original capacity of the main pool was 400 MTHM. Various analyses have been performed to increase this capacity to the 1,200 to 2,000 MTHM range with reracking and other arrangements. It has been estimated that maximum wet storage corresponds to approximately 5,200 Pressurized Water Reactor assemblies (Taylor et al., 1994). For foreign research reactor spent nuclear fuel, this would correspond to over 25,000 elements; and, thus, as noted previously, the BNFP could accommodate all of the fuel.

The environmental impacts of spent nuclear fuel storage at the BNFP have also been analyzed for between 360 and 5,000 MTHM of commercial fuel (Taylor et al., 1994). The results were:

- Dose commitments to the 80 km (50 mi) population were estimated to be 0.067 person-rem and 0.071 person-rem for 15- and 25-year storage periods, respectively.
- The worst accident would result in a dose commitment of 1 mrem total body, 6 mrem thyroid, and 100 mrem skin to an exposed individual located at the eastern boundary of the site.

These analyses were based upon commercial spent nuclear fuel, but should bound the consequences of foreign research reactor spent nuclear fuel storage at the BNFP. Potential impacts are discussed in more detail in Section F.4.

The BNFP site consists of some 680 ha (1,680 acres), bounded on three sides by the Savannah River Site. Preliminary walkthroughs and analyses by the Savannah River Site indicate the facility is in good condition, and principally needs a main transformer for power supply. The Savannah River Site has estimated a cost of $50 million (Matthews, 1991; WSRC, 1992a-d). Actual acquisition and reactivation costs are claimed to be as low as $25 million (Matthews, 1994; WSRC, 1992a-d). This facility, however, would not be available immediately to receive the foreign research reactor spent nuclear fuel.

Figure F-16 displays the foreign research reactor spent nuclear fuel storage capacity versus time for the Savannah River Site. Clearly, the Savannah River Site can accommodate foreign research reactor spent nuclear fuel at existing facilities supplemented by dry storage, modified reactor disassembly basins, or the potential use of the BNFP. The reactor basins could be used to store the non-aluminum-based spent nuclear fuel currently in the RBOF because the poorer water quality in the basins would not cause additional corrosion for this other fuel that is not aluminum based. Recent improvements in reactor basin water chemistry control have resulted in a substantial decrease in the potential for corrosion of aluminum-clad spent nuclear fuels.

F.1.3.2 Idaho National Engineering Laboratory

The Idaho National Engineering Laboratory has several reactors and critical assemblies operating and also possesses several reactors that are either in standby or shutdown and awaiting decommissioning. From 1953 until 1992, the Idaho National Engineering Laboratory was responsible for processing and recovering highly-enriched uranium (HEU) from naval reactors. The Idaho National Engineering Laboratory discontinued processing spent nuclear fuel in 1992. Consequently, the Idaho National Engineering Laboratory has spent nuclear fuel facilities, spent nuclear fuel in storage, and spent nuclear fuel from

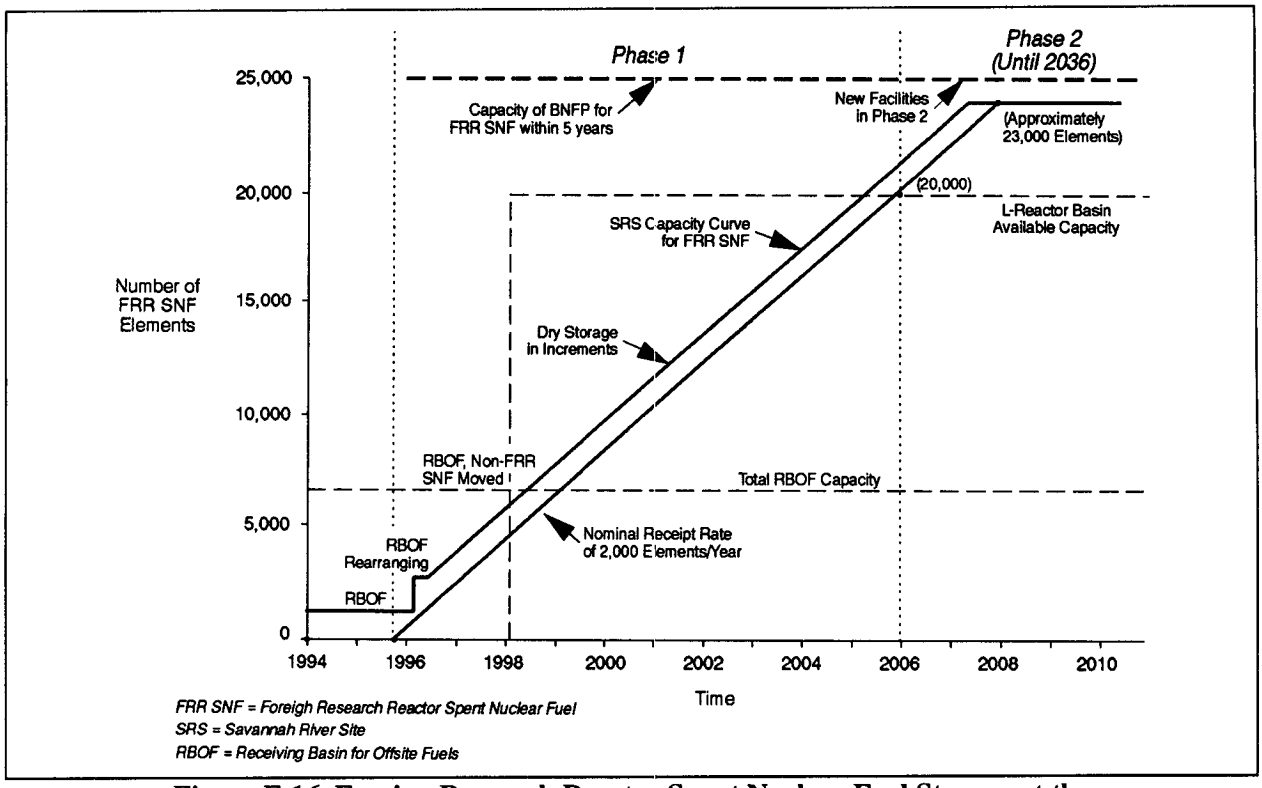


Figure F-16 Foreign Research Reactor Spent Nuclear Fuel Storage at the Savannah River Site

current operations. The Idaho National Engineering Laboratory site map with spent nuclear fuel facilities is shown in Figure F-17.

F.1.3.2.1 Spent Nuclear Fuel Activities at the Idaho National Engineering Laboratory

Six major facility areas at the Idaho National Engineering Laboratory store spent nuclear fuel:

- ICPP,
- Test Area North,
- Power Burst Facility,
- Test Reactor Area,
- Argonne National Laboratory-West, and
- Naval Reactors Facility.

A description of each major facility area and its spent nuclear fuel storage activities is presented below.

F.1.3.2.2 Spent Nuclear Fuel Storage Facilities at the Idaho National Engineering Laboratory

Spent nuclear fuel at the Idaho National Engineering Laboratory is sorted in a variety of dry and wet configurations. The total amount of spent nuclear fuel at the Idaho National Engineering Laboratory

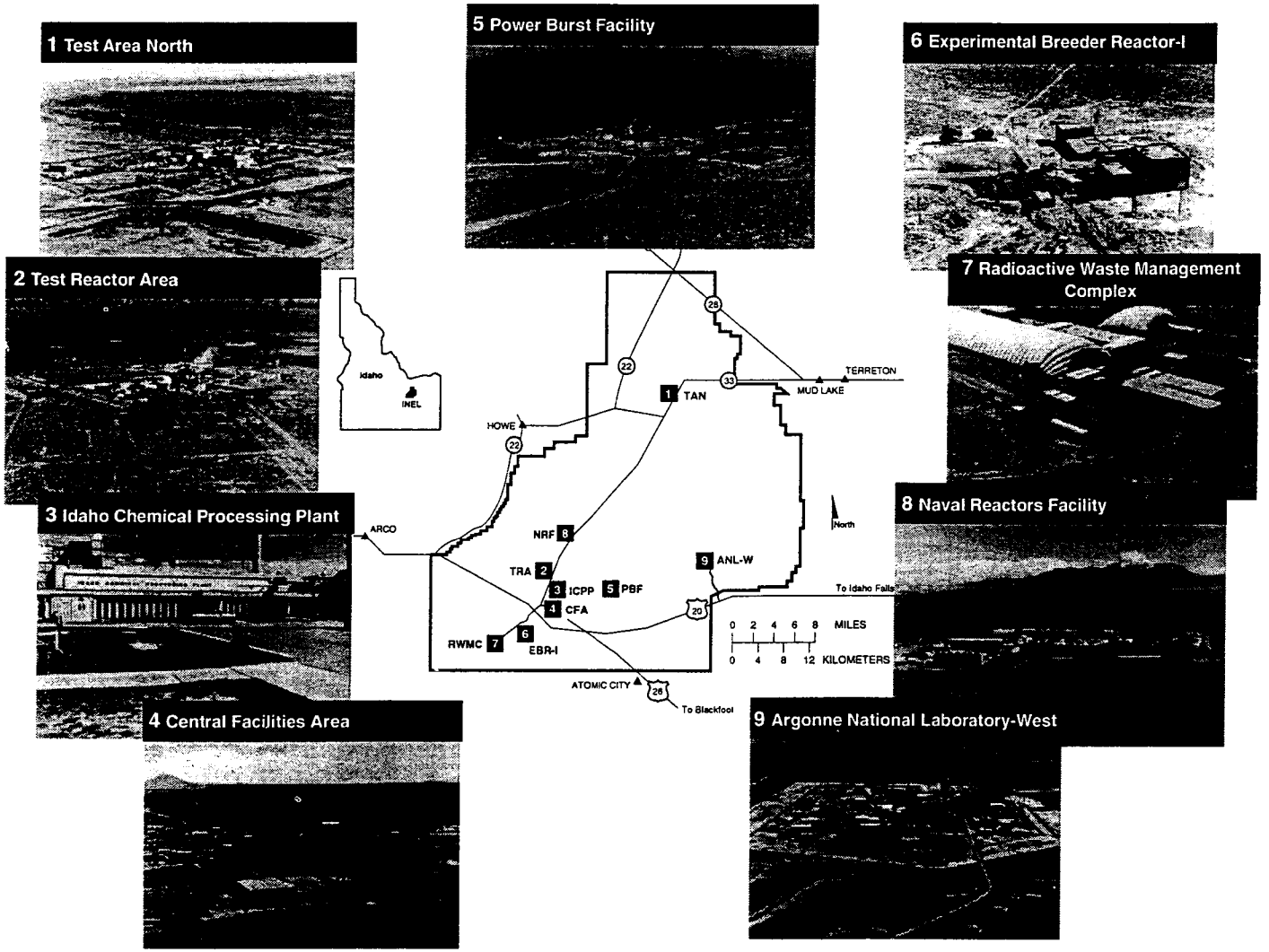


Figure F-17 Location of Spent Nuclear Fuel Storage and Handling Facilities at the Idaho National Engineering Laboratory

accounts for about 10 percent (by weight of heavy metal) of the spent nuclear fuel in the DOE complex (DOE, 1995g).

Table F-11 lists the primary spent nuclear fuel storage facilities, including the type of storage configuration, capacity for foreign research reactor spent nuclear fuel receipts, and accessibility. The number, variety, and location of the wet and dry configurations currently in use at the Idaho National Engineering Laboratory are largely the result of the different purposes for the facilities (e.g., at-reactor storage, storage research and development, reprocessing, and fuel research and development). The condition of the spent nuclear fuel in storage is generally good, with the notable exception of minor amounts of fuel in the Underwater Fuel Storage Facility at the ICPP-603.

The ICPP has received spent nuclear fuel from many onsite and offsite reactors (including foreign research reactor spent nuclear fuel) for reprocessing. Reprocessing for recovery of HEU materials was ceased in 1992. The ICPP now has the mission of managing its current spent nuclear fuel inventory and assigned new spent nuclear fuel receipts, development of technologies in support of dispositioning the spent nuclear fuel, and eventually packaging the material for shipment to a repository. The ICPP stores virtually all types of spent nuclear fuel except production reactor fuel (i.e., fuel from the Hanford Site and the Savannah River Site production reactors). It stores nonproduction reactor aluminum, stainless steel, zirconium, and graphite-clad spent nuclear fuel and uses both wet and dry storage configurations. The ICPP facilities have experience and some capacity for foreign research reactor spent nuclear fuel storage. These are discussed in more detail in Section F.3.

The Test Area North has been a reactor testing facility and has received significant amounts of spent nuclear fuel for examination and testing purposes. This includes the commercial dry storage cask demonstration program and the Three Mile Island debris examination program. It has a very large hot cell and an adjacent underwater storage pool to support the testing programs. It also has a large hot shop where large pieces of equipment, such as transportation casks, have been reconfigured or maintained. At the current time, the Test Area North hot cell and pool have no future mission, but may be used by the U.S. Navy. If Test Area North is not used by the Navy, then the Test Area North hot cell and pool may have significant capacity for receipt of foreign research reactor spent nuclear fuel and for placing it into temporary underwater storage or dry storage casks.

Other storage areas such as the Power Burst Facility reactor canal and the MTR storage pool have limited storage capacities for receipt or storage of foreign research reactor spent nuclear fuel.

The Argonne National Laboratory-West facilities supported the Experimental Breeder Reactor program and also contain the Transient Reactor Test Facility, the Zero Power Physics Reactor, and the Neutron Radiography Reactor. Spent nuclear fuel storage facilities include an at-reactor molten sodium storage pool, in-process lag storage in the Hot Fuel Examination Facility and dry underground SILOs for spent fuel and wastes pending disposition. The Hot Fuel Examination Facility would be suitable for foreign research reactor spent nuclear fuel examination activities.

The Naval Reactors Facility is also located at the Idaho National Engineering Laboratory, but is not included in Table F-11 because of its sole purpose to support the Naval ship propulsion program. The Naval Reactors Facility includes the Expended Core Facility, which receives and examines Naval spent nuclear fuel to support fuel development and performance analyses. In addition, the Expended Core Facility removes structural support material from the Naval spent nuclear fuel before transfer of the fuel portion to the ICPP for reprocessing or interim storage.

Table F-11 Description of Existing Spent Nuclear Fuel Facilities at the Idaho National Engineering Laboratory

Facility	*Description*	*Capacity for Foreign Research Reactor Spent Nuclear Fuel*	*Access*
ICPP-666 Underwater Fuel Storage Area	Water Storage Facility with 6 lined storage basins 9.4 m x 14.2 m by 9.4 m or 12.5 m deep (31 ft x 46.5 ft x 31 ft or 41 ft deep)	Temporary storage after reracking for 8,400 elements	Shipment by truck. Rail shipments to a site receiving area 8 km (5 mi) away.
ICPP-603 Underwater Fuel Storage Area	Water Storage Facility with three basins of varying sizes, no sealant or liner	Not Available - facility is being shut down	Shipment by truck.
ICPP-603 Irradiated Fuel Storage Facilities	Dry Storage Facility with remote unloading area and vault storage with 636 0.5 x 3.4 m L (18 in x 11 ft long) containers	200 containers available for storage of 9,000 foreign research reactor elements	Shipment by truck. Rail shipments to a site receiving area 8 km (5 mi) away.
ICPP-749 Underground Fuel Storage Area	Dry Storage Facility with 218 underground SILOs	Approximately 60 SILOs available following renovation of first generation SILOs; capacity for 3,600 elements after fiscal year 1998	Requires receipt into ICPP-666 or ICPP-603 IFSF and packaging and conditioning for dry storage.
Test Area North-607 Pool and Hot Cell	Water Storage Facility with adjacent remote hot cell	Approximately 56 m^2 (600 ft^2) of basin 7.3 m (24 ft) deep. Capacity for 4,000 elements after new rack installation.	Additional storage space available in hot cell. Shipment by truck, cask unloading in hot cell.
Test Reactor Area-620 Power Burst Facility	Small water storage pool adjacent to Power Burst Facility reactor	Minimal space available	Shipment by truck. Crane capacity inadequate for foreign research reactor casks.
Test Area North-607 Cask Storage Pad	Five commercial fuel storage casks on concrete pad	Easily expandable for more cask storage as necessary for foreign research reactor spent nuclear fuel shipments	Shipment by truck to hot cell where foreign research reactor spent nuclear fuel can be transferred to storage casks and moved to storage pad.
Test Reactor Area-603 MTR Pool	Water Storage Pool in basement of the MTR	Minimal space available	Shipment by truck. Crane capacity and access inadequate for foreign research reactor casks.
Test Reactor Area-660 ARMF and CFRMF Reactors and Canal	Swimming pool reactors with connecting canal	Minimal space available	Shipment by truck. Crane capacity and access inadequate for foreign research reactor casks.
Argonne National Laboratory-West Hot Fuel Examination Facility	Large two room hot cell facility for fuel examinations with argon atmosphere	Minimal space available without extensive removal of examination equipment	Shipment by truck access to hot cell limited to special designed small transfer cask.
Argonne National Laboratory-West Radioactive Scrap and Waste Facility	1,200 vertical steel-lined underground dry storage wells	About 500 wells are not used	Access requires transfer through Hot Fuel Examination Facility.

F.1.3.2.3 Planned or Potential Spent Nuclear Fuel Storage Facilities at the Idaho National Engineering Laboratory for Foreign Research Reactor Spent Nuclear Fuel

The main focus of near-term activities is the accurate quantification and characterization of DOE-owned spent nuclear fuel, identification of spent nuclear fuel management facilities and their conditions, identification of safe interim storage for existing and new spent nuclear fuel, and identification of

technologies and requirements to place DOE spent nuclear fuel in safe interim storage. Long-term activities include the development of final waste acceptance criteria requirements and stabilization technologies for alternate fuel disposition, construction of facilities to stabilize fuel to meet waste disposal requirements, processing of the fuel to a final waste form, and transportation of the waste form for disposition (discussed in more detail in Section F.3). As shown in Figure F-18, the Idaho National Engineering Laboratory has sufficient capacity for foreign research reactor spent nuclear fuel if the existing facilities are supplemented by dry casks.

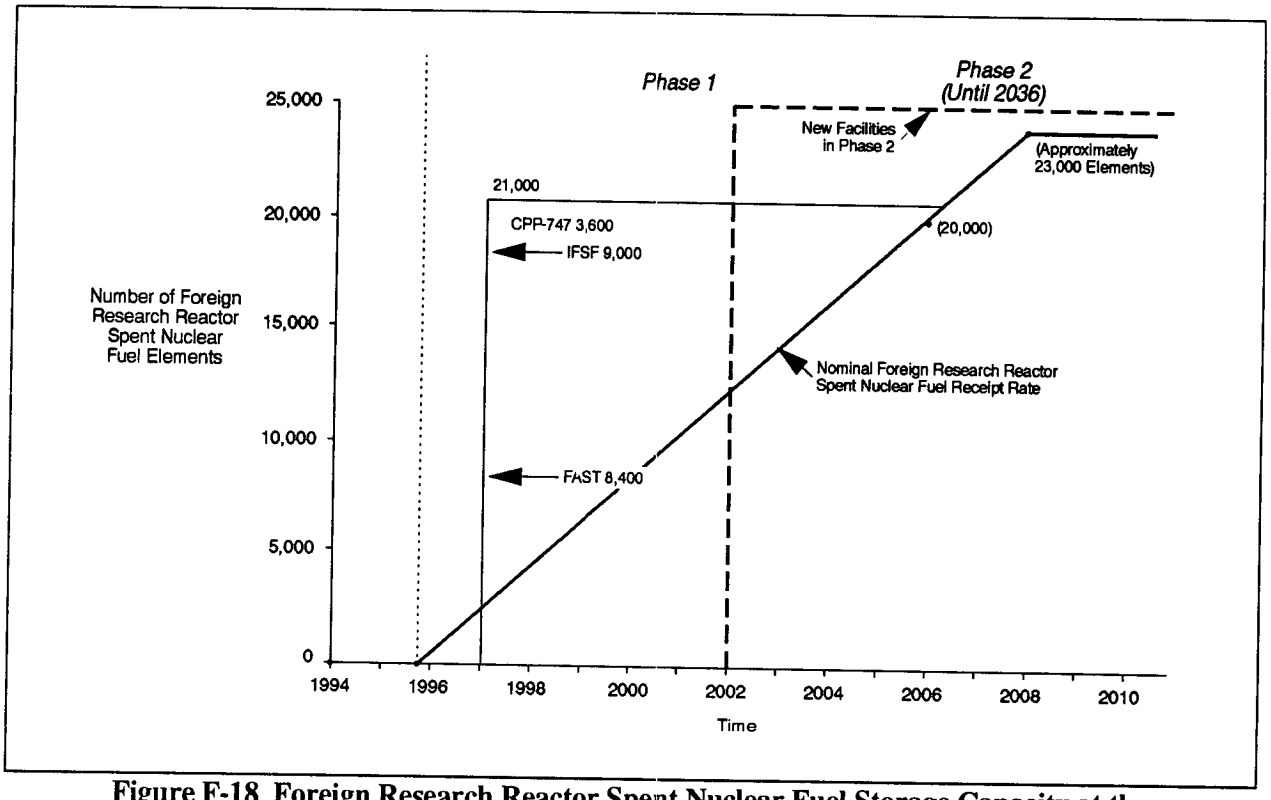


Figure F-18 Foreign Research Reactor Spent Nuclear Fuel Storage Capacity at the Idaho National Engineering Laboratory

F.1.3.3 Hanford Site

The Hanford Site lies within the semi-arid Pasco Basin of the Columbia Plateau in southeastern Washington State (DOE, 1995g). The Hanford Site occupies an area of around 1,450 km^2 (560 mi^2) north of the confluence of the Yakima and Columbia Rivers. Only about six percent of the site has been disturbed in the process of special nuclear materials production for national defense reprocessing and used for DOE purposes, such as nuclear materials production, processing, research and development, and waste management. The Hanford Site facilities include nine shutdown production reactors and several smaller research reactors. Several processing and product finishing facilities are located on the site, but are not currently operating and will not likely operate in the future. Currently, the principal mission of the site is environmental management and includes:

- decontamination and decommissioning of surplus facilities,
- environmental restoration of over 1,500 waste management units and 4 groundwater contamination plumes,

- waste management, including new processing facilities and retrievable disposal, and
- research and development into energy, environmental, and waste management technologies.

A Tri-Party Agreement between DOE, the U.S. Environmental Protection Agency, and the State of Washington provides milestones and guidance for these activities at the Hanford Site. Current schedules use a 2030 date for the completion of most of the restoration activities at the site. A map of the Hanford Site that shows spent nuclear fuel facilities is presented in Figure F-19. Existing spent nuclear fuel facilities are listed in Table F-12.

F.1.3.3.1 Spent Nuclear Fuel Activities at the Hanford Site

The following spent nuclear fuel types and their associated facilities are at the Hanford Site:

- *N Reactor Spent Nuclear Fuel:* This is zircaloy-clad, metallic uranium fuel stored in water in the 105-KE and 105-KW Basins (1,146 and 954 MTHM, respectively), and exposed to air in the plutonium-uranium extraction dissolver cells A, B, and C (0.3 MTHM).
- *Single-Pass Reactor Spent Nuclear Fuel:* This is aluminum-clad, metallic uranium fuel stored in water in the 105-KE and 105-KW Basins (0.4 and 0.1 MTHM, respectively), and stored in water in the plutonium-uranium extraction basin (approximately 2.9 MTHM).
- *Fast Flux Test Facility Spent Nuclear Fuel:* This consists of stainless steel-clad fuel stored in liquid sodium at the Fast Flux Test Facility, comprised mainly of a uranium/plutonium oxide fuel, but with some carbide, metallic, and nitride fuel elements (in all, fuel from 329 assemblies of spent nuclear fuel).
- *Shippingport Core II Spent Nuclear Fuel:* These assemblies are zircaloy-clad uranium dioxide fuel, and are stored in the T-Plant Canyon, Pool Cell 4.
- *Miscellaneous Commercial and Experimental Spent Nuclear Fuel:* This includes primarily zircaloy-clad uranium dioxide fuel stored in air, but does include some Test, Research, Isotope, General Atomic (TRIGA) reactor hydride spent nuclear fuel stored in water and aluminum-clad, uranium-aluminum metallic fuel stored in air. These are principally stored in the 300-Area at Hanford Site.

F.1.3.3.2 Spent Nuclear Fuel Storage Facilities at the Hanford Site

The Hanford Site spent nuclear fuel storage facilities are principally based upon wet methods. Table F-12 provides a brief summary of these facilities. The age, condition, available capacity of these facilities, and the Tri-Party Agreement milestones generally prevent the use of the existing facilities for storage of foreign research reactor spent nuclear fuel. It is extremely unlikely that significant processing activities on spent nuclear fuel will occur in the near future, and thus, new facilities would be required for foreign research reactor spent nuclear fuel management at the Hanford Site.

Two spent nuclear fuel EIS documents address the environmental impacts from spent nuclear fuel management at the Hanford Site. The first is the DOE Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final EIS (SNF&INEL Final EIS) (DOE, 1995g), the Record of Decision of which was issued on May 30, 1995, that in general specifies spent nuclear fuel management throughout DOE; and in particular

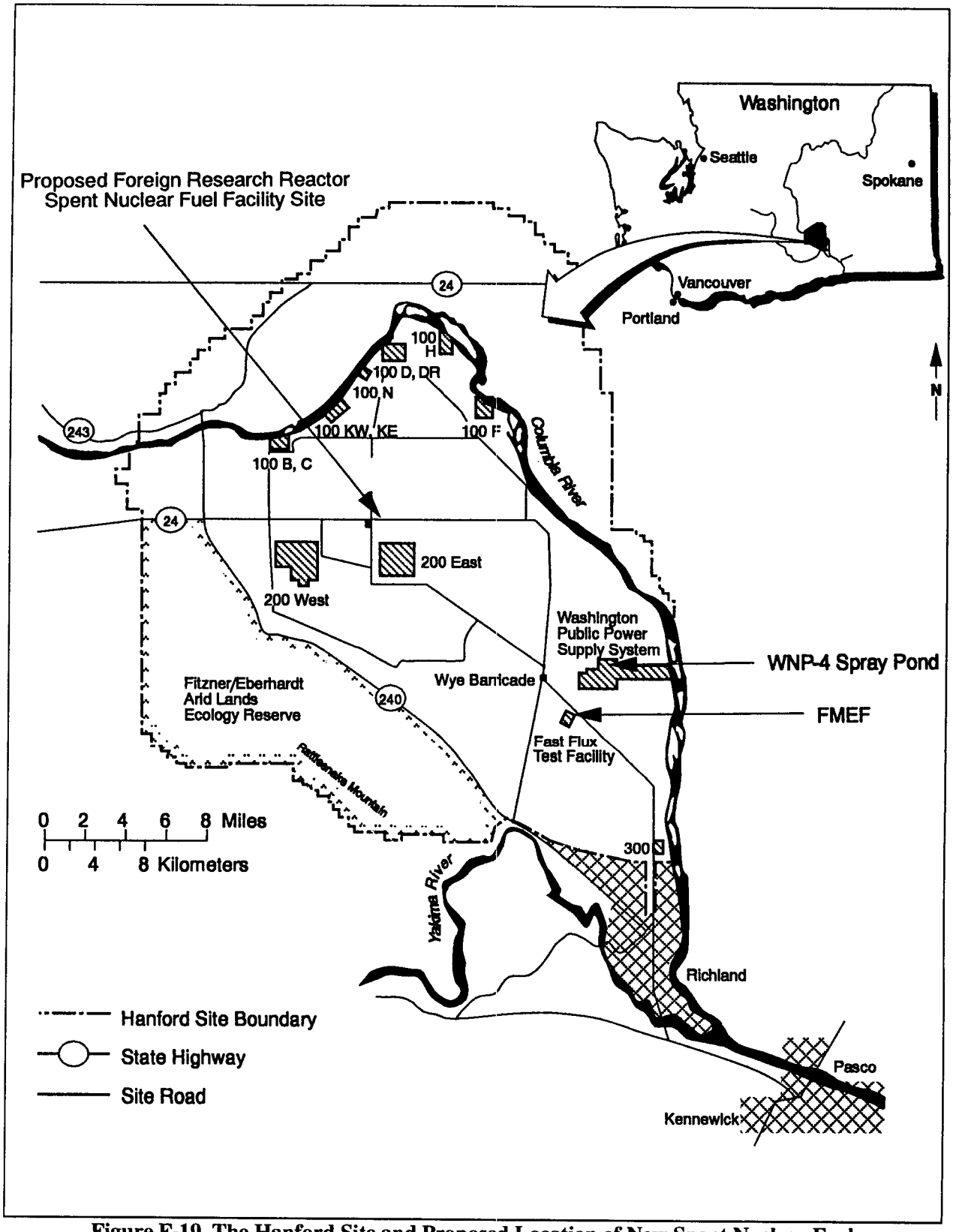


Figure F-19 The Hanford Site and Proposed Location of New Spent Nuclear Fuel Storage Facility

Table F-12 Description of Existing Spent Nuclear Fuel Facilities at Hanford Site

Facility	Description	Capacity for Foreign Research Reactor Spent Nuclear Fuel	Access
105-KE Basin[a]	Water storage pool; 38 m x 20 m x 6 m deep, concrete walls and floor, no sealant or liner	75% - 100% full	By rail, 27 metric tons crane, fairly restrictive
105-KW Basin[a]	Water storage pool, 38 m x 20 m x 6 m deep, concrete walls and floor, epoxy sealant, no liner	75% full; no space for foreign research reactor spent nuclear fuel	By rail, 27 metric tons crane, fairly restrictive
T Plant: Cell 4	Water storage pool, 4 m x 8.4 m x 5.8 m deep	50% full; no space for foreign research reactor spent nuclear fuel	By rail or truck All fuel handling remote
PUREX Plant: East end of 202A Bldg, plus Dissolver Cells A, B, and C[b]	Water storage pool, 9.5 m x 6.1 m x 5.2 m deep, Dissolver Cell sizes vary	No additional capacity	Shipment by rail 36 metric tons crane
Plutonium Finishing Plant: 2736-ZB Bldg.	Dry storage in 208 L[c]	No additional capacity	Shipment by truck
FFTF: Reactor in-vessel storage, interim decay storage, and fuel storage facility locations[b]	Liquid sodium pool storage (fuel storage facility is separate from reactor containment building, with limit of kilowatts/assembly)	More than 75% full; no space for foreign research reactor spent nuclear fuel	By truck 91 metric tons Crane
200 Area LL Burial Grounds: 218-W-4C Trenches 1 and 7; and 218-W-3A Trenches 8 and S6	Dry, retrievable storage, 13 lead-lined, concrete-filled 208 liter drums, soil covered, 22 concrete casks (1.66 m x 1.66 m x 1.22 m or 1.92 m high), soil covered, 39 EBR II casks (1.5 m high x 0.4 m diameter), soil covered; 1 Zircaloy Hull Container (152 cm long x 76 cm diameter)	Large additional capacity; not suitable for foreign research reactor spent nuclear fuel	By truck
308 Building Annex: Neutron Radiography Facility[b]	Built in late 1970s water storage pool, 2.8 m diameter x 6 m deep	Small additional capacity	Truck shipments 4.5 metric tons crane
324 Building: B and D Cells	Dry storage in air, B Cell: 6.7 m x 7.6 m x 9.3 m high (spent nuclear fuel uses 10% of floor space). D Cell: 4 m x 6.4 m x 5.2 m high (small part for fuel), thick concrete walls and floors with steel liners	Small additional capacity	Truck shipments only B Cell - 2.7 and 5.4 metric tons cranes; Airlock - 27 metric tons crane
325 Building: A and B Cells in 325A Radiochemical Facility; 325B Shielded Analytical Laboratory	Dry Storage in air 325A - 1.8 m x 2.1 m x 4.6 m high (typical cell) 325B - 1.7 m x 1.7 m floor area (typical cell)	Small additional capacity	Truck shipments only 325A - 27 metric tons crane 325B - 2.7 metric tons crane
327 Building: A-F and I Cells; Upper and Lower SERF; Dry Storage vault, EBR II cask, Large Basin	Dry storage in air, except for water in small basin; variety of cell sizes, but storage only for fuel research	Small additional capacity	No direct rail Truck shipments 13.5 and 18 metric tons cranes

FFTF = Fast Flux Test Facility; EBR = Experimental Breeder Reactor; PUREX = Plutonium Uranium Extraction

[a] *If 105-KE Basin fuel is consolidated with 105-KW Basin fuel, 105-KE Basin would be shut down. The storage capacity of 105-KW Basin would be increased by replacing all of the storage racks to allow multi-tiered stacking of fuel canisters and by making minor facility modifications.*

[b] *Facility is being shut down.*

[c] *One 55 gal drum.*

specifies that Hanford generated spent nuclear fuel will remain in storage at Hanford pending decisions on ultimate disposition. The second, is the Management of Spent Nuclear Fuel from the K Basins at the Hanford Site Draft EIS (DOE, 1995d) which was issued for comment in October 1995. This EIS addresses the location and method of managing Hanford spent nuclear fuel for up to 40 years or until decisions on ultimate disposition are made.

New facilities would be required for storage of foreign research reactor spent nuclear fuel. However, there may be some economies of scale achieved from overlap with the other spent nuclear fuel activities at the Hanford Site.

F.1.3.3.3 Planned or Potential Spent Nuclear Fuel Storage Facilities at the Hanford Site for Foreign Research Reactor Spent Nuclear Fuel

The Hanford Site has concluded that there are no existing facilities available and ready for accepting foreign research reactor spent nuclear fuel (Bergsman et al., 1994). Consequently, the Hanford Site proposes the following strategies:

- construction of a "generic" modular dry vault or dry cask storage facility,
- construction of a "generic" wet storage and handling facility,
- modification and completion of the Fuel Maintenance and Examination Facility (FMEF) (located at the Fast Flux Test Facility) as a modular dry vault storage facility, and
- acquisition, modification, and completion of the Washington Nuclear Plant-4 Spray Cooling Pond (at the Washington Public Power Supply System) as a wet storage facility.

These facilities and their potential applications to foreign research reactor spent nuclear fuel storage are discussed in detail in Section F.3.

Figure F-20 displays the Hanford Site capacity for foreign research reactor spent nuclear fuel storage. The Hanford Site is not considered capable of immediately accepting foreign research reactor spent nuclear fuel because of the required construction of new facilities. The Hanford Site would have sufficient capacity for foreign research reactor spent nuclear fuel storage after new facility construction.

F.1.3.4 Oak Ridge Reservation

The Oak Ridge Reservation is located on approximately 140 km^2 (54 mi^2) of federally owned land near Knoxville, TN (DOE, 1995g). There are three primary plant complexes within the Oak Ridge Reservation:

- *Y-12 Plant:* produces various materials used for national defense purposes,
- *K-25 Site (formerly called the Oak Ridge Gaseous Diffusion Plant):* originally used for uranium enrichment and now an environmental management site, and
- *Oak Ridge National Laboratory (also known as X-10):* research and development into nuclear energy and other energy technologies.

The Oak Ridge National Laboratory has operated several small reactors for research and isotope production and, of the Oak Ridge Reservation sites, is the most familiar with spent nuclear fuel

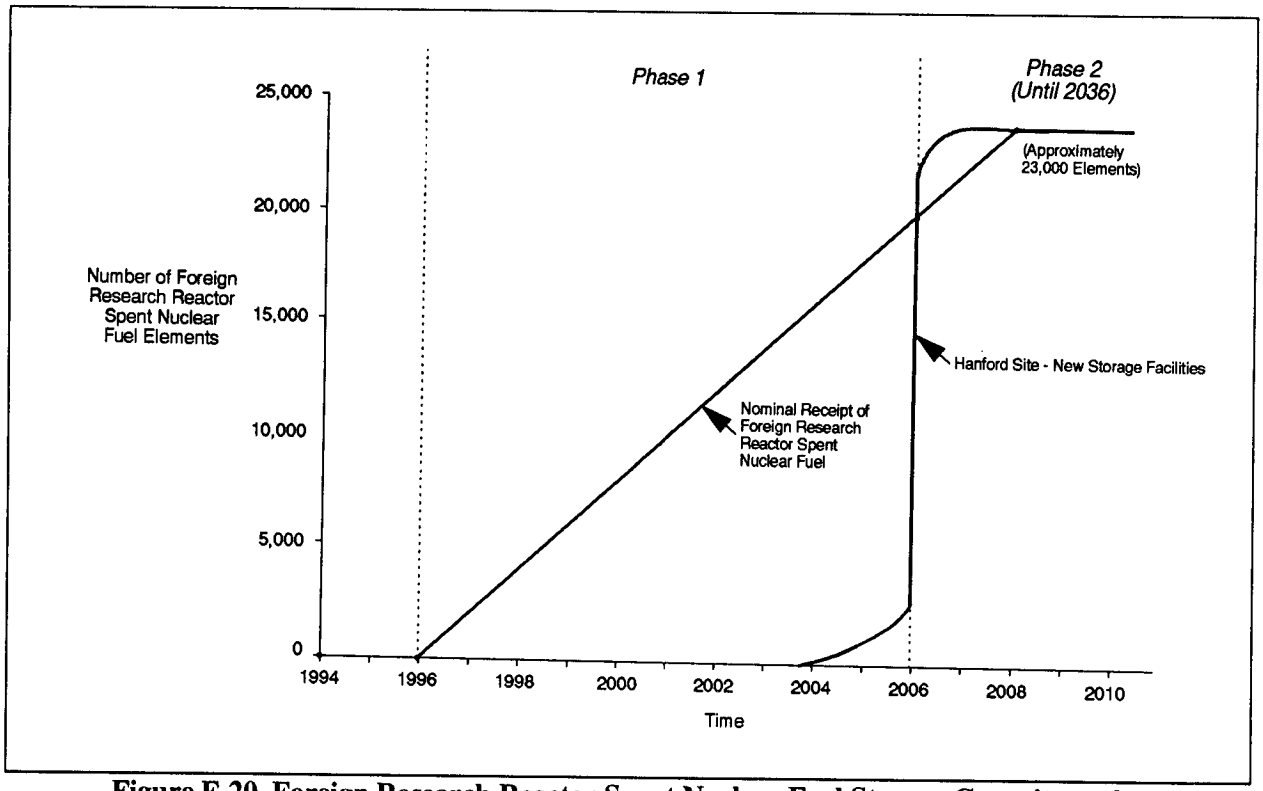


Figure F-20 Foreign Research Reactor Spent Nuclear Fuel Storage Capacity at the Hanford Site

requirements. A map of the Oak Ridge Reservation and its candidate sites for foreign research reactor spent nuclear fuel storage is presented in Figure F-21.

F.1.3.4.1 Spent Nuclear Fuel Activities at the Oak Ridge Reservation

Most Oak Ridge Reservation spent nuclear fuel activities occur at the Oak Ridge National Laboratory. The Oak Ridge National Laboratory has operated several small research reactors, all of which generate (or have generated) spent nuclear fuel. These reactors all have small fuel preparation and handling facilities associated with them ranging up to the single digit MTHM capacity. The spent nuclear fuel storage space is small, and most is either full or committed, with little excess capacity. The Oak Ridge National Laboratory also has hot cell and irradiated fuel examination facilities. Currently, only the High Flux Isotope Reactor is operating and generating spent nuclear fuel. More spent nuclear fuel facilities at Oak Ridge Reservation are presented in Table F-13.

F.1.3.4.2 Spent Nuclear Fuel Storage Facilities at the Oak Ridge Reservation

The Oak Ridge Reservation stores spent nuclear fuel in several small facilities. Most of these facilities are old and are unlikely to meet modern building code and seismic standards. The spent nuclear fuel facilities include the following structures:

- *Building 3525 - Irradiated Fuels Examination Laboratory:* This two-story brick structure was constructed in 1963. It houses hot cells and contains small quantities of irradiated research reactor fuel in the form of samples and targets.

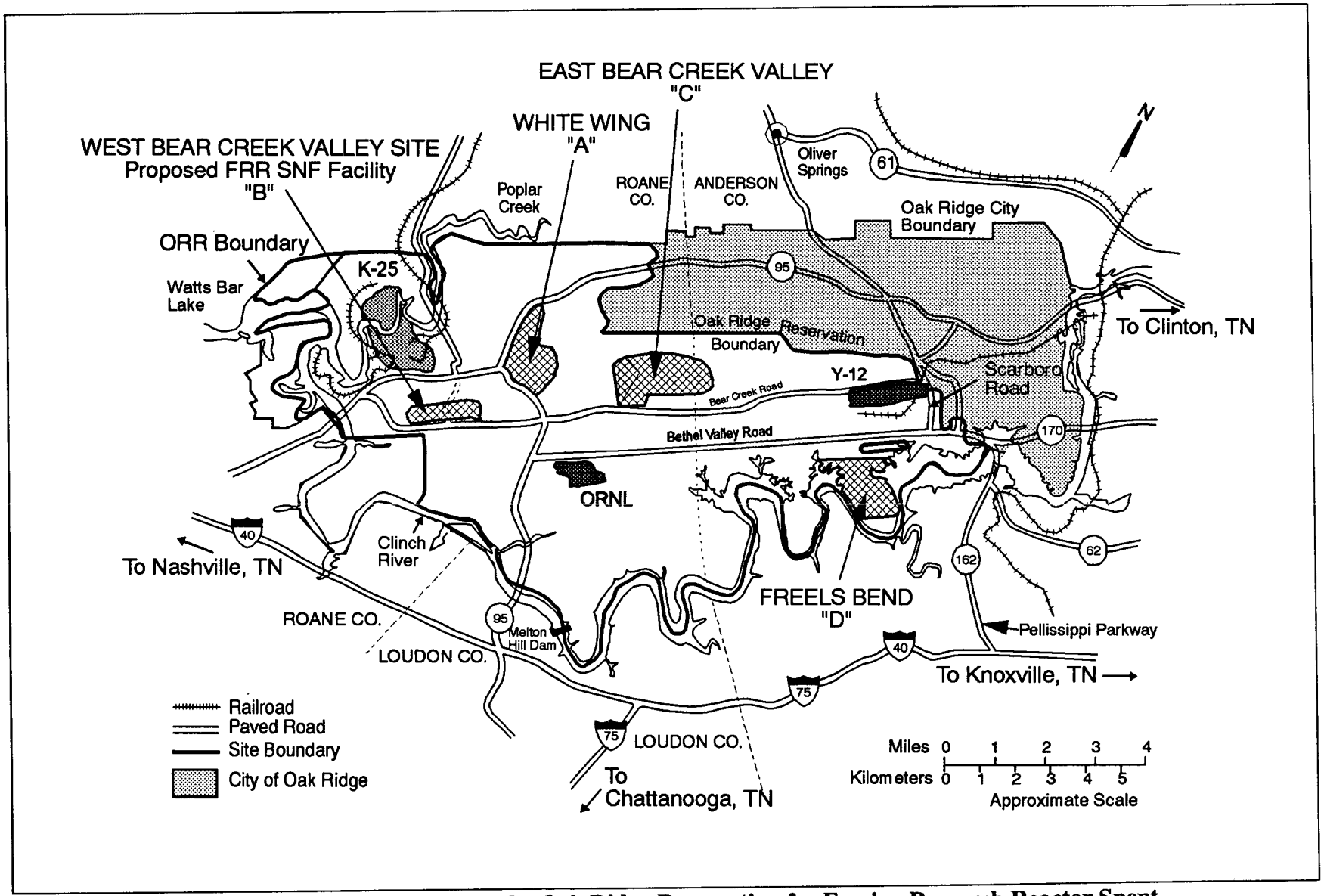


Figure F-21 Candidate Sites at the Oak Ridge Reservation for Foreign Research Reactor Spent Nuclear Fuel Storage

Table F-13 Major Spent Nuclear Fuel Facilities at the Oak Ridge Reservation

Facility	*Characteristics*	*Capacity for Foreign Research Reactor Spent Nuclear Fuel*	*Access*
Building 3525	Hot Cells	No, too small	Truck
Building 4501	Hot Cells	No, too small	Truck
Building 7827	Drywells	No space	Truck
Building 7920	Hot Cells	No, too small	Truck
Building 9720-5 (Y-12)	Warehouse	No, unirradiated fuel only	Truck
Other	Research Reactors	No, storage space near capacity	Truck

- *Building 4501 - High-Level Radiochemical Facility:* This facility dates from 1951 and contains hot cells for examining irradiated materials. This facility contains small quantities (several kg) of sectioned commercial fuel.

- *Building 7920 - Radiochemical Engineering Development Center:* This is a multi-purpose, hot cell facility for (relatively) large quantities of irradiated spent nuclear fuel. This facility supports target preparation and processing for the High Flux Isotope Reactor and contains samples and targets of research reactor spent nuclear fuel in dry storage.

- *Building 9720-5 (Y-12):* This is a large warehouse for storing and safeguarding unirradiated or low burnup HEU fuel. It currently contains around 0.2 MTHM.

- *Research Reactors:* There are five existing and one planned research reactor at the Oak Ridge Reservation. All of these reactors have small spent nuclear fuel storage basins nearby, and this capacity is essentially full. Only the High Flux Isotope Reactor is currently operating.

- *The Oak Ridge Reservation* also has several drywells such as Building 7827 and drum storage areas for irradiated fuel. Spent nuclear fuel would be relocated in accordance with actions of the DOE Programmatic SNF&INEL Final EIS (DOE, 1995g).

None of these locations have any significant capacity for the potential quantities of foreign research reactor spent nuclear fuel.

F.1.3.4.3 Planned or Potential Spent Nuclear Fuel Storage Facilities at the Oak Ridge Reservation for Foreign Research Reactor Spent Nuclear Fuel

The Oak Ridge Reservation has plans for dry storage of spent nuclear fuel. This would be accomplished via a modular route at the High Flux Isotope Reactor location. This dry storage area could be extended almost indefinitely to accommodate the Oak Ridge Reservation's needs.

DOE is evaluating a spent nuclear fuel management complex for handling DOE spent nuclear fuel from other sites as an alternative in the DOE Programmatic SNF&INEL Final EIS (DOE, 1995g). The spent nuclear fuel management complex would include the following:

- Spent Nuclear Fuel Receiving and Canning Facility,

- Technology Development Facility,

- Interim Dry Storage Facility, and

- Expended Core Facility for Naval-type fuel similar to the one at Idaho National Engineering Laboratory.

The receiving and canning facility would receive spent nuclear fuel cask shipments from offsite and prepare the spent nuclear fuel for dry storage. The facility incorporates a pool (wet) storage facility for cooling spent nuclear fuel (tentatively identified as a 5-year period) prior to placement into dry storage, as necessary. The technology development facility would investigate the applicability of dry storage technologies and pilot scale technology development for disposal for various types of spent nuclear fuel. The interim dry storage area would consist of passive storage modules to safely store the spent nuclear fuel for 40 years. Naval fuel would be examined at the Expended Core Facility prior to interim storage. The total land required for the facility, including a buffer zone, is approximately 36 ha (90 acres).

The proposed site for the spent nuclear fuel facilities is located in the West Bear Creek Valley Area, in the western portion of the Oak Ridge Reservation site. This area of the Oak Ridge Reservation is currently in the Natural Areas land use category and is designated for future Waste Management land use. Land uses bordering on the Oak Ridge Reservation in this area are primarily agricultural farmland and commercial forest, with sparsely located residences (i.e., low population density).

Environmental, safety, and health consequences are calculated to be negligible from the spent nuclear fuel facilities, although a preliminary design and/or layout is not provided. Releases of krypton-85, chlorine, and hydrogen fluoride are included in the analysis for incident-free operations, but the source of these emissions is not reported. Facility budgetary requirements are not delineated.

Foreign research reactor spent nuclear fuel represents less than one percent of the DOE spent nuclear fuel quantities in terms of mass and, thus, its effect would be minimal as compared to the other fuels. The foreign research reactor spent nuclear fuel contribution to the operational consequences and its costs are not delineated. Figure F-22 summarizes foreign research reactor spent nuclear fuel capacity at the Oak Ridge Reservation. New facility construction would be required for foreign research reactor spent nuclear storage.

F.1.3.5 Nevada Test Site

The Nevada Test Site is located in the southeastern part of the State of Nevada, and is used as the on-continent site for nuclear weapons testing (DOE, 1995g). The Nevada Test Site encompasses approximately 3,500 km^2 (1,350 mi^2) of desert land, with flats, mesas, and mountain ridges (Figure F-23). Essentially no permanent surface waters exist, and the depth to groundwater routinely exceeds 330 m (1,000 ft). The Nellis Air Force Base Range surrounds the Nevada Test Site to the north, east, and west; and, with the Tonapah Test Range, provides a 24 to 104 km (15 to 65 mi) buffer zone between the Nevada Test Site and public lands. The Bureau of Land Management owns land on the southern and southwestern borders of the Nevada Test Site. Principal access to the site is via the town of Mercury, on the southeastern corner. Las Vegas is approximately 104 km (65 mi) from this corner of the Site.

Activities at the site have included nuclear weapons testing, nuclear reactor tests, nuclear rocket engine development, and waste management. Current activities include nuclear weapons-related activities (e.g., emergency search teams, arms control/verification, etc.), low-level waste/low-level mixed waste disposal, and site characterization for commercial spent nuclear fuel disposal.

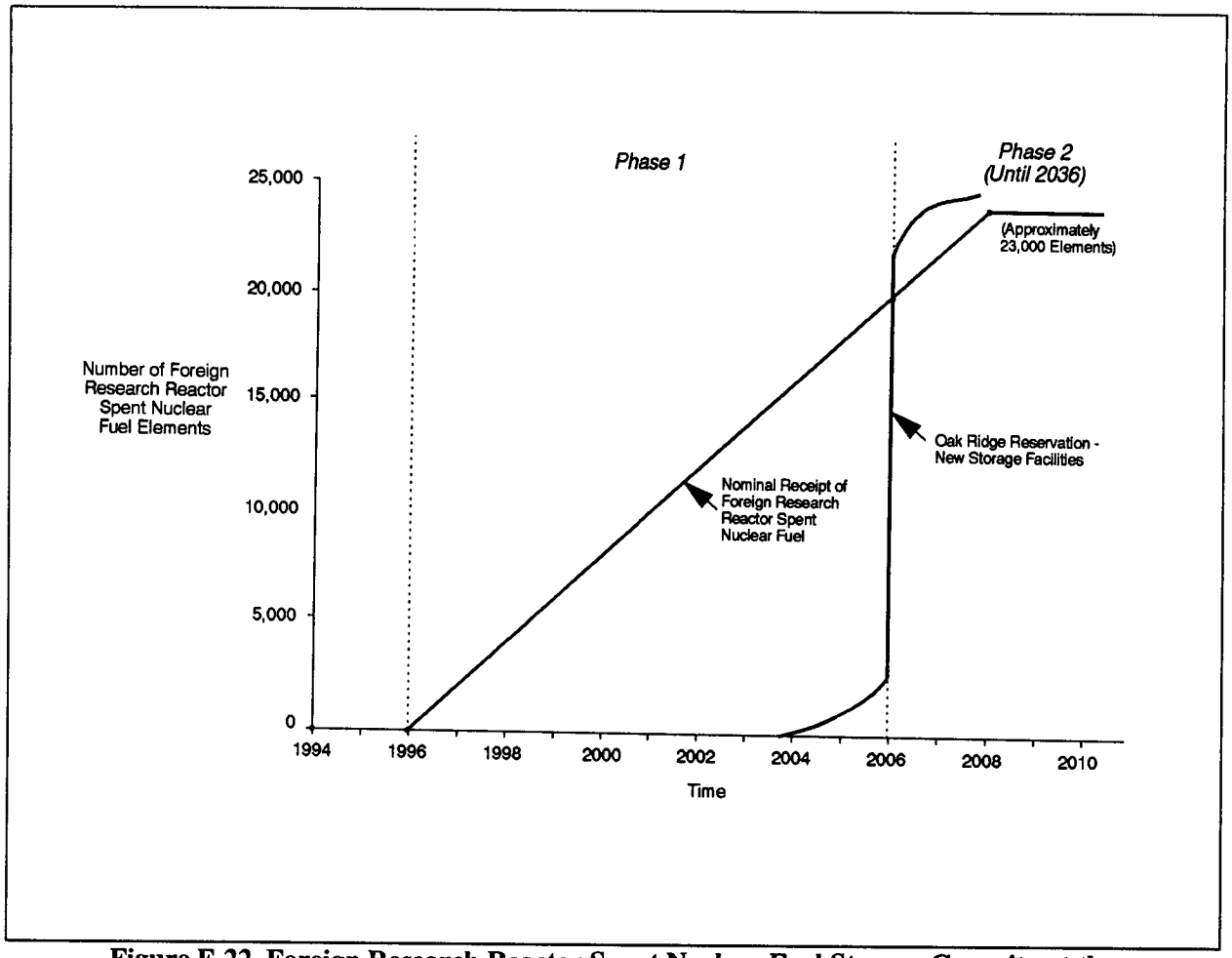


Figure F-22 Foreign Research Reactor Spent Nuclear Fuel Storage Capacity at the Oak Ridge Reservation

F.1.3.5.1 Spent Nuclear Fuel Activities at the Nevada Test Site

The Nevada Test Site has several existing facilities that could be useful for spent nuclear fuel management. These facilities were principally used for nuclear rocket engine development and are located at Jackass Flats, in a southern portion of the Nevada Test Site called the Nevada Research & Development Area (Cosimi, 1994; Chandler et al., 1992; Gertz, 1994; Hynes, 1994; Reed, 1994). The facilities include several large hot cell and fuel examination "shops," with large cranes and manipulators. At least two of these facilities appear to be ideally suited for handling and storing foreign research reactor spent nuclear fuel after relatively minor upgrades and refurbishments. Table F-14 summarizes the capabilities of these facilities for foreign research reactor spent nuclear fuel.

The Engine Maintenance and Disassembly (E-MAD) facility was originally constructed for the assembly and preparation of nuclear rocket engines for testing, refurbishment of activated engines, and disassembly and inspection of tested engines and components. The facility is designed for remote handling and examination of highly radioactive components. The building is a T-shaped, multi-storied structure, with overall dimensions of 85 x 107 m (280 ft x 350 ft) (Figure F-24). Numerous hot cells exist, with remote handling and transfer equipment, and the largest hot cell is 20 m wide x 45 m long x 23.5 m high (66 ft wide by 146 ft long and 77 ft high). Typically, 1.5 m (5 ft) thick concrete walls provide the shielding. Material transfer capabilities include several 36 metric tons (40 ton) cranes and a cask handling system of

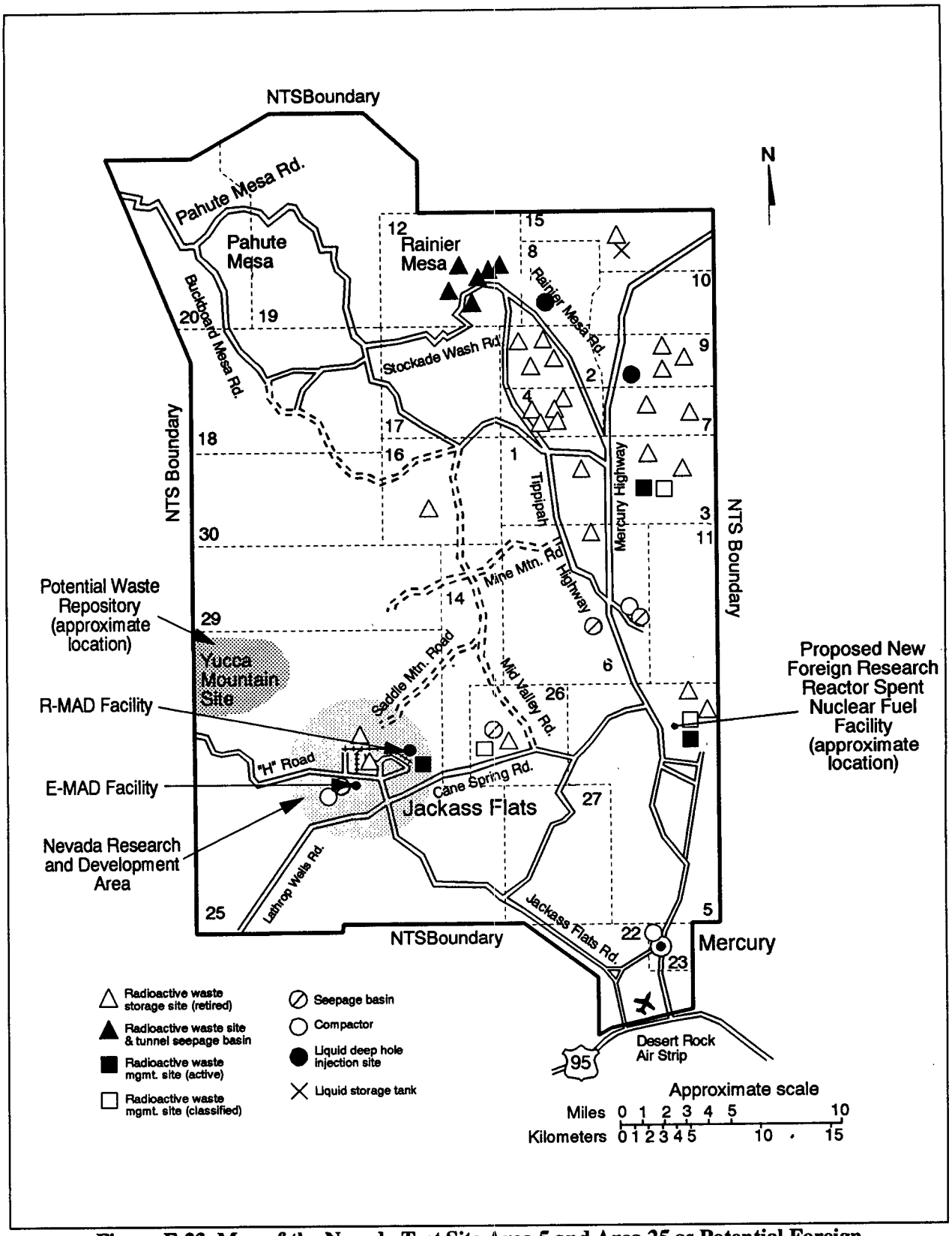


Figure F-23 Map of the Nevada Test Site Area 5 and Area 25 as Potential Foreign Research Reactor Spent Nuclear Fuel Storage Areas

Table F-14 Major Spent Nuclear Fuel-Capable Facilities at the Nevada Test Site

Facility	*Characteristics*	*Capacity for Foreign Research Reactor Spent Nuclear Fuel*	*Access*
E-MAD	Large hot cell, with smaller hot cells. Main hot cell area is 895m^2 (9,600 ft^2)	Yes, as either a vault or a staging facility for dry casks, after 1-2 years refurbishments, 25,000 elements	Truck
R-MAD	Large hot cell, with smaller hot cells. Main hot cell area is 223m^2 (2,400 ft^2)	Yes, as a staging facility for dry casks or a small vault, after 1-3 years refurbishment, 25,000 elements	Truck

approximately 91 metric tons (100 tons) capacity. The heating, ventilation, and air conditioning systems for the hot cell areas maintain negative pressure and exhaust through High Efficiency Particulate Air filters.

The E-MAD facility is currently unused and last saw service during the 1980s for commercial spent nuclear fuel storage experiments (e.g., Climax Mine Project) (Gertz, 1994). Thirteen commercial spent nuclear fuel assemblies were tested in casks and drywells. The E-MAD facility was subsequently used to load transportation casks for shipment of the spent nuclear fuel to Idaho. Several of these spent nuclear fuel storage casks remain at the site (Hynes, 1994). The Los Alamos National Laboratory assessment (Chandler et al., 1992) considers the facility to require only minor upgrades and routine maintenance.

The Reactor Maintenance and Disassembly facility is located a short distance from the E-MAD facility. This facility contains two (contact) assembly bays and one remotely operated hot disassembly bay. The hot bay dimensions are 18 x 12 x 18 m (60 by 40 by 60 ft) high, with 1.8 m (6 ft) thick walls for shielding. A transfer system connects six hot cells to the hot disassembly bay. The Los Alamos National Laboratory assessment (Chandler et al., 1992) found the Reactor Maintenance and Disassembly facility to require a minor upgrade.

F.1.3.5.2 Spent Nuclear Fuel Storage Facilities at the Nevada Test Site

At the present time, the Nevada Test Site is not storing spent nuclear fuel. As noted, facilities in the Jackass Flats area have handled spent nuclear fuel in the past and could be adapted to accommodate foreign research reactor spent nuclear fuel and serve as the nucleus of a spent nuclear fuel storage facility. The E-MAD and Reactor Maintenance and Disassembly facilities appear to have sufficient size and design for accommodating all of the foreign research reactor spent nuclear fuel in a dry storage mode, either vault or cask, and for accomplishing any required transfer, examination, and canning operations.

F.1.3.5.3 Planned or Potential Spent Nuclear Fuel Storage Facilities at the Nevada Test Site for Foreign Research Reactor Spent Nuclear Fuel

Besides the Area-25 facilities, DOE evaluated an elaborate spent nuclear fuel handling system as an alternative in the DOE Programmatic SNF&INEL Final EIS (DOE, 1995g). The spent nuclear fuel management complex would be located in Test Area 5, near the eastern border of the site, and in the general proximity of the low-level waste/low-level mixed waste disposal areas. The spent nuclear fuel complex would include:

- Spent Nuclear Fuel Receiving and Canning Facility,
- Technology Development Facility,
- Interim Dry Storage Area, and
- Expended Core Facility, similar to the one at Idaho National Engineering Laboratory.

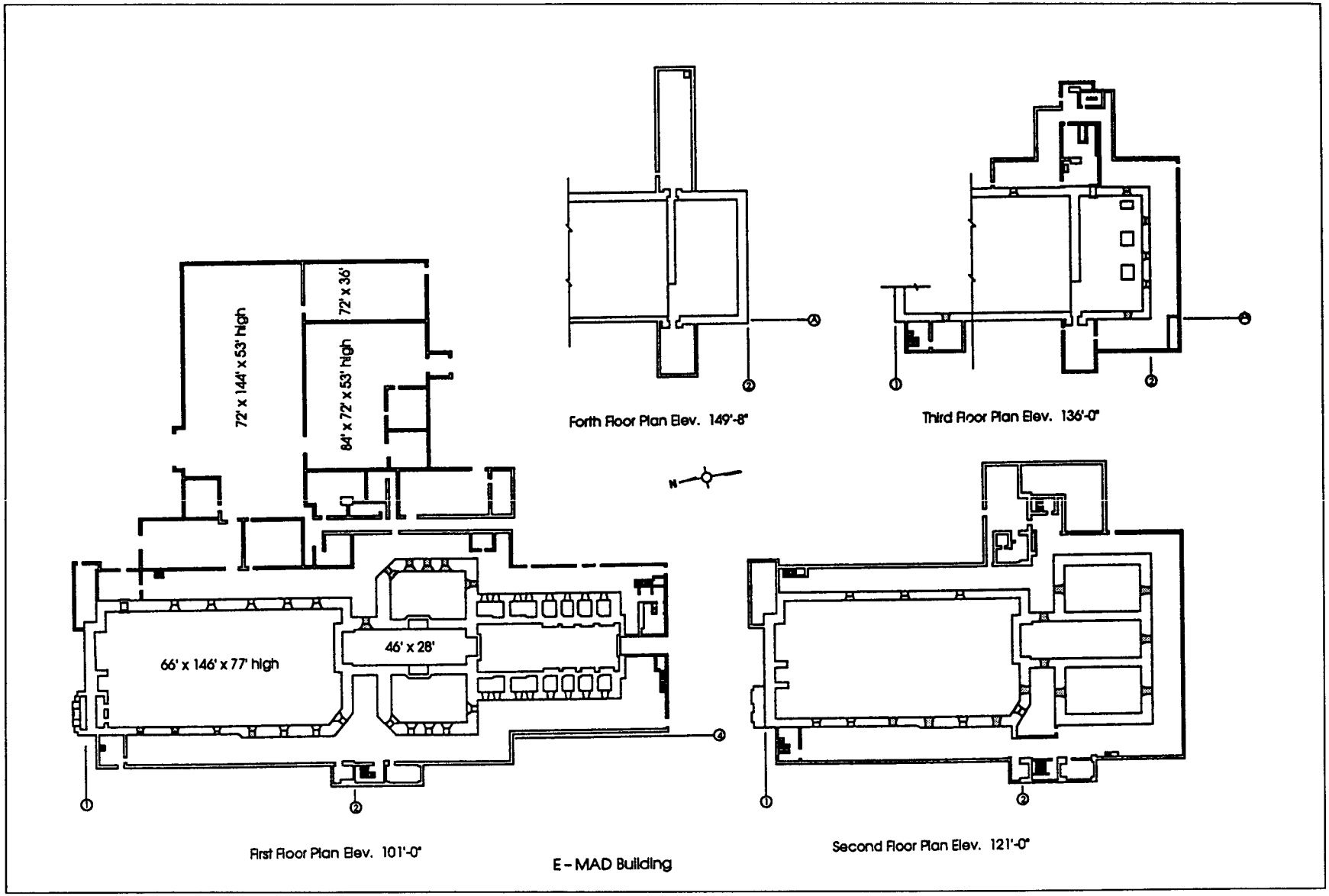


Figure F-24 Schematic of the Engine Maintenance and Disassembly Facility at the Nevada Test Site

The receiving and canning facility would receive spent nuclear fuel cask shipments from offsite and prepare the spent nuclear fuel for dry storage. The facility incorporates a pool (wet) storage facility for cooling spent nuclear fuel (tentatively identified as a 5-year period) prior to placement into dry storage, as necessary. The technology development facility would investigate the applicability of dry storage technologies and pilot scale technology development for disposal for various types of spent nuclear fuel. The interim dry storage area would consist of passive storage modules to safely store the spent nuclear fuel for 40 years. Naval fuel would be examined at the Expended Core Facility prior to interim storage. The total land required for the facility, including a buffer zone, is approximately 36 ha (90 acres).

Environmental, safety, and health consequences are calculated to be negligible from the spent nuclear fuel facilities, although a preliminary design and/or layout is not provided. Releases of krypton-85, chlorine, and hydrogen fluoride are included in the analysis for incident-free operations, but the source of these emissions is not reported. Facility budgetary requirements are not reported.

Foreign research reactor spent nuclear fuel represents less than 1 percent of the DOE spent nuclear fuel quantities in terms of mass (i.e., potential source term), and about 10 percent in terms of volume. Thus, its effect would be minimal as compared to the other fuels. The foreign research reactor spent nuclear fuel contribution to the operational consequences and its costs are not delineated.

Figure F-25 summarizes the Nevada Test Site storage capabilities for foreign research reactor spent nuclear fuel. The Area-25 facilities could all receive and provide for dry storage of foreign research reactor spent nuclear fuel close to the proposed Yucca Mountain repository. It should be noted that these facilities have comparable shielded floor areas and volumes as compared to the generic modular dry vault

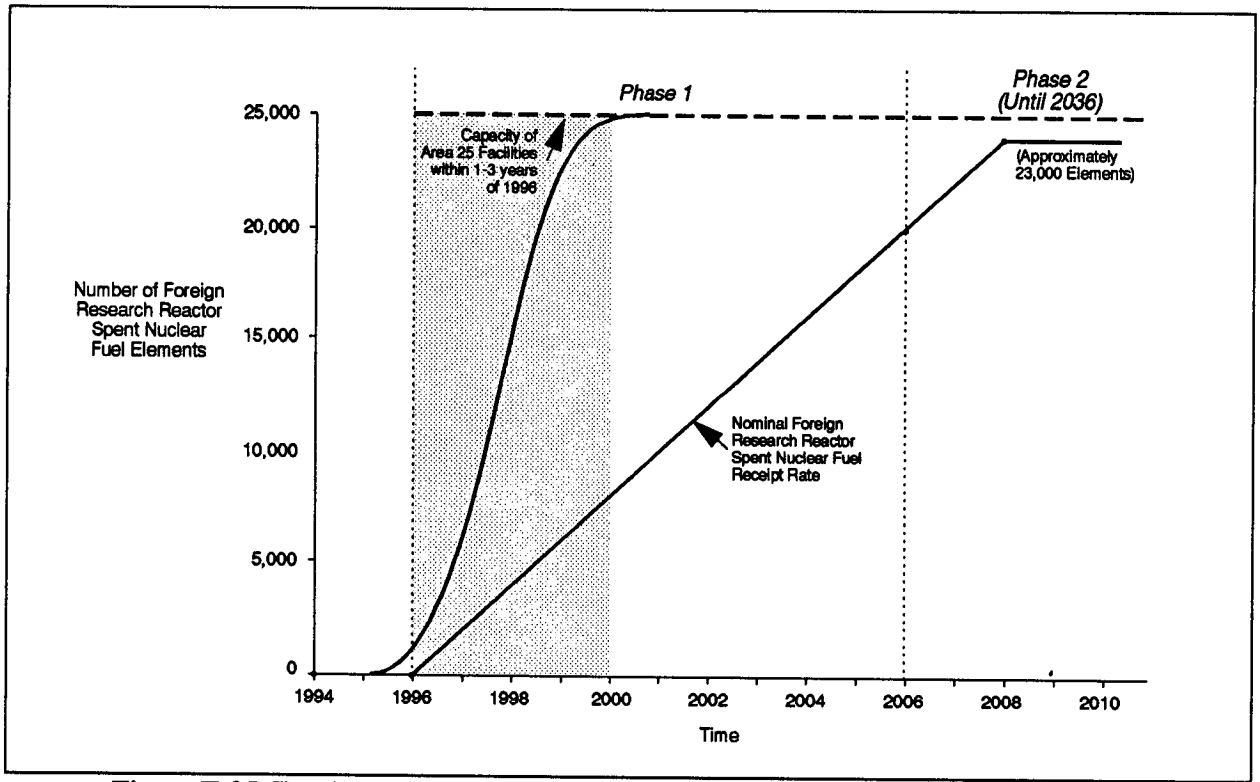


Figure F-25 Foreign Research Reactor Spent Nuclear Fuel Storage Capacity at the Nevada Test Site

for foreign research reactor spent nuclear fuel discussed in Section F.3. Alternatively, new facilities could be built, but these would require a longer transportation path to the proposed Yucca Mountain repository.

F.1.3.6 Storage at Overseas Facilities

Currently, foreign research reactor spent nuclear fuel is being stored in wet pools at foreign research reactor sites. These pools are approaching the levels of their capacity, which is why the foreign research reactor operators would like the United States to accept their spent nuclear fuel. An alternative being considered by DOE is foreign research reactor spent nuclear fuel storage at overseas facilities. Several facilities exist in Europe for contractual storage of both commercial and research reactor spent nuclear fuel for a fee, including:

- British facilities at Dounreay, Scotland and Sellafield, England. The former has several small pools for research reactor fuels, while the latter has several large pools with a capacity of 3,000 MTHM for commercial spent nuclear fuel (Bonser, 1994).

- French facilities at La Hague, with several large pools having a total capacity of 14,000 MTHM for commercial spent nuclear fuel (Nuclear Fuel, 1993); facilities at Marcoule, for research and metallic spent nuclear fuel.

Electricite De France has also announced its intention of constructing a commercial spent nuclear fuel wet storage facility with a capacity of 12,000 MTHM (Nuclear Fuel, 1994b). Dry storage of spent nuclear fuel is also being considered.

These facilities are predominantly stainless-steel lined wet storage pools that meet modern seismicity and confinement standards and maintain good water chemistry. Wet storage pools designed for commercial spent nuclear fuel could, after license modification and new rack installation, store foreign research reactor spent nuclear fuel. These overseas wet storage pools are similar in design and layout to the generic wet storage facility discussed in Section F.3.

F.1.4 Vitrified Waste Storage Facilities

If foreign research reactor spent nuclear fuel is processed, the resulting high-level waste would be vitrified and placed into stainless steel canisters. The Savannah River Site is the only domestic site that currently has a storage facility designed and built for storing vitrified high-level waste from the processing of spent nuclear fuel. This facility is termed the Glass Waste Storage Building, and it is located immediately adjacent to the Savannah River Site vitrification facility (the Defense Waste Processing Facility), in the S-Area of the site near the H-Area processing facilities (DOE, 1994g). Figure F-26 provides a general overview of the facilities in the S-Area. Figure F-27 displays a general layout of the building. The Glass Waste Storage Building is designed to accommodate the standard Defense Waste Processing Facility vitrified waste canister (Figure F-28). The existing building has space for 2,286 of these canisters. A second, almost identical building, is planned for construction starting in 2007. Additional buildings may be built, up to a total interim storage capacity of 10,000 canisters if delays in the Federal Repository Program are encountered (DOE, 1994g). The Defense Waste Processing Facility/Glass Waste Storage Building area does not currently include a cask receiving/shipping facility, but one is planned for future construction.

The facility is relatively simple in design and operation. It consists of a structure enclosing a concrete floor that functions as the charging face to the vault beneath it. Shield plugs are removed from the floor to provide access to storage tubes in the vaults that would contain the canisters. Each storage tube contains

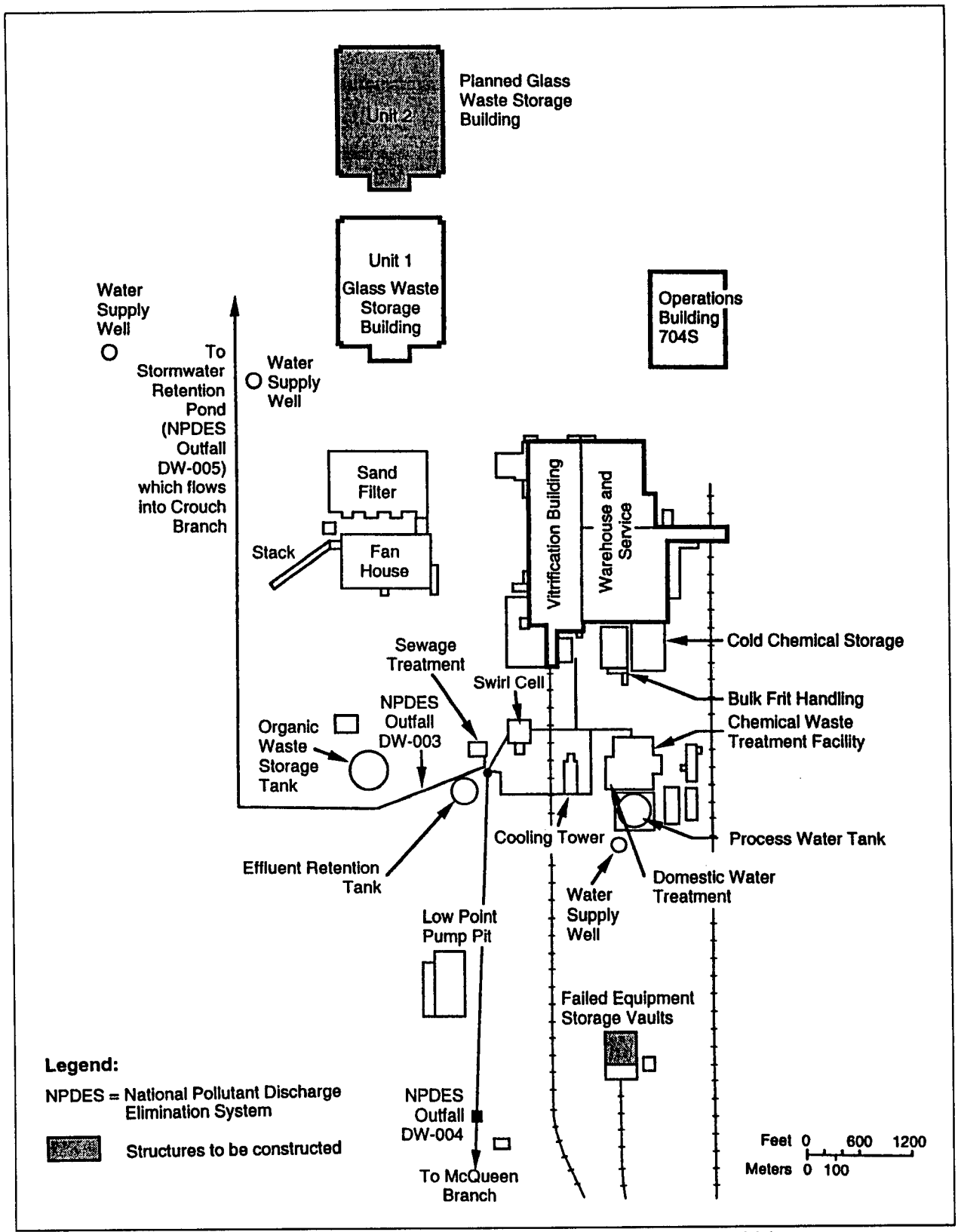


Figure F-26 General Layout of the Existing Vitrification Facilities at the Savannah River Site

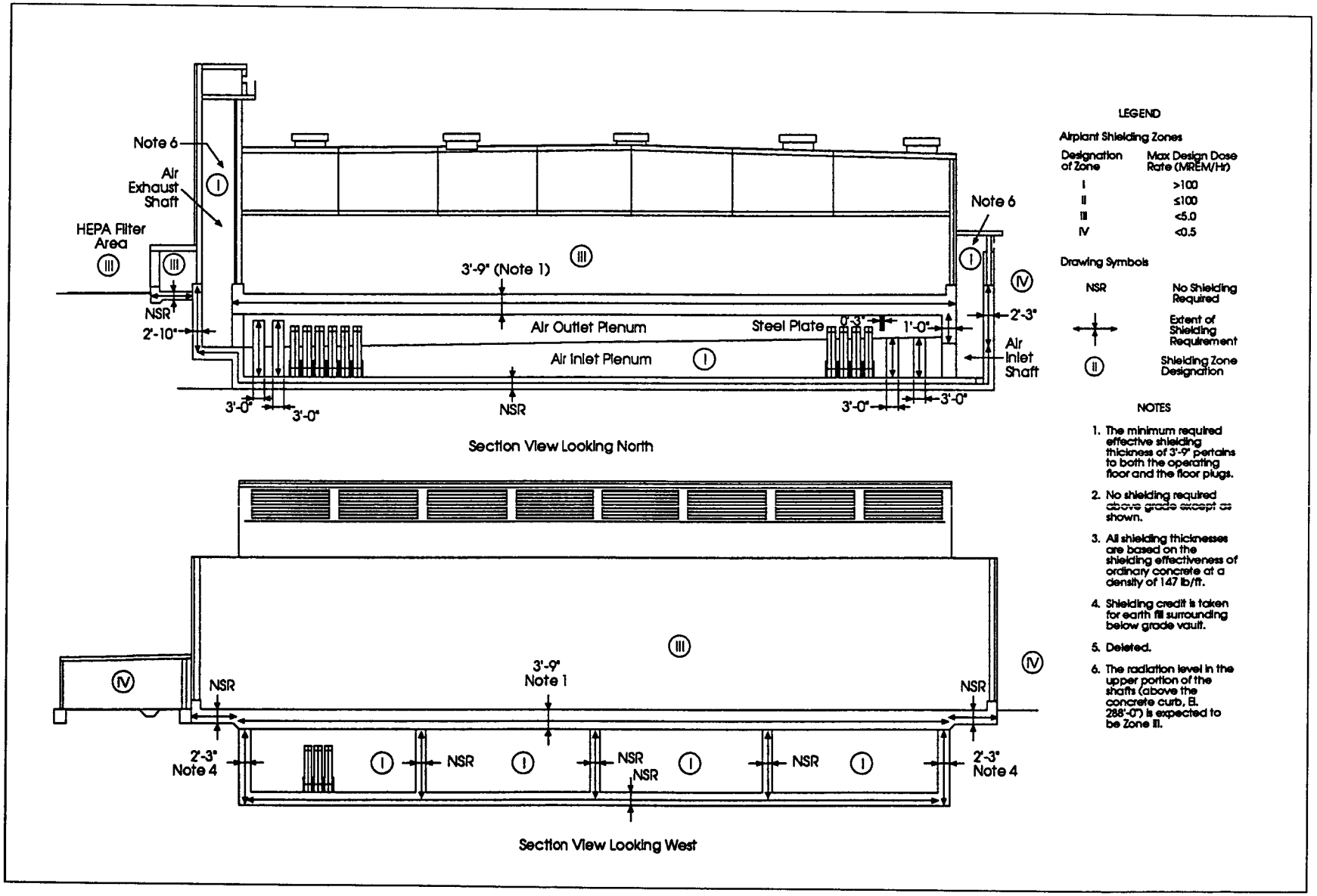
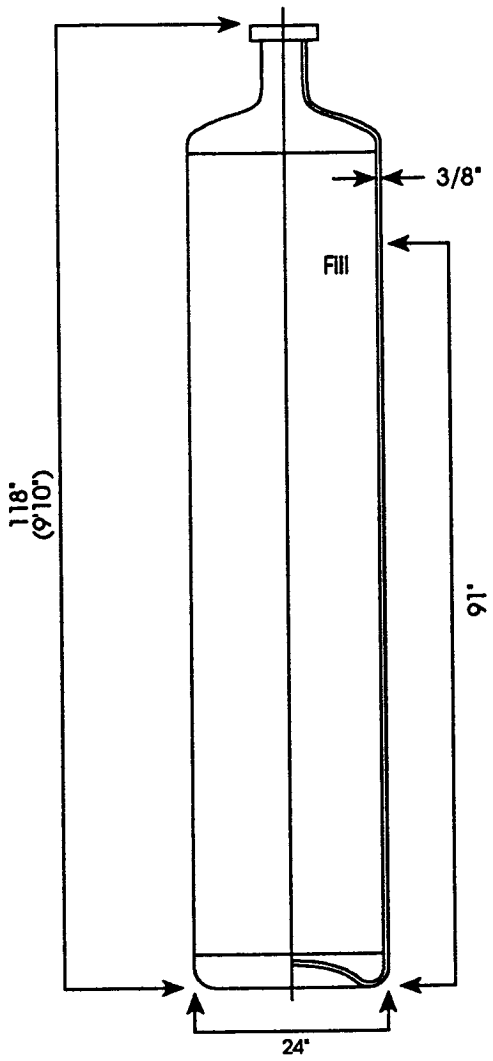


Figure F-27 Layout of the Glass Waste Storage Building



Material:	304L Stainless Steel
Empty Weight:	1,100 lb
Net Weight:	3,540 lb (Glass)
Weight of Radionuclide:	41 kg (90 lb)
Activity:	8.3 x 10^{15} Bq (223,000 Ci)
Decay Heat:	660 W
Radiation Field (at Surface):	6,300 rad/hr
Surface Contamination:	Less than 10^{-4} μCi/cm^2

Figure F-28 Typical Defense Waste Processing Facility Glass Waste Canister

two canisters, stacked vertically. The vault area consists primarily of steel-reinforced concrete and is designed to resist all earthquake and severe weather incidents.

Radioactive decay heat from the canisters is removed by the Glass Waste Storage Building's forced air fan exhaust system. The exhaust air is drawn around the canisters and then exhausted through the building's High Efficiency Particulate Air filtered ventilation system and discharged to the atmosphere via a stack. No condensate is expected to form, although the building does include a sump for exhaust air condensate. No radioactivity is expected in the exhaust air or in any condensates that might form.

During operation, a special dedicated transporter vehicle moves the canister from the Defense Waste Processing Facility vitrification building to the Glass Waste Storage Building in a shielded transporter. The transporter's cask is placed over the appropriate vault borehole, the shield plug is removed, and the canister is lowered via a crane mechanism into the borehole. The shield plug is replaced, and the transporter returns to the vitrification plant for the next shipment.

Several overseas facilities also exist for vitrified waste storage at Marcoule (France), La Hague (France), and Sellafield (England) (COGEMA, 1994a and 1994b; BNFL, 1994a and 1994b). These facilities are designed as natural circulation vaults and, thus, do not require fans for storage cooling. These vaults use a smaller canister, with several thousand currently in storage.

F.2 Storage Technology Evaluation Methodology

The selection of a spent nuclear fuel storage technology for foreign research reactor spent nuclear fuel requires a multi-disciplinary approach including the evaluation of, at the minimum, the environmental impact of alternatives and the following key design and performance areas:

- chemical compatibility,
- subcriticality assurance,
- shielding effectiveness,
- structural integrity (i.e., containment),
- thermal performance,
- ease of use,
- cost, and
- regulatory basis and licensing.

Other factors that may affect the decision process are whether the design has been previously licensed and actually used to store spent nuclear fuel, and its perceived ability to meet applicable regulations and standards if it has not yet been licensed.

Two principal types of spent nuclear fuel storage can be used for foreign research reactor spent nuclear fuel, wet and dry. Wet storage denotes the immersion of fuel in a pool of water, which performs the dual functions of shielding/leaking radionuclide removal and decay heat removal, but which relies on active systems. Dry storage encompasses a wide spectrum of structures that house the fuel in a dry inert gas environment, with an emphasis on passive system design and operation.

F.2.1 Chemical Compatibility

The most important criterion in assessing foreign research reactor spent nuclear fuel storage technologies is the compatibility of the spent nuclear fuel with the fuel storage technology environment. The research reactor fuel cladding is either aluminum or stainless steel. Aluminum cladding fuel is the predominant type in the mix of foreign research reactor spent nuclear fuel being considered for acceptance in this EIS. The selected method of storage for any foreign research reactor spent nuclear fuel that may be accepted must provide a benign and noncorrosive environment for the fuel.

In reviewing the corrosive potential of aluminum, acidic, alkaline, and even many neutral chemical solutions have been found to be significantly corrosive. Therefore, the use of wet storage technology for the majority of the foreign research reactor spent nuclear fuel that contains aluminum cladding would require the maintenance of high water purity throughout the storage life of the pool, which may equal or exceed 40 years.

Unlike wet storage, most of the dry storage technologies utilize a dry inert gas atmosphere for the fuel, which is a noncorrosive noble gas that also enhances conduction heat transfer from the fuel to the encapsulating container. Some dry storage technologies use dry nitrogen instead of inert gas. Even in the event of a loss of inert gas atmosphere, the air atmosphere would be less corrosive than a less-than-high-purity water pool. Finally, previous experience at many DOE wet storage facilities has shown that poor water quality dramatically deteriorates the integrity of aluminum fuel. Thus, the chemical compatibility criterion indicates that dry storage is a more appropriate technology than wet storage for extended storage of foreign research reactor spent nuclear fuel.

F.2.2 Subcriticality Assurance

Uranium and plutonium are the principal elements that have the unique ability to split or fission after absorbing a neutron, and release energy and several new neutrons from this fission process. The particular forms or isotopes of uranium that are effective in the fission process are called fissile materials and are ^{233}U, ^{235}U, and ^{239}Pu. Of these three isotopes, only ^{235}U exists naturally, while the other two isotopes can be produced artificially. Under the right conditions, the fission process can be self-sustaining or even grow by a chain reaction. This chain reaction produces as many or more neutrons than are absorbed in an assembly of fissile materials.

In nuclear engineering terminology, the numerical measure of a mass of fissile material to achieve and maintain a self-sustaining fission chain reaction is termed K-effective. K-effective is the net ratio of neutrons produced per neutron absorbed in the fissile material mass. When K-effective equals 1.0, the mass is said to be critical because it can maintain the fission process. When K-effective is less than 1.0, the mass is considered to be subcritical.

Subcriticality can be ensured by a number of factors, including:

- diluted concentration of fissile materials,
- adequate separation distance between masses of fissile materials such as nuclear fuel rods or assemblies,
- presence of materials (such as boron) mixed with the fissile material that absorbs neutrons before they can be captured by the fissile material,

- exclusion of substances such as water that can encourage the absorption of neutrons by the fissile isotopes or reflect neutrons leaving the mass of fissile materials back into the mass, and

- restricting the mass of fissile material below the minimum that nature requires to initiate, maintain, and/or sustain a fission chain reaction.

In nuclear criticality safety, the principle of double contingency is used to protect against criticality. Double contingency requires that the design of any system containing fissile material use two of the aforementioned factors to prevent the onset of criticality. Criticality analyses would be required to confirm spacing and the effects of optimum moderation, as well as the different structural materials in foreign research reactor spent nuclear fuel as compared to commercial fuel (e.g., aluminum, stainless steel, hydride, inconel in foreign research reactor spent nuclear fuel as compared to zircaloy in commercial fuel).

Another important factor is that most of the products of the fission reaction are radioactive fission products that are not capable of sustaining a fission reaction. Like most elements in nature, these fission products can absorb neutrons, but do not produce any neutrons or energy during this absorption. Mixed with these fission products is a small amount of fissile ^{239}Pu, which was also created during the fission process. However, the sum of the remaining ^{235}U and the created ^{239}Pu is much smaller than the original quantity and concentration of ^{235}U in the new fuel. The relatively low (in comparison to its initial value) ^{235}U enrichment and ^{239}Pu present in foreign research reactor spent nuclear fuel, coupled with the presence of neutron-absorbing fission products, greatly reduces the physical ability of foreign research reactor spent nuclear fuel to become critical.

Another important aspect in selecting an appropriate storage technology is the maintenance of subcriticality. For wet (pool) storage, subcriticality is ensured by fuel spacing, and in some cases, the use of spacing plates between adjacent fuel assemblies that contain boron. In addition, control of the maximum allowable concentration of fissile isotopes (i.e., ^{235}U enrichment) is another method used to control subcriticality. Since all dry storage technologies use a storage canister for fuel, the subcriticality design relies on controlling the fissile material inventory, fuel spacing, and if necessary, the use of neutron-absorbing materials. The subcriticality control design of all fuel storage technologies is acceptable and does not provide any discriminating factors for selecting one technology over another.

F.2.3 Shielding Effectiveness

Shielding effectiveness design impacts both onsite worker and public dose rates during the loading and subsequent storage of spent nuclear fuel. Both neutron and gamma ray shielding must be provided and ensured throughout the life of the storage facility. Wet storage technology uses pool water as a shield, which effectively reduces both neutron and gamma doses to acceptable levels. The only weakness of this shielding design is any event in which the water could be lost due to a leak in the pool wall or, if the design includes piping at a low enough level, a pipe break in a line connected to the pool for the water purification or decay heat removal systems. Precluding piping or wall leakage, spent nuclear fuel pool water is an inexpensive shield medium that offers the advantage of providing visual inspection of the stored fuel as long as water purity and clarity are maintained.

Dry storage technology relies on a number of solid shielding materials, sometimes in combination, to reduce gamma and neutron dose rates. The most common materials are different forms of concrete (i.e., low-density, high-density, hydrogenated), cast iron, carbon or stainless steel, lead, borated resin, and polyethylene (for neutrons). As with water, these materials have been widely used in the nuclear industry

for shielding and their properties are well known. They are more costly than pool water and prevent visual inspection of the spent nuclear fuel, but are not prone to material loss like pool water.

In comparing shielding designs, it is important to note that most of the shielding materials have inherent limiting temperatures (i.e., maximum allowable temperature) with the exception of the steels and cast iron. These metals' temperature limits are much greater than the aluminum-based fuel cladding temperature limit. Shielding material thermal limits include both absolute values of temperature and, in the case of concrete, temperature gradients that create thermal stresses. Wet storage pool water also has a thermal limit that is the prevention of local or bulk boiling in the pool. Operation of the spent nuclear fuel pool heat removal system prevents pool water boiling, but a postulated accident in which this system is disabled requires calculation of the time before the inception of bulk pool boiling. Adequate natural convection between adjacent fuel assemblies and within storage racks prevents local nucleate boiling in any fuel flow channel.

Shielding geometry plays an important role in the determination of a dose rate profile around the storage facility. A continuous and constant thickness of shielding completely surrounding the fuel provides a relatively constant dose rate at all locations. A shielding design that is asymmetric and contains air gaps and/or varying material thickness results in hot spots and a relatively larger variation in surface dose rates. The wet pool design offers a continuous shield of water with resulting low constant dose rates throughout the pool surface. The water and pool wall, usually steel-lined concrete, also maintain a low continuous dose rate profile outside the walls.

The dry storage concrete building and concrete cask technologies rely on concrete walls for shielding with some steel internal to the walls. The need for internal airflow passages in the concrete introduces gaps in these walls. These gaps, which are labyrinths, require complex shielding analyses and typically allow a relatively larger dose rate at the air inlets and/or outlets than at the bulk concrete wall. This effect is more significant for concrete casks than for concrete buildings because the casks are more limited in the concrete thickness that is used in their shield wall. In the case of metal casks, since there are no internal air passages in the metal shield, the dose rate is relatively uniform around the surface. Different axial shielding and neutron-gamma source terms will result in different axial dose rates for the metal and concrete casks. Inground storage systems use a relatively small amount of concrete radially coupled with the surrounding earth for shielding and employ thick steel plugs for axial shielding. The hybrid metal-concrete cask design uses shielding principles similar to the concrete cask.

In comparing spent nuclear fuel storage shielding designs, the four basic technologies can be characterized as water, lead, metal, and concrete. Water and metal provide the most uniform dose rate reduction because they do not require the inclusion of labyrinth airflow passages for decay heat removal necessary for concrete. Water is most susceptible to a sudden rapid loss of shielding effectiveness because it is a liquid requiring confinement. It should be noted, however, that pool storage of spent nuclear fuel has been effectively used in the nuclear industry for over 40 years. Both concrete and water are susceptible to degradation of their shielding effectiveness if temperature limits are exceeded. These thermal limits can be accommodated by proper design of the spent nuclear fuel pool cooling system for water shields and conservative design along with airflow passage surveillance for the concrete shield. The shielding properties of all three shields are well known and therefore not subject to significant design uncertainties.

Shielding design is dictated by the regulatory dose limits, maximum bounding radiological neutron and gamma ray source terms of the fuel to be stored, cost, weight (in some cases), and thermal limits of some shielding materials. In general, the commercial nuclear power spent nuclear fuel storage technologies discussed in this appendix were designed to provide adequate shielding for fuel assemblies containing several hundred thousand curies (Ci) of fission products per assembly. The foreign research reactor spent

nuclear fuel being considered for acceptance in the United States will contain fission product inventories of from 1,000 to 100,000 (maximum) Ci per assembly. Therefore, the radiation source term for shielding design purposes, assuming the same number of fuel assemblies in each storage technology unit, may be significantly smaller for foreign research reactor spent nuclear fuel than for commercial fuel. The cost savings associated with a reduction in shielding thickness are expected to be more significant for the metal cask and concrete building designs because of their relatively higher costs. At the present time, it appears appropriate to use available designs from the vendors.

Based on the aforementioned vulnerabilities, the best shield would be the metal cask. Concrete shields are judged second best after metal based on their lack of dependence on any active systems. The water shield requires active systems for decay heat removal to prevent heatup and makeup to compensate for long term evaporation. It is also vulnerable to leaks from connected piping and its enclosing structure. Although water appears to be the least expensive shield material, its requirements for several active systems and qualified walls and floor actually make it one of the more expensive shields.

F.2.4 Structural Integrity

All of the spent nuclear fuel storage technologies are required to meet the same standards for structural integrity in accordance with appropriate codes. Structural integrity ensures that the confinement boundary around the spent nuclear fuel is maintained under all operational and accident conditions.

For incident-free operation, the dry storage designs are analyzed in terms of peak stresses on their canister and enclosing structure (i.e., metal cask, concrete cask, or vault). In wet storage designs, the fuel racks and pool structure are analyzed for operating loads. The source of these loads, in accordance with appropriate American Society of Mechanical Engineers codes, include such factors as deadweight, pressure, fill gas pressure, and thermal gradients.

For accident cases, additional loads are imposed upon the structures. These additional loads include seismic acceleration, high (or low) ambient temperature and solar heat flux, component drop or tip over, airflow passage blockage, external fire, tornado missile, flooding, etc. As with incident-free operation, specific prescribed margins of safety between the peak calculated stresses and the maximum allowable stress for a given component, location, and material must be maintained to substantiate structural integrity.

The principal structural-related differences between foreign research reactor spent nuclear fuel and commercial fuel for storage technology design purposes are:

- a typical foreign research reactor spent nuclear fuel element is much lighter [5 kg (11 lbs) as compared to 800 kg (1,760 lbs)] and shorter than a commercial fuel assembly (a stack of 5 typical foreign research reactor spent nuclear fuel elements is approximately equal in length to 1 commercial fuel assembly), and

- the strength of foreign research reactor spent nuclear fuel, in particular the predominant aluminum-clad design, is expected to be less than the commercial fuel assembly.

The much lower foreign research reactor spent nuclear fuel weight will reduce the total weight and load on the storage technology unit by about 19 metric tons (21 tons) for a 24-commercial fuel assembly design. For metal and concrete casks, this is a significant fraction of the total cask's weight, and can only improve the structural strength of the cask. The lower weight of the foreign research reactor spent nuclear fuel will increase the structural margins in the design and possibly allow for the use of less material in the structure compared with the commercial cask design. Any design changes to take advantage of the lower fuel weight would require detailed re-analysis, and are probably unnecessary.

The lower strength of the foreign research reactor spent nuclear fuel would require analyses to demonstrate that operational and postulated accident events do not result in structural failure of the fuel. However, since the principal means of confinement is the canister surrounding the fuel, its structural integrity is expected to be maintained, as it has already been qualified for the heavier commercial fuel under the same conditions and accidents.

Assuming that the same structural design limits apply for foreign research reactor spent nuclear fuel storage as for commercial fuel storage, the lower weight and strength of the foreign research reactor spent nuclear fuel would be expected to increase the original stress design margins.

The basket of any currently licensed cask would require redesign to accommodate the foreign research reactor spent nuclear fuel. Furthermore, it could be anticipated that permanently installed neutron poisons may be required in the basket to prevent criticality for the highly enriched fuels (initially 90 to 93 percent enrichment).

Each of the spent nuclear fuel storage technology designs that have been licensed by the NRC have undergone rigorous structural analyses and have been shown to meet all applicable standards and codes. Designs which have not yet been licensed would be required to present detailed structural analyses for review and confirmation to ensure structural integrity. No design has specific structural vulnerabilities that make it unsuitable for the storage of foreign research reactor spent nuclear fuel. It should be noted that any changes in existing NRC-approved storage designs that are deemed to impact stresses (i.e., reducing shielding wall thickness) would require extensive re-analysis and technical review for structural integrity. Thus, use of existing designs is favored.

F.2.5 Thermal Performance

Adequate decay heat removal is vital to preventing degradation of the fuel cladding barrier to fission product releases. The wet and dry storage technologies rely on a combination of conduction, convection (natural or forced), and radiation heat transfer mechanisms to ensure fuel cladding temperatures below appropriate long term storage limits.

In wet pool designs, fuel decay heat is transferred to the pool water by conduction and natural convection, which is induced by the axial enthalpy rise of the water as it passes over the active region of the fuel. An active cooling system consisting of redundant pumps, heat exchangers, and piping connected to the pool removes the heat in the bulk pool water. Careful thermal design of the spent nuclear fuel storage racks allows for sufficient natural convection flow over each fuel assembly to prevent any local nucleate boiling on the cladding surface throughout the pool. Therefore, the thermal performance of the pool technology relies on storage rack design for local thermal effects and an active external system for global heat removal. As previously discussed, this design has a long-established history of satisfactory performance. Wet storage can accommodate fuel of any power level.

The metal cask, dry storage design relies on a totally passive system for heat removal. The fuel decay heat, in an encapsulating inert gas atmosphere canister, is transferred to the canister's walls by a combination of radiation and conduction heat transfer. The canister walls, in contact with the metal (or sometimes metal sandwiched with a neutron-absorbing material) cask wall transfers this heat by conduction through the metal wall. At the outside of the metal cask, the heat is removed by conduction and natural convection to the environment. Some designs incorporate cooling metal fins on the exterior of the cask to enhance heat transmission to the air. The four metals used in spent nuclear fuel storage cask designs are ductile cast iron, carbon steel, lead, and stainless steel. In terms of their heat conduction properties, cast iron, lead, and carbon steel are superior to stainless steel because they have a thermal

conductivity which is about three times that of stainless steel. The metal cask heat transfer system is not susceptible to thermal limits, since these metals have a higher temperature limit than fuel cladding. The only possible degradation of heat transfer could occur if the fuel canister seal was broken and the inert gas atmosphere lost. The sealing system is designed to withstand all postulated accidents and maintain integrity over the lifetime of the cask, because it constitutes part of the radioisotope confinement boundary.

As with metal casks, concrete casks use a passive heat removal system, but the concrete cask system has one inherent vulnerability. To remove fuel decay heat and stay below both the fuel cladding and concrete temperature limits, concrete casks must include a labyrinth airflow passage design that allows natural convection-driven air to enter the cavity enclosing the canister inside the concrete. The air then exits through higher elevation paths through the concrete to the environment. Concrete thermal conductivity is a factor of 10 to 40 lower than that of the previously discussed cask metals. The need for these airflow passages and their associated inlets and outlets introduces the possibility of an accident in which the inlet and/or outlets could be blocked by debris, snow, or even nests or hives. Therefore, concrete casks require surveillance of their air inlet and outlet flow passages. Typically, measurement of the air temperature rise between the inlet and outlet is also used to validate the thermal design and as an operating specification. The elevation difference between the air inlets and outlets is an important design factor in the effectiveness of natural convection-driven airflow through the cask. Larger elevation differences induce a greater airflow rate, which improves heat removal. The above discussion would not apply to a solid concrete design (such as a SILO), because it does not use internal airflow passages for decay heat removal; it uses only concrete conduction.

In a concrete cask, heat transfer within the canister is identical to that of the metal cask. The canister transfers heat by conduction, natural convection, and radiation heat transfer to the airflow around it and the concrete walls surrounding it. That portion of the heat transferred to the concrete walls is then conducted through the concrete to the outside air. The concrete building technology uses a heat transfer system identical to that of the concrete cask. However, its relatively larger size, translating to a larger flow area for air inlets and outlets, makes it less susceptible to flow passage inlet and/or outlet blockage. Also, the concrete building designs typically incorporate a much larger elevation difference between air inlets and outlets than the concrete cask, which further enhances natural convection flow driven heat transfer.

For commercial nuclear fuel, the long-term storage temperature limits are well known (Levy et al., 1987; Johnson and Gilbert, 1983; Einziger and Cook, 1985; and Kohli et al., 1985), and typically about 350°C (662°F). The shielding material limits usually apply to concrete or concrete-like materials, but may also apply to resins or polyethylene. Shielding material temperature limits are not affected by the use of foreign research reactor spent nuclear fuel instead of commercial nuclear fuel in the storage technology. However, the thermal limits of the TRIGA and MTR foreign research reactor spent nuclear fuel could affect the thermal design.

Currently, there is limited well-documented information available on long-term foreign research reactor spent nuclear fuel storage temperature limits for fuel cladding. However, the aluminum cladding of the MTR-type foreign research reactor spent nuclear fuel has a much lower melting point than commercial nuclear fuel zircaloy cladding [649°C (~1,200°F) for aluminum versus 1,832°C (~3,330°F) for zircaloy]. Thus, the maximum long-term storage temperature limit for aluminum-clad foreign research reactor spent nuclear fuel would be expected to be considerably lower than that for zircaloy-clad commercial nuclear power fuel. Aluminum also undergoes a phase change at around 250°C (482°F), which results in a reduction of its tensile properties. An offsetting physical property of aluminum that may partially compensate for its lower melting point is that aluminum has a thermal conductivity more than 10 times greater than zircaloy. This would tend to reduce the temperature difference across the aluminum cladding as compared to zircaloy cladding. TRIGA foreign research reactor spent nuclear fuel cladding is

composed of stainless steel or inconel, which have similar thermal conductivities to zircaloy, but a melting temperature of about 1,371°C (2,500°F). TRIGA fuel storage temperature limits are expected to be greater than for aluminum-clad fuel. The Savannah River Site is conducting a research and development project, initiated in FY 1994, to examine the applicability of aluminum-clad spent nuclear fuel dry storage.

At a minimum, a new thermal analysis would need to be performed for existing designs of spent nuclear fuel storage technologies. This analysis would use the parameters associated with foreign research reactor spent nuclear fuel instead of commercial spent nuclear fuel. The important changes in thermal performance parameters for the foreign research reactor spent nuclear fuel are:

- lower individual fuel assembly decay heat power,
- lower and/or different fuel temperature limits for aluminum-clad and stainless steel-inconel-clad fuels, and
- higher clad and fuel thermal conductivity for aluminum foreign research reactor spent nuclear fuel.

A temperature limit of 175°C (347°F) has been tentatively identified to avoid damage to the cladding of aluminum-clad spent nuclear fuel (Shedrow, 1994a and 1994b; Taylor et al., 1994). The results of this revised thermal analysis could impact the thermal design of the spent nuclear fuel storage technology. If the existing design results in unacceptable fuel and/or shielding temperatures, redesign could reduce the maximum heat load of each module or cask or increase the airflow passage area or height for concrete casks that rely on natural convection heat transfer. The new thermal analysis must take into account design restrictions that are imposed by criticality limits (i.e., the maximum allowable number of foreign research reactor spent nuclear fuel assemblies), and possible changes in shielding thickness due to lower gamma and neutron source terms that would improve the storage technology's thermal performance. Again, existing designs should be used to the greatest extent possible.

Commercial spent nuclear fuel dry storage systems require a minimum cooldown period of 5 years. For aluminum-clad foreign research reactor spent nuclear fuel, the preliminary cladding temperature limit of 175°C (347°F) becomes the determining criteria for dry storage loading above an average spent nuclear fuel element power level of 40 Watts each. Foreign research reactor spent nuclear fuel averages more than 40 Watts per element after a single year's discharge from the reactor and, if immediately placed into dry storage, would result in oversized facilities within several years as the radionuclides decay. Consequently, for the size of a foreign research reactor spent nuclear fuel dry storage facility to be minimized, an average foreign research reactor spent nuclear fuel power level below 40 Watts per element is necessary. On average, a 3-year cooldown period would be required. This results in the element's volume being the constraining criteria, and corresponds to maximum density of spent nuclear fuel (hence, minimum size of the facility) in the dry storage method. Consequently, the storage approach uses a minimum wet storage period of 3 years prior to emplacement into dry storage.

A comparative evaluation of the thermal performance of each fuel storage technology points to the metal cask and the solid concrete SILO as the simplest, effective, and least susceptible to any degradation. However, another design which has many merits is the concrete building. Although concrete buildings require open airflow passages to remove decay heat, size and a large elevation difference are factors which compensate for this weakness and make them good candidates. The concrete cask, with adequate design margins and surveillance is an acceptable thermal system. Finally, the wet pool system is a proven technology, but is dependent on an active system to remove heat. The inground concrete system in

Denmark (RISO National Laboratory) relies on a forced air active system and is characterized similar to the wet system in terms of its heat removal capabilities.

F.2.6 Ease of Use

For spent nuclear fuel storage, ease of use is defined as the lack of complexity involved in the process of loading spent nuclear fuel, and operating and maintaining the storage technology. For all storage designs, the spent nuclear fuel must be removed from the transportation cask to be placed into the storage facility, unless the design is a dual-purpose cask.

The technology that requires the fewest steps and lowest complexity for transferring spent nuclear fuel from the transportation cask to its storage location is wet pool storage. At a pool, the transportation cask is simply immersed under the water, opened underwater, and the fuel moved underwater to its final location in a storage rack in the pool. Pool water provides shielding, heat removal, and viewing of the fuel. The dry storage technologies all require additional intermediate steps, which include the insertion of fuel into a canister that must be subsequently drained of all water and air, seal welded, tested for leakage, and backfilled with inert gas. The canister is then placed into its dry storage structure (i.e., vault, concrete, or metal cask). The vault provides for this entire process within a shielded enclosing building, whereas the casks require transport by some vehicle between the transportation cask fuel transfer location and the cask site. Thus, for spent nuclear fuel transfer and loading, the wet storage design is easiest to use, followed by the dry vault.

After loading, operation of the storage facility is another important factor in determining ease of use. For operation, the individual metal or concrete casks are easiest, since they are designed as totally passive systems requiring only periodic visual inspection from a distance. The vault is slightly more complex than the casks because it includes a number of active systems (i.e., crane, power supplies, fuel handling machine) that may require some operational support. The wet storage is the most complex from an operational viewpoint because it includes a number of vital safety-related systems that must be monitored and controlled (e.g., heat removal system, water purification system, makeup water system, ventilation exhaust system).

Maintenance ease of use is closely related to operational ease of use since designs with more operational complexity require greater maintenance. Thus, the cask systems can be considered easiest, followed by the vault, and the wet technology.

In ranking the relative importance of the three aforementioned factors of ease of use (fuel loading, operation, and maintenance) the fraction of time spent during the life of the facility for fuel loading is expected to be much smaller than for operation and maintenance. Fuel loading will be a sporadic event over a long period of time, whereas operation and maintenance are considered continuous over this same period of time. Thus, operation and maintenance ease of use is given greater importance than fuel loading ease of use. With this ranking, the cask (both metal and concrete) technology is judged to have the greatest ease of use, followed by the vault system. The wet storage technology is judged to have the lowest ease of use principally because of its safety-related active systems.

F.2.7 Cost

Information on the cost of different spent nuclear fuel storage technologies is limited because of its proprietary nature, but several comparative statements apply to the different designs. Operation and maintenance costs are expected to be highest for those technologies that rely on active systems for safety. Thus, the wet pool and inground forced air technologies have higher operations and maintenance costs

than dry metal casks, dry concrete casks, and dry concrete buildings. The dry concrete vault/building technology would be expected to have slightly higher operations and maintenance costs than the individual metal or concrete casks, since these buildings use active nonsafety systems such as lighting, cranes, and fuel drying dedicated to the vault facility.

For the construction of a new fuel storage facility for the purpose of storing foreign research reactor spent nuclear fuel on the order of approximately 23,000 assemblies, elements and/or rods, it is assumed that 5 "trimmed" foreign research reactor spent nuclear fuel assemblies would occupy the same approximate space as one commercial nuclear power plant fuel assembly (Boiling Water Reactor-type). "Trimmed" means that the non-essential portions (i.e., ends) of the spent nuclear fuel element have been removed, as detailed in Appendix B. Therefore, storage of the total amount of foreign research reactor spent nuclear fuel under consideration in this EIS would be the equivalent of about 5,000 commercial Boiling Water Reactor spent nuclear fuel assemblies. Since typical concrete, inground, or metal casks can store 52 power fuel assemblies, this foreign research reactor spent nuclear fuel inventory would require around 100 casks. A suitably sized single pool or concrete building could accommodate this inventory of spent nuclear fuel. Spent nuclear fuel storage manufacturers have indicated that metal casks typically cost about twice as much as concrete casks for the same quantity of fuel storage due to the higher costs of metal as compared to concrete. Based on its design, the least expensive concrete cask is expected to be the simple concrete SILO, since it does not have steel-lined internal air passages. The number of foreign research reactor spent nuclear fuel assemblies under consideration in this EIS may be amenable to the economic advantages that a single building or pool offers over a large number of individual casks. Another potential cost advantage of the pool or concrete building is that these are self-contained, not requiring access to any other facilities for the transfer of the fuel from the transport cask. Presented below is a brief summary of commercial cost experience with storage.

F.2.7.1 Costs for Dry Storage Designs

The cost for different spent nuclear fuel storage technologies varies significantly between designs. Some information on cost has been obtained from manufacturers and openly available literature. Relative order of magnitude cost data was obtained for the horizontal concrete NUHOMS module, vertical concrete Ventilated Storage Cask design, vertical concrete SILO, metal CASTOR vertical cask, and the modular dry vault concrete building design.

The principal elements of cost that should be considered for the storage of foreign research reactor spent nuclear fuel are: (1) engineering for redesign and licensing, (2) capital for the construction of the facility, and (3) operations and maintenance. In the interest of minimizing cost and schedule for the completion of any storage facility for foreign research reactor spent nuclear fuel, the licensing basis of 10 CFR 72 used by the NRC for commercial nuclear power plant spent nuclear fuel should be adopted for the foreign research reactor spent nuclear fuel. This regulation provides all the requirements for licensing foreign research reactor spent nuclear fuel storage and has been successfully applied to numerous dry spent nuclear fuel storage installations in the United States.

Redesign engineering should be limited to changes in the design of the basket that encapsulates the fuel, since foreign research reactor spent nuclear fuel has different dimensions, would probably be stacked, and could require different spacing and/or the incorporation of neutron absorbing plates to maintain subcriticality safety margins. Outside the basket, all remaining components should be identical to those already licensed for commercial nuclear fuel by the NRC, thereby significantly reducing engineering analysis and license review time and costs as well as drawing and specification changes. This could result in some overdesign in the shielding and heat removal of the system, but would have the benefit of greatly reduced engineering, licensing, and schedule costs. If thermal analyses show that unacceptable foreign

research reactor spent nuclear fuel temperatures would occur in the storage facility, then more extensive redesign would be required (e.g., reduce excess concrete wall thickness not needed for shielding, which then improves the conduction heat transfer) or fewer fuel assemblies could be stored in each unit.

Information obtained on the unit capital costs for different storage designs shows a significant variation. The least expensive unit is the SILO due to its simple concrete-canister design and lack of internal air passage labyrinth. The most expensive unit cost, excluding the modular dry vault (which stores a larger number of fuel assemblies than the other storage designs), is the CASTOR metal cask, due to its use of a thick metal wall instead of concrete. The Ventilated Storage Cask and NUHOMS designs' costs fall between the SILO and CASTOR. If one were to rank, in decreasing order, the unit cost of the four cask designs, they would be: CASTOR, NUHOMS, Ventilated Storage Cask, and SILO. There is more than a factor of 10 difference between the SILO and the CASTOR.

An estimate of the capital costs for storing approximately 23,000 foreign research reactor spent nuclear fuel elements can be made with the following two assumptions. First, the average spent nuclear fuel assembly decay heat is between 10 and 40 Watts, which is reasonable and conservative based on the status of foreign research reactor spent nuclear fuel under consideration in this EIS. Second, five trimmed foreign research reactor spent nuclear fuel assemblies can be stacked to fit into the same approximate space as one commercial nuclear power plant spent nuclear fuel assembly (Boiling Water Reactor-type). Using these assumptions, 23,000 foreign research reactor spent nuclear fuel elements would require 375 SILOs, 100 VSC-24s, 100 NUHOMS-24Ps, or 150 CASTOR V21s. One sufficiently sized and designed modular dry vault would also accommodate the foreign research reactor spent nuclear fuel.

The operations and maintenance costs for all these designs are expected to be small based on utility experience in operating dry spent nuclear fuel storage at numerous sites throughout the United States. The passive nature of these designs eliminates the need for any control room or continuous monitoring. Once completed and loaded with fuel, the storage facility would not require any onsite staff. Remote security surveillance cameras, fences, and thermoluminescent dosimeters for radiation monitoring would be utilized. Some designs (Ventilated Storage Cask and NUHOMS) require a periodic visual inspection of the labyrinth airflow inlets and outlets to ensure that there is no blockage. Periodic security fence thermoluminescent dosimeter retrieval and analysis would also be an expected operating requirement. No onsite utility consumption would be necessary except for that used in security lighting and cameras. Under incident-free conditions, no significant maintenance costs would be anticipated for most of the designs, with the exception of the modular dry vault, where equipment used in the movement and encapsulation of fuel would require some periodic maintenance.

Table F-15 provides a summary of the dry storage costs. Full-Time Equivalent estimates assume full-time assignment, whereas the utility experience indicates only part-time assignment would be necessary. Thus, Table F-15 costs are extremely conservative.

F.2.7.2 Costs for Wet Storage Designs

Based on previous utility experience, the costs associated with the design, licensing, construction, operation, and maintenance of a new spent nuclear fuel pool are expected to be higher than most of the dry storage designs. This is due to the structural, equipment, and active system requirements of a pool that must also be enclosed in a properly qualified structure. The need for active operating safety-related systems at a wet facility increases the operations and maintenance costs. These important systems include water purification and chemistry, water heat removal, water level, and heating, ventilation, and air conditioning for the building. Table F-16 provides a summary of the wet storage costs. Thus, it can be stated that the overall costs associated with the selection of a new wet storage facility for foreign research

Table F-15 Summary of Dry Storage Facility Costs Based Upon Utility Experience[a]

	Approximate Unit Capital Cost Range, $	*Approximate # of Canisters/Sleeves for Foreign Research Reactor Spent Nuclear Fuel*	*Total Capital Cost $M*	*Full-Time Equivalents, Loading/ Inspection[b]*	*Full-Time Equivalents Monitoring[c]*	*Other Annual Costs, $M*	*Total Annual Operating Cost $M[d,e]*
Metal Cask	800,000-1.1M	150 (max)	165	15 (max)	3 (max)	1	3.7
Horizontal Dry Storage Cask	400,000-500,000	100 (max)	50	15 (max)	3 (max)	1	3.7
Vertical Concrete Storage Cask	350,000	100 (max)	35	15 (max)	3 (max)	1	3.7
Modular Dry Vault	13,000/tube	5 foreign research reactor/vaul t tube	65	15 (max)	3 (max)	1	3.7
SILO	100,000	375 (max)	37.5	15 (max)	3 (max)	1	3.7

Reference for costs: (EPRI, 1993)

[a] *Intermediate wet pool required for dry storage facility not included because utilities already possess an on-site pool*

[b] *One shift operation*

[c] *Monitoring based on one Full-Time Equivalent per shift*

[d] *Average Full-Time Equivalent cost of $150,000 per year*

[e] *Estimated absolute maximum from utility experience; around $1 million per year appears to be the average*

Table F-16 Summary of Wet Storage Costs

Approximate Facility Capital Cost	$80-100 million
Full-Time Equivalents Loading/Inspection	30
Full-Time Equivalents Operations/Monitoring	(in above)
Other Annual Costs	around $1million
Total Annual Operating Cost	$6-12 million

(Nuclear Fuel, 1994a)

reactor spent nuclear fuel could be significantly larger than for any comparably sized dry storage design using concrete.

F.2.8 Design, Construction, and Operational Requirements

The DOE has orders dealing indirectly with the storage of spent nuclear fuel. A search was also made to determine if other Federal requirements exist that specifically deal with spent nuclear fuel.

DOE Order 5400.1 (DOE, 1988), entitled "General Environmental Protection Program," establishes environmental protection program requirements. It applies to all Departmental elements and contractors performing work for DOE. Although the order makes no direct reference to spent nuclear fuel, Chapter IV deals with environmental monitoring requirements, which could be useful in establishing a legal framework for storing spent nuclear fuel.

DOE Order 5400.5 (DOE, 1990), entitled "Radiation Protection of the Public and the Environment," establishes standards and requirements for operations of the DOE and DOE contractors with respect to

protection of the public from undue radiological risk. The provisions apply to all Departmental elements. This order references the storage of spent nuclear fuel. It also references instances where some DOE facilities are subject to provisions of 10 CFR 72. It was not made clear in the order which DOE facilities are subject to 10 CFR 72, which deals directly with all aspects of interim storage of spent nuclear fuel.

DOE Order 5480.22 (DOE, 1992b), entitled "Technical Safety Requirements," requires that DOE nuclear facilities delineate criteria, content, scope, documents, etc. The scope includes DOE elements, but excludes facilities exempt from NRC licensing and Naval Propulsion Program facilities. Although this order does not reference spent nuclear fuel, there are useful discussions of limiting conditions for operation of nonreactor nuclear facilities.

DOE Order 5633.3A (DOE, 1994e), entitled "Control and Accountability of Nuclear Materials," prescribes minimum requirements and procedures for control and accountability of nuclear materials at DOE facilities, which are exempt from NRC licensing requirements. By DOE definition, "nuclear materials" includes spent nuclear fuel. Storage of nuclear material is mentioned with respect to repositories.

DOE Order 6430.1A, (DOE, 1989a), entitled "General Design Criteria," has a section dealing with irradiated fissile material storage facilities (Section 1320). General criteria for nuclear criticality, confinement systems, effluent control and monitoring, and decontamination and decommissioning are discussed. Reference is made that, "the design professional shall consider the criteria provided in 10 CFR 72," (NRC, 1994) as well as NRC Regulatory Guides 3.49 (NRC, 1981) and 3.54 (NRC, 1984) for applicability to irradiated fissile material storage facilities. Other important standards for dry storage are ANSI/ANS-57.9 (ANSI, 1984a) and NRC Regulatory Guide 1.13 (NRC, 1975).

F.2.9 Aluminum-Clad Research Reactor Spent Nuclear Fuel Dry Storage Experience

F.2.9.1 Australia

Australia has successfully operated an underground dry storage facility for High Flux Australian Reactor MTR-type aluminum-clad research reactor spent nuclear fuel for 31 years at the Lucas Heights Facility (Australia, 1993; Ridal, 1994; Silver, 1993). The facility consists of a building enclosing a concrete floor with 50 steel plugs that are bolted to a steel collar set into the concrete.

Each plug covers a stainless steel-lined 0.64 cm (0.25 in) thick, 14 cm (5.5 in) inner diameter, 15.2 m (50 ft) deep borehole tube that is sealed at the bottom. The rock around these 50 borehole tubes is sandstone with a variable clay matrix and bands of enriched siderite. The actual boreholes in the sandstone are 16.5 cm (6.5 in) in diameter, 16.8 m (55 ft) deep, and spaced 1.14 m (45 in) center-to-center apart.

Each borehole liner is filled with 11 stainless steel canisters that hold 2 stacked fuel assemblies each. The borehole liner is evacuated and backfilled with dry nitrogen. The borehole liner plug is designed with its own plug to allow for atmosphere purging, backfilling, and annual monitoring of any fission product gases that would indicate canister breach.

The stored High Flux Australian Reactor spent nuclear fuel is uranium-aluminum alloy with aluminum cladding in the shape of four concentric tubes. Each fuel assembly has an outer diameter of 10 cm (3.93 in) and a length of 66 cm (26 in). The ^{235}U content for each fresh fuel assembly was 170 g (0.37 lbs), and the ^{235}U was enriched to 60 percent. Fuel has been stored at this facility for 8 to 31 years with no radioactivity releases or evidence of corrosion over this time period. No nuclear poisons for

criticality safety or heat transfer analyses were deemed necessary because of the relatively low ^{235}U content, large borehole spacing, and low fuel assembly decay heat. The storage criteria for each fuel assembly is a maximum decay heat of less than 4.5 Watts, which after 20 years, drops to 1.5 Watts per fuel assembly. Fuel examined in a hot cell after 10 and 25 years of storage at this facility showed no visible signs of corrosion. Figure F-29 illustrates the facility design.

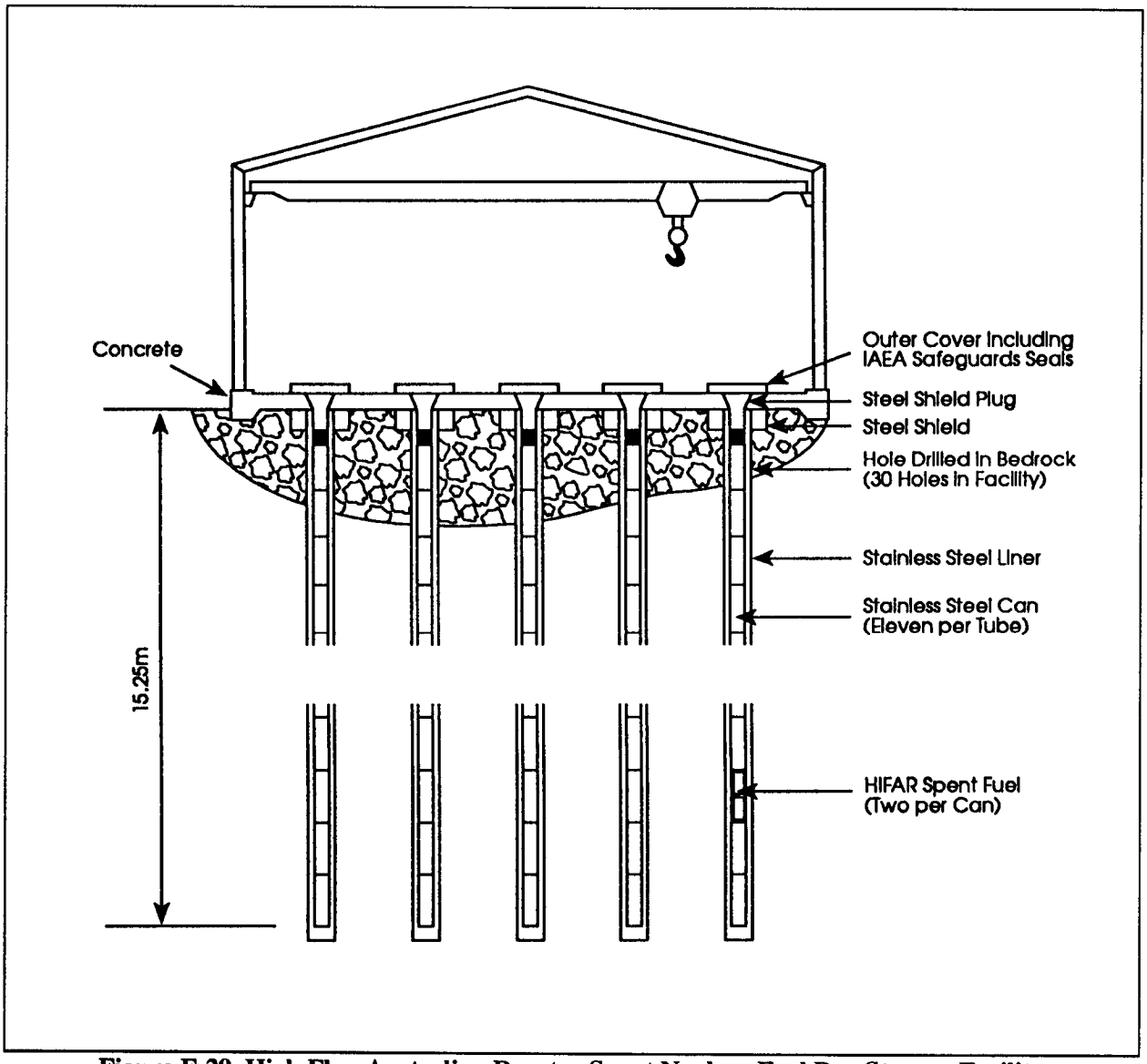


Figure F-29 High Flux Australian Reactor Spent Nuclear Fuel Dry Storage Facility

F.2.9.2 Japan

In 1982, The Japan Atomic Energy Research Institute completed construction of a dry spent nuclear fuel storage facility at Tokai, Japan for the storage of JRR-3 research reactor spent nuclear fuel (Shirai et al., 1991). The facility consists of a building enclosing several support areas (cask receipt, loading, cask maintenance, and control room) and the drywell storage structure (Figure F-30). The storage structure is 12 m (39.4 ft) long, 13 m (42.7 ft) wide, 5 m (16.4 ft) high concrete box that encapsulates a 10 x 10 lattice array of drywells (Figure F-31). Each drywell storage canister (Figure F-32) comprises a

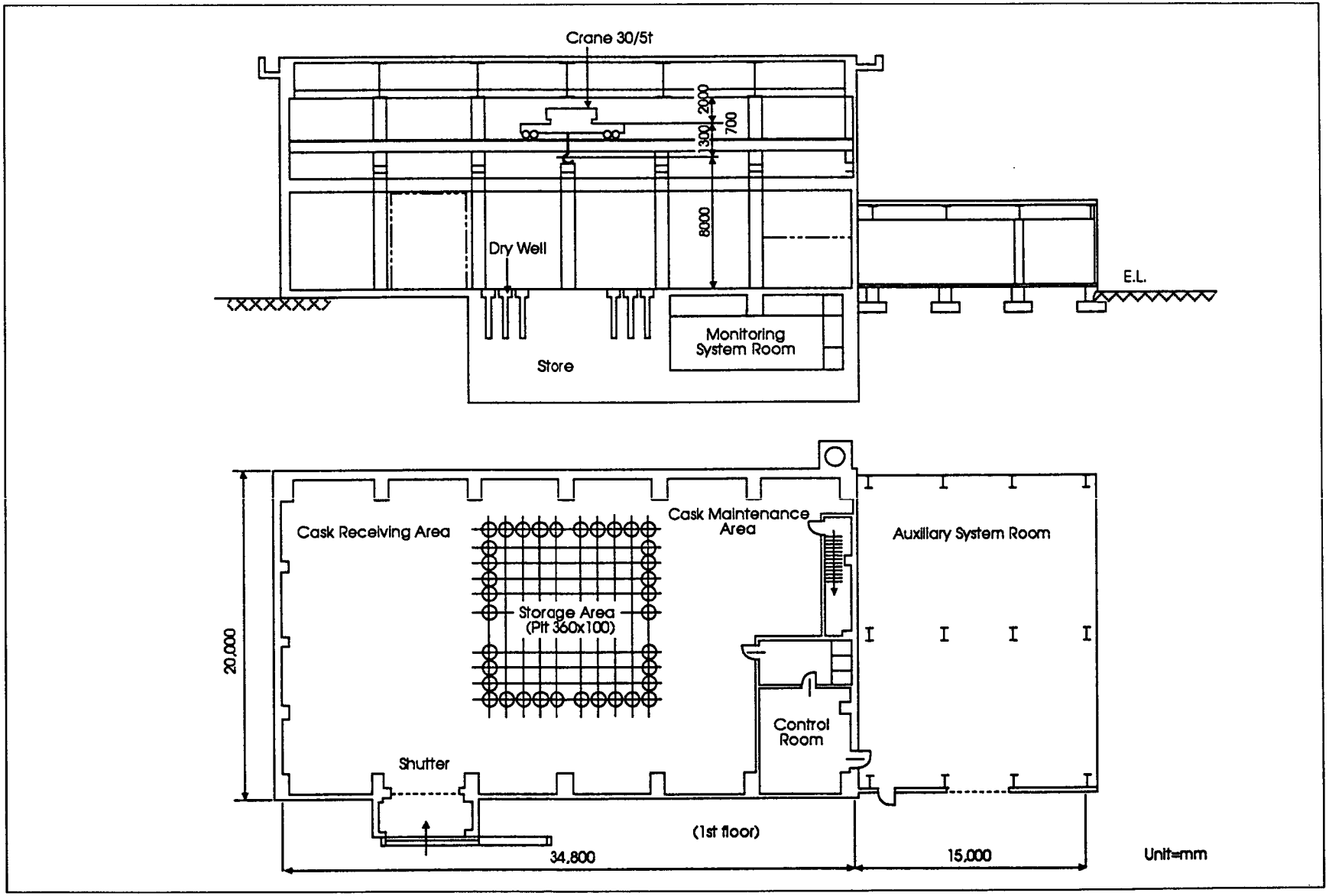


Figure F-30 General Arrangement of Dry Storage Facility at Tokai, Japan

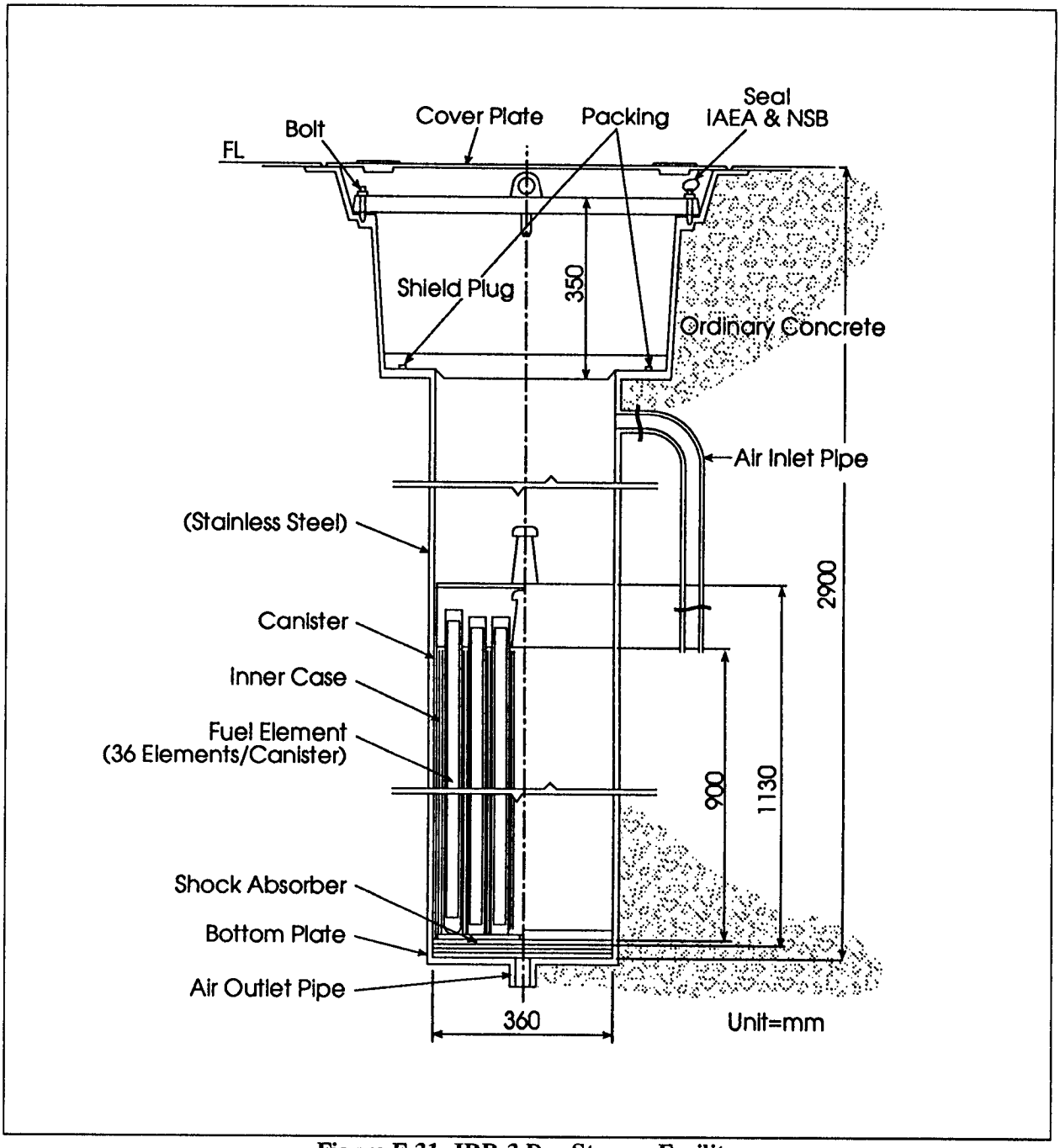


Figure F-31 JRR-3 Dry Storage Facility

0.8 cm (0.3 in) thick stainless steel liner 2.5 m (8.2 ft) deep and has a 36 cm (14.2 in) inner diameter. Each drywell has a labyrinth air inlet and outlet pipe for radiation monitoring and decay heat removal, and is covered with a 35 cm (13.8 in) thick carbon steel shield plug. The plug is bolted to the concrete and has a cover plate above it. Each drywell has a minimum of 1.5 m (4.9 ft) of concrete shielding around it.

A cylindrical stainless steel canister (Figure F-32) is placed in each drywell. The canister has 0.5 cm (0.2 in) thick walls, a 35 cm (13.8 in) outer diameter, and a height of 1.25 m (4.1 ft). Each canister holds 36 fuel elements and is fusion welded after being loaded with spent nuclear fuel, evacuated, and filled with inert gas. Each element is a natural metallic or 1.5 percent ^{235}U-enriched uranium oxide cylinder encased

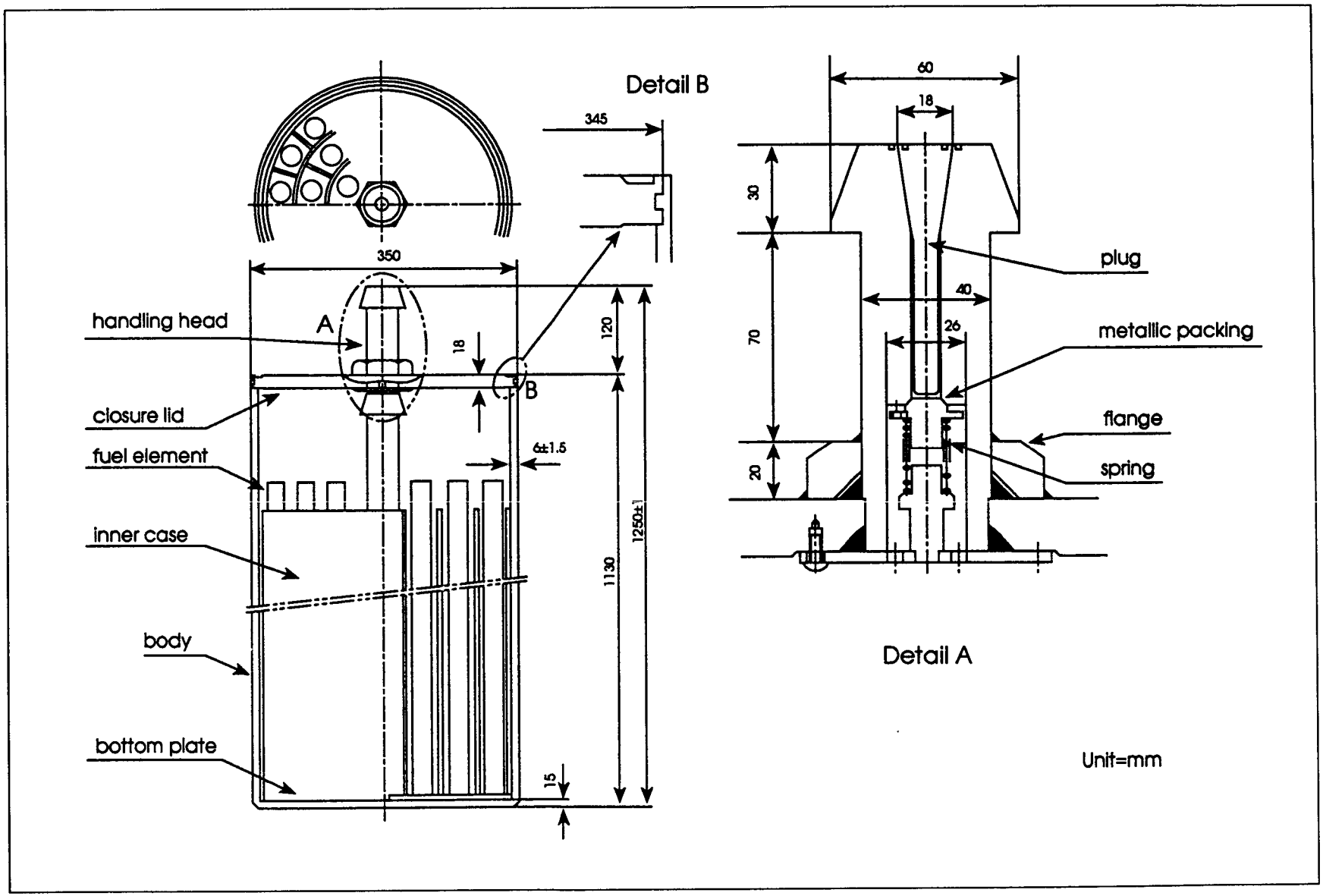


Figure F-32 Storage Canister

in aluminum cladding. The element is about 95 cm (37.4 in) long, with a 2.5 cm (1 in) outer diameter. Before storage, each element must meet the specifications of:

- maximum burnup = 800 Megawatt Days per metric ton,
- minimum cooling time = 2,500 days (6.8 years),
- maximum fission product activity = 110 Ci, and
- maximum decay heat = 0.5 Watt.

Although the low decay heat for the fuel elements eliminates the need for any cooling system (i.e., natural convection and conduction are sufficient), a system of blowers, filters, dehumidifiers, and monitors is provided for the facility. This system is used to provide subatmospheric pressure in the drywell so that any leakage would always be into the structure and its associated filters. This system ensures low humidity for minimizing any corrosion, and is also part of the radiation monitoring system designed to sample airflow for any escaping Krypton-85, a long-lived fission product that would be indicative of canister and fuel degradation. Maximum fuel storage temperature is maintained below 45°C (113°F) in this storage facility.

As of 1991, 1,800 fuel elements [14 metric tons (15 tons) of uranium] have been stored at this facility without any incidents. In 1987, after 5 years of storage, 2 canisters and their 72 fuel elements were removed and examined. None of the fuel elements or canisters exhibited any signs of corrosion, cracking, degradation, or failure.

F.2.10 Summary

In summary, the preceeding discussion indicates the following:

- Dry storage of spent nuclear fuel is a mature technology and requires the least maintenance.
- Dry storage of foreign research reactor spent nuclear fuel appears to be practical using existing designs from commercial utility experience and has been demonstrated in operating storage facilities for foreign research reactor spent nuclear fuel in Australia and Japan.
- Wet storage technology is the most common method for spent nuclear fuel.

F.3 Selection of Storage Technologies for Further Evaluation

The preceding discussions have identified several storage technologies suitable for foreign research reactor spent nuclear fuel. Three basic categories encompass these technologies:

- Dry Vault Storage,
- Dry Cask Storage, and
- Wet Pool Storage.

The three technologies are discussed in this section, including site-specific modifications, while Section F.4 describes the potential impacts and ramifications at the five candidate management sites. All

three approaches are estimated to require less than 4.5 ha (11 acres) of site land for receipt of all of the foreign research reactor spent nuclear fuel under consideration in this EIS.

F.3.1 Dry Storage Facility Designs

F.3.1.1 Spent Nuclear Fuel Storage Using a Dry Vault (Modular Dry Vault Storage)

As noted previously, the dry vault facility is an aboveground, self-contained concrete structure that includes dry fuel loading and unloading (Fort St. Vrain, 1992; Shedrow, 1994a and 1994b; Taylor et al., 1994; Claxton et al., 1993). The vault approach design consists of four major components: a receiving/loading area, fuel storage canisters, a shielded container handling machine, and a modular array for storing the fuel storage canisters (Figure F-33). The receiving area uses a small wet pool for unloading the transportation casks and for short-term (1 to 3 year) storage of foreign research reactor spent nuclear fuel exceeding 40 Watts per element. Table F-17 summarizes some typical modular dry vault storage parameters. The vault consists of several array units, and each unit provides storage for hundreds of fuel elements. The vault itself consists of a charge/discharge bay with a fuel handling machine above a floor containing steel tubes that house the (removable) fuel canisters. Shielding above the spent nuclear fuel is provided by the thick concrete floor and shield plugs inserted into the top of the steel storage tubes. The steel tubes serve as secondary containment for the foreign research reactor spent nuclear fuel and descend into an open storage area. Large labyrinth air supply ducts and discharge chimneys permit natural convection cooling of the steel spent nuclear fuel storage tubes, while the perimeter concrete walls provide for shielding. The design allows for expansion by adding additional units of arrays to the end of the vault, or by construction of another module. The vault facility also includes a receiving and loading bay that allows handling of the shielded transportation casks and unloading of the foreign research reactor spent nuclear fuel into the short-term wet storage pool. The receiving bay provides for spent nuclear fuel inspection, canning as required, and could be used for spent nuclear fuel characterization with additional equipment and modifications.

In operation, the transportation cask is lifted by a crane and placed in the unloading area of the small wet pool. The fuel elements are removed under water, examined, and, if the heat generation rate is below 40 Watts per element, the spent nuclear fuel is placed within the transfer canister. The transfer canister is subsequently drained, dried, and seal-welded. The handling machine then transports the loaded canister to the storage tubes. The handling machine includes radiation shielding. Heat dissipation is accomplished by natural convection from the surfaces of the handling machine and canister. The handling machine transfers the spent nuclear fuel canister from the receiving area to the vault and places the canister vertically into the storage tubes. The shield plug is placed on top of the loaded storage tube. Decay heat is dissipated by natural convection; air enters through inlet ducts at the bottom of the vault module, passes around the outside of the steel storage tubes containing the spent nuclear fuel canisters, and exits through outlet ducts at the top of the module. The vault facility stores spent nuclear fuel in canisters that are approximately 40.6 cm (16 in) in diameter by some 4.6 m (15 ft) long. As currently envisioned, foreign research reactor spent nuclear fuel would be stored in 5 levels of fuel with 4 elements per level, for a total of 20 fuel elements per spent nuclear fuel canister (MTR aluminum-clad type design). The vault design allows for 36 to 44 canisters per array unit, depending upon the decay heat of the spent nuclear fuel and a cladding temperature limit [175°C (347°F) for aluminum cladding with an air inlet temperature of 49°C (120°F)] (Shedrow, 1994a; Taylor et al., 1994).

Thus, the number of vault units/arrays required is as follows:

- spent nuclear fuel decay heat exceeding 80 Watts per element: 35 vault units;

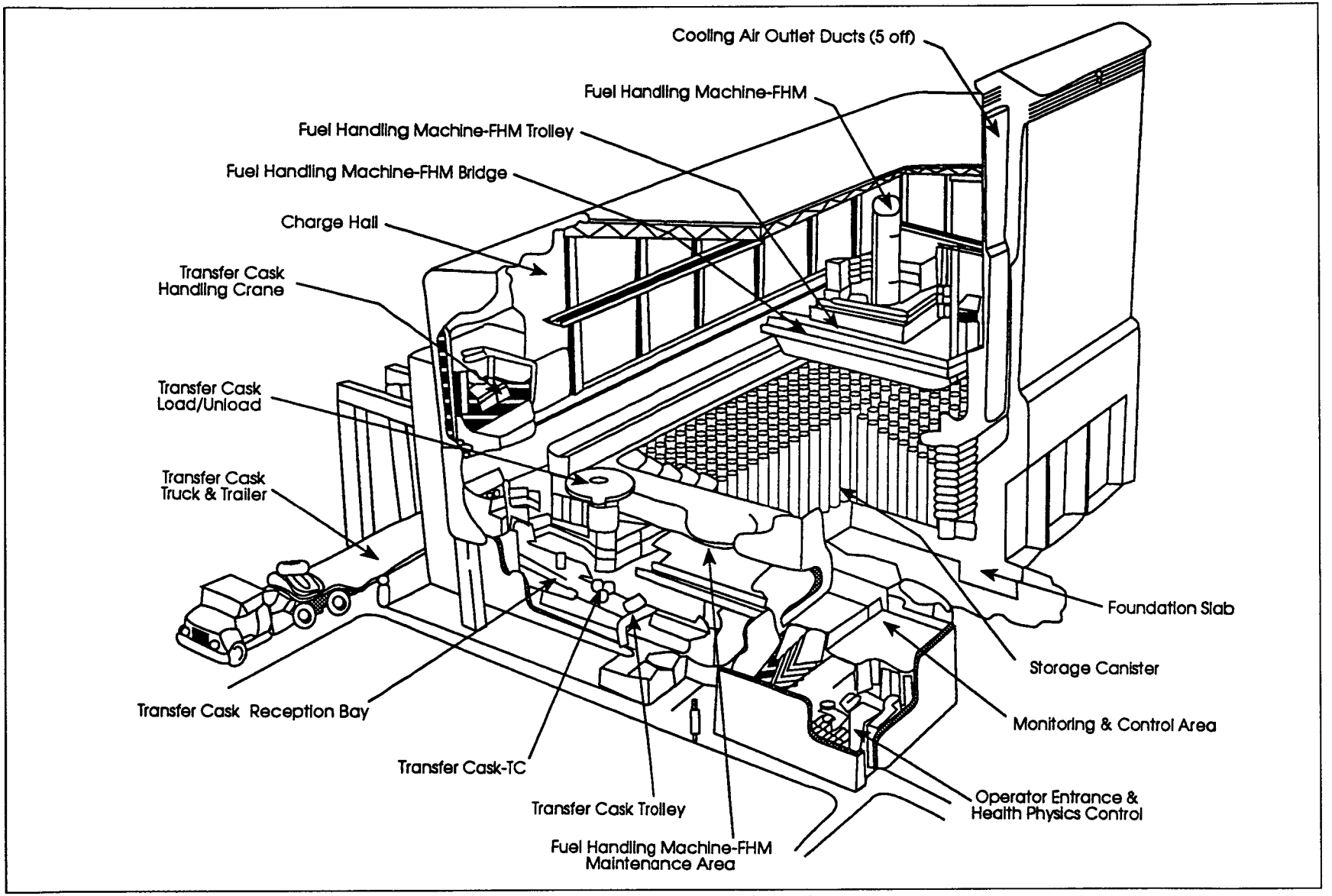


Figure F-33 Vault Elevation View

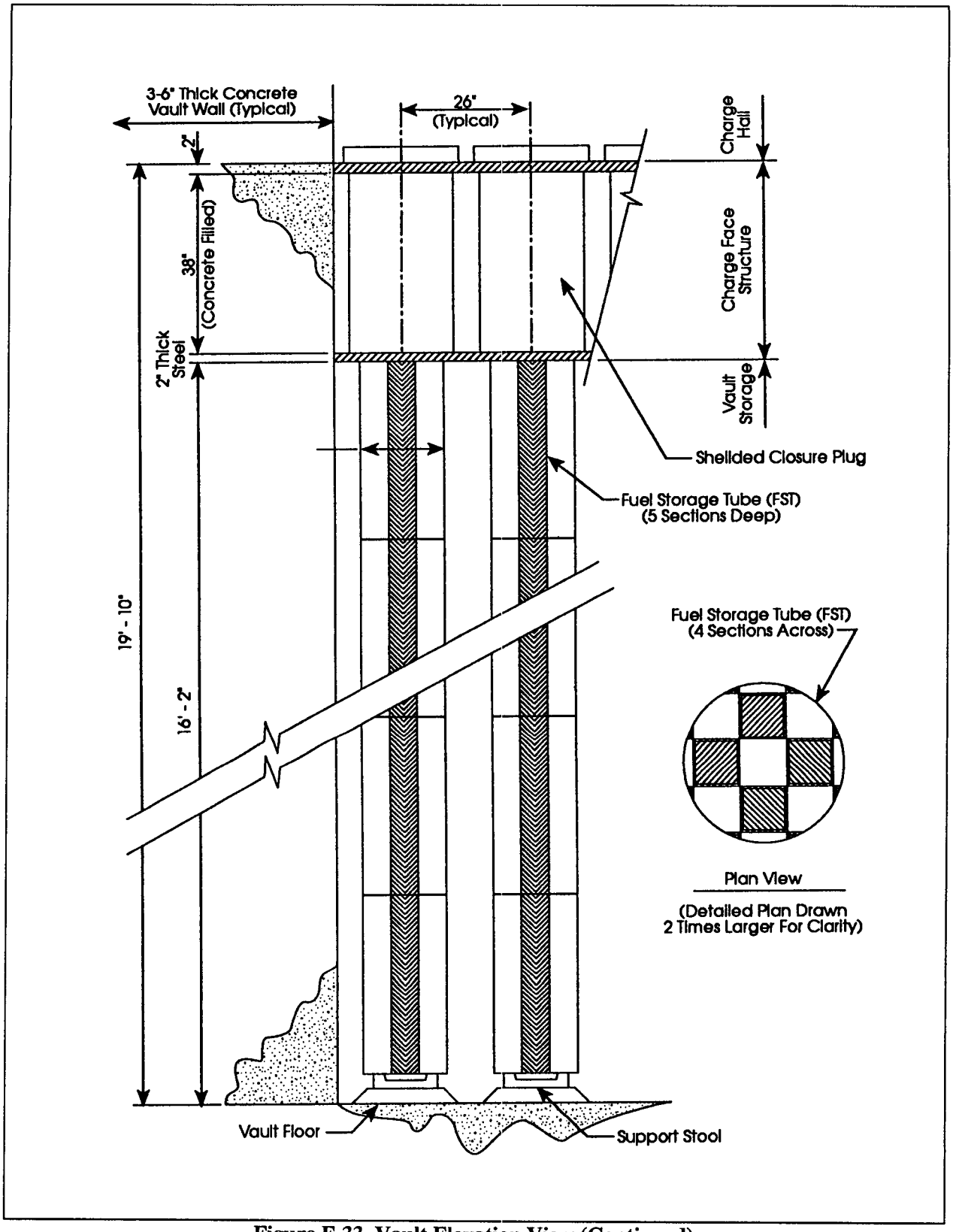


Figure F-33 Vault Elevation View (Continued)

Table F-17 Summary of Modular Dry Vault Storage Parameters for Foreign Research Reactor Spent Nuclear Fuel[a]

Construction Phase:	
Disturbed Land Area	3.7 ha (9 acres)
Facility: Size (Area) Concrete Steel	 5,000 m^2 (54,000 ft^2) 21,800 m^3 (28,500 yd^3) 5,200 mt (5,750 tons)
Soil Moved	11,000 m^3 (14,400 yd^3)
Equipment Fuel	835,000 l (221,000 gal)
Construction Debris/Waste	1,800 m^3 (2,400 yd^3)
Work Force	190/yr average, 234/yr peak
Duration (Years)	4 years for construction, 1.5 years for design
Capital Cost	$370 million[b]
Operation Phase:	
Electricity	800 - 1,000 MW-hr/yr (staging facility)
Water	2.1 million l/yr (550,000 gal/year) for first 10 years, 0.9 million l/yr (238,000 gal/yr) thereafter
Wastestreams	
Solid Low Level Waste	22 m^3/yr (780 ft^3/yr) during receipt, 1 m^3/yr (35 ft^3/yr) thereafter
Waste Water	1.59 million l/yr (420,000 gal/yr) during receipt, 0.4 million l/yr (109,000 gal/yr) thereafter
Staff (Full-Time Equivalents)	30 during receipt, 8 thereafter
Annual Operating Cost	$15.6 million during handling, $0.6 million during storage[b]

[a] *Staging facility parameters are based upon the regionalized, small wet pool (Dahlke et al., 1994).*

[b] *Cost estimates are in $1993 (EG&G, 1993)*

- spent nuclear fuel decay heat between 40 and 80 Watts per element: 32 vault units; and
- spent nuclear fuel decay heat between 10 and 40 Watts per element: 28 vault units.

For "cold" fuel (10 Watts per element), potentially more than 44 spent nuclear fuel canisters could be placed per vault unit. This would require a customized design. Figure F-34 displays the 10 to 40 Watts and 80 Watts per element cases.

Higher decay heat foreign research reactor spent nuclear fuel would have to be temporarily stored in the small wet storage pool. The storage period is not expected to exceed 3 years.

Criticality concerns are addressed by fuel geometry within the canister and by the use of nuclear poisons (e.g., borated steel in the baskets, etc.). Vault geometry is used to maintain a minimum spacing between adjacent fuel elements or groups of fuel elements to prevent criticality. Nuclear poisons absorb neutrons, thus preventing criticality.

The vault/canyon design has been licensed by the NRC for a specific site. It represents a complete stand-alone facility that can be dedicated to foreign research reactor spent nuclear fuel without requiring the utilization of any other facilities at the host site. Cask handling, maintenance, spent nuclear fuel loading, spent nuclear fuel inspection, spent nuclear fuel storage, and (potentially) characterization can all be accomplished within the same facility.

The cost to construct a modular dry vault storage facility with a staging area sufficient to unload, characterize, can, temporarily store in a small pool, and transfer the spent nuclear fuel to the vault storage

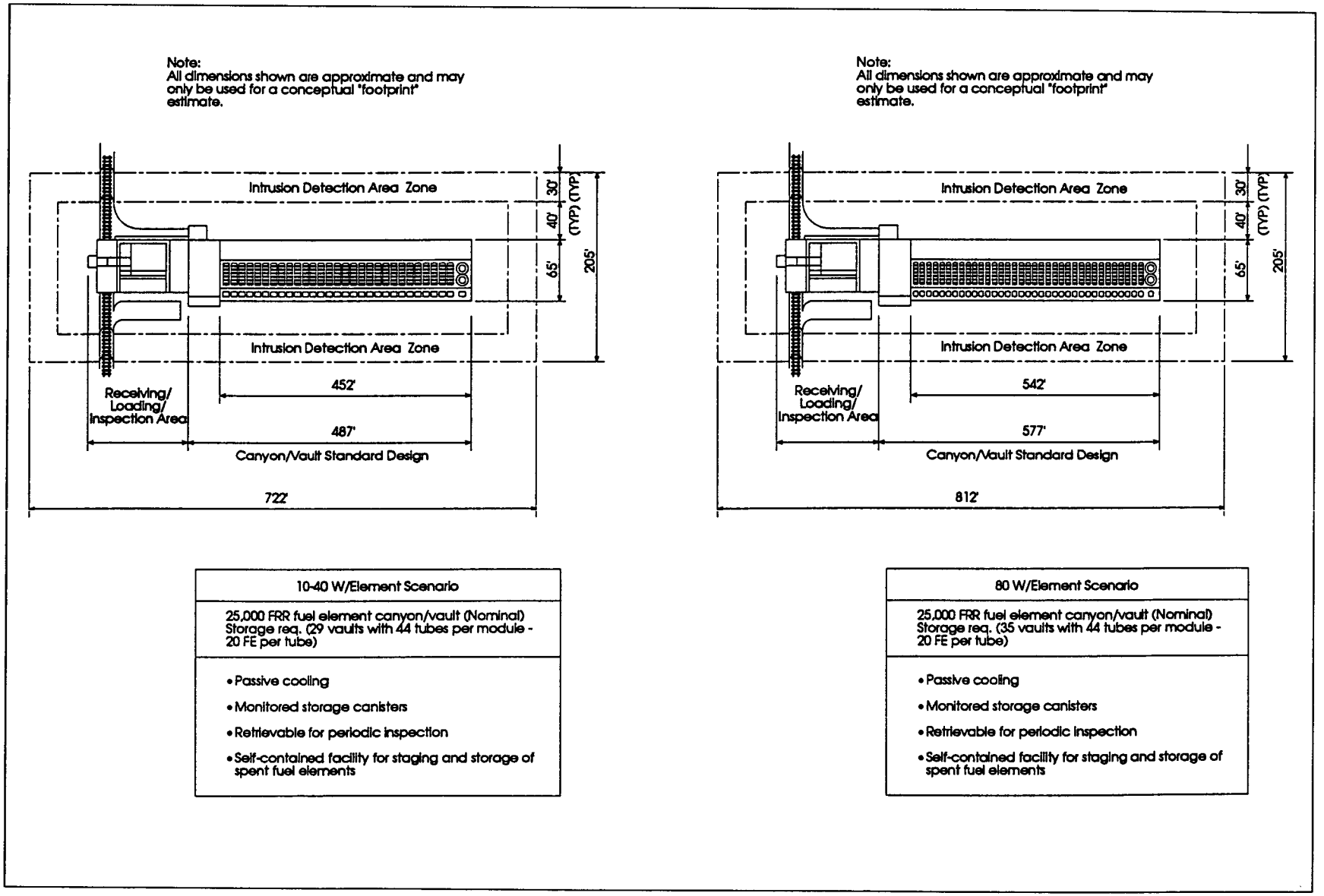


Figure F-34 Canyon/Vault Standard Design (10 to 40 Watt and 80 Watt Scenarios)

area is estimated to be $370 million. The annual operating cost for this facility is estimated to be $15.6 million during the period of handling and transfers of the spent nuclear fuel and $0.6 million during the period of storage. The cost estimate for the facility is based on a cost report prepared by Idaho Inc. (EG&G, 1993) with the addition of the cost of a small wet storage facility reported by Dahlke et al. (Dahlke et al., 1994).

F.3.1.2 Spent Nuclear Fuel Storage Using Dry Casks

The dry cask storage approach consists of the following components (BG&E, 1989; Duke Power Company, 1988; Shedrow, 1994a and 1994b; Taylor et al., 1994; Claxton et al., 1993):

- a staging facility for cask receipt and unloading and for loading foreign research reactor spent nuclear fuel into the dry storage casks [a wet pool is used for this purpose, and for short-term (1 to 3 years) storage of foreign research reactor spent nuclear fuel with a heat load exceeding 40 Watts per element],
- an inspection/characterization facility, for examining fuel integrity and canning degraded spent nuclear fuel as required (this may be incorporated into the staging facility as an inspection cell or be immediately adjacent to it),
- a dry storage cask (usually concrete) [this provides for the shielding and the structural stability of the spent nuclear fuel storage],
- a transfer mechanism, such as a dedicated truck/trailer combination with a ram for horizontal modules, or a crane for vertical modules, and
- a separate fuel canister which may or may not be used [if used, it is typically around 4.6 m (15 ft) long and 1.7 m (5.5 ft) in diameter and weighs around 32 metric tons (36 tons)].

The dry cask approach requires the staging facility to receive and inspect the spent nuclear fuel shipment. The transportation cask would be unloaded in a small wet pool within the facility. Subsequently, the spent nuclear fuel is loaded into the dry cask (or spent nuclear fuel canister for the horizontal cask), and the cask is placed upon an outside concrete slab. The horizontal approach uses a dry spent nuclear fuel transfer canister for containing the spent nuclear fuel. This is placed within a shielded transfer cask and moved to the outside modular storage facility. A hydraulic ram inserts the transfer canister inside the horizontal storage module, followed by sealing with a shield plug.

The dry storage modules are designed to withstand normal loads and design basis accident effects, such as earthquakes, tornadoes, and floods. The concrete provides radiation shielding for gamma rays and neutrons. Natural air circulation dissipates the heat as air enters through inlet vents near the bottom of the cask, passes around the spent nuclear fuel canister, and exits near the top. Screens and grills keep birds and other animals out of the cooling duct area. Some of the candidate sites have facilities which may be used for cask receipt and unloading and spent nuclear fuel inspection and transfer to storage.

The application of dry cask storage technology to foreign research reactor spent nuclear fuel depends upon the heat load. Horizontal casks are anticipated to be slightly more restrictive than the vertical casks with respect to the heat load, and are thus the focus of the discussion. The standard design for a horizontal fuel canister provides for 24 or 52 sleeves (i.e., Pressurized Water Reactor or Boiling Water Reactor spent nuclear fuel, respectively), each about 4.6 m (15 ft) long. As with the vault approach, it is conservatively assumed that each sleeve contains five foreign research reactor spent nuclear fuel elements (i.e., in layers), within a basket or can arrangement for maintaining spacings and retrievability. As with the vault

approach, the number of dry storage casks depends upon the decay heat of the spent nuclear fuel and a cladding temperature limit [175°C (347°F) for aluminum cladding, with an air inlet temperature of 49°C (120°F)]. The 24-sleeve design allows for a maximum of 120 elements of foreign research reactor spent nuclear fuel with 40 to 80 Watts per element of decay heat, while the 52-sleeve design provides for a maximum of 260 elements per dry storage cask. Thus, the number of casks required is as follows:

- decay heat between 40 and 80 Watts per element: 205 casks, and
- decay heat between 10 and 40 Watts per element: 94 casks.

Note that these values are very conservative and correspond to a maximum of around 40 percent of the NRC-licensed heat loads per cask. Initially, foreign research reactor spent nuclear fuel with higher heat loads could be unsuitable for the dry storage cask pending detailed heat transfer analysis and a determination of limiting fuel storage temperature for aluminum-clad and TRIGA spent nuclear fuel. However, such relatively high decay heat fuel represents a small percentage of the currently identified foreign research reactor spent nuclear fuel so that its impact would be small; and after 1 to 5 years of wet storage, it would all be below a heat duty of 80 Watts per elements. The storage approach assures a minimum spent nuclear fuel wet storage time of 3 years after discharge prior to dry storage. This would essentially ensure that all foreign research reactor spent nuclear fuel is below a heat output of 40 Watts per assembly.

Figure F-35 displays approximate layouts for the dry cask storage facility predicated upon a horizontal cask design. Table F-18 summarizes some general parameters of dry cask storage.

The dry storage cask technology requires a separate staging facility for foreign research reactor spent nuclear fuel unloading, canning, and storage cask loading and transportation cask maintenance. This facility has the following operational areas:

- *Transportation Cask Handling*: This incorporates cask maintenance, truck/railcar unloading, decontamination/washdown, radioactive material control, and cask sampling/flushing/degassing.
- A small wet pool for fuel transfer and short-term storage.
- *Spent Nuclear Fuel Unit Handling*: Fuel removal, decontamination, fuel drying, fuel canning, inerting, and thermal measurements.
- *Spent Nuclear Fuel Unit Transfer*: This constitutes placement of the spent nuclear fuel into the cask or canister, followed by sealing.
- *Radwaste Treatment*: This includes collection, treatment, and preparation for disposal of contaminated effluents and radwaste treatment and solidification.
- *Heating, Ventilation, and Air Conditioning*: This represents heating, ventilation, and air conditioning of the facility so that contamination of the workers and the environment is avoided.

The inspection/characterization facility includes a shielded dry hot cell for spent nuclear fuel analysis and examination, and canning of degraded spent nuclear fuel. All equipment and instrumentation within the cells is remotely operated to provide chemical, physical, and radiological properties, as needed. The facility is maintained under negative pressure with exhaust through High Efficiency Particulate Air filters

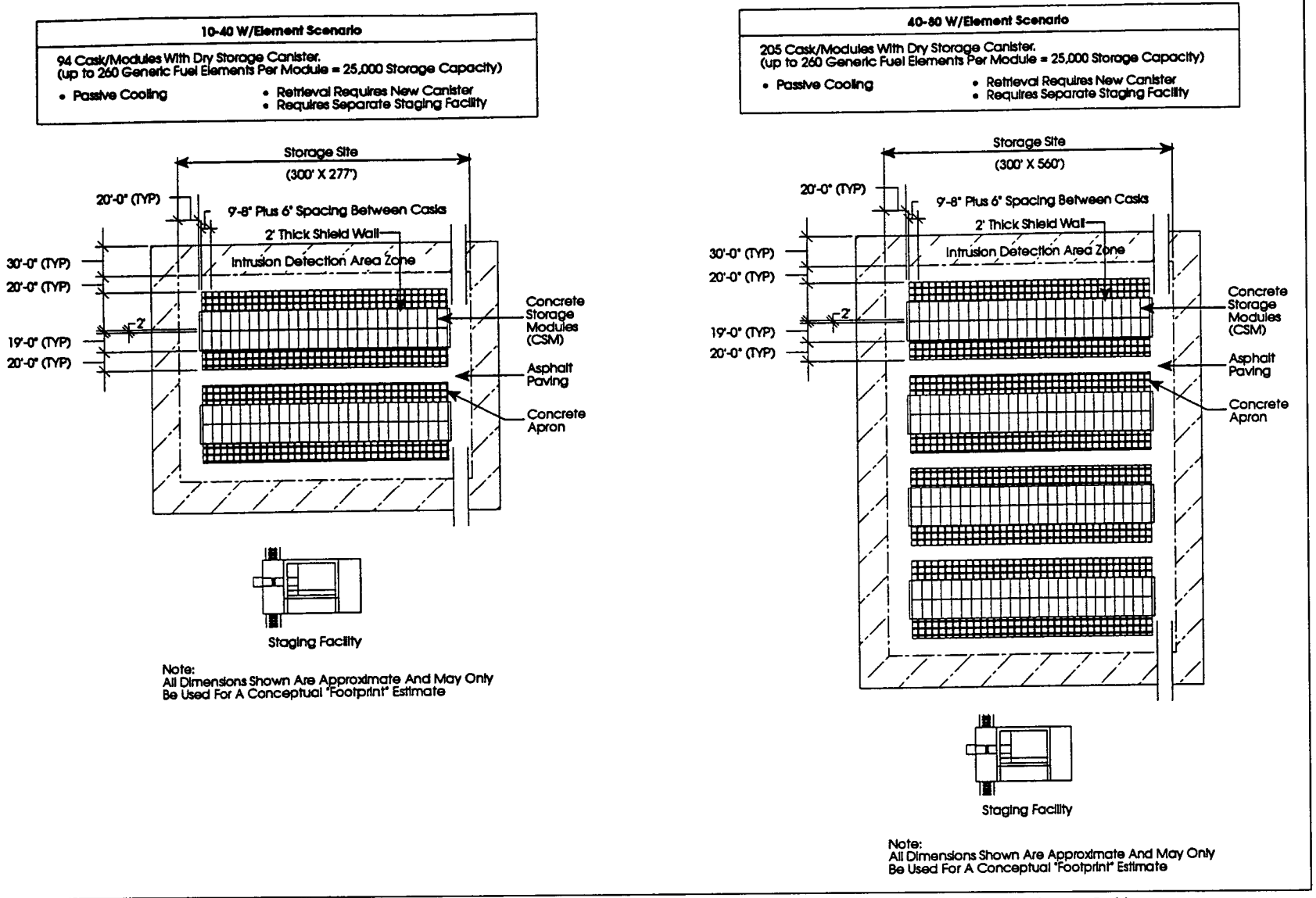


Figure F-35 Schematic of Expanded Dry Cask Storage Facility (10 to 40 Watts Scenario and 40 to 80 Watts Scenario)

Table F-18 Summary of Dry Cask Storage Parameters for Foreign Research Reactor Spent Nuclear Fuel[a]

Construction Phase:	
Disturbed Land Area	3 ha (7.7 acres)
Facility: Size (Area) Concrete Steel	 2,200 m^2 (24,000 ft^2) 17,500 m^3 (22,900 yd^3) 4,500 metric tons (5,000 tons)
Soil Moved	11,000 m^3 (14,400 yd^3)
Equipment Fuel	810,000 l (214,000 gal)
Construction Debris/Waste	1,800 m^3 (2,400 yd^3)
Work Force	50/yr for staging facility, 50 per 25 cask array, 1 array/yr
Duration (Years)	4 years for construction, 1.5 years for design
Capital Cost	$366 million[b]
Operation Phase:	
Electricity	800 - 1,000 MW-hr/yr (staging facility)
Water	2.1 million l/yr (550,000 gal/yr) during receipt, 0.9 million l/yr (238,000 gal/yr) thereafter
Wastestreams	
Solid Low Level Waste	16 m^3/year (565 ft^3/year) during receipt, 1 m^3/yr (35 ft^3/yr) thereafter
Waste Water	1.58 million l/yr (412,000 gal/year) during receipt, 0.4 million l/yr (109,000 gal/yr) thereafter
Staff (Full-Time Equivalents)	30 during receipt, 8 thereafter
Annual Operating Cost	$17.3 million during handling, $0.3 million during storage[b]

[a] *Staging facility parameters based upon the Regionalized, Small Wet Pool (Dahlke et al., 1994)*

[b] *Cost estimates are in $1993 (EG&G, 1993)*

to mitigate the environmental effects of any radionuclide releases. This facility is normally located immediately adjacent to, or within, the staging facility.

Dry cask storage is unique among the three storage technologies because of its ability to be operationally integrated with existing facilities, which allows for faster implementation as compared to the other two storage technologies. Several DOE sites have facilities with spent nuclear fuel handling capabilities similar to the requirements of the staging facility. Potential examples include the RBOF at the Savannah River Site and the ICPP-666 storage pool area. For dry cask storage, the spent nuclear fuel would be shipped to the existing facility and unloaded from the transportation cask. The spent nuclear fuel would be inspected, canned if identified as a degraded element, and placed inside the storage canister. Spent nuclear fuel with heat loads exceeding 40 Watts per element would be stored in the existing facility to allow cooldown prior to cask storage. After filling, the canister would be sealed and placed inside the storage cask. The only new construction required would be the concrete storage pad (for vertical casks) or the concrete storage modules (for horizontal casks). For the foreign research reactor spent nuclear fuel receipt rate of approximately 2,000 elements per year considered in the analyses in this EIS, approximately 8 storage casks would be needed annually.

The cost to construct a dry cask storage facility with a staging area sufficient to unload, characterize, can, temporarily store in a small pool, and transfer the spent nuclear fuel to the cask storage area is estimated to be $366 million. The annual operating cost for this facility is estimated to be $17.3 million during the period of handling and transfers of the spent nuclear fuel and $0.3 million during the period of storage.

The cost estimate for the facility is based on a cost report prepared by Idaho Inc. (EG&G, 1993) with the addition of the cost of a small wet storage facility reported by Dahlke et al. (Dahlke et al., 1994).

F.3.2 Wet Storage Facility

Three generic wet storage facility options have been proposed for foreign research reactor spent nuclear fuel. They are denoted Centralized-Underwater Fuel Storage Facility, Regionalized Large-Underwater Fuel Storage Facility, and Regionalized Small-Underwater Fuel Storage Facility (Dahlke et al., 1994). The difference between these 3 options is that Centralized-Underwater Fuel Storage Facility is sized to store 100 percent of the foreign research reactor spent nuclear fuel under consideration in this EIS (Figure F-36), Regionalized Large-Underwater Fuel Storage Facility is designed for the storage of 75 percent of the foreign research reactor spent nuclear fuel, and Regionalized Small-Underwater Fuel Storage Facility will accommodate 25 percent of the foreign research reactor spent nuclear fuel. These three options were selected to encompass any conceivable decision regarding centralization or regionalization (by geography or fuel type) for the foreign research reactor spent nuclear fuel storage sites. The design features of all three wet storage facility options are identical with the exception that building and pool sizes and, in the case of the Regionalized Small-Underwater Fuel Storage Facility, the number of storage pools and receiving bays is smaller for the Regionalized Large-Underwater Fuel Storage Facility and Regionalized Small-Underwater Fuel Storage Facility. Table F-19 presents the difference in design between these three facilities. Because the design and environmental impacts of the larger Centralized-Underwater Fuel Storage Facility would bound the two smaller facility designs, the balance of the presentation in this section addresses the specific design of the Centralized-Underwater Fuel Storage Facility for storage of 100 percent of the foreign research reactor spent nuclear fuel.

The proposed new wet storage facilities consist of a fuel storage area and support areas (Dahlke et al., 1994). The Fuel Storage Area provides for the receipt of cask transportation vehicles, cask unloading and decontamination, fuel handling, transfer, and storage. Support areas provide for the equipment necessary to maintain and operate the storage area (e.g., heating, ventilation, air conditioning, water treatment, and waste management). The wet storage facility would be constructed as a structure that meets all current nuclear regulations for withstanding natural events such as seismic, tornado, and flood, as well as aircraft impact loads. All systems supporting the operation of the fuel storage facility would also meet these safety requirements. The facility is equipped with a 118-metric ton (130-ton) overhead cask handling crane, and a 9-metric ton (10 ton) fuel handling crane. Each cask transportation vehicle would enter the facility through one of two bays, where it would be monitored and washed from transportation dust. When the external surfaces are cleaned, the cask would be placed into a decontamination room where the cask would be prepared as needed to facilitate underwater unloading. The cask would then be placed in an unloading pool. Transportation casks would be monitored and, if clean of radioactive contamination, placed in an unloading pool. The cask receiving area can accept two simultaneous shipments on 3 m (10 ft) by 24.4 m (80 ft) trucks or railcars and casks weighing up to 114 metric tons (126 tons), each with a total individual cask and transport vehicle weight of 177 metric tons (195 tons).

There are two stainless steel-lined unloading pools, one measuring 6.4 m (21 ft) long, 5.8 m (19 ft) wide by 13.4 m (44 ft) deep, and the other measuring 6.1 m (20 ft) long, 6.1 m (20 ft) wide, and 11 m (36 ft) deep. There are two decontamination hot cells. Each unloading pool has a cask washdown system. Prior to being placed in one of the two storage pools, each fuel element would be checked to ensure that it is properly configured for direct transfer to the fuel storage pool buckets. If not, it would be transferred to the fuel cutting/canning pool, which is 10.4 m (34 ft) long, 5.8 m (19 ft) wide, and 9.4 m (31 ft) deep. Here it would be prepared for transfer to the storage pool buckets.

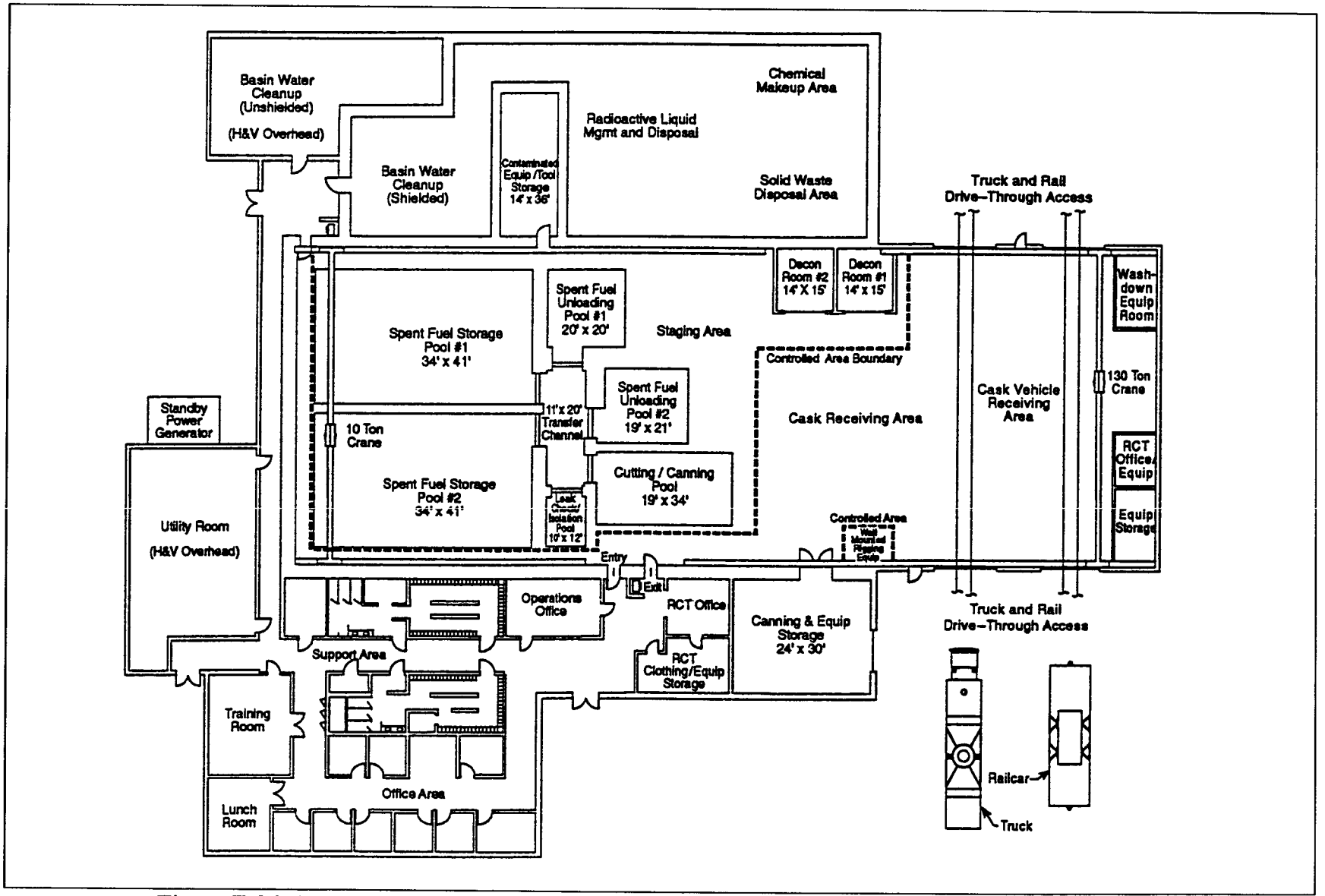


Figure F-36 Generic Wet Storage Facility for All of the Foreign Research Reactor Spent Nuclear Fuel

Table F-19 Design Difference Between 100 Percent, 75 Percent, and 25 Percent Generic Wet Storage Facilities

Design Parameter	Wet Storage Capacity (Amount of Foreign Research Reactor Spent Nuclear Fuel)		
	100%	75%	25%
Number of Storage Pools	2	2	1
Storage Pool Length and Width, m (ft)	16.5 x 10.4 (54 x 34)	12.5 x 10.4 (41 x 34)	10.4 x 8.2 (34 x 27)
Transfer Channel Length and Width, m (ft)	6.1 x 3.4 (20 x 11)	6.1 x 3.4 (20 x 11)	6.1 x 3 (20 x 10)
Fuel Unloading Pool Length and Width, m (ft)	6.4 x 5.8 (21 x 19)	6.4 x 5.8 (21 x 19)	6.1 x 6.1 (20 x 20)
Number of Receiving Bays	2	2	1

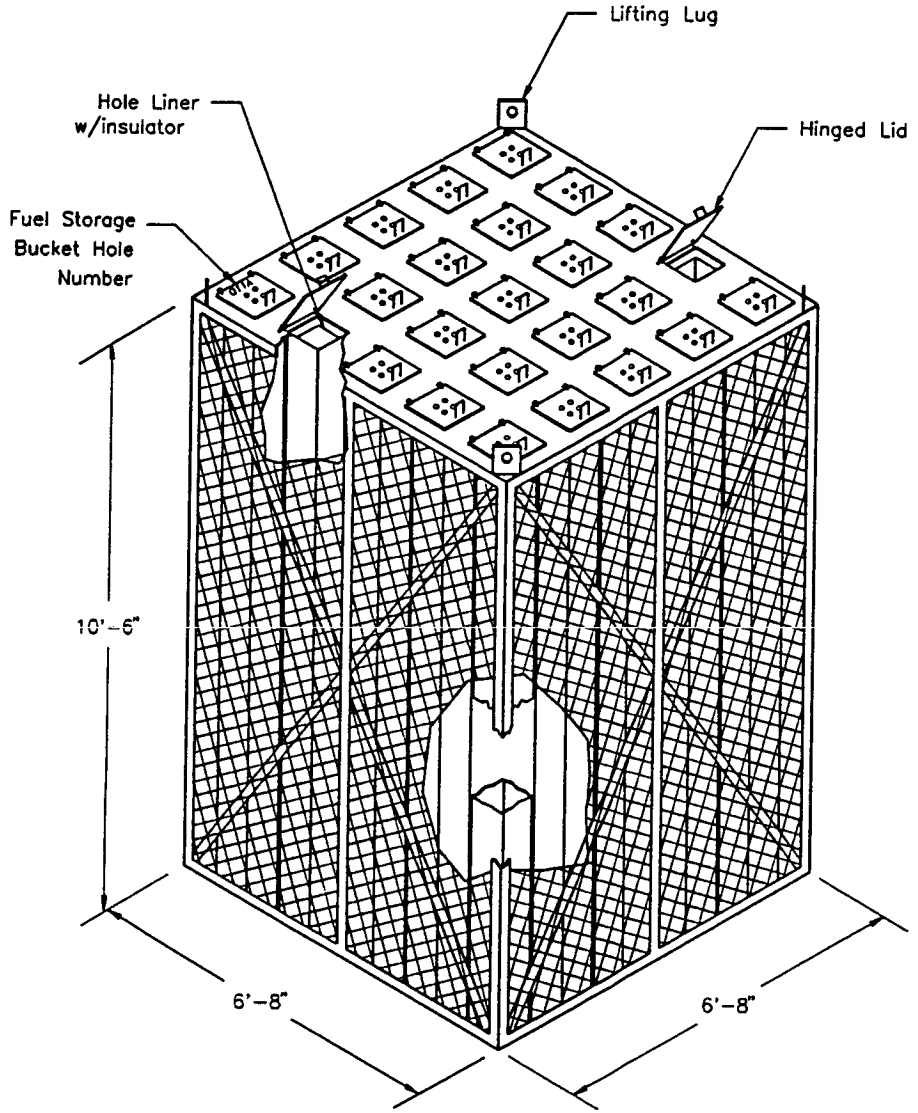
If cask measurements indicate that fuel is degraded, the fuel would be transferred to the isolation pool which is 3.7 m (12 ft) long, 3 m (10 ft) wide, and 9.4 m (31 ft) deep. This pool is equipped so that wet sipping, dry sipping, or vacuum sipping of the suspect fuel element could be performed. Sipping is a method of measuring radioisotope leakage from spent nuclear fuel. An identified degraded fuel element would then be transferred to the cutting/canning pool, where it would be canned before transfer to the storage pool. If it is not found to be degraded, it would be transferred directly to the storage pool.

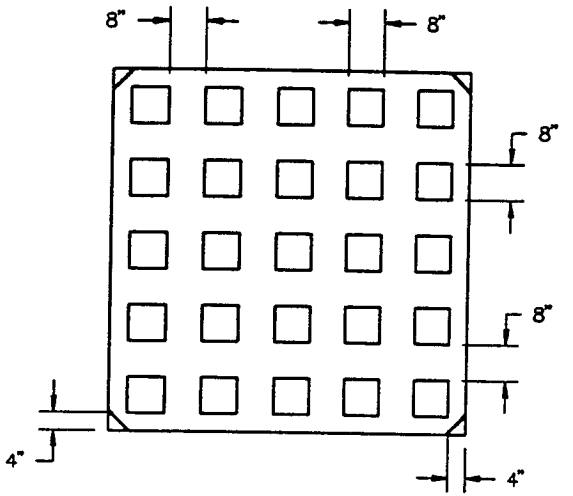
All six pools in this facility (two unloading; two storage, cutting/canning; and two leak check/isolation) are hydraulically connected by a stainless steel-lined transfer channel/pool which is 6.1 m (20 ft) long, 3.3 m (11 ft) wide, and 9.4 m (31 ft) deep. Gates between this transfer channel and each pool allow for hydraulic watertight isolation of the other pools to control contamination and allow for individual pool water pump-out. All pools and channels are constructed of concrete with stainless steel floors and liners. Pool water leak detection and collection systems are provided in accordance with NRC Regulatory Guide 1.13 (NRC, 1975) and American National Standards Institute Standard N305-1975 (ANSI, 1975b).

Each of the two stainless steel-lined, interconnected storage pools is 16.5 m (54 ft) long, 10.4 m (34 ft) wide, and 9.4 m (31 ft) deep. Each contains stainless steel storage racks which hold 1,000 fuel storage holes, with a 0.2 m (8 in) spacing maintained between adjacent storage holes (Figure F-37). Each storage hole can hold three stacked stainless steel fuel storage buckets (Figure F-38), which can each contain up to four fuel elements. A loading fixture is used during spent nuclear fuel emplacement. Thus, each pool has the capacity for 12,000 fuel elements (or 24,000 for both pools). The 0.2-m (8-in) space provides neutron isolation between adjacent storage holes and, therefore, ensures criticality safety. Each rack is 2 m (6.7 ft) square and 3.2 m (10.4 ft) high, and consists of a 5 x 5 array of 25 fuel positions. A hinged lid is above each of these fuel positions. Each pool can hold 40 of these racks. Fuel elements are stored in the racks so that at least 25.4 cm (10 in) of rack protrudes above the top of the fuel.

The heating, ventilation, and air conditioning system for the wet storage facility would include a room for air supply equipment and a room for air exhaust equipment with separate filtering and monitoring rooms for the different areas within the facility. There are two heating, ventilation and air conditioning equipment rooms. Although a total of six different rooms are used for heating, ventilation, and air conditioning, all exhaust air is directed through pre-filters, High Efficiency Particulate Air filters, radiation monitors, filter fire protection components, and heat recovery coils before it exhausts to the atmosphere.

The wet storage facility's water treatment system consists of redundant pumps, piping, filters, deionizers, and ultraviolet microorganism control systems. A heat removal system is sized to maintain the bulk water temperature at or below 43°C (109°F). The system's filters and deionizers include anion and cation exchangers that maintain water chemistry and remove radionuclides from the pool water.





Top View
(w/o Lids)

Note:
Dimensions are nominal

Figure F-37 Storage Racks

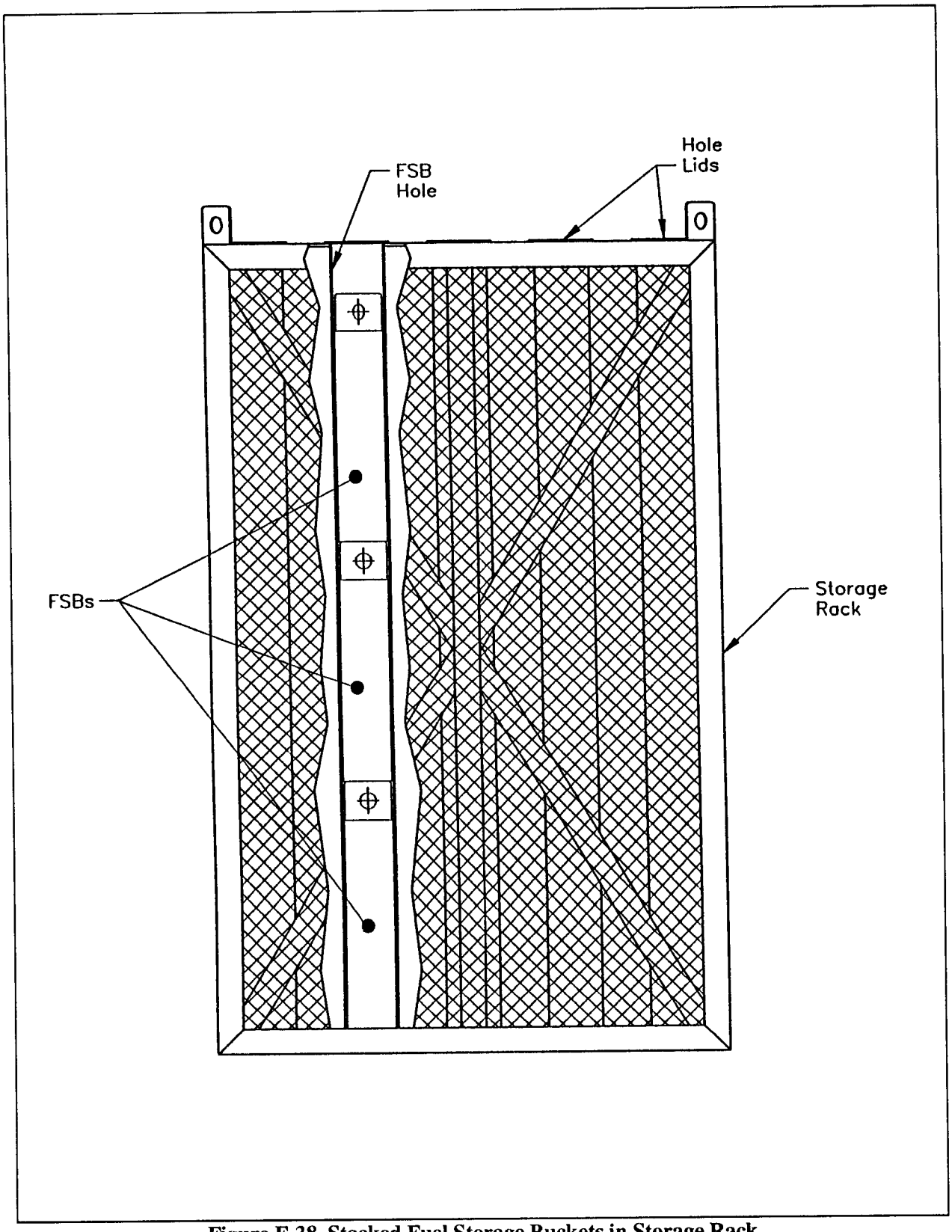


Figure F-38 Stacked Fuel Storage Buckets in Storage Rack

The staff required to operate the wet storage facility is estimated to be a maximum of 30 when 24-hour-a-day fuel loading is being performed, with only occasional maintenance visits by administrative personnel for operation. Potential radiological consequences are extrapolated from other operating wet storage facilities and are discussed in Section F.4.

No high-level radioactive waste is expected to be generated by the wet storage facility. Low-level solid radioactive waste generated over the 40-year life of the facility is expected to be about 488 m^3 (17,200 ft^3). Nonradioactive solid waste generated over the facility's life is expected to be about 300 m^3 (10,594 ft^3). No nonradioactive air emissions are expected to be generated by this facility. Table F-20 summarizes the parameters for the facility.

The cost to construct a wet storage facility with a staging area sufficient to unload, characterize, can, and transfer the spent nuclear fuel to the storage area is estimated to be $449 million. This cost may include some duplicate facilities and equipment present in both the staging facility and the rest of the wet storage facility which were costed separately. The annual operating cost for this facility is estimated to be $23.3 million during the period of handling the spent nuclear fuel and $3.5 million during the period of storage. The cost estimate for the facility is based on a cost report prepared by Idaho Inc. (EG&G, 1993).

F.3.3 Site-Specific Facilities Proposed for Foreign Research Reactor Spent Nuclear Fuel Storage and Management

F.3.3.1 Savannah River Site

RBOF

The Savannah River Site has proposed the use of its RBOF, which is also designated as Building 244-H (DuPont, 1983a and 1983b; Shedrow, 1994a and 1994b; WSRC, 1994a; Claxton et al., 1993; DOE 1993c). The RBOF is a 30-year-old steel and concrete block structure that contains several water pools that have been used for the storage of spent nuclear fuel including foreign research reactor spent nuclear fuel since approximately 1964.

The RBOF facility is located in H-Area on 0.8 ha (2 acres) of land about 397 m (1,300 ft) west of the 221-H Canyon building. A railroad track terminates within the facility, and a roadway surrounds it for access by trucks. The RBOF Building (244-H) is about 42 m (139 ft) wide and 45 m (148 ft) long and contains water-filled basins. The basin area extends below grade to a maximum depth of 13.7 m (45 ft), the roof over the 91 metric ton (100 ton) crane bay is about 13.7 m (45 ft) above grade, and most of the remainder of the roof is at an elevation of 4.6 m (15 ft).

The building consists of seven main sections separated by partition and shielding walls. A ventilation system is provided to exhaust any airborne particulate contamination through filters. The basins, cubicles, and shielding walls are made of reinforced concrete. Most of the above-grade structure consists of standard structural steel shapes with an exterior wall of Transite™ (registered trademark of Johns-Manville Co.). The walls are insulated with Fiberglas™ (registered trademark of Owens-Corning Corp.).

The basin, or working area, of the building has an inner wall of Transite™ to prevent water damage to the insulation from condensation. The disassembly and inspection basins are separated by an inner concrete block wall, and the repackaging basins are enclosed by concrete block walls.

Table F-20 Summary of Wet Storage Parameters for Foreign Research Reactor Spent Nuclear Fuel

Construction Phase:	
Disturbed Land Area	2.8 ha (7 acres)
Facility:	
Size (Area)	3,800 m^2 (41,000 ft^2)
Concrete	12,400 m^3 (16,260 yd^3)
Steel	3,100 metric tons (3,443 tons)
Soil Moved	18,000 m^3 (24,000 yd^3)
Equipment Fuel	600,000 l (159,000 gal)
Construction Debris/Waste	2,600 m^3 (10,300 yd^3)
Work Force	157/yr average, 184 peak
Duration (Years)	4 years for construction, 1.5 years for design
Capital Cost	$449 million[a,b]
Operation Phase:	
Electricity	1,000 - 1,500 MW-hr/yr
Water	2.7 million l/yr (720,000 gal/yr) during receipt, 1.5 million l/yr (409,000 gal/yr) thereafter
Wastestreams	
High Level Waste	none
Transuranic Waste (TRU)	none
Solid Low Level Waste	16 m^3/yr (580 ft^3/yr)
Waste Water	1.59 million l/yr (420,000 gal/yr) during receipt, 0.4 million l/yr (109,000 gal/yr) thereafter
Staff (Full-Time Equivalents)	30
Annual Operating Cost	$23.3 million during handling $3.5 million during storage[a]

Source: (Dahlke et al., 1994)

[a] *Cost estimates are in $1993 (EG&G, 1993)*

[b] *The cost may include duplicate equipment costed in both the staging facility and the wet storage facility*

The two storage pools are between 6.7 and 8.8 m (22 and 29 ft) deep, and approximately 70 percent of their capacity is filled with a variety of fuel types, including aluminum-clad fuel with a ^{235}U enrichment up to 93.91 percent. Subcriticality is maintained by appropriate fuel spacing [center-to-center fuel spacing in these racks currently varies between 23 and 65 cm (9 and 25.5 in) depending on the specific rack] in the storage racks, since no neutron absorption material is used in the pool water. Rack height is 3.4 m (11.17 ft), but some fuel protrudes above the top of the racks. Some of this fuel has been stored at the RBOF for as long as 15 years without any significant degradation. These aluminum storage racks have been present in the pools for 30 years without degradation. Figure F-39 shows the floor plan, and Figure F-40 displays an elevation view.

The RBOF includes specific design, operating, and maintenance procedures for the receipt of a wide variety of fuel types and casks, including damaged fuel elements. The RBOF has the facilities and experience in all aspects of spent nuclear fuel receipt including cask wash, fuel unloading, fuel transfer, fuel storage, fuel inspection, fuel disassembly, and fuel repackaging.

The RBOF pools have a stainless steel bottom and epoxy-coated walls. Pool walls are made of reinforced concrete that varies in thickness from 0.9 m (3 ft) at the top of the pool to 2 m (6.5 ft) at the lower elevations, and the pool floor is a stainless steel liner over a 91-cm (3-ft) thick reinforced concrete slab. Most of the pools have a 6.4-mm (0.25-in) thick stainless steel liner on the floor. The disassembly, inspection, and repackaging basins also have a 3.2-mm (0.125-in) thick stainless steel liner on the walls. Pools or basins are connected by transfer canals with underwater doors.

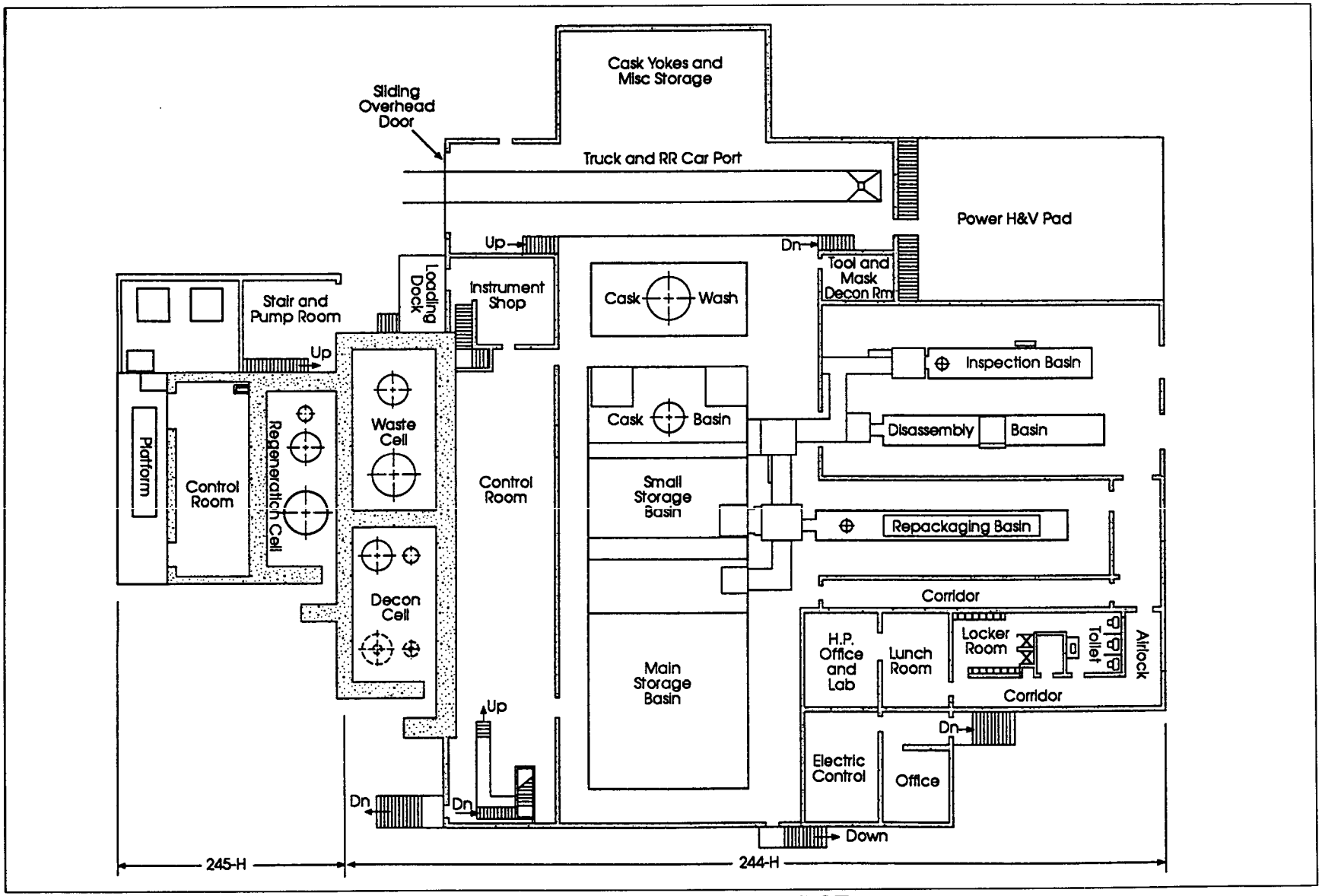


Figure F-39 Plan View of the RBOF

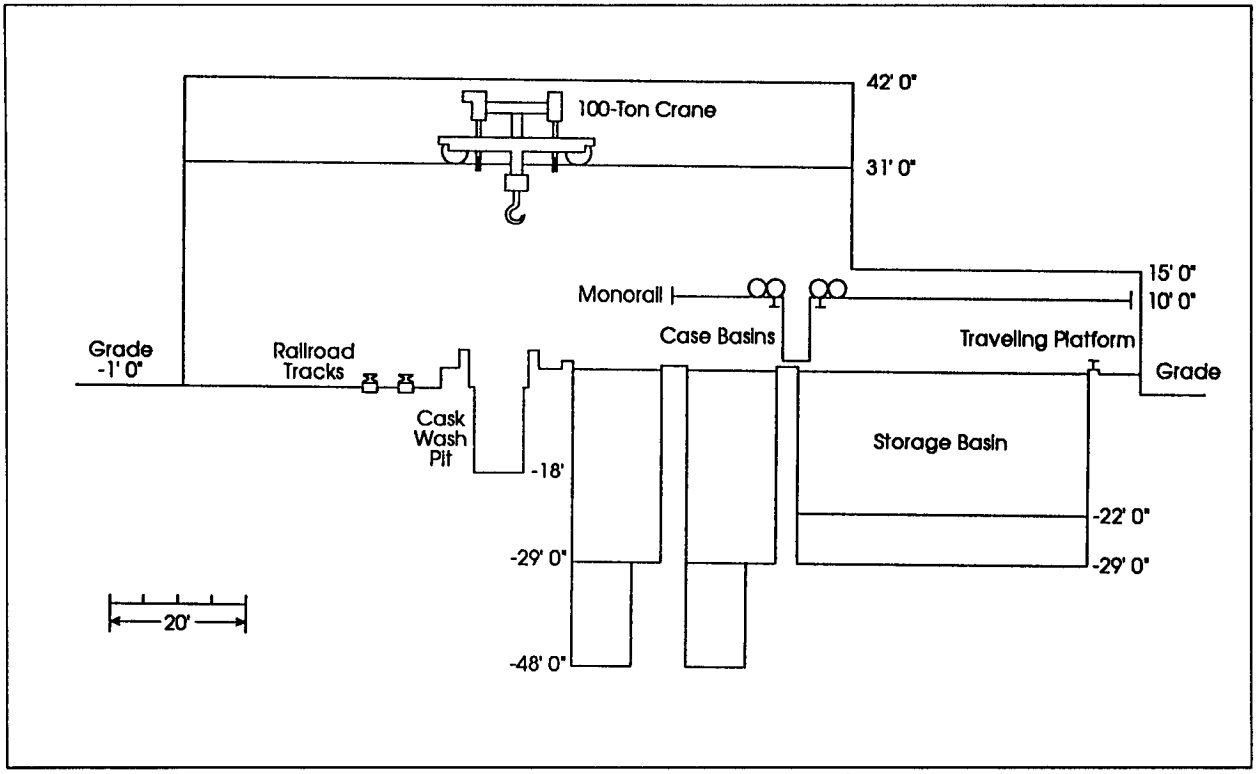


Figure F-40 Elevation Schematic of the RBOF (Facing East)

Water from any basin can be pumped through a filter-deionizer and then returned to the basin as purified water with a conductivity in the range of 0.5 to 1.5 μmhos/cm. In addition, the activity level of the water, which is typically in the range of 0.5 to 1.5 x 10^{-4} μCi/ml, is reduced to less than 0.05 x 10^{-4} μCi/ml by this process. The normal inventory of activity in the approximately 1,700,000 l (450,000 gal) of total basin water is thus 0.1 to 0.3 Ci. For typical flow rates of 454 l/min (120 gal/min), the deionizer processes approximately 1.1 x 10^{8} l (3 x 10^{7} gal) during 6 months of service and may contain about 20 Ci of radioactivity (mostly as cesium) when regeneration is required. The deionizer is typically regenerated every 4 to 5 months. The "Porostone" (aluminum oxide) filter that precedes the deionizer is normally backflushed and recoated with filter-aid whenever a significant pressure drop occurs, which, in practice, is about three to four times per month. When the filter tubes become plugged, they are chemically treated with oxalic acid and sodium hydroxide to open the pores of the filter. This occurs once or twice per year. The purification system maintains excellent chemistry, with mercury and copper kept below two parts per billion, and iron and aluminum maintained below 2 parts per million (ppm). Chloride is maintained below 10 parts per billion.

In the event of an interruption of normal power to the RBOF, critical equipment essential for maintaining personnel safety and containing radioactivity are automatically supplied with emergency power from a 12.5-kilovolt amps, 10-kilowatts, 460-volts gasoline-driven generator.

The building ventilation system serves to minimize airborne radioactivity both inside and outside the facility because of the "once-through" airflow system and the use of High Efficiency Particulate Air filters on the building exhaust. Because of the once-through airflow, activity levels do not tend to increase with time within the building, and the High Efficiency Particulate Air filters serve to effectively remove particulate radioactivity that would otherwise be released to the atmosphere. In addition, the facility is maintained at less than atmospheric pressure so that all building air will be filtered before release. The

basin areas are also kept at a lower pressure than the rest of the building, and a separate ventilation system supplies air to the control room, offices, and change room. All air, after filtration, is discharged through a 1.5-m (5-ft) diameter by 16.2-m (53-ft) high stack. The exhaust system for the process vessels in the Waste Cell and the Decontamination Cell is similar to the building system, but is separate and employs acid resistant components. This exhaust is discharged through a 25-cm (10-in) diameter by 16.2-m (53-ft) high pipe.

The 91-metric ton (100-ton) capacity bridge crane travels on a 27.4-m (90-ft) long runway located 9.4-m (31-ft) above grade which permits access to the carport, the cask wash pit, and the cask basin. It is used to handle transportation casks, cask lids, cask basin shims, and a semi-remote impact wrench.

The twin hook crane consists of two 45-metric ton (50-ton) capacity hoist trolleys, which can be arranged for independent travel, or which can be electrically locked to provide for operation as a single unit. Load clearance above the 1.1-m (3-ft 6-in) high cask basin railing is 8.1-m (26-ft 6-in). The bridge crane is pendant-operated from a walkway on the west side of the basins.

A 2.7-metric ton (3-ton) hoist, suspended from a monorail on the south girder of the bridge, is used in the handling of a semi-remotely operated impact wrench. The other 2.7-metric ton (3-ton) hoist is used primarily for the handling of yokes and other ancillary equipment in the yoke storage area adjoining the carport.

Brakes on the cranes and hoist are applied automatically in the event of a power outage.

Two small bridge cranes, one motorized and one manually operated, are employed over the repackaging basin. Both have a load capacity of 2.7 metric tons (3 tons).

The RBOF includes a High Efficiency Particulate Air heating, ventilation, and air conditioning system and maintains subatmospheric pressure within the building to minimize environmental releases of radionuclides. Automatic atmospheric isolation is actuated by activity level monitors inside the RBOF. The RBOF is also equipped with groundwater monitoring for detecting leakage from the pool confinement boundary.

Analysis of the RBOF was performed and included an evaluation of the reliability of process equipment and controls, administrative controls, and engineered safety features. The evaluation identified potential scenarios and radiological consequences. Risks were calculated in terms of 50-year population dose commitment per year (person-rem per year) to the onsite staff and to an individual at the plant boundary. Risk is defined as the product of the expected frequency of a release and the consequences of the release. Consequences are expressed in terms of dose commitment to onsite and offsite populations surrounding the release point.

An evaluation of the RBOF as a potential storage site for foreign research reactor spent nuclear fuel indicates a number of problem areas. The current cask handling capacity of the RBOF is approximately one cask per week. This capacity is based upon facility operations at two shifts per day, 5 days per week. The cask handling capacity could be increased, perhaps to as much as 84 casks per year, if facility operations were expanded to around-the-clock (3 shifts per day), 7 days per week. However, considering that shipments out of the RBOF also require cask handling, the net receipt capacity of the RBOF is practically limited to four casks per month. This capacity would not be sufficient for the potential foreign research reactor spent nuclear fuel cask receipt rate of ~60 casks per year. If the RBOF were used for the receipt and loading of dry storage canisters, its receipt rate could be reduced by half. Only ~1,000 fuel storage spaces are available at the RBOF. Consolidation of the spent nuclear fuel might open an additional 1,425 spaces, but this is much less than that required for the number of foreign research reactor spent

nuclear fuel elements under consideration in this EIS. The Savannah River Site has proposed movement of other spent nuclear fuel to the reactor storage basins, and use of dry storage for foreign research reactor spent nuclear fuel.

The DOE Spent Fuel Working Group Report has identified a number of vulnerabilities at the RBOF, including insufficient training, inadequate tornado missile protection, no seismic qualification, lack of water leak detection system, and no up-to-date and approved Safety Analysis Report (DOE, 1993b). It should be noted that a system description and a Safety Analysis Report for the RBOF do exist and were published in 1983. Current recommendations are to address and correct these problems by FY 1996 (DOE, 1993b; Taylor et al., 1994). The 30-year age of these pools may also require analyses to determine the remaining safe lifetime without significant replacement or design modifications.

Reactor Disassembly Basins

Savannah River Site has also proposed the use of one or more of its reactor disassembly basins for Phase 1 storage of foreign research reactor spent nuclear fuel (Shedrow, 1994a and 1994b; Taylor et al., 1994). All of these basins were constructed in the early 1950's and became operational in the mid-1950's. The disassembly basins are similar to each other and are briefly described in the sections that follow, using the L-Reactor disassembly basin as an example.

The L-Reactor performed the basic function of irradiating elements in a heavy water moderated and cooled reactor for the purpose of supplying special nuclear materials for national defense, medical, and research applications. The Savannah River Site production reactors are not currently operating. The disassembly area of the Savannah River Site Production Reactors was designed to serve as a processing area for reactor target and fuel assemblies. This processing included removal of decay heat, disassembly of components, short term storage of fissile product material, and cask loading operations. Total residence time from reactor discharge to shipment to the separation areas was typically 12 to 18 months.

The disassembly basin is arranged into three major sections: the machine basin, the vertical tube storage basin, and the transfer area (Figure F-41). The machine basin and vertical tube storage basins are divided into the following interconnected basins:

Vertical Tube Storage Basin	*Machine Basin*
Deposit and Exit Canal*	Machine Area
Vertical Tube Storage	Horizontal tube storage Target bucket storage Dry cave

* *The Deposit and Exit canal is a water-filled canal that connects the disassembly area and the area that houses the reactor tank top or process room. This canal also acts as a water seal to allow access by an underwater conveyer, but no airflow.*

The disassembly basin contains 12,776,000 l (3,375,000 gal) of water. Vertical tube storage holds 3,730,000 l (985,000 gal), while the machine basin holds 9,050,000 l (2,390,000 gal) (transfer area included). The depth of the disassembly basin ranges from 5.2 to 9.2 m (17 to 30 ft), but most of the basin is around 5.2 m (17 ft) deep. The approximate overall dimensions are 47 m (154 ft) wide by 66 m (216 ft) long. There is a small 0.9 m (3 ft) diameter circular section of the machine basin that is 15.6 m (50 ft) deep.

Figure F-42 shows a basic block diagram of the disassembly process. The reactor assemblies were discharged from the reactor tank to the Deposit and Exit canal, placed in the Deposit and Exit conveyer,

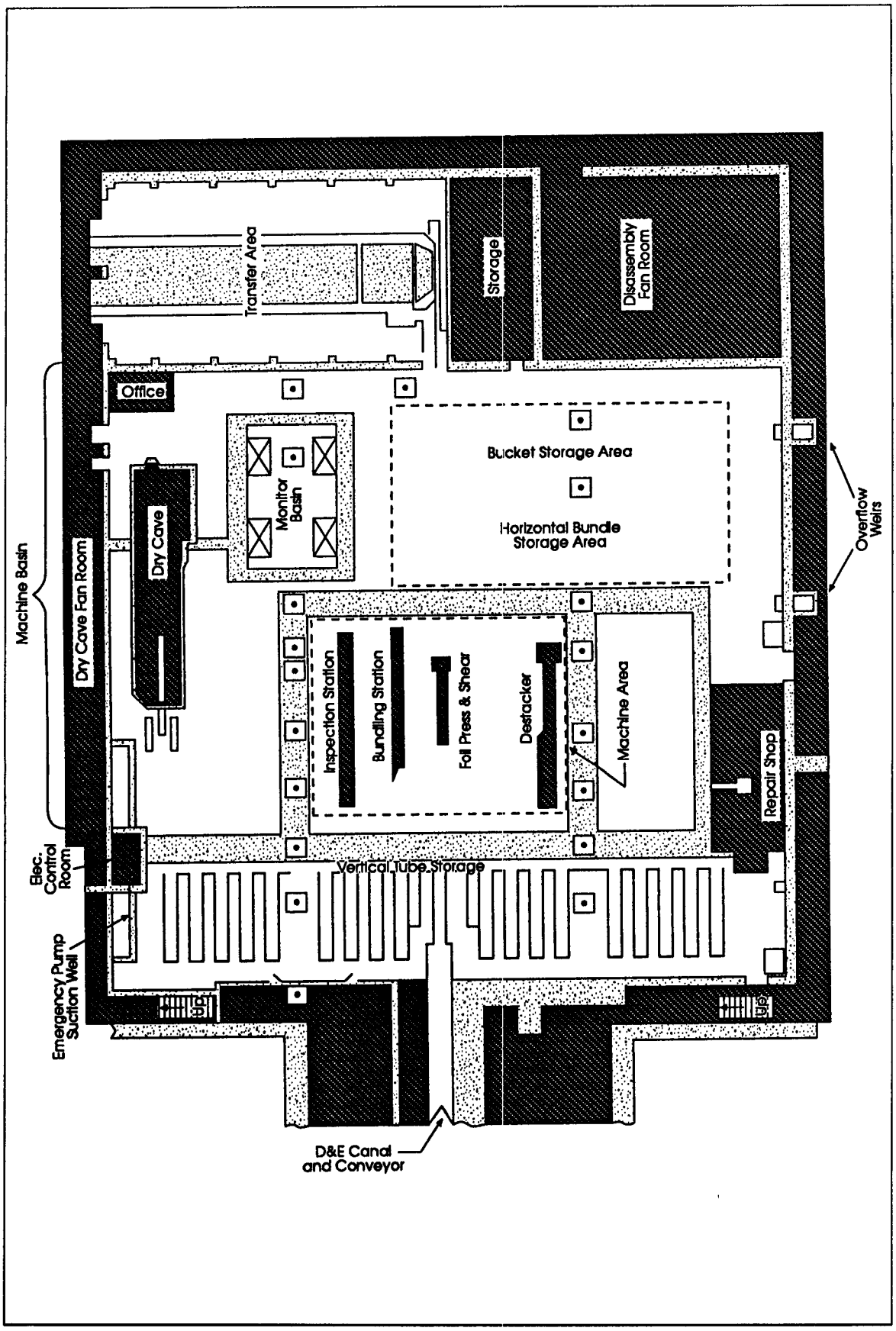


Figure F-41 Typical Reactor Disassembly Basin Area Layout

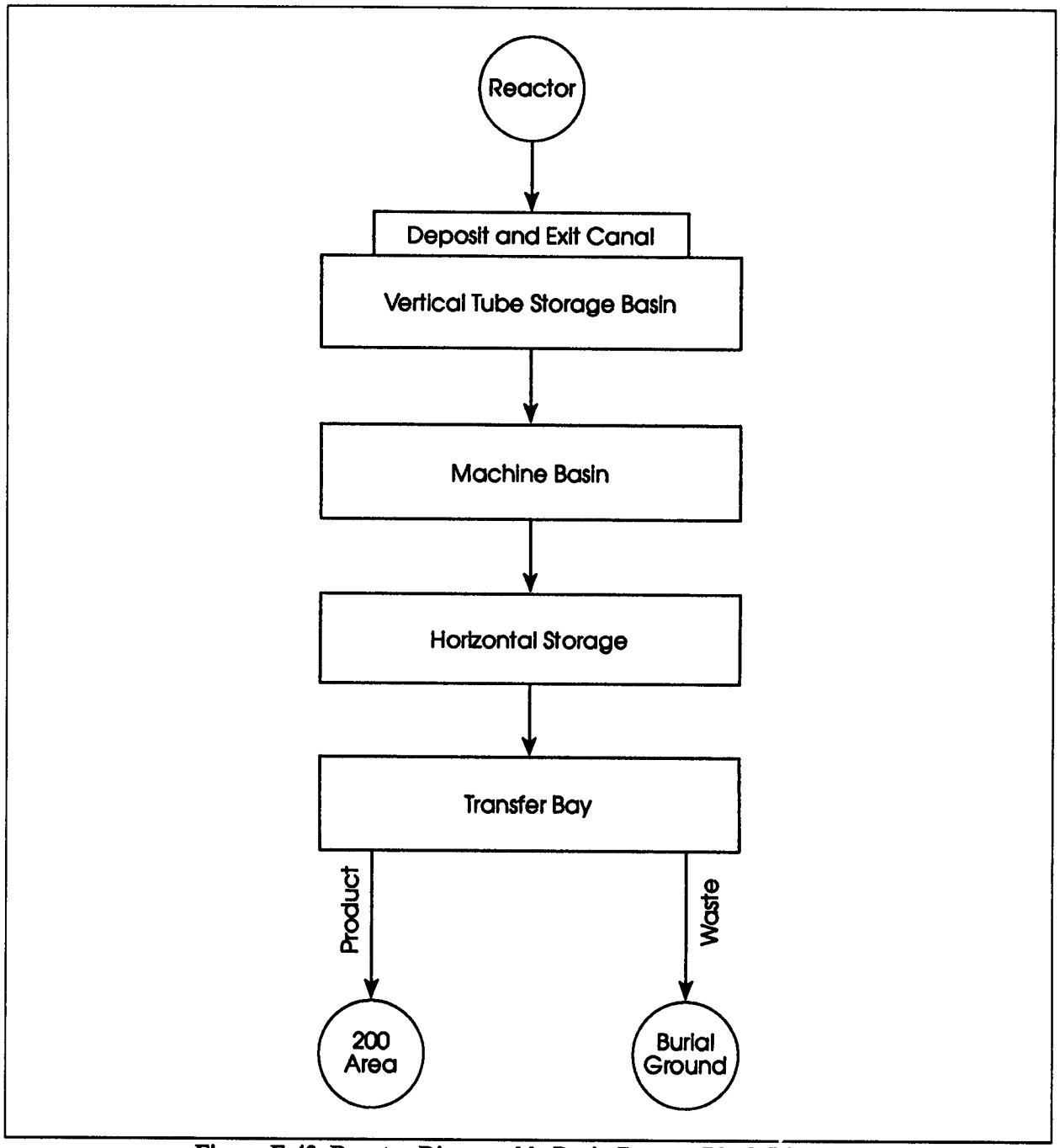


Figure F-42 Reactor Disassembly Basin Process Block Diagram

and transferred to the disassembly area side of the Deposit and Exit canal. The assemblies were transferred to hangers suspended from overhead monorails and were initially stored in the vertical tube storage area for 3 to 8 months. Fuel and target assemblies were moved to the machine basin area where they were disassembled. Target material was placed in stainless steel buckets and then stored in the bucket storage area. Fuel was bundled in aluminum bundles and stored in horizontal storage racks. The components were then allowed to cool for up to another 8 months. The fuel and target material was expected to be in the basin no longer than 18 months. The components, once sufficiently cooled, were moved to the transfer area to be shipped by cask to the processing facility.

Use of a disassembly basin for foreign research reactor spent nuclear fuel would require continuous demineralizer treatment for water quality, and new storage racks. Existing heat exchanger systems can remove upwards of 6,800 kilowatts (24 x 10^6 BTU/hr), which should far exceed the 240-1,000 kilowatts heat generation rate of foreign research reactor spent nuclear fuel (i.e., 10 to 40 Watts per element). These changes would allow each basin to accommodate approximately 20,000 elements.

The transfer area provides an area for shipping or receiving material and equipment. This area consists of two water-filled basins which are designated the scrap pit and the transfer pit. Irradiated material ready for shipping is transferred from horizontal storage to the transfer bay. Transportation casks are moved to and from the transfer pit and irradiated material placed in the cask using hoists mounted on the monorail system. Transportation casks can be transported to and from the reactor areas by tractor trailer or railroad. Trailers or railcars are positioned inside the transfer pit and casks are lifted and transported into/out of the basin using an 85/30 ton overhead crane.

Over the course of the site's history, at least 10 different casks have been used for various applications, many of which are still available for use pending proper inspection and maintenance. Two types are now used for most, if not all, disassembly work. EP-85 is a 63.5-metric ton (70-ton) fuel and target transport cask and EP-383 is a 13.6 metric ton (15-ton) cask used to move scrap to the burial ground.

The transfer area cranes would have to be modified to accommodate the different casks used for offsite shipments. These changes would allow a disassembly basin to receive up to seven casks per month in addition to the projected Savannah River Site shipping requirements.

A monorail system is mounted to the ceiling throughout the disassembly area. This system is used to transport and store all types of spent nuclear fuel and reactor components in the disassembly basin area. Most of the disassembly monorail system is designed for a working load of 907 kg (2,000 lbs) per foot of rail, which would be adequate for moving foreign research reactor spent nuclear fuel.

H-Canyon

The H-Area facilities occupy approximately 160 ha (395 acres). The H-Area Canyon processed irradiated fuel elements via modifications of the plutonium-uranium extraction process (Figure F-43) and is oriented toward HEU recovery. Primary operations also include the dissolution of fuel tubes, chemical and physical separations, and purification of materials. DOE stores the high-level waste from the operations in large tanks (nominally, 3.8 million l or 1 million gal each) for future stabilization and disposal via the Defense Waste Processing Facility.

The facility arrangement of the H-Canyon is identical to the F-Canyon. The main facility in the H-Area is the 221 H-Canyon, where most of the separations of irradiated materials were accomplished. The H-Canyon is a Class 1 reinforced concrete structure with exterior dimensions of 254.4 m (835 ft) by 37.2 m (122 ft) by 20.1 m (66 ft) high. The facility houses two parallel process canyons, each 9.1 m (30 ft) wide. The two process canyons handle high activity and lower activity materials, and are designated as the hot and warm canyons, respectively. Each of these process canyons is divided into 14 process cells, 13.1 m (43 ft) long by 4.6 m (15 ft) wide by 13.7 m (45 ft) high. Each process canyon is serviced by an overhead crane that operates the entire length of the canyon. The cranes perform remote operations for the processes such as equipment replacement, piping and electrical changes, leak repair, and inspections. Recently, new cranes were installed in both canyons. These cranes are remotely operated and include a Closed Circuit Television system for better monitoring capabilities. The warm process canyon crane has a lifting capacity of 27.2 metric tons (30 tons) and the hot process canyon's crane capacity is 45.4 metric

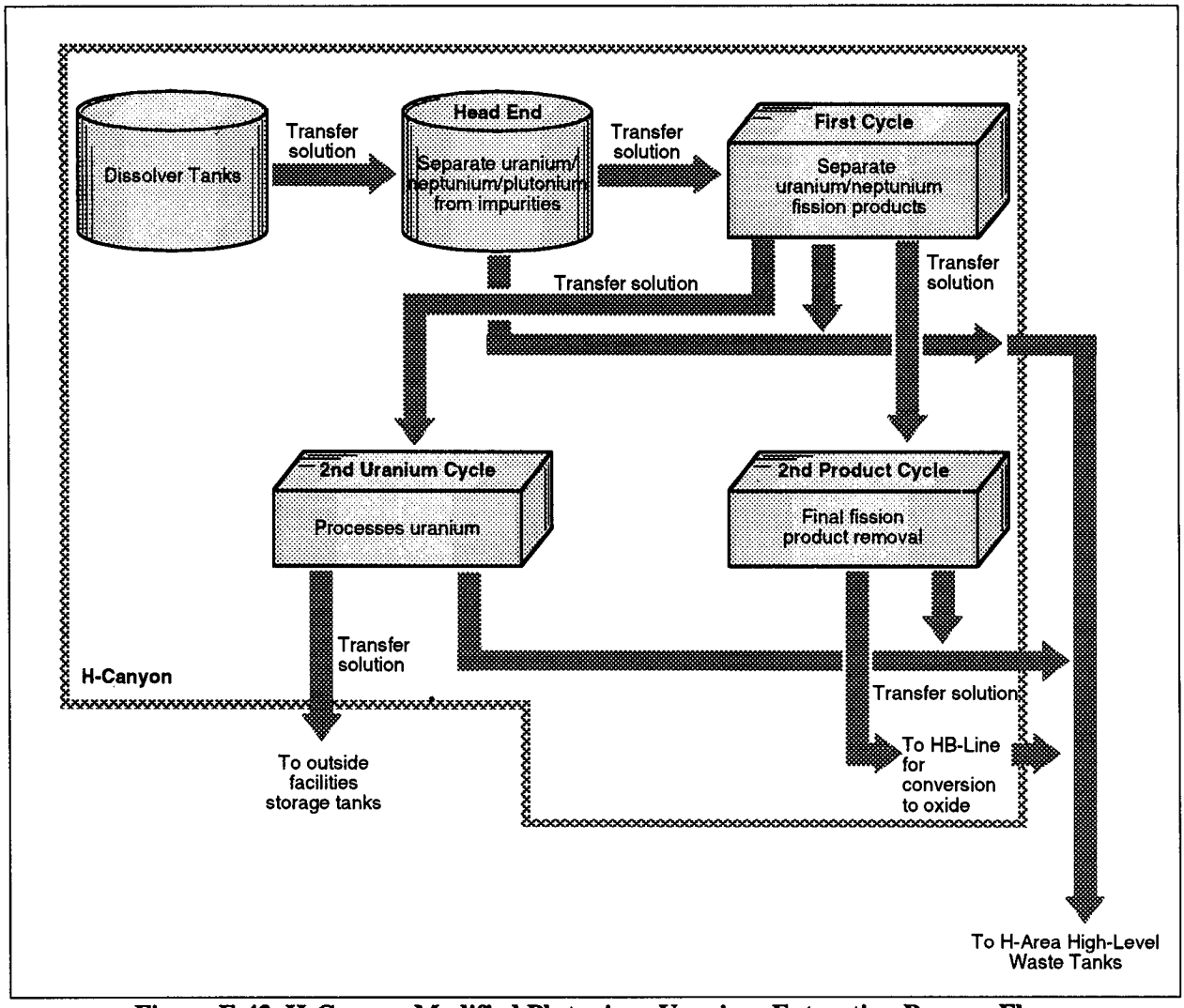


Figure F-43 H-Canyon Modified Plutonium-Uranium Extraction Process Flow

tons (50 tons). A separate maintenance area for each canyon provides for crane maintenance and repair. The original canyon cranes are still in place and can be utilized as backups to the new ones.

Spent nuclear fuel is delivered by a water-filled railway mounted cask into a shielded tunnel. The hot canyon overhead crane unloads spent nuclear fuel either into a storage basin in Section 3 or into the dissolver. The H-Canyon basin was never designed for storage of spent nuclear fuel, but only as a staging area prior to reprocessing. As such, it does not have the capability to establish, circulate, or maintain water chemistry. Basin water is sampled and analyzed every 3 months and domestic water is added manually every 3 months by opening an appropriate valve to the basin to make up for evaporation.

The H-Canyon storage basin is constructed of concrete and is 5.4 m (17.75 ft) long, 2.38 m (7.83 ft) wide, and 7.6 m (25 ft) deep. The floor is covered by a stainless steel liner that also extends 4.3 m (14 ft) up each wall. A stainless steel storage rack sits in the bottom of the basin and provides adequate spent nuclear fuel separation. The basin is filled with water to a level of 3.8 m (12.5 ft). The fuel currently being stored in the basin contains approximately 40 kg (88 lbs) of ^{235}U. The H-Canyon is currently in a status ready for restarting. An EIS was prepared to cover the canyon's restart for processing of the liquids

currently stored in tanks within the facility. Future missions for the facility are still being analyzed. For foreign research reactor spent nuclear fuel, H-Canyon could be used for chemical separation and blending down of HEU to LEU material.

F.3.3.2 Idaho National Engineering Laboratory

On October 17, 1995, litigation with the State of Idaho was settled by stipulation of the parties and entry of a consent order. This settlement would provide for the transportation of up to 61 shipments of foreign research reactor spent nuclear fuel to the Idaho National Engineering Laboratory prior to the year 2000, if DOE and the Department of State choose to adopt a policy of accepting such spent nuclear fuel. After the year 2000, additional shipments of such spent nuclear fuel could be made to the Idaho National Engineering Laboratory under the stipulated settlement and consent order. However, the following discussion is to provide a full understanding of the existing capabilities at the Idaho National Engineering Laboratory in light of the fact that this site has been considered as a reasonable alternative to manage the foreign research reactor spent nuclear fuel as in the preparation of the Draft EIS.

Irradiated Fuel Storage Facility

The ICPP-603 includes an underwater fuel storage basin area and the IFSF, which is a remotely operated, dry-vault facility specifically constructed for the storage of graphite fuel from the Fort St. Vrain and Peach Bottom reactors. It was built in 1974 as an addition to the underwater Fuel Storage Facility and contains 636 storage positions. This facility can handle casks weighing up to 55 metric tons (60 tons). Spent nuclear fuel currently stored here is from two commercial high-temperature, gas-cooled reactors (Fort St. Vrain and Peach Bottom), some for the ROVER Nuclear Rocket Program, and some Tory 2C and BER II TRIGA fuel. The IFSF is a good candidate for spent nuclear fuel requiring frequent monitoring because of the ease of visual fuel inspections.

Since the facility can accommodate fuels up to 3.0 m (130 in) in length, all types of foreign research reactor spent nuclear fuel under consideration in this EIS could be handled. Transfer cart modifications would be needed for the proposed foreign research reactor spent nuclear fuel transportation casks, since the existing transfer cart only has the capability to handle the Rover cask, the Fort St. Vrain cask, and the Peach Bottom cask. New fuel handling tools, such as a new can grapple, would be needed. New cell preparations and work stations would also be needed. Sipping, unloading, canning, sealing, and leak checking equipment would need to be added to the cell. A 14 metric ton (15 ton) crane is present in the vault room for fuel handling. Visual inspection and gamma spectroscopy could readily be performed in the existing vault room.

The vault room is 7 m by 7.1 m by 6.6 m (22 ft 10 in by 23 ft 3 in by 21 ft 6 in) high, and the storage room is 437 m^2 (4,700 ft^2). Loaded fuel cans can be transferred from the vault room to the storage area by a shuttle bin. The vault room is being reanalyzed structurally to validate its capability to meet the current seismic requirements of 10 CFR 72. Recent reliable data regarding the effectiveness of the filtering and ventilation systems must be obtained in order to assess the amount of radionuclides that may be vented into the outside air. The cost to add the required capabilities to the IFSF for storage of foreign research reactor spent nuclear fuel is approximately $5 million.

It should be mentioned that, although this facility was originally constructed to accommodate the Fort St. Vrain High Temperature Gas-Cooled Reactor graphite fuel, it will not be used for this purpose because of the October 16, 1995 Settlement Agreement with the State of Idaho that declared that the Fort St. Vrain fuel will not be brought to the Idaho National Engineering Laboratory for interim storage. Public Service of Colorado has obtained a 10 CFR 72 license to store all of the fuel in the Foster Wheeler

modular dry vault facility built adjacent to the reactor site. That modular dry vault is currently completely loaded with Fort St. Vrain fuel, and the reactor is being decommissioned. Availability of the IFSF for foreign research reactor spent nuclear fuel will be dependent on decisions to consolidate spent nuclear fuel from other Idaho National Engineering Laboratory facilities at this facility.

Approximately 300 positions are available in the IFSF dry storage facility for foreign research reactor spent nuclear fuel. Preparations to receive the foreign research reactor spent nuclear fuel could be completed as soon as calendar year 1997. However, many activities are already scheduled for this facility. A new canning station for spent nuclear fuel from the ICPP-603 basins is being constructed in the handling cave, and the canning will then be accomplished. Other spent nuclear fuel management activities being considered in this facility include ROVER reactor fuel shipments, Experimental Breeder Reactor II and FERMI movements fuel from ICPP-666. Naval fuel inspection sample receipts from the Expended Core Facility are scheduled. The Peach Bottom fuel in the ICPP-749 facility and Rover fuel ash transfers from a shutdown fuel processing facility are also being considered for repackaging in the IFSF handling cell, and the Idaho National Engineering Laboratory spent fuel consolidation activities are scheduled to begin within 2 years. Detailed facility usage schedules have been drafted to demonstrate how the foreign research reactor spent nuclear fuels could be accommodated in this workload.

With this schedule as background, foreign research reactor spent nuclear fuel preparations could take place during early 1996. Fuel could be received beginning in 1997 (61 shipments through FY2000) and up to 101 shipments in the years beyond this timeframe.

The 300 positions could store up to approximately 9,000 foreign research reactor spent nuclear fuel elements. Approximately 60 dry storage positions in the ICPP-749 drywells could also be utilized to store foreign research reactor spent nuclear fuel. Some refurbishment would have to take place to receive spent nuclear fuel. This could be completed in 1997, and the facility would be ready to receive fuel at the beginning of 1998. With 60 fuel elements per position, up to 3,600 fuel elements could be stored in the ICPP-749. Any fuel that is stored in the ICPP-749 would have to go through the ICPP-603-IFSF to be placed in sealed containers and transferred to an interfacility transfer cask.

Idaho Chemical Processing Plant-666 Fuel Storage Area

This facility (Figure F-44) is the modern Idaho National Engineering Laboratory underwater storage facility. Receipt and storage of foreign research reactor spent nuclear fuel has been accomplished in the past as one of its many missions. It has the capability of receiving and unloading spent nuclear fuel casks at a rate of approximately five per week. Storage capability for up to 8,400 foreign research reactor spent nuclear fuel elements can be provided for an approximate 10-year period by using the increased capacity fuel storage racks that will be installed in Pool 1 via a reracking project planned following the Programmatic SNF&INEL Final EIS, and by installing additional fuel storage racks in the cutting pool. The increased capacity being provided in Pool 1 will be required for Naval spent nuclear fuel receipts beginning in about FY 2005. The racks being removed from Pool 1 as part of the reracking project could be placed in the cutting pool for the foreign research reactor spent nuclear fuel.

The capability of the ICPP-666 facility to receive foreign research reactor spent nuclear fuel in the near term is limited, however, due to the number of activities scheduled through 1998. These activities include reracking in Pools 1, 6, and 5. Fuel receipts from the Navy and the Advanced Test Reactor, and fuel transfers from CPP-603 will continue. The CPP-603 fuel transfers are required to meet a court order requirement. These activities utilize nearly all resources, such as cranes, manpower, and health physics personnel in the near term of 1995 through 1997. A limited number of shipments (one per month) are possible for the 1996 and 1997 schedules. In 1998, the schedule relaxes enough that up to 30 shipments

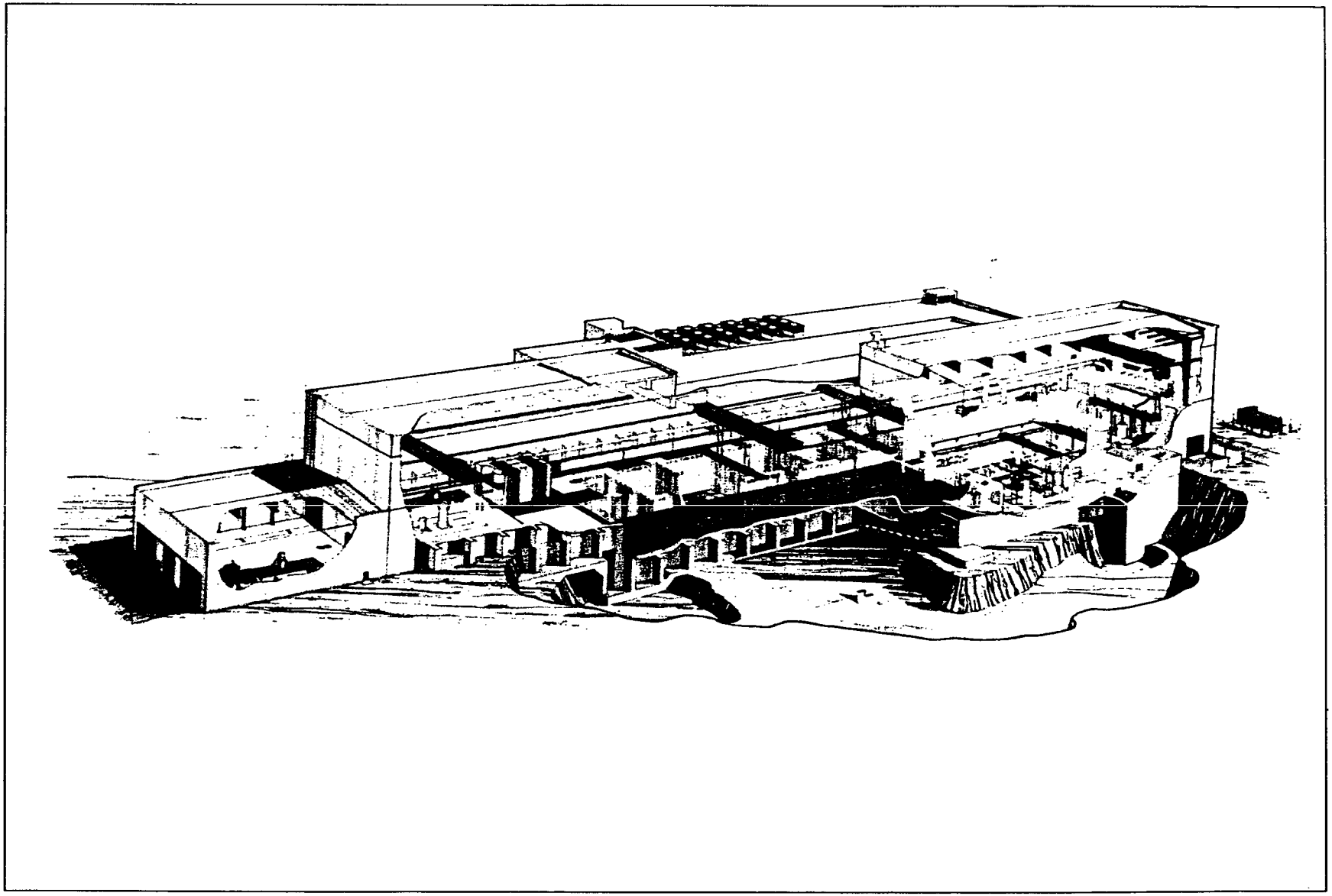


Figure F-44 Pictorial of the Idaho Chemical Processing Plant-666

could be received because most of the ICPP-603 fuel transfers to Fluorinel Dissolution and Fuel Storage (FAST) will have been completed. By the end of 1999, a total of 3,600 fuel elements could be received under this scenario. This schedule is predicated on the assumption that resolution of Idaho National Engineering Laboratory facility vulnerabilities and Naval and Advanced Test Reactor fuel receipts have a higher priority than foreign fuel receipts.

Idaho Chemical Processing Plant-666 Fluorinel Dissolution Process

The conversion of the ICPP-666 Flourinel Dissolution Process cell for canning of spent nuclear fuel without removal of any existing equipment or decontamination of the cell is proposed as a low-cost option to prepare foreign research reactor spent nuclear fuel for dry storage. Only minor modifications would be made to the cell, so as to preserve the current dissolution capability for possible future use. This option would utilize the Flourinel Dissolution Process cell, which currently has remote fuel handling, sampling, and waste load-out capabilities, as well as a connection to the ICPP-666 Fuel Storage Area, for fuel inspection, stabilization, and packaging for interim dry storage.

A potential disadvantage is noted. The equipment inside the Flourinel Dissolution Process cell is contaminated, and radiation fields are too high for manned entry. Retaining the dissolution cell equipment will make it impossible to adequately clean the cell to allow personnel entry. For this reason, equipment requiring installation within the Flourinel Dissolution Process cell must be assembled outside the cell and installed remotely with the in-cell crane and master-slave manipulators. Preventative and corrective maintenance of the equipment inside the cell would be done remotely. The modular design of the components would facilitate removal and replacement.

No general Flourinel Dissolution Process utility upgrades, such as electrical power or ventilation, would be required. Piping services could be added to support the vacuum drying and inert gas backfilling functions envisioned to meet dry storage requirements. All of the Reduced Enrichment for Research and Test Reactors (RERTR) program spent nuclear fuel could be accommodated by the existing transfer tunnel and transfer cart. Modifications of the existing fuel shear tools, or new ones, could be acquired to shear larger objects such as cans and lids.

Fuel Processing Restoration

Another structure that may represent an option for fuel storage is the Fuel Processing Restoration building (Figure F-45) that was constructed to house the Fuel Processing Restoration process. It is approximately 56.4 m (185 ft) long and contains shielded, below-grade process cells. These cells vary in dimension, with the nine main process cells measuring 5 to 6 m (16.5 to 20 ft) wide, 10.4 m (34 ft) long, and 12.2 m (40 ft) deep. Fuel racks could be designed to accommodate cans of the type proposed for dry storage in arrays that could contain as many as 17 cans along the 10.4 m (34 ft) axis by 8 cans along the 4.9 m (16 ft) axis, and be 3 cans deep. Airflow through each of these cells could be controlled by dampers in the cell ductwork. Construction of this facility was interrupted prior to completion, and it currently does not include cell ventilation, fire safety equipment, instrumentation, or lighting. These additions would cost approximately $15 million. Several other processes are being considered for use of this facility, and there is no assurance that it would be used for fuel storage. When completed, the building will be seismically qualified, and could physically accommodate approximately 540 canisters per main process cell. Special remote handling tools and techniques would be developed to allow the fuel cans to be inserted into the storage cell. The total estimate to make all necessary conversions is $65 million.

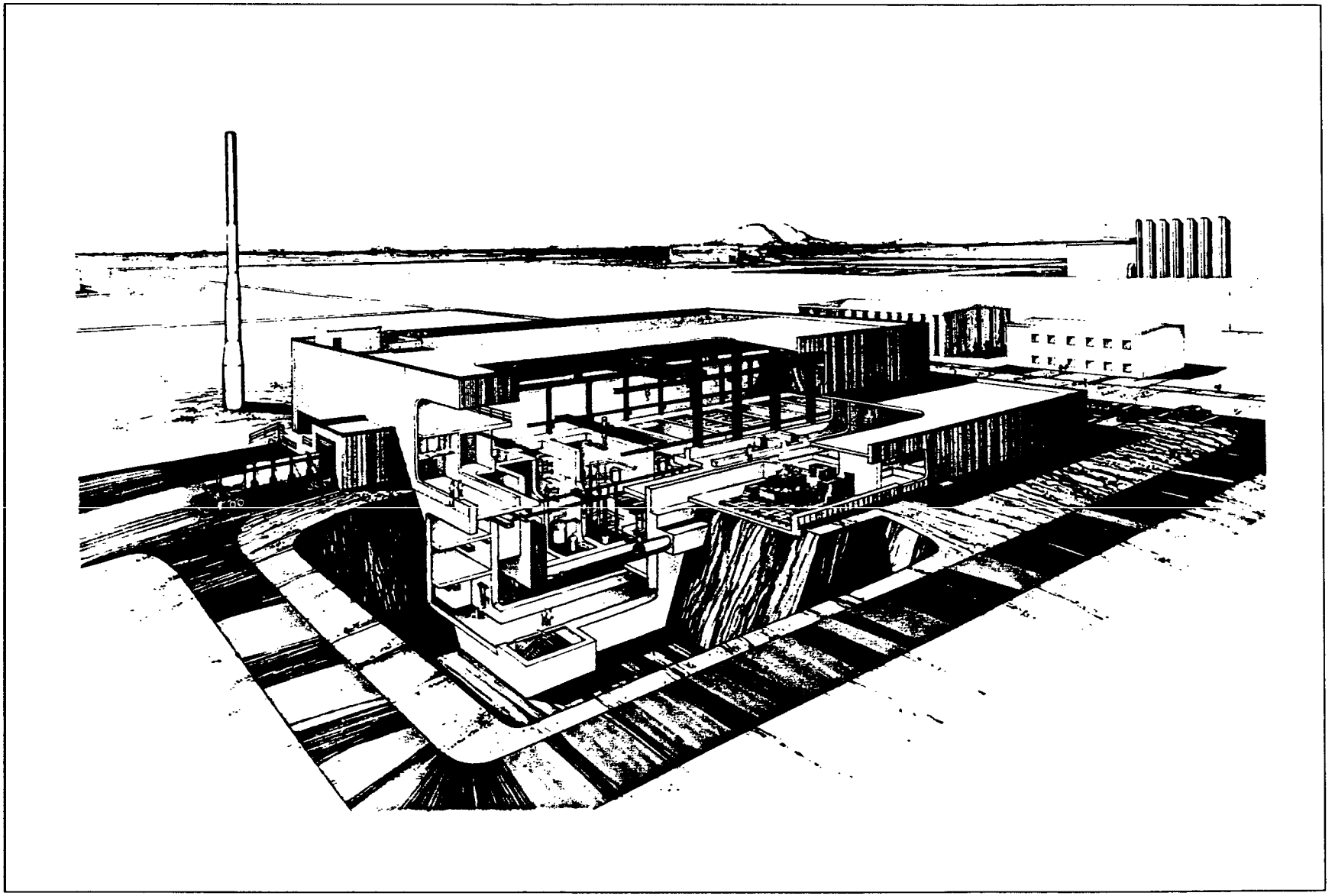


Figure F-45 Fuel Processing Restoration Facility (Unfinished)

Hot Fuel Examination Facility

The Hot Fuel Examination Facility is a facility used for examining and storing irradiated fuels from the EBR-II breeder reactor at Idaho National Engineering Laboratory. Figure F-46 presents the layout of the main cell of the Hot Fuel Examination Facility. Although it was not designed for storage, the Hot Fuel Examination Facility could be used to receive, inspect, examine, and transfer foreign research reactor spent nuclear fuel to dry cask storage if it is fitted with an appropriate spent nuclear fuel examination station. The cost of these modifications and the purchase and installation of the dry casks and their equipment would be the principal costs involved.

Test Area North-607 Pool, Hot Cell, and Cask Storage Pad

The utilization of the Test Area North-607 facilities is a potential option for receipt and storage of the foreign research reactor spent nuclear fuel. This could be accomplished without significant modification to the hot cell. The hot cell has significant lag capacity for interim storage of foreign research reactor spent nuclear fuel and has most of the equipment necessary for placement of the fuel into dry interim storage casks. There is adequate space for installation of the characterization and conditioning equipment needed for dry storage. There are significant vulnerabilities associated with the underwater storage pool which would need to be corrected if underwater interim storage were desired. The cask storage pad could be easily expanded to accept additional dry storage casks. At the current time, the entire Test Area North area is being planned for shutdown in approximately ten years due to reduced mission needs. If Test Area North had adequate new missions and it was determined to be economical, the Test Area North hot cell and cask storage area would have significant capacity for receipt and temporary storage of foreign research reactor spent nuclear fuel.

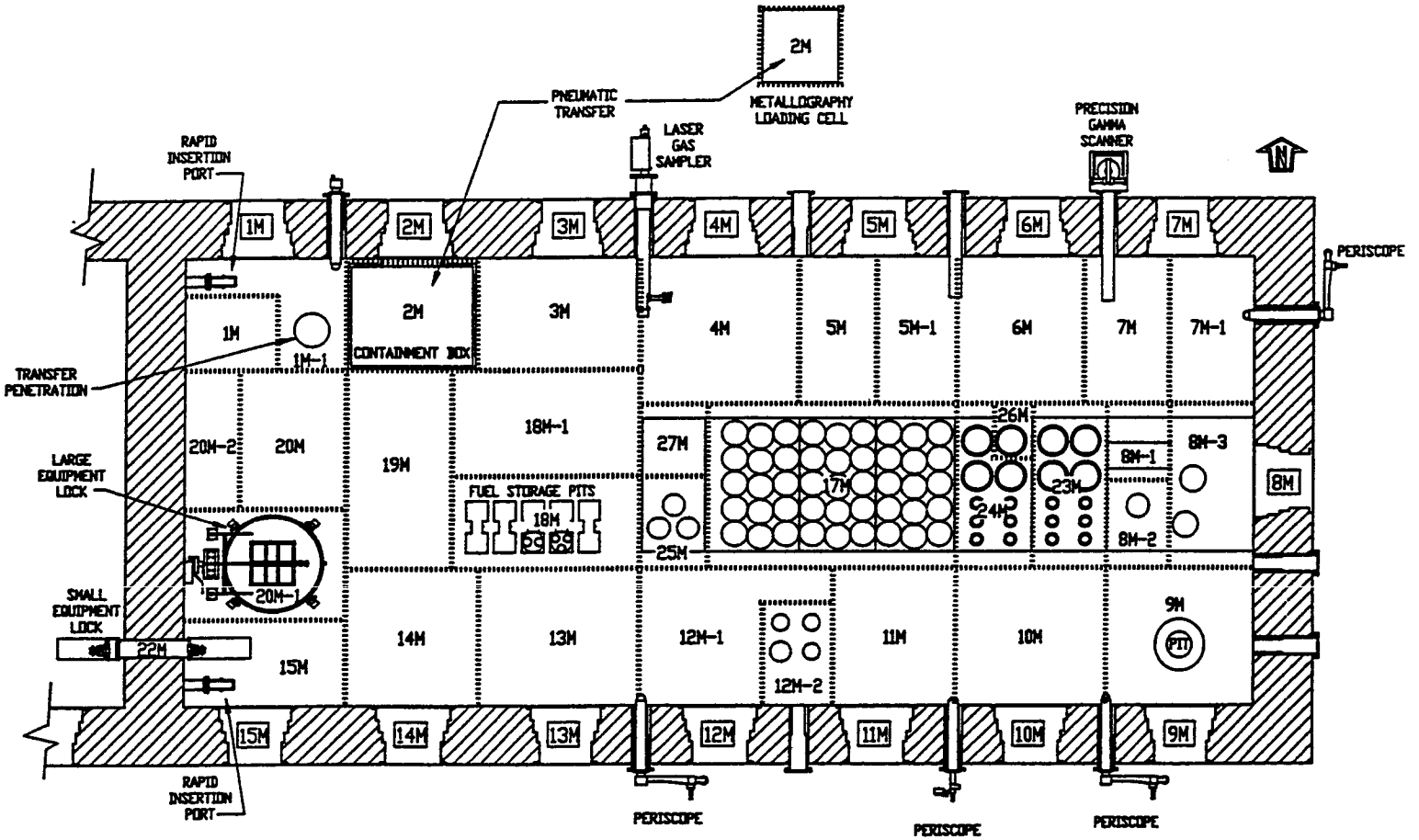
F.3.3.3 Hanford Site

In addition to the generic dry and wet storage facilities, two existing facilities at Hanford Site have been identified as potential candidates for the storage of foreign research reactor spent nuclear fuel: the FMEF and the Washington Nuclear Plant-4 Spray Pond. They will be discussed in greater detail in the following sections.

F.3.3.3.1 Fuel Maintenance and Examination Facility (FMEF)

The FMEF, built during the late 1970s and early 1980s (but never completed), consists of a 82.3 m (270 ft) long, 53.3 m (175 ft) wide, 29.9 m (98 ft) high Process Building with attached mechanical equipment and entry wings. The FMEF was intended to receive and extensively examine irradiated breeder reactor test fuels. The seismically-qualified FMEF Process Building, which extends 10.7 m (35 ft) below the surface, consists of 6 operating floors or levels and encloses a total of 17,466 m^2 (188,000 ft^2) of operations space. The FMEF has a 68 metric ton (75 ton) overhead crane, 18 metric ton (20 ton) hoist, and 9 metric ton (10 ton) hoist. Three areas within the FMEF, the Shipping and Receiving area, Decon Cell, and the Entry Tunnel would be used for the storage of foreign research reactor spent nuclear fuel. Figure F-47 presents a ground floor plan, and Figure F-48 shows vertical storage of spent nuclear fuel canisters.

The Shipping and Receiving Area, also known as Room 300, is the access area to the FMEF for truck or rail shipments of spent nuclear fuel. This area provides a 24.4 m (80 ft) long working area, washdown and decontamination of casks and shipping vehicles, and crane interface access to other areas within the FMEF. The 68 metric ton (75 ton) crane and hoists can transport casks to the Entry Tunnel from this area. The principal modification needed for this area would be the construction of a 0.8 km (0.5 mi) rail extension to the existing Hanford Site rail system.



RESPONSIBLE CHIEF TECHNICIAN	DESIGNATED AREAS
1. METALLOGRAPHIC OPERATIONS GROUP —	1M, 1M-1
2. METALLOGRAPHIC OPERATIONS GROUP —	2M, 25M, 27M
3. IN-CELL EXAMINATION GROUP —	3M, 4M, 5M, 5M-1, 6M, 7M, 7M-1, 17M, 18M-1, 26M
4. SAFETY EXPERIMENT GROUP —	8M-1, 8M-2, 8M-3, 9M, 10M, 23M, 24M
5. S/A DISMANTLING, RECONSTITUTION AND HANDLING GROUP —	11M, 12M-1, 12M-2, 13M, 14M, 18M, 20M, 20M-2
6. FACILITIES AND SYSTEM GROUP —	15M, 19M, 20M-1, 22M

Figure F-46 Hot Fuel Examination Facility Main Cell Layout

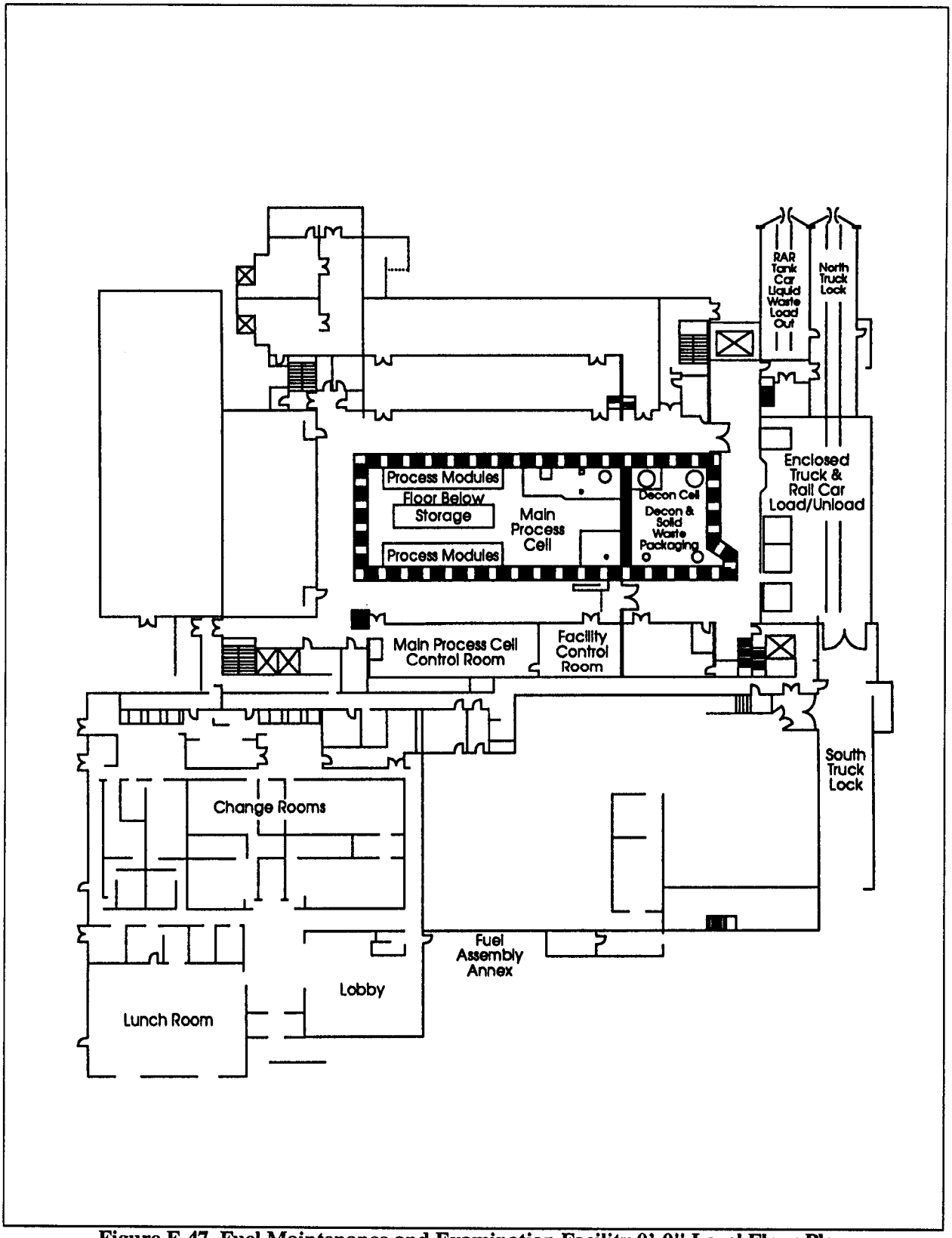


Figure F-47 Fuel Maintenance and Examination Facility 0'-0" Level Floor Plan

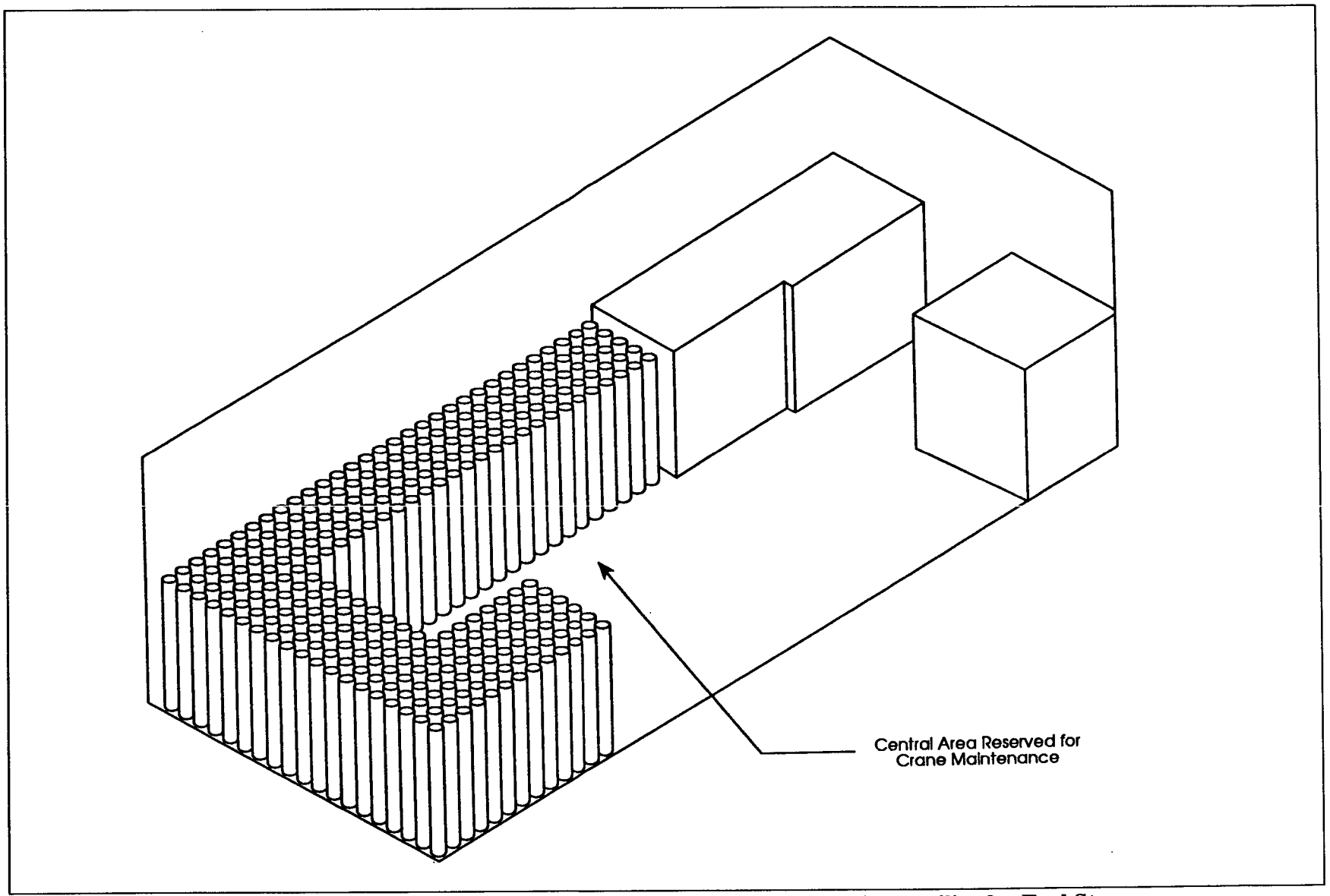


Figure F-48 Potential Use of the Fuel Maintenance and Examination Facility for Fuel Storage Partial Plan View

The Entry Tunnel is a 9.9 m (32.5 ft) high tunnel below the Shipping and Receiving area floor designed to transfer transportation casks to the Decon and Main Process Cell areas of the FMEF. It includes a 68 metric ton (75 ton) overhead bridge crane. To transport heavier multi-purpose casks when the foreign research reactor spent nuclear fuel would be shipped out of the FMEF in the future, the tunnel would be extended and modified to accommodate an above-grade 114 metric ton (125 ton) crane. The entry tunnel would be extended to connect to the new adjacent storage facility.

The Decon Cell is a room 12.2 m (40 ft) long, 9.1 m (30 ft) wide, and 11.6 m (38 ft) high, with thick concrete shielding. Nine work stations with remote manipulators and viewing windows are part of the design of this cell, although it should be noted that the viewing windows and equipment have not been installed. Access is available through two 2.1 m (84 in) diameter hatches, a 0.8 m (30 in) diameter port, and a 0.3 m (12 in) diameter opening. The Decon Cell includes material handling capability by cranes, manipulators, and hoists ranging from 1.4 to 6.8 metric tons (1.5 tons to 7.5 tons). The Decon Cell would be used to inspect foreign research reactor spent nuclear fuel that has been unloaded from transportation casks and to subsequently load this spent nuclear fuel into storage baskets. Each basket holds three foreign research reactor spent nuclear fuel elements. After basket loading, four baskets would be stacked into a 4.6 m (15 ft) high stainless steel canister. The canisters would be moved to the adjacent storage facility using a Transfer Tunnel, which is equipped with a cart.

The Main Process Cell represents a potential storage location for foreign research reactor spent nuclear fuel at the FMEF (Figure F-47). This room is 30.5 m (100 ft) long, 12.2 m (40 ft) wide, and 11.6 m (38 ft) high with concrete walls either 1.2 or 1.5 m (4 or 5 ft) thick, depending on the concrete's density. The Main Process Cell design includes two 4.5 metric ton (5 ton) bridge cranes and two 1.4 metric ton (1.5 ton) electro-mechanical manipulators.

A zoned heating, ventilation, and air conditioning system with negative differential pressure, redundant cooling systems, and staged multiple High Efficiency Particulate Air filters provides decay heat removal and protection from environmental releases of radioisotopes. This system provides for flow, by negative air pressure differential, from the least contaminated zones to the most contaminated zones, thereby maintaining individual zone relative contamination potential. Supply air is drawn from tornado-hardened and seismically qualified intake shafts and dampers. All heating, ventilation, and air conditioning equipment required to supply high contamination zones is designed as Seismic Category 1. After multiple High Efficiency Particulate Air filtration and monitoring for radioactivity, heating, ventilation, and air conditioning exhaust air is released from a seismically qualified reinforced concrete 35.7 m (117 ft) tall stack.

The FMEF is provided normal power by two separate 115 kV electric power supply lines from the Bonneville Power Administration. Emergency power is provided by two 100 percent redundant 900-kilowatt gas turbines which, along with their seismically qualified support and fuel oil systems, are capable of 24 hours of continuous operation. An Uninterruptible Power Supply, consisting of two 150-kVA lead calcium batteries, can provide full load for 30 minutes. Emergency generators require 2 minutes to start up and produce rated power.

A number of modifications would be required for the FMEF to be used as a storage facility for foreign research reactor spent nuclear fuel. They can be categorized as: addition of a 114 metric ton (125 ton) crane, railroad tunnel extension, and storage rack canisters. Even with these modifications, the FMEF does not have sufficient space to store 23,000 foreign research reactor spent nuclear fuel elements, but it could be used as an unloading and support facility for an adjacent dry vault storage facility. Costs for the necessary modifications to the FMEF have been estimated to be approximately $32 million. The adjacent dry storage facility is estimated to cost an additional $100 million. It should be noted that the FMEF is

being considered for other spent nuclear fuel storage which could eliminate it for use with foreign research reactor spent nuclear fuel.

F.3.3.3.2 Washington Nuclear Plant-4 Spray Pond Wet Storage

The Washington Nuclear Plant-4 Spray Pond is a nuclear safety-related structure that was originally designed for decay heat removal following a Loss of Coolant Accident at the Washington Nuclear Plant-4 commercial nuclear power plant. The Washington Nuclear Plant-4 was canceled, but the spray pond structure is essentially complete. This pond is 91.4 m (300 ft) long, 76.2 m (250 ft) wide, and 8.2 m (27 ft) deep, and was designed and built to 10 CFR 50 Appendix B quality assurance standards as a seismic and safety class structure. It should be noted that the size of this spray pond is much greater than that needed to store the foreign research reactor spent nuclear fuel. Figure F-49 presents a schematic of the Washington Nuclear Plant-4 Spray Ponds and the necessary modifications required to store foreign research reactor spent nuclear fuel.

In order for this pond to be used for wet storage of foreign research reactor spent nuclear fuel, several modifications would have to be made to duplicate the features of the Generic Pool Facility. These modifications include: an enclosure with a qualified building superstructure, inclusion of a shipping-receiving-handling facility in this structure; a deeper loading pool; a 114 metric ton (125 ton) loading crane; a 274 m (900 ft) long railroad line extension; installation of heating, ventilation, and air conditioning, and pond water cooling and water chemistry/cleaning systems; canister support racks into the pond; installation of a stainless steel liner in the pond; installation of partition walls to isolate the fuel storage and handling areas from the unused portion of the spray pond; and a leak detection system. The supporting pumphouse is a 12 m (40 ft) by 30 m (100 ft) concrete building designed to the same standards as the spray pond and would be used to house some of the fuel handling and storage support equipment. Total cost for these modifications was estimated to be approximately $113 million (Bergsman et al., 1994).

F.3.3.4 Oak Ridge Reservation

No existing facilities at the Oak Ridge Reservation are being used for the storage of foreign research reactor spent nuclear fuel. However, either the generic wet (pool) or dry storage facilities, as described in Sections F.3.1 and F.3.2, could be constructed and operated at Oak Ridge Reservation.

F.3.3.5 Nevada Test Site

No existing facilities at the Nevada Test Site are being used for storage of foreign research reactor spent nuclear fuel, although the Area 25 facilities (E-MAD/Reactor Maintenance and Disassembly) have been used in the past and might be suitable in 1 to 3 years. These Area-25 facilities appear capable of accommodating the required cask receipt rate and dry storing all of the foreign research reactor spent nuclear fuel under consideration in this EIS. However, in addition to Area 25, either the generic wet (pool) or dry storage facilities, as described in Sections F.3.1 and F.3.2, could be constructed and operated at Nevada Test Site in Area 5.

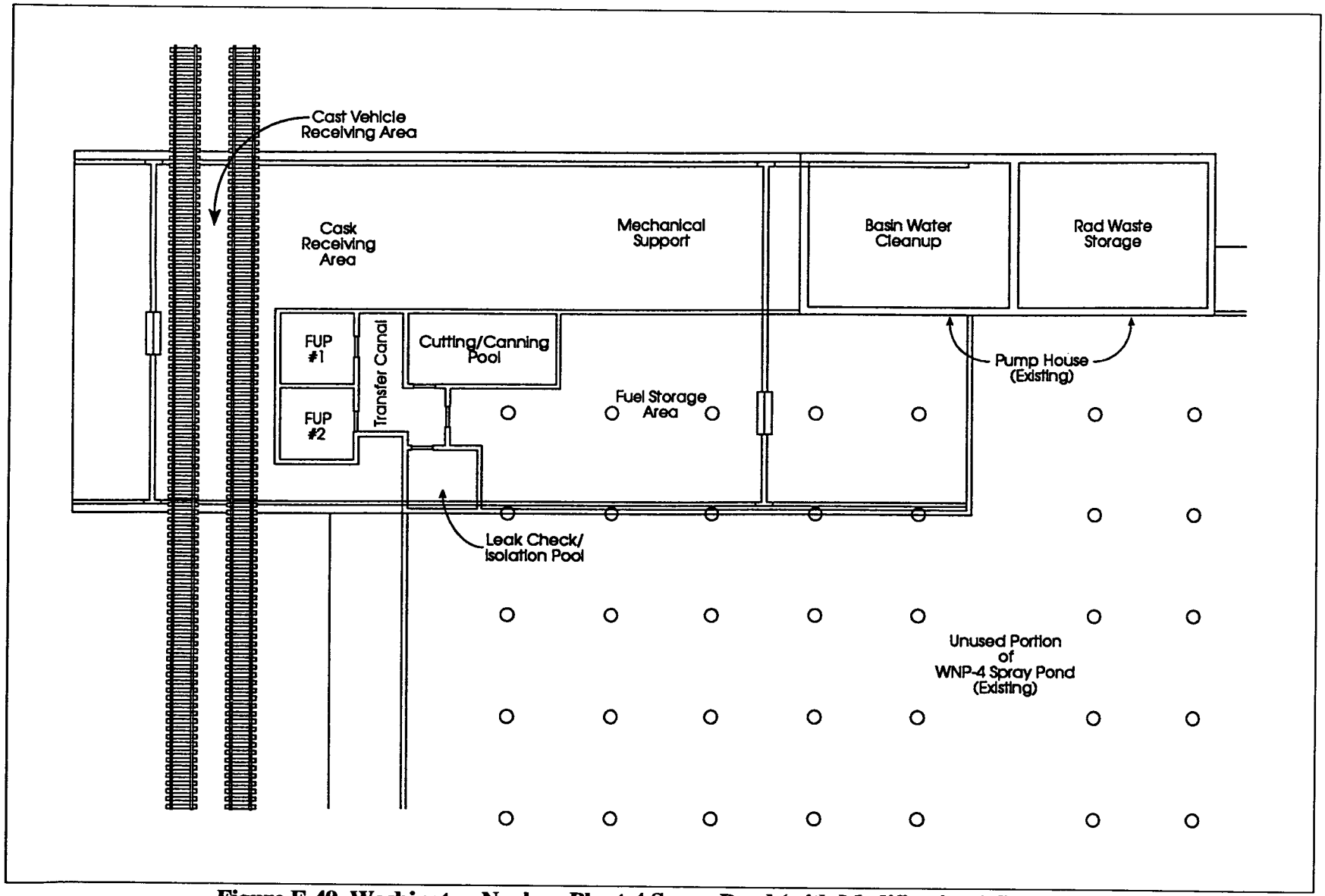


Figure F-49 Washington Nuclear Plant-4 Spray Pond (with Modifications) Schematic

F.4 Environmental Impacts at Foreign Research Reactor Spent Nuclear Fuel Management Sites

This section analyzes the environmental impacts associated with the storage of foreign research reactor spent nuclear fuel at the five potential management sites considered in the Programmatic SNF&INEL Final EIS (DOE, 1995g), namely: the Savannah River Site, the Idaho National Engineering Laboratory, the Hanford Site, the Oak Ridge Reservation, and the Nevada Test Site.

The Record of Decision for the Programmatic SNF&INEL Final EIS was issued on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel accepted by DOE would be managed at the Savannah River Site in South Carolina, and any other foreign research reactor spent nuclear fuel to be accepted by DOE would be managed at the Idaho National Engineering Laboratory. Nevertheless, all five of the spent nuclear fuel management sites originally considered in this EIS and the spent nuclear fuel distribution alternatives have been kept in the final to maintain maximum consistency with the analyses provided in the Programmatic SNF&INEL EIS (DOE, 1994h and 1995g).

The environmental impacts analyzed pertain to management of foreign research reactor spent nuclear fuel under the basic implementation, and implementation alternatives of Management Alternative 1, the storage of vitrified waste that may be accepted by the United States under Management Alternative 2, and the management of foreign research reactor spent nuclear fuel under Management Alternative 3, the Hybrid Alternative. Chemical separation, which is an implementation alternative to storage, is analyzed in Section 4.3 of this EIS.

Since foreign research reactor spent nuclear fuel is part of the DOE's overall management of spent nuclear fuel, the management options in this EIS must be consistent with the site management alternatives considered in the Programmatic SNF&INEL Final EIS. The alternatives considered in the Programmatic SNF&INEL Final EIS are: Decentralization and 1992/1993 Planning Basis (even distribution of foreign research reactor spent nuclear fuel between the Idaho National Engineering Laboratory and the Savannah River Site), Regionalization by Geography, Regionalization by Fuel Type, and Centralization (all foreign research reactor spent nuclear fuel eligible under the policy).

The foreign research reactor spent nuclear fuel management options also depend on the availability of the sites to implement the policy immediately. Of the five sites, only the Savannah River Site and the Idaho National Engineering Laboratory would be available in late 1995. The other three sites could become available at a later date when appropriate facilities would be completed (either constructed or refurbished). This constraint has necessitated a two-phased approach to foreign research reactor spent nuclear fuel management in the United States in which foreign research reactor spent nuclear fuel is received and managed first at an available management site and is shipped to another site later. For the purpose of this analysis, the implementation of the policy was divided into two functional periods — the period during which receipt and storage of foreign research reactor spent nuclear fuel would be accomplished by using existing facilities (Phase 1), and the period during which new or refurbished facilities could be used (Phase 2). The first phase would be characterized by operational activities only, while the second involves impacts from construction in addition to operational activities.

The environmental impacts from the basic implementation of each Management Alternative, as they relate to storage of the foreign research reactor spent nuclear fuel in the United States, are analyzed in Sections F.4.1 through F.4.5. Elements of this analysis are combined and summarized in Section 4 of this EIS to present the impacts of all Implementation Alternatives under the proposed action.

F.4.1 Savannah River Site

If the Savannah River Site is the site to manage all DOE-owned spent nuclear fuel, foreign research reactor spent nuclear fuel would be received and managed at the site until ultimate disposition. If the Savannah River Site is not the site to manage DOE-owned spent nuclear fuel, foreign research reactor spent nuclear fuel could be received and managed at the Savannah River Site until the selected site(s) would be ready to receive the foreign research reactor spent nuclear fuel. The construction of new facilities for managing foreign research reactor spent nuclear fuel is estimated to take about 10 years. Modifications to existing facilities for the same purpose could take less time. This period is referred to as Phase 1. The period following Phase 1 until ultimate disposition is referred to as Phase 2. The amount of spent nuclear fuel that could be received and managed at the Savannah River Site under Management Alternative 1, as discussed in Section 2.2.2, is dictated by the distribution considered in the Programmatic SNF&INEL Final EIS. Accordingly, the Savannah River Site could receive one-half of the foreign research reactor spent nuclear fuel under the Decentralization and the 1992/1993 Planning Basis alternatives, the aluminum-based foreign research reactor spent nuclear fuel under the Regionalization by Fuel Type alternative, the foreign research reactor spent nuclear fuel from eastern ports under the Regionalization by Geography Alternative, or all foreign research reactor spent nuclear fuel under the Centralization Alternative. As discussed in Section 2.6.4.1, the split of foreign research reactor spent nuclear fuel evenly between the Savannah River Site and the Idaho National Engineering Laboratory under the Decentralization and 1992/1993 Planning Basis alternatives in the Programmatic SNF&INEL Final EIS was not considered to have a practical basis, and was therefore not evaluated in detail.

As a potential Phase 1 site under Management Alternative 1, the Savannah River Site would receive and manage foreign research reactor spent nuclear fuel at existing wet storage facilities: RBOF and the L-Reactor disassembly basin. Descriptions of RBOF and the L-Reactor disassembly basin are provided in Section F.3. RBOF is located at the H-Area. It is a facility with provisions for the receipt and storage of irradiated nuclear fuel elements. Since 1963, irradiated spent nuclear fuel elements have been received from offsite reactors and from the Savannah River Site reactors. RBOF provides the capability for underwater unloading of the transportation casks and the handling and storage of the foreign research reactor spent nuclear fuel. The foreign research reactor spent nuclear fuel would be stored in RBOF until its storage capacity is exhausted. Currently, RBOF has space for approximately 1,170 foreign research reactor spent nuclear fuel elements. This capacity could be increased to a total of 2,425 elements by rearrangement and consolidation of existing inventory (O'Rear, 1995).

The L-Reactor disassembly basin is not currently configured for storage of aluminum-based foreign research reactor spent nuclear fuel; however, minor modifications which would provide new storage racks, new handling equipment, safety documentation, etc., along with upgrades in progress to address vulnerabilities associated with water chemistry control, would permit receipt and management of foreign research reactor spent nuclear fuel. Installation of racks equivalent to those in RBOF would provide storage for approximately 20,000 foreign research reactor spent nuclear fuel elements. The modifications to RBOF and L-Reactor disassembly basin are part of the ongoing programs at the site to be performed independent of the proposed action in this EIS.

Between the RBOF and the L-Reactor disassembly basin, there would be sufficient storage capacity and handling capability to accommodate the receipt and management of foreign research reactor spent nuclear fuel during the estimated 10-year period for Phase 1.

An additional option to enhance storage capacity during Phase 1 would be to use RBOF and/or L-Reactor disassembly basin to unload the transportation casks and provide storage capacity in dry storage casks

which would be placed near the existing facility. Descriptions of the dry storage casks are provided in Section F.3.

As a Phase 2 site under the basic implementation of Management Alternative 1, the Savannah River Site would continue to receive foreign research reactor spent nuclear fuel beyond Phase 1 in a new dry storage facility that would be constructed at the H-Area. The H-Area is the preferred site among several considered for the construction of new foreign research spent nuclear fuel storage facilities, and is the location assumed for the environmental impacts calculations. An alternative site, equally qualified for construction of new storage facilities is located on a ridge between the P-Reactor and the Pen Branch watershed as indicated in Section 2, Figure 2-14 of this EIS (Shedrow, 1994a). Foreign research reactor spent nuclear fuel stored during Phase 1 would be transferred to the new facility and would be stored there for an additional 30 years until ultimate disposition. The dry storage would encompass a number of designs, examples of which were provided in Section 2.6.5.1.1 and in Section F.3.

The analysis of environmental impacts from the management of foreign research reactor spent nuclear fuel at the Savannah River Site is based on the above considerations. The analysis options selected do not represent all possible combinations, but a reasonable set which provides a typical, and in many cases, bounding estimate of the resulting impacts.

The specific analysis options are as follows:

1A. The Savannah River Site would receive foreign research reactor spent nuclear fuel during Phase 1 and store it at the RBOF and/or the L-Reactor disassembly basin. For the purpose of this analysis, the amount of fuel to be stored is all foreign research reactor spent nuclear fuel that would be received during Phase 1 (approximately 17,500 elements). The spent nuclear fuel would be shipped offsite at the end of Phase 1.

1B. Foreign research reactor spent nuclear fuel stored under analysis option 1A would be transferred to a newly constructed dry storage facility, where it would be stored until ultimate disposition. Foreign research reactor spent nuclear fuel arriving in the United States after Phase 1 concludes would be received and stored at the new dry storage facility. For the purpose of this analysis, the amount of spent nuclear fuel that would be stored would be all the foreign research reactor spent nuclear fuel eligible under the policy (22,700 elements).

The implementation alternatives of Management Alternative 1 for managing foreign research reactor spent nuclear fuel in the United States, as discussed in Section 2.2.2, introduce additional analysis options that would be considered for the Savannah River Site as follows:

- Under Implementation Subalternative 1a (Section 2.2.2.1), the amount of spent nuclear fuel to be received in the United States would be reduced to 5,000 elements. In this case, the Savannah River Site would be likely to receive and manage foreign research reactor spent nuclear fuel in existing facilities during the Phase 1 period. The impacts would be bounded by analysis option 1A (above). Impacts of construction and operation of the dry storage facility considered in analysis option 1B would bound those of the facility required to accommodate this amount of fuel. The spent nuclear fuel would either be shipped offsite after Phase 1, or it would be managed along with the rest of the spent nuclear fuel at the Savannah River Site.

- Under Implementation Subalternative 1b (Section 2.2.2.1), the Savannah River Site would receive only HEU from the foreign research reactors eligible under the policy. The amount of HEU would be approximately 4.6 MTHM, representing 11,200 elements. The impacts

from the management of this amount of spent nuclear fuel at the Savannah River Site would be bounded by analysis options 1A and 1B above.

- Under Implementation Subalternative 1c (Section 2.2.2.1), the Savannah River Site would receive target material in addition to the foreign research reactor spent nuclear fuel considered under the basic implementation of Management Alternative 1. The receipt and management of this material, which in uranium content represents approximately 620 typical foreign research reactor spent nuclear fuel elements, would increase the impacts of analysis options 1A or 1B (above) by a small percentage.

- Under Implementation Subalternative 2a (Section 2.2.2.2), the duration of the policy would be decreased to 5 years, and therefore the amount of spent nuclear fuel available for acceptance would also be decreased. The impacts from the management of the decreased amount of spent nuclear fuel at the Savannah River Site would be bounded by analysis options 1A or 1B above.

- Under Implementation Subalternative 2b, (Section 2.2.2.2), the acceptance of a small portion of the spent nuclear fuel would be extended over an indefinite period of time, but the amount of spent nuclear fuel to be received and stored would remain constant. The impacts would be the same as in analysis options 1A or 1B.

- Under Implementation Alternative 3 (Section 2.2.2.3), DOE and the Department of State would consider alternative financial arrangements. These arrangements would affect the amount of spent nuclear fuel that would be accepted by the United States because the foreign research reactors would consider their own alternatives as to whether or not to send the spent nuclear fuel to the United States. The amount of foreign research reactor spent nuclear fuel, in this case, cannot be quantified. The upper limit, however, as considered under analysis options 1A and 1B (above), would be bounding.

- Under Implementation Alternative 4 (Section 2.2.2.4), DOE and the Department of State would consider alternatives for the location where title of foreign research reactor spent nuclear fuel would be taken. The choices do not affect the impacts at the Savannah River Site.

- Under Implementation Alternative 5 (Section 2.2.2.5), DOE would consider wet storage technology for new construction. DOE would implement the policy by constructing a new wet storage facility at the H-Area or by using the BNFP, owned by Allied General Nuclear Services. DOE would have to acquire the facility which could be ready for use in approximately 5 years. Therefore, if the Savannah River Site is selected under either the Regionalization or Centralization Alternatives of the Programmatic SNF&INEL Final EIS, Phase 2 at the Savannah River Site could start as early as 5 years from the start of implementation period by using BNFP. The new wet storage facility is described in Section 2.6.5.1.2. BNFP is described in Section F.1. For this implementation alternative, an analysis option 1C is considered, which is similar to 1B, as follows:

1C. The spent nuclear fuel managed under analysis option 1A would be transferred to a newly constructed wet storage facility or the BNFP where it would be managed until ultimate disposition. Spent nuclear fuel arriving in the United States after Phase 1 would be received and managed at these facilities. For the purpose of this analysis, the amount of spent nuclear

fuel that would be managed in these facilities would be all the foreign research reactor spent nuclear fuel eligible under the policy (approximately 22,700 elements).

- Under Implementation Alternative 6 (Section 2.2.2.6), DOE and the Department of State would consider chemical separation of foreign research reactor spent nuclear fuel in the United States. As noted in Section 2.3.6, the Savannah River Site is currently limited to chemical separation of aluminum-based foreign research reactor spent nuclear fuel.

Under Management Alternative 2, as discussed in Section 2.3, DOE and the Department of State would assess the management of foreign research reactor spent nuclear fuel in a foreign location which would include an evaluation of foreign reprocessing with acceptance by the United States of the vitrified high-level waste resulting from reprocessing. The waste would be received and managed at the Defense Waste Process Facility at the Savannah River Site. DOE estimates that the total volume of the vitrified high-level waste would be about 2.4 m^3 (8.5 ft^3) and it would fill about 16 European-size canisters. A European-size canister is about four times smaller than the canister used in the Defense Waste Process Facility at the Savannah River Site.

Under Management Alternative 3 (Hybrid Alternative), as discussed in Section 2.4, the Savannah River Site would receive the aluminum-based fuel which would not be reprocessed overseas. This spent nuclear fuel would be processed at the Savannah River Site chemical separation facilities in the same manner as in Implementation Alternative 6 above. The amount of foreign research reactor aluminum-based spent nuclear fuel to be chemically separated would be approximately 12,200 elements, 12.9 MTHM, 79 m^3 (2,600 ft^3).

F.4.1.1 Existing Facilities (Phase 1)

Analysis option 1A utilizes existing facilities that would be ready to receive and store foreign research reactor spent nuclear fuel by late 1995. The environmental impacts from this analysis option include only those related to operations, specifically: socioeconomics; occupational and public health and safety; materials, utilities, and energy; air quality; and waste management. For this analysis, it was assumed that the amount of foreign research reactor spent nuclear fuel to be received at the management site is the maximum, and the receipt rate is uniform at approximately 1,800 elements per year.

F.4.1.1.1 Socioeconomics

Potential socioeconomic impacts associated with analysis option 1A would be attributable to the staffing requirements for existing facilities. Currently, these facilities are being used to store spent nuclear fuel, so any incremental staffing requirements related to foreign research reactor spent nuclear fuel storage would be small. All personnel required for the operation and support of the existing facilities could be acquired from the current work force at the Savannah River Site. Use of the current work force would not result in any net socioeconomic impact relative to baseline employment data. In fact, using the current work force may partially compensate for the decline in employment expected from changes in site mission from 20,000 persons in 1995 to approximately 15,800 persons in 2004 (DOE, 1995g).

F.4.1.1.2 Occupational and Public Health and Safety

Radiological exposures could affect occupational and public health and safety. Possible sources of radiological exposure from the receipt and storage of foreign research reactor spent nuclear fuel include: (1) airborne emissions from incident-free operations; (2) incident-free handling activities; and (3) airborne emissions from accident conditions. Radiological exposures are presented in individual subsections for

emissions-related impacts and handling-related impacts. Accident-related impacts are presented in Section F.4.1.3.

Emissions-Related Impacts: Doses that could be received by the public during incident-free operation associated with the receipt and management of the foreign research reactor spent nuclear fuel at the Savannah River Site would be attributed to airborne emissions of radioactive material that could be carried by wind offsite. The general public would be too far from the locations where handling activities or storage would take place to receive any dose from direct exposure. Doses were calculated for the maximally exposed individual (MEI), defined as an individual at the site boundary receiving the maximum exposure, and for the general population within an 80 km (50 mi) radius of the facility. These doses would result from incident-free airborne radiological emissions assumed to be released from the unloading of the transportation cask and the existing storage facility (RBOF and/or L-Reactor disassembly basin) during storage. The methodology and assumptions used for the calculation of the radiological emissions and resulting doses are discussed in Section F.6 of this appendix. Table F-21 summarizes the annual emission-related doses to the public and the associated risks for the MEI and the population at the Savannah River Site during Phase 1 operations.

Table F-21 Annual Public Impacts for Foreign Research Reactor Spent Nuclear Fuel Receipt and Storage in Existing Facilities at the Savannah River Site (Phase 1)

	MEI Dose (mrem/yr)	*MEI Risk (LCF/yr)*	*Population Dose (person-rem/yr)*	*Population Risk (LCF/yr)*
Receipt/Unloading at:				
• RBOF (wet)	0.00011	5.5×10^{-11}	0.0057	0.0000028
• L-Reactor Basin (wet)	0.000073	3.7×10^{-11}	0.0046	0.0000023
Storage at:				
• RBOF (wet)	1.2×10^{-9}	6.0×10^{-16}	6.2×10^{-8}	3.1×10^{-11}
• L-Reactor Basin (wet)[a]	0.00036	1.8×10^{-10}	0.022	0.000011

[a] *L-Reactor basin doses are due to existing conditions. The foreign research reactor spent nuclear fuel contribution would be six orders of magnitude lower.*

Handling-Related Impacts: Management site workers would receive radiation doses during handling operations, such as receiving and unloading the transportation casks, transferring the spent nuclear fuel from one facility to another, or preparing the spent nuclear fuel for shipment offsite. Analysis option 1A involves the receipt of 644 shipments of spent nuclear fuel into the existing wet storage facility (RBOF and/or L-Reactor disassembly basin) during Phase 1, and the preparation of 161 transportation casks for offsite shipment at the end of Phase 1. It was assumed that at the end of a 10-year period (i.e., Phase 1), the spent nuclear fuel would have decayed sufficiently to be accommodated in larger capacity transportation casks, such as those currently used in the United States for commercial spent nuclear fuel. For the purpose of this analysis, the transportation casks used for intrasite shipping are assumed to have a capacity four times as large as the capacity of the transportation casks used for the marine transport of the foreign research reactor spent nuclear fuel to the United States. The assumptions and methodology used to calculate the doses to a working crew associated with the handling activities of the spent nuclear fuel are described in Section F.5 of this appendix.

The collective doses that would be received by the members of the working crew and the associated risk were calculated for Phase 1 operations. The worker MEI doses and risks were not calculated because of the large uncertainties associated with the assumptions for such calculation. However, the upper bound for such a dose would be equal to administrative or regulatory limits at the management site. For DOE radiation workers, the regulatory limit is 5,000 mrem per year. All these workers would be monitored and

if any worker's dose approached this limit, he or she would be rotated into a different job. This regulatory limit provides a very conservative upper bound on the radiation dose for the worker MEI. If one worker received the full 5,000 mrem per year for the full 13 years of potential spent nuclear fuel receipt, then the MEI dose would be 65,000 mrem. The associated risk of incurring a latent cancer fatality (LCF) would be 2.6 percent. The collective dose to the workers would be 250 person-rem with an associated LCF risk of 0.10.

F.4.1.1.3 Material, Utility, and Energy Requirements

The estimated annual consumption of materials, utilities, and energy from the use of existing storage facilities is shown in Table F-22.

Table F-22 Annual Utility and Energy Requirements for Foreign Research Reactor Spent Nuclear Fuel Storage at Existing Facilities at the Savannah River Site (Phase 1)

Commodity	Baseline Site Usage	RBOF	L-Reactor Basin	Percent Increase
Electricity (MW-hr/yr)	659,000	1,430	784	0 percent
Fuel (l/yr)	28,400,000	6,570	15,000	0.05 percent
Water (l/yr)	88,200,000,000	35,100,000	2,900,000	0.04 percent

The material, utility, and energy requirements for analysis option 1A would represent a small percentage of current requirements. No new generation or treatment facilities would be necessary. Increases in fuel consumption at the Savannah River Site would be minimal because overall onsite activity would not increase due to changes in the Savannah River Site mission and the general reduction in employment levels. The Programmatic SNF&INEL Final EIS concluded that the existing capacities and distribution systems for electricity, steam, water, and domestic wastewater treatment are adequate to support any of the five alternatives considered for spent nuclear fuel management at the Savannah River Site. This conclusion would also be valid for analysis option 1A because it is bounded by the alternatives considered in the Programmatic SNF&INEL Final EIS (DOE, 1995g).

F.4.1.1.4 Waste Management

The estimated annual waste generation for foreign research reactor spent nuclear fuel at the RBOF and L-Reactor disassembly basin is shown in Table F-23. These quantities represent a very small percent increase above current levels at the Savannah River Site. Existing waste management storage and disposal activities at the Savannah River Site could accommodate the waste generated by foreign research reactor spent nuclear fuel storage at the RBOF and L-Reactor disassembly basin. Therefore, the impact of this waste on existing Savannah River Site waste management activities would be minimal.

Table F-23 Annual Waste Generation for Foreign Research Reactor Spent Nuclear Fuel Storage at Existing Facilities at the Savannah River Site (Phase 1)

Waste Form	Baseline Site Generation	RBOF	L-Reactor Basin	Percent Increase
High-Level Waste (m^3/yr)	127,400[a]	0	0	0 percent
Transuranic Waste (m^3/yr)	760	0	0	0 percent
Solid Low-Level Waste (m^3/yr)	19,750	161	510	2.6 percent
Wastewater (l/yr)	690,000,000	2,650,000	35,000,000	5.1 percent

[a] *Total inventory (m^3) at the Savannah River Site.*

F.4.1.1.5 Air Quality

Nonradiological Emissions: Impact assessments for nonradiological air emissions associated with implementation of the respective spent nuclear fuel management alternatives (excluding construction-related activities) are based primarily on analyses performed for the Programmatic SNF&INEL Final EIS (DOE, 1995g). These analyses were based on the following assumptions and qualifications:

- Air emissions data for wet storage are based upon releases from the RBOF
- All air pollutant sources, except standby diesel generators, are assumed to operate continuously. The standby diesel generators are assumed to operate daily for 1 hour; whereas their actual operation consists of a single monthly test.

Table F-24 lists the annual potential maximum emissions of criteria and toxic air pollutants (in tons per year) attributable to existing facilities. These data indicate little or no difference in pollutant loading between the baseline and the regionalization alternative considered in the Programmatic SNF&INEL Final EIS. The greatest pollutant contribution for criteria air pollutants would be for nitrogen oxides (7.7 metric tons per year, or 8.5 tons per year) and carbon monoxide (1.8 metric tons per year, or 2.0 tons per year). Assuming that the foreign research reactor spent nuclear fuel comprises approximately nine percent of the total spent nuclear fuel managed under the Centralization Alternative of the Programmatic SNF&INEL Final EIS, the incremental and cumulative nonradiological air quality impacts attributable to the storage of foreign research reactor spent nuclear fuel in existing facilities (RBOF, L-Reactor disassembly basin) would be small.

Table F-24 Annual Maximum Emissions of Criteria Air Pollutants Attributable to Foreign Research Reactor Spent Nuclear Fuel Storage at Existing Facilities at the Savannah River Site (Phase 1)

Pollutant	Baseline Wet (tons/yr)[a,b,c]	RBOF (tons/yr)[a,b]	Percent Increase
Sulfur Oxides	0.4	0.005	1.3 percent
Nitrogen Oxides	6.0	0.77	12.8 percent
Total Suspended Particulates	0.4	0.006	1.5 percent
Carbon Monoxide	1.5	0.18	12 percent
Total Volatile Organic Compounds	0.6	0.077	12.8 percent
Gaseous Fluorides	none	none	none

[a] *Source: Hunter and Stewart, 1994*

[b] *To convert tons to metric tons, multiply by 0.907*

[c] *Decentralization based on management of the existing Savannah River Site inventory of spent nuclear fuel*

Radiological Emissions: The ventilation system serving the RBOF is designed to minimize airborne radioactivity levels both inside and outside of the facility. This ventilation system is based on a "once through" multiple-air-zone concept in which air flows from areas with low potential for contamination to areas with higher potential. The airflow is passed through High-Efficiency Particulate Air filters mounted on the building exhaust. A review of 1993 emissions data from the RBOF indicates emissions of approximately 2.7×10^{-7} Ci per year of ^{137}Cs (DOE, 1995g).

The RBOF and L-Reactor disassembly basin are currently being utilized to wet store spent nuclear fuel, and their emissions are reflected within baseline environmental conditions.

F.4.1.1.6 Water Resources

The use of RBOF and the L-Reactor disassembly basin for the interim storage of foreign research reactor spent nuclear fuel would not change the current levels of water usage at these facilities. Nor would it change thermal discharges from cooling water or the quantity or quality of radioactive and nonradioactive wastewater effluents.

Viable accidents during this interim storage period could be a release of pool water onto the ground surface or a breach of the liner of the wet storage basins in which the spent nuclear fuel would be stored. These type of accidents have been analyzed for both the RBOF and the L-Reactor disassembly basin in the safety analysis documentation (Dupont, 1983a and 1983b; WSRC, 1995b and 1995c) and the Programmatic SNF&INEL Final EIS (DOE, 1995g). As discussed in the Programmatic SNF&INEL Final EIS, radionuclides in the released water would enter the water table aquifer but would not reach any surface-water or any drinking water aquifer on or off the Savannah River Site. Basin water contains no toxic or hazardous chemicals, therefore, accidental releases from the basins would have minimal impacts on surface- and groundwater resources.

F.4.1.2 New Facilities (Phase 2)

Analysis options 1B and 1C involve the use of new facilities for the storage of foreign research reactor spent nuclear fuel at the Savannah River Site. The environmental impacts analyzed relate to the construction and operation of these new facilities. The impacts include: land use; socioeconomics; cultural resources; aesthetic and scenic resources; geology; air and water quality; ecology; noise; traffic and transportation; occupational and public health and safety; materials, utilities and energy; and waste management.

F.4.1.2.1 Dry Storage

Analysis option 1B is associated with the construction and operation of new dry storage facilities. The dry storage option encompasses both the dry vault design and the dry cask design as described in Section 2.6.5 of this EIS and earlier in this appendix. None of the environmental impact parameters discriminate between the two designs. For the purpose of this analysis, the impacts from the larger dry vault design are presented.

F.4.1.2.1.1 Land Use

A new dry storage facility would be located in one of two 60-plus ha (150-plus acres) undeveloped areas near the H- and P-areas, respectively. Predominant land use at both areas is managed timber land. Construction activities, including laydown areas, would disturb 3.7 ha (9 acres) of land. This represents about 6 percent of the available space at either area. A new dry storage facility would occupy 5,000 m^2 (54,000 ft^2) of land and would move 11,000 m^3 (14,400 yd^3) of soil. Neither construction nor operation of a new dry storage facility at either area would significantly impact land use patterns on the Savannah River Site.

F.4.1.2.1.2 Socioeconomics

As discussed in Section F.3.1.1 the total capital cost of a new dry storage facility is estimated to be $370 million. Construction activities are projected to take 4 years. Assuming that the capital cost is

evenly distributed over this 4-year period, the annual expenditures would be about $92.5 million. This represents about 7.7 percent of the estimated FY 1995 total expenditures for the Savannah River Site. The relative socioeconomic impact from annual construction expenditures on the region of influence would be small but positive. The annual operations costs from a new dry storage facility are estimated to be $15.6 million for receipt and handling and $.6 million for storage. These costs represent about 1.3 percent and 0.05 percent of FY 1995 total expenditures for the Savannah River Site. The relative socioeconomic impact from annual operation expenditures on the region of influence would be small.

Direct employment associated with construction of new dry storage facility is estimated to be 190 persons. The relative socioeconomic impact from construction employment on the region of influence would be small. In addition, when compared to the projected FY 1995 work force at the Savannah River Site of approximately 20,000 persons, the relative socioeconomic impact of this temporary increase in construction employment would be insignificant. Direct employment associated with receipt and storage operations is estimated to be 30 persons. Upon completion of these activities, direct employment is expected to decrease to eight persons. The relative socioeconomic impact of this increase in operations employment would be insignificant to both the region of influence and the Savannah River Site.

F.4.1.2.1.3 Cultural Resources

There are no known cultural or historic resources located within the two proposed construction locations for a new dry storage facility. Both locations are within an area of low archaeological site density. Activities within this zone would have a low probability of encountering archaeological sites and virtually no chance of impacting large sites with more than three prehistoric components. Neither location has been specifically surveyed for archaeological resources, but this would occur prior to initiation of any construction-related activities.

Three Native American groups have expressed concerns relating to the possible existence on the Savannah River Site of several plant species traditionally used in Tribal ceremonies. These plant species are known to occur on the Savannah River Site, typically in wet, sandy areas such as evergreen shrub bogs and savannas. However, these plants are not likely to be found in the two proposed construction locations because of a lack of suitable habitat.

F.4.1.2.1.4 Aesthetics and Scenic Resources

Construction and operation of a new dry storage facility would not adversely impact aesthetic or scenic resources. A new dry storage facility would not be visible from any onsite or offsite public access roads. Potential soil erosion and dust generation associated with construction-related activities would be controlled by the implementation of best-management practices. Any visibility impacts from fugitive dust generation by construction-related activities should be insignificant and short term. Facility operations associated with the new dry storage of foreign research reactor spent nuclear fuel should not generate any atmospheric emissions which would reduce area visibility.

F.4.1.2.1.5 Geology

There are no unique geologic features or minerals of economic value on the Savannah River Site that would be adversely impacted by site development. Construction of a new dry storage facility would result in localized impacts to surficial soils and would necessitate the clearing and grading of 3.7 ha (9 acres).

Site preparation, land shaping and grading activities associated with construction would present a slight to moderate erosion hazard, which would be controlled and minimized by implementing best-management practices. The operation of the new dry storage facility would have no effect on the geologic characteristics at the Savannah River Site.

F.4.1.2.1.6 Air Quality

Nonradiological Emissions: Potential air quality impacts associated with construction-related activities include the generation of fugitive dust (particulate matter), smoke from earth moving and clearing operations, and emissions from the construction equipment. Sources of fugitive dust include:

- transfer of soil to and from haul trucks and storage piles;
- turbulence created by construction vehicles moving over cleared, unpaved surfaces; and
- wind-induced erosion of exposed surfaces.

Cleared vegetation would be burned at the construction site rather than hauled to a landfill. The open burning of this material is not expected to adversely impact ambient air quality at the Savannah River Site. As shown in Table F-25, air quality impacts associated with construction-related activities would be minimal and compliance with Federal and State ambient air quality standards would not be adversely affected. Therefore, construction activities would not be expected to have any detrimental effect on the health and safety of the general population.

Table F-25 Estimated Maximum Concentrations of Criteria Pollutants at the Savannah River Site Attributable to New Dry Storage Construction

Pollutant	*Averaging Time*	*Ambient Standard*[a]	*Baseline Concentration*[b]	*Construction Activities*
Savannah River Site Boundary ($\mu g/m^3$):				
• Total Suspended Particulate (TSP)	Annual	75	11	0.002 - 0.003
• Particulate Matter (PM_{10}), Daily	24-hr	150	56	0.1
• Particulate Matter (PM_{10}), Daily	Annual	50	2.7	0.003

[a] *Source: (DOE, 1995g)*

[b] *Baseline values due to actual emissions from all the Savannah River Site sources during 1990 plus sources permitted through 1992*

No nonradiological air emissions would be expected during operation of a new dry storage facility. Any emissions associated with new dry storage would be directly attributable to front-end wet storage activities only.

Radiological Emissions: No radiological emissions would be produced during construction of a dry new storage facility.

Based on fuel drying and storage operations conducted at the Idaho National Engineering Laboratory, potential atmospheric releases from the spent nuclear fuel storage facility would consist of minor amounts of particulate radioactive material and larger amounts of gaseous fission products that could escape from the fuel through cladding defects. The majority of radioactive material responsible for fuel and cask internal surface contamination consists of activation products that plate out on the spent nuclear fuel assemblies during reactor operation. This material is dependent on corrosion of structural materials and

generally consists of radionuclides, such as ^{58}Co, ^{60}Co, ^{59}Fe, etc. This contamination activity would have to be controlled during the cask opening and fuel handling operations to prevent internal personnel exposures. Proper facility ventilation (designed to provide airflow from areas of low contamination to progressively high contamination) would help provide contamination control. High-Efficiency Particulate Air filters in the facility exhaust would reduce the airborne effluent quantities of this particulate material to quantities that are well within the prescribed limits.

Cask opening and fuel drying operations may also be responsible for the release of significant amounts of ^{3}H, ^{85}Kr, and minor amounts of ^{129}I. The amounts of these radionuclides released during the cask opening operation depend on the following parameters: (1) the number of spent nuclear fuel clad defects; (2) the spent nuclear fuel material and the diffusion rate of these radionuclides through the fuel matrix for the fuel temperature while in the cask; and (3) the time that the spent nuclear fuel is contained within the cask before opening.

Similarly, for fuel drying operations, the temperature of the drying gas (as well as the parameters discussed above) would cause quantities of ^{3}H, ^{85}Kr, and ^{129}I to be released from the fuel. Charcoal or silver zeolite filters could be used to remove the ^{129}I from the exhaust, but the ^{3}H and ^{85}Kr, being gases, or in a vapor state for the case of tritiated water, would be exhausted to the atmosphere. During spent nuclear fuel storage small amounts of the gaseous/volatile radionuclides are expected to be released to the environment based on the fuel matrix, clad defects, and storage temperature. Release rates would decrease with storage time due to radioactive decay. It is anticipated that the fuel drying operation would be responsible for the most significant release of these gaseous/volatile radionuclides to the environment.

Radiological emissions from the operation of a new dry storage facility were calculated based on the methodology and assumptions discussed in Section F.6. The radiological consequences of air emissions are discussed in Section F.4.1.2.1.11. The annual emission releases from the dry storage facility during receipt and unloading and storage are provided in Section F.6.6.1.

F.4.1.2.1.7 Water Resources

The water usage during construction of a new dry storage facility is estimated to be about 7.75 million l (2 million gal). During operations, annual water consumption would be 2.1 million l (550,000 gal) for receipt and handling and 0.4 million l (109,000 gal) for storage. With an annual average water usage of approximately 88,200 million l (23,300 million gal) for the Savannah River Site, these amounts represent no more than a 0.002 percent increase in annual water usage. Therefore, a new dry storage facility would have minimal impact on water resources at the Savannah River Site.

Best-management practices during construction would prevent sediment runoff or spills of fuels or chemicals. Therefore, construction activities should have no impact on water quality at the Savannah River Site. The impact on water quality during operations would also be negligible. Existing water treatment facilities at the Savannah River Site could accommodate any new domestic and process wastewater streams from a new dry storage facility. The expected total flow volumes at the Savannah River Site would still be well within the design capacities of treatment systems at the Savannah River Site. A new dry storage facility would meet National Pollutant Discharge Elimination System limits and reporting requirements, so no impact on the water quality of receiving streams is expected.

F.4.1.2.1.8 Ecology

Terrestrial Resources: The two proposed locations for new spent nuclear fuel management facilities encompass approximately 60-plus ha (150-plus acres) of undeveloped forest land. Surface vegetation consists primarily of upland pine stands. Loblolly and slash pine dominate, but small pockets of hardwoods (oaks, hickory, sweetgum, and yellow poplar) are also evident. The locations possess suitable habitat for white-tailed deer and feral hogs, as well as other faunal species common to the mixed pine/hardwood forests of South Carolina. The locations contain no suitable habitat for the various threatened and endangered species found on the Savannah River Site. The construction of a new dry storage facility would necessitate the clearing of 3.7 ha (9 acres) and is therefore not expected to significantly affect the terrestrial ecology of the area.

Wetlands: Dry storage of foreign research reactor spent nuclear fuel would not adversely impact wetlands. Although two small wetland areas are located along the southeastern perimeters of the potential storage locations, there is sufficient land area available within these locations to avoid these critical habitats. The implementation of best-management practices to control surface runoff and sedimentation would ensure the protection of wetlands and the aquatic ecosystem during construction activities.

Threatened and Endangered Species: The potential locations contain no suitable habitat for threatened, endangered, or candidate species known to occur on or near the Savannah River Site (DOE, 1995g). The southern bald eagle and wood stork feed and nest near wetlands, streams, and reservoirs, and thus would not be attracted to the highly industrialized foreign research reactor spent nuclear fuel management sites. Red-cockaded woodpeckers prefer open pine forests with mature trees greater than 70 years old for nesting and 30 years old for foraging. It is not believed that this species utilizes the relatively young pine stands (5 to 40 years of age) present within the potential storage locations. The nearest red-cockaded woodpecker colony is located across Upper Three Runs Creek, approximately 3.2 km (2 mi) north of H-Area. DOE has begun consultations with the U.S. Fish and Wildlife Service to determine the potential for endangered species to be affected, as required by the Endangered Species Act. Impacts to threatened and endangered species are not anticipated.

F.4.1.2.1.9 Noise

Noise generated onsite by construction or operation of a new dry storage facility should not adversely affect the public or the Savannah River Site environment. Noise generated by construction would be site specific and short lived. A small number of new construction jobs would be generated, but the resultant temporary increase in worker and materials traffic is expected to be insignificant compared to existing baseline traffic loads. Noise generated by operation would not significantly impact the environment because the facility would be located adjacent to previously developed, industrialized areas. The number of daily freight trains in the region and through the site (approximately 13) are not expected to change as a result of dry storage. There may be a slight increase in truck traffic to and from the potential storage locations, but this is not expected to result in a perceptible increase in traffic noise or any change in community reaction to noise along the major access routes to the Savannah River Site.

F.4.1.2.1.10 Traffic and Transportation

Construction materials, wastes, and excavated materials would be transported both onsite and offsite. These activities would result in increases in operation of personal-use vehicles by commuting construction

workers, commercial truck traffic, and in traffic associated with the daily operations of the Savannah River Site. Again, traffic congestion would not be a significant problem. As long as commercial trucks are complying with the Federal and State loading and speed regulations, truck traffic would not significantly damage the roadbed.

Traffic due to operations of a new dry storage facility would not increase site levels because the required workers would be drawn from the existing the Savannah River Site labor force.

F.4.1.2.1.11 Occupational and Public Health and Safety

Emissions Related Impacts: Doses that could be received by the public during incident-free operation associated with the receipt and management of the foreign research reactor spent nuclear fuel at the Savannah River Site would be attributed to emissions of radioactive material that could be carried by the wind offsite. The general public would be too far from the locations where handling activities or storage take place to receive any dose from direct exposure. Doses were calculated for the MEI, defined as an individual at the site boundary receiving the maximum exposure, and for the general population within an 80 km (50 mi) radius of the storage facility. These doses would result from incident-free airborne radiological emissions assumed to be released from the unloading of the transportation cask and the storage facility during storage. The methodology and assumptions used for the calculation of the radiological emissions and resulting doses are discussed in Section F.6 of this appendix. Table F-26 summarizes the annual emission-related doses to the public and the associated risks for the MEI and population at the Savannah River Site. Integrated doses for the duration of a specific implementation period can be obtained by multiplying the annual dose by the number of years in the period.

Table F-26 Annual Public Impacts for Foreign Research Reactor Spent Nuclear Fuel Receipt and Storage at Savannah River Site (New Dry Storage)

Facility	*MEI Dose (mrem/yr)*	*MEI Risk (LCF/yr)*	*Population Dose (person-rem/yr)*	*Population Risk (LCF/yr)*
Receipt/Unloading at: • New Dry Storage Facility	0.00018	9.0×10^{-11}	0.0086	0.0000043
Storage at: • New Dry Storage Facility	0	0	0	0

Handling-Related Impacts: Workers at the site would receive radiation doses during handling operations (i.e., receiving and unloading the transportation cask), transferring the spent nuclear fuel from one facility to another, or preparing the spent nuclear fuel for shipment offsite. Analysis option 1B involves the receipt of 644 shipments of foreign research reactor spent nuclear fuel into an existing wet storage facility (RBOF and/or L-Reactor disassembly basin) during Phase 1, the preparation of 161 transportation casks for shipment to a dry storage facility at the end of Phase 1, and the receipt of 193 shipments of foreign research reactor spent nuclear fuel directly from the ports to the new dry storage facility after Phase 1 operations. It was assumed that at the end of a 10-year period, the foreign research reactor spent nuclear fuel would have decayed sufficiently to be accommodated in larger capacity transportation casks, such as those currently used in the United States for commercial spent nuclear fuel. For the purpose of this analysis, the transportation casks used for intrasite shipping are assumed to have a capacity four times as large as the capacity of the transportation casks used for the marine transport of the foreign research reactor spent nuclear fuel to the United States. Doses were calculated for the dry vault and dry cask designs. The assumptions and methodologies used to calculate the doses to a working crew associated with the handling activities of the foreign research reactor spent nuclear fuel are described in Section F.5 of this appendix.

Table F-27 presents the population dose that would be received by the members of the working crew and the associated risk if that working crew handled the total number of transportation casks at the Savannah River Site. The worker MEI doses and risks were not calculated because of the large uncertainties associated with the assumptions for such calculations. However, the upper bound for such a dose would be equal to the administrative or regulatory limit at the site. For DOE radiation workers, the regulatory limit is 5,000 mrem per year. All these workers would be monitored and if any worker's dose approached this limit, he or she would be rotated into a different job to prevent further exposure. This regulatory limit provides a very conservative upper bound on the radiation dose for the worker MEI. If a single worker received the full 5,000 mrem per year dose for the full 13 years of potential foreign research reactor spent nuclear fuel receipt, then the MEI dose would be 65,000 mrem. For this dose, the associated risk of incurring an LCF would be 2.6 percent.

Table F-27 Handling-Related Impacts to Workers at the Savannah River Site (New Dry Storage)

	Worker Population Dose (person-rem)			*Worker Population Risk (LCF)*		
	RBOF/L-Reactor	*New Dry Storage Cask*	*New Dry Storage Vault*	*RBOF/L-Reactor*	*New Dry Storage Cask*	*New Dry Storage Vault*
Phase 1	250	NA	NA	0.10	NA	NA
Phases 1 and 2	NA	416	363	NA	0.17	0.15

NA = Not Applicable

F.4.1.2.1.12 Material, Utility, and Energy Requirements

Construction of a new dry storage facility at the Savannah River Site would consume 21,800 m^3 (28,500 yd^3) of concrete and 5,200 metric tons (5,750 tons) of steel. The total energy and water requirements during construction are estimated to be 835,000 l (221,000 gal) for fuel; and 7.75 million l (2 million gal) for water. The annual utility and energy requirements during operations are shown in Table F-28. These requirements represent a small percent of current requirements for the Savannah River Site. No new generation or treatment facilities would be necessary, and connections to existing networks would require only short tie-in lines. Increases in consumption would be minimal because overall activity on the Savannah River Site is expected to decrease due to changes in site mission and a general reduction in employment.

Table F-28 Annual Utility and Energy Requirements for New Dry Storage at the Savannah River Site

Commodity	*Baseline Site Usage*	*Dry Storage Usage*	*Percent Increase*
Electricity (MW-hr/yr)	659,000	800 - 1,000	0.15 percent
Fuel (l/yr)	28,400,000	0	0 percent
Water (l/yr)	88,200,000,000	1,590,000[a] 400,000[b]	0.002 percent[a] 0.00046 percent[b]

[a] *During receipt and handling.*

[b] *During storage.*

F.4.1.2.1.13 Waste Management

Construction of a new dry storage facility at the Savannah River Site would generate approximately 1,800 m^3 (2,400 yd^3) of debris. The annual quantities of waste generated during operations are shown in Table F-29. These quantities represent a very small percent increase above current levels at the Savannah River Site. Existing waste management storage and disposal activities at the Savannah River Site could accommodate the waste generated by a new dry storage facility. Therefore, the impact of this waste on the existing Savannah River Site waste management capacities would be minimal.

Table F-29 Annual Waste Generated from New Dry Storage at the Savannah River Site

Waste Form	Baseline Site Generation	Dry Storage Generation	Percent Increase
High-Level Waste (m^3/yr)	127,400[a]	none	0 percent
Transuranic Waste (m^3/yr)	760	none	0 percent
Solid Low-Level Waste (m^3/yr)	19,750	22[b] 1[c]	0.11 percent[b] 0.005 percent[c]
Wastewater (l/yr)	690,000,000	1,590,000[b] 400,000[c]	0.21 percent[b] 0.06 percent[c]

[a] *Total inventory (m^3) at the Savannah River Site*

[b] *During receipt and handling*

[c] *During storage*

F.4.1.2.2 Wet Storage

Analysis option 1C is associated with the construction and operation of a new wet storage facility or the modification and operation of BNFP at the Savannah River Site (Implementation Alternative 5 to Management Alternative 1). The environmental impacts from the modification of the BNFP would be bounded by the impacts associated with the construction of a new wet storage facility.

F.4.1.2.2.1 Land Use

A new wet storage facility would be located in one of two 60-plus ha (150-plus acres) undeveloped areas near the H- and P-areas, respectively. Predominant land use at both areas is managed timber land. Construction activities, including laydown areas, would disturb 2.8 ha (7 acres) of land. This represents less than 5 percent of the available space at either area. A new wet storage facility would occupy 3,800 m^2 (41,000 ft^2) of land and would move 18,000 m^3 (24,000 yd^3) of soil. Neither construction nor operation of a new wet storage facility at either area would significantly impact land use patterns on the Savannah River Site.

F.4.1.2.2.2 Socioeconomics

As discussed in Section F.3.2 the total capital cost of a new wet storage facility is estimated to be $449 million. Construction activities are projected to take 4 years. Assuming that the capital cost is evenly distributed over this 4-year period, the annual expenditures would be about $112.2 million. This represents approximately 9.4 percent of the estimated FY 1995 total expenditures for the Savannah River Site ($1,198 million). The relative socioeconomic impact from annual construction expenditures on the region of influence would be small but positive. The annual operations costs of a new wet storage facility

are estimated to be $23.3 million for receipt and handling and $3.5 million for storage. These costs represent about 1.9 percent and 0.3 percent of FY 1995 total expenditures for the Savannah River Site. The relative socioeconomic impact from annual operation expenditures on the region of influence would be small.

Direct employment associated with construction of a new wet storage facility is estimated to be 157 persons. The relative socioeconomic impact from direct construction employment on the region of influence would be small. In addition, when compared to the projected FY 1995 work force at the Savannah River Site of approximately 20,000 persons, the relative socioeconomic impact of this temporary increase in construction employment would be insignificant. Direct employment associated with operations of a new wet storage facility is estimated to be 30 persons. The relative socioeconomic impact of this increase in operations employment would be small to both the region of influence and the Savannah River Site.

F.4.1.2.2.3 Cultural Resources

Impacts to cultural resources would be the same as for new dry storage (Section F.4.1.2.1.3).

F.4.1.2.2.4 Aesthetic and Scenic Resources

Impacts to aesthetic and scenic resources would be the same as for new dry storage (Section F.4.1.2.1.4).

F.1.4.2.2.5 Geology

Impacts to geology would be the same as for new dry storage (Section F.4.1.2.1.5).

F.4.1.2.2.6 Air Quality

Nonradiological Emissions: Construction of a new wet storage facility would necessitate the clearing and grading of approximately 2.8 ha (7 acres) of land. In comparison, approximately 3.7 ha (9 acres) of land would be disturbed by new dry storage construction. Therefore, air quality impacts associated with wet storage construction would be bound by those associated with new dry storage construction, as presented in Table F-25.

Operations-related impacts associated with wet storage would be similar to those discussed under existing facilities.

Radiological Emissions: Incident-free airborne releases from a new wet storage facility would be limited to radioactive noble gases and some radioactive iodine which could be released from the stored fuel prior to canning. The airborne materials released to the building atmosphere during incident-free operations would be filtered by the building heating and ventilation system. Radioactive and nonradioactive effluent gases would be routed through double-banked high-efficiency particulate air filters prior to release to the environment through an exhaust air system. The high-efficiency particulate air filter would have a minimum efficiency of 99.97 percent for 0.3-micron diameter particulates and would allow in-place dioctyl phthalate testing.

The new wet storage facility would discharge all ventilated gas, except truck exhaust, to the facility's exhaust system. The truck exhaust would be discharged directly to the environment during cask off-loading operations in the truck receiving area. The exhaust air system would employ a detector to monitor ^{137}Cs. For other building areas which would be sources of airborne radioactive contamination, the heating, ventilation, and air conditioning system would be designed to maintain airflow from areas of low potential contamination into areas of higher potential contamination. These airborne effluents would be required to be below the radioactivity concentration guides listed in DOE Order 5480.1B for both onsite and offsite concentrations (DOE, 1989b).

Air emissions from the new wet storage facility are expected to be similar to the air emissions from the IFSF at the Idaho National Engineering Laboratory. The annual air emission for the IFSF was designed to result in ground-level concentrations of less than 0.003 percent of DOE Order 5480.1B limits for uncontrolled areas.

Radiological emissions from the operation of the new wet storage facility were calculated based on the methodology and assumptions used in Appendix F, Section F.6. The annual emission releases from the wet storage facility during the receipt and unloading, and storage are provided in Section F.6.6.1.

F.4.1.2.2.7 Water Resources

The annual water usage during construction and operation of a new wet storage facility is estimated to be about 1.9 million l (502,000 gal) and 2.7 million l (720,000 gal), respectively. With an annual average water usage of approximately 88,200 million l (23,300 million gal) for the Savannah River Site, these amounts represent an increase of less than 0.01 percent for both. Therefore, a new wet storage facility would have minimal impact on water resources at the Savannah River Site.

Best-management practices during construction would prevent sediment runoff or spills of fuels or chemicals. Therefore, construction activities should have no impact on water quality at the Savannah River Site. The impact on water quality during operations would also be negligible. Existing water treatment facilities at the Savannah River Site could accommodate any new domestic and process wastewater streams from a new wet storage facility. The expected total flow volumes at the Savannah River Site would still be well within the design capacities of treatment systems at the Savannah River Site. A new wet storage facility would meet National Pollutant Discharge Elimination System limits and reporting requirements, so no impact on the water quality of receiving streams is expected.

F.4.1.2.2.8 Ecology

Impacts to the ecology would be the same as for new dry storage (Section F.4.1.2.1.8).

F.4.1.2.2.9 Noise

Impacts from noise would be the same as for new dry storage (Section F.4.1.2.1.9).

F.4.1.2.2.10 Traffic and Transportation

Impacts from traffic and transportation would be the same as for new dry storage (Section F.4.1.2.1.10).

F.4.1.2.2.11 Occupational and Public Health and Safety

Emission-Related Impacts: Doses that could be received by the public during incident-free operation associated with the receipt and management of the foreign research reactor spent nuclear fuel at the Savannah River Site would be attributed to emissions of radioactive material that could be carried by wind offsite. The general public would be too far from the locations where handling activities or storage take place to receive any dose from direct exposure. Doses were calculated for the MEI, defined as an individual at the site boundary receiving the maximum exposure, and for the general population within an 80 km (50 mi) radius of the storage facility. These doses would result from incident-free airborne radiological emissions assumed to be released from the unloading of the transportation cask and the storage facility during storage. The methodology and assumptions used for the calculation of the radiological emissions and resulting doses are discussed in Section F.6 of this appendix. Table F-30 summarizes the annual emission-related doses to the public and the associated risks for the MEI and population at the Savannah River Site. Integrated doses for the duration of a specific implementation period can be obtained by multiplying the annual dose by the number of years in the period.

Table F-30 Annual Public Impacts for Receipt and Storage of Foreign Research Reactor Spent Nuclear Fuel at the Savannah River Site (Implementation Alternative 5 of Management Alternative 1)

Facility	MEI Dose (mrem/yr)	MEI Risk (LCF/yr)	Population Dose (person-rem/yr)	Population Risk (LCF/yr)
Receipt/Unloading at:				
• BNFP	0.00065	3.3×10^{-10}	0.0045	0.0000023
• New Wet Storage Facility	0.00011	5.5×10^{-11}	0.0057	0.0000028
Storage at:				
• BNFP	7.5×10^{-9}	3.8×10^{-15}	4.8×10^{-8}	2.4×10^{-11}
• New Wet Storage Facility	1.2×10^{-9}	6.0×10^{-16}	6.2×10^{-8}	3.1×10^{-11}

Handling-Related Impacts: Workers at the site would receive radiation doses during handling operations (i.e., receiving and unloading the transportation cask), transferring the spent nuclear fuel from one facility to another, or preparing the spent nuclear fuel for shipment offsite. Analysis option 1C involves the receipt of 644 shipments of foreign research reactor spent nuclear fuel into an existing wet storage facility (RBOF and/or L-Reactor disassembly basin) during Phase 1, the preparation of 161 transportation casks for shipment to a wet storage facility at the end of Phase 1, and the receipt of 193 shipments of foreign research reactor spent nuclear fuel directly from the ports into the new wet storage facility after Phase 1 operations. It was assumed that at the end of a 10-year period, the foreign research reactor spent nuclear fuel would have decayed sufficiently to be accommodated in larger capacity transportation casks, such as those currently used in the United States for commercial spent nuclear fuel. For the purpose of this analysis, the transportation casks used for intrasite shipping are assumed to have a capacity four times as large as the capacity of the transportation casks used for the marine transport of the foreign research reactor spent nuclear fuel to the United States. The assumptions and methodologies used to calculate the doses to a working crew associated with the handling activities of the foreign research reactor spent nuclear fuel are described in Section F.5 of this appendix.

Table F-31 presents the population dose that would be received by the members of the working crew and the associated risk if that working crew handled the total number of transportation casks at the Savannah River Site. The worker MEI doses and risks were not calculated because of the large uncertainties associated with the assumptions for such calculations. However, the upper bound for such a dose would be equal to the administrative limits at the site. For DOE radiation workers, the regulatory limit is 5,000 mrem per year. All these workers would be monitored and if any worker's dose approached this

limit, he or she would be rotated into a different job to prevent further exposure. This regulatory limit provides a very conservative upper bound on the radiation dose for the worker MEI. If a single worker received the full 5,000 mrem per year dose for the full 13 years of potential foreign research reactor spent nuclear fuel receipt, then the MEI dose would be 65,000 mrem. For this dose, the associated risk of incurring an LCF would be 2.6 percent.

Table F-31 Handling-Related Impacts to Workers at the Savannah River Site (Implementation Alternative 5 of Management Alternative 1)

Facility	Worker Population Dose (person-rem)	Worker Population Risk (LCF)
Phase 1: RBOF/L-Reactor Basin	250	0.10
Phase 1 and Phase 2: New Wet Storage Facility	360	0.14
Phase 1: RBOF/L-Reactor Basin	250	0.10
Phase 1 and Phase 2: BNFP	360	0.14
Phase 1: RBOF/L-Reactor Basin	250	0.10
Phase 1 and Phase 2: BNFP[a]	310	0.12

[a] *Assumes that BNFP would be ready in 5 years instead of 10 years.*

F.4.1.2.2.12 Material, Utility, and Energy Requirements

Construction of a new wet storage facility at the Savannah River Site would consume 12,400 m^3 (16,260 yd^3) of concrete and 3,100 metric tons (3,443 tons) of steel. The total energy and water requirements during construction are estimated to be 600,000 l (159,000 gal) for fuel, and 4.4 million l (1.2 million gal) for water. The annual utility and energy requirements during operations are shown in Table F-32. These requirements represent a small percent of current requirements for the Savannah River Site. No new generation or treatment facilities would be necessary, and connections to existing networks would require only short tie-in lines. Increases in consumption would be minimal because overall activity on the Savannah River Site is expected to decrease due to changes in site mission and a general reduction in employment.

Table F-32 Annual Utility and Energy Requirements for New Wet Storage at the Savannah River Site (Implementation Alternative 5 of Management Alternative 1)

Commodity	Baseline Site Usage	Wet Storage Usage	Percent Increase
Electricity (MW-hr/yr)	659,000	1,000 - 1,500	0.23 percent
Fuel (l/yr)	28,400,000	0	0 percent
Water (l/yr)	88,200,000,000	2,700,000[a]	0.003 percent
		1,500,000[b]	0.001 percent

[a] *During receipt and handling*

[b] *During storage*

F.4.1.2.2.13 Waste Management

Construction of a new wet storage facility would generate 2,600 m^3 (10,300 yd^3) of debris. The annual quantities of waste generated during operations are shown in Table F-33. These quantities represent a very small percent increase in current levels at the Savannah River Site. Existing waste management storage and disposal activities at the Savannah River Site could accommodate the waste generated by a new wet

Table F-33 Annual Waste Generated from New Wet Storage at the Savannah River Site (Implementation Alternative 5 of Management Alternative 1)

Waste Form	Baseline Site Generation	Wet Storage Generation	Percent Increase
High-Level (m^3/yr)	127,400[a]	none	0 percent
Transuranic (m^3/yr)	760	none	0 percent
Solid Low-Level (m^3/yr)	19,750	16[b] 1[c]	0.08 percent 0.005 percent
Wastewater (l/yr)	690,000,000	1,590,000[b] 400,000[c]	0.23 percent 0.06 percent

[a] *Total inventory (m^3) at the Savannah River Site.*

[b] *During receipt and handling*

[c] *During storage*

storage facility. Therefore, the impact of this waste on the existing Savannah River Site waste management capacities would be minimal.

F.4.1.3 Accident Analysis

An evaluation of incident-free operations and hypothetical accidents at the Savannah River Site is presented here, based on the methodology presented in Appendix F, Section F.6. The evaluation assessed the possible radiation exposure to individuals and general population due to the release of radioactive materials. The analyses are based on the same operations carried out at the different potential storage locations and the same accidents at any of the sites evaluated.

The radiation doses to the following individuals and the general population are calculated for accident conditions at the spent nuclear fuel storage facility:

- ***Worker***: An individual located 100 m (330 ft) from the radioactive material release point. For elevated release, the worker dose was calculated at a point of maximum dose. The distance at which the maximum dose occurs is frequently greater than 100 m (330 ft) for elevated release. The direction to the worker was chosen as the direction to the maximally exposed sector. The dose to the worker is calculated for the 50th-percentile meteorological condition (DOE, 1992a).

- ***Maximally Exposed Offsite Individual (MEI):*** A theoretical individual living at the storage site boundary receiving the maximum exposure. The individual is assumed to be located in a direction downwind from the release point. The dose to the MEI is shown for the 95th-percentile meteorological condition.

- ***Nearest Public Access Individual (NPAI).*** An individual stranded on a highway or public access road near to the facility at the time of an accident. The distance to the NPAI was chosen as the distance to the nearest public access point; the direction was chosen as the direction to that point. The dose to the NPAI is shown for the 95th-percentile meteorological condition.

- ***General Population Within an 80 km (50 mi) Radius of the Facility:*** The dose calculations are performed for the direction downwind from the release point that results in highest dose to the public. The dose to the population is shown for the 95th-percentile meteorological condition.

The radiation dose to individuals and the public resulting from exposure to radioactive contamination was calculated using external (direct exposure), inhalation, and ingestion pathways. Dispersion in air from point of release was estimated with both 50th-percentile and 95th-percentile meteorological conditions. The 50th-percentile condition represents the median meteorological condition. The 95th-percentile condition is defined as that condition which is not exceeded more than 5 percent of the time, and is more conservative than the 50th-percentile condition.

The ingestion dose is calculated by considering that the individual and the public would consume contaminated food produced in the vicinity [up to 80 km (50 mi)] of the accident. This is conservative, and it is expected that continued consumption of contaminated food products by the public would be suspended after a protective action guideline is reached. In 1991, the U.S. Environmental Protection Agency recommended protective action guidelines in the range of one to five rem whole-body exposure (EPA, 1991). To ensure a consistent analytical basis, no reduction of exposure due to a protective action guideline was used in this analysis.

Accidents considered for detailed analysis are similar to those analyzed in the Programmatic SNF&INEL Final EIS. The selection of accidents was based on the following considerations:

- Accidents in the Programmatic SNF&INEL Final EIS were reviewed to select reasonably foreseeable accidents. They are: (1) criticality caused by human error during operation, equipment failure, or earthquake; (2) mechanical damage to foreign research reactor spent nuclear fuel during examination and preparation (cropping off the aluminum and nonfuel end of a spent nuclear fuel element); and (3) accident involving an impact by either an internal or an external initiator with and without an ensuing fire.

Six accident scenarios were evaluated at each storage location using identical source terms (estimated amounts of radioactive material released during postulated accidents). The wet pool accidents are assumed to be cutting into the fuel region or mechanical damage due to operator error, an accidental criticality, and an aircraft crash into the water pool facility. The dry storage accidents are assumed to be cutting into the fuel region or mechanical damage during examination work and handling in a dry cell, dropping of a fuel cask, and an aircraft crash with an ensuing fire.

Table F-34 presents frequency and consequences in terms of mrem or person-rem, of postulated accidents to the offsite MEI, NPAI, and offsite population for the 95th-percentile meteorological conditions using the assumptions and input values discussed above. The worker doses are calculated only for the 50th-percentile meteorology. This is an individual assumed to be 100 m (330 ft) downwind of the accident. DOE did not estimate the worker population dose.

Multiplying the frequency of each accident times its consequences at the Savannah River Site and converting the radiation doses to LCF yields the annual risks associated with each potential accident at the Savannah River Site. These annual risks are multiplied by the maximum duration of the policy at each site to obtain conservative estimates of risks for the entire program at the Savannah River Site. These risk estimates are presented in Table F-35.

Table F-36 presents the frequency and consequences of the accidents analyzed for the Savannah River Site for wet storage (Implementation Alternative 5 of Management Alternative 1). Multiplying the frequency of each accident times its consequences at the Savannah River Site and converting the radiation doses to LCF yields the annual risks associated with each potential accident at the Savannah River Site. These annual risks are multiplied by the maximum duration of this implementation alternative at the Savannah

Table F-34 Frequency and Consequences of Accidents at the Savannah River Site

	Frequency (per year)	Consequences			
		MEI (mrem)	NPAI (mrem)	Population (person-rem)	Worker (mrem)
Dry Storage Accidents - New					
• Spent Nuclear Fuel Assembly Breach	0.16	0.24	0.068	9.2	28
• Dropped Fuel Cask	0.0001	0.018	0.00034	0.55	0.28
• Aircraft Crash w\Fire	1×10^{-6}	40	0.29	1300	120
Wet Storage Accidents at RBOF					
• Spent Nuclear Fuel Assembly Breach	0.16	0.0070	0.00039	0.23	0.14
• Accidental Criticality	0.0031	130	44	4,800	16,000
• Aircraft Crash	1×10^{-6}	4.1	0.98	150	400
Wet Storage Accidents at L-Reactor Basin					
• Spent Nuclear Fuel Assembly Breach	0.16	0.0093	0.00097	0.14	0.11
• Accidental Criticality	0.0031	170	120	3,000	14,000
• Aircraft Crash	1×10^{-6}	4.2	2.6	93	70

Table F-35 Annual Risks of Accidents at the Savannah River Site

	Risks			
	MEI (LCF/yr)	NPAI (LCF/yr)	Population (LCF/yr)	Worker (LCF/yr)
Dry Storage Accidents - New				
• Spent Nuclear Fuel Assembly Breach	1.9×10^{-8}	5.5×10^{-9}	0.00075	0.0000018
• Dropped Fuel Cask	9.0×10^{-13}	1.7×10^{-14}	2.8×10^{-8}	1.1×10^{-11}
• Aircraft Crash w\Fire	2.0×10^{-11}	1.5×10^{-13}	6.5×10^{-7}	4.8×10^{-11}
Wet Storage Accidents at RBOF				
• Spent Nuclear Fuel Assembly Breach	5.5×10^{-10}	3.1×10^{-11}	0.000019	8.8×10^{-10}
• Accidental Criticality	2.0×10^{-7}	7.0×10^{-8}	0.0074	0.000020
• Aircraft Crash	2.1×10^{-12}	4.9×10^{-13}	7.5×10^{-8}	1.6×10^{-10}
Wet Storage Accidents at L-Reactor Basin				
• Spent Nuclear Fuel Assembly Breach	7.4×10^{-10}	8.0×10^{-11}	0.000011	7.1×10^{-9}
• Accidental Criticality	2.6×10^{-7}	1.9×10^{-7}	0.0047	0.000017
• Aircraft Crash	2.1×10^{-12}	1.3×10^{-12}	4.7×10^{-8}	2.8×10^{-11}

Table F-36 Frequency and Consequences of Accidents at Savannah River Site (Implementation Alternative 5 of Management Alternative 1)

	Frequency (per year)	Consequences			
		MEI (mrem)	NPAI (mrem)	Population (person-rem)	Worker (mrem)
Wet Storage Facility - New					
• Spent Nuclear Fuel Assembly Breach	0.16	0.0070	0.00039	0.23	0.14
• Accidental Criticality	0.0031	17	9.5	370	1,600
• Aircraft Crash	1×10^{-6}	4.1	0.98	150	400
BNFP					
• Spent Nuclear Fuel Assembly Breach[a]	0.16	0.018	0.00099	0.028	0.0008
• Accidental Criticality[a]	0.0031	80	75	44	75
• Aircraft Crash	1×10^{-6}	92	31	23	70

[a] *Emissions would be released through a tall stack.*

River Site to obtain conservative estimates of risks at the Savannah River Site. Table F-37 presents the risk estimates from this implementation alternative.

Table F-37 Annual Risks of Accidents at the Savannah River Site (Implementation Alternative 5 of Management Alternative 1)

	Risks			
	MEI (LCF/yr)	*NPAI (LCF/yr)*	*Population (LCF/yr)*	*Worker (LCF/yr)*
Wet Storage Facility - New				
• Spent Nuclear Fuel Assembly Breach	5.5×10^{-10}	3.1×10^{-11}	0.000019	8.8×10^{-10}
• Accidental Criticality	2.7×10^{-8}	1.5×10^{-8}	0.00060	0.0000020
• Aircraft Crash	2.1×10^{-12}	4.9×10^{-13}	7.5×10^{-8}	1.6×10^{-10}
BNFP				
• Spent Nuclear Fuel Assembly Breach[a]	2.8×10^{-9}	8.0×10^{-11}	0.0000023	5.2×10^{-11}
• Accidental Criticality[a]	1.3×10^{-7}	1.2×10^{-7}	0.000070	9.2×10^{-8}
• Aircraft Crash[a]	4.6×10^{-10}	1.6×10^{-11}	1.2×10^{-8}	2.8×10^{-10}

[a] *Emissions would be released through a tall stack.*

F.4.1.3.1 Secondary Impact of Radiological Accidents at the Savannah River Site

In the event of an accidental release of radioactivity, there is a potential for impacts to land uses, cultural resources, water quality, ecology, national defense, and local economies (secondary impacts). For this analysis, secondary impacts of radiological accidents involving foreign research reactor spent nuclear fuel have been qualitatively assessed based on the results of the accident calculations presented in Section F.4.1.3. Radiological accidents that would result in doses to the MEI of less than the annual Federal radiological exposure limit for the public of 100 mrem (10 CFR Part 20) were considered to have no secondary impacts.

The MEI dose provides a measure of the air concentration and radionuclide deposition at the receptor location. As such, it can be used to express the level of contamination from a given radiological accident. In estimating the human health effects from radiological exposure (as presented in Section F.4.1.3), the MEI dose evaluates four pathways: (1) air immersion, (2) ground surface, (3) inhalation, and (4) ingestion. In estimating the environmental effects from radiological exposure, however, only the air immersion and ground surface pathways need be considered.

At the Savannah River Site, the radiological accident with the highest MEI dose is the accidental criticality at a wet storage facility (Table F-34). For this accident, the MEI dose would be 170 mrem. For the air immersion and ground surface pathways only, the dose would be 50 mrem, (Table F-115A) which is lower than the 100 mrem limit used in this analysis. Local contamination would be likely around the dry storage facility, but is expected to be contained entirely within the boundaries of the Savannah River Site. Cleanup activities should be small and any impacts to land uses, cultural resources, water quality, and ecology would be reversible. No impacts to national defense or local economies would be expected.

F.4.1.4 Cumulative Impacts at the Savannah River Site

This section presents the cumulative impacts of the proposed action, potential impacts of other major contemplated DOE actions, and other offsite (non-DOE) facility impacts at the Savannah River Site. A major portion of the presentation is based on information included in the Interim Management of Nuclear Materials Final EIS for the Savannah River Site, issued in October 1995 (DOE, 1995b). The cumulative impacts include those associated with the handling and dry storage of foreign research reactor spent

nuclear fuel at the Savannah River Site and the following existing or major foreseeable activities proposed for the site:

- The operation of the Vogtle Electric Generating Plant located approximately 16 km (10 mi) south west of the center of the Savannah River Site.
- The implementation of the preferred scenario in the Interim Management of Nuclear Materials EIS (DOE, 1995b).
- Shipment of aluminum-based spent nuclear fuel to the Savannah River Site for storage and disposal discussed in Appendix C of the Programmatic SNF&INEL Final EIS (DOE, 1995g).
- Completion of the construction and operation of the Defense Waste Processing Facility (DOE, 1994g).
- Processing of F-Canyon plutonium solutions to metal (DOE, 1994a).
- Treatment and minimization of radioactive and hazardous wastes at the site as identified in the Savannah River Site Waste Management Final EIS (DOE, 1995f).
- Construction of an accelerator for tritium production at the Savannah River Site, along with associated support facilities (DOE, 1995a).
- Disposition of Surplus Highly Enriched Uranium at the site (DOE, 1995e).
- Storage and Disposition of Weapons-Usable Fissile Materials.
- Stockpile Stewardship and Management Program.
- Current Savannah River Site projects (based on 1993 data).

Any other foreseeable activities would have minimal impacts compared to the activities considered above.

Table F-38 summarizes the cumulative impacts for land use, socioeconomics, nonradiological air quality, occupational and public health and safety, waste generation, and energy and water consumption. As shown in Table F-38, the contribution of foreign research reactor spent nuclear fuel to the cumulative impacts at the Savannah River Site would be minimal.

F.4.1.5 Unavoidable Adverse Environmental Impacts

The construction and operation of facilities for the receipt and management of foreign research reactor spent nuclear fuel at the Savannah River Site would result in some adverse impacts to the environment. Changes in designs and other methods of mitigation could eliminate, avoid, or reduce most impacts to minimal levels. The following paragraphs identify adverse impacts that mitigation could not reduce to minimal levels or avoid altogether.

The generation of some fugitive dust during construction would be unavoidable, but could be controlled by water and dust suppressants. Similarly, construction activities would result in some minor, yet unavoidable, noise impacts from heavy equipment, generators, and vehicles.

The maximum loss of habitat would result from conversion of approximately 4 ha (10 acres) of managed pine forest to industrial land use.

Table F-38 Cumulative Impacts at the Savannah River Site

Environmental Impact Parameter	*FRR SNF Contribution*	*Current Activities*[a]	*Other Activities*[b]	*Cumulative Impact*
Land Use (acres)	9	9,075[c]	3,975	13,059
Socioeconomics (persons)	190[d]/30[e]	(f)	11,000[d]/6,200[e]	11,190[d]/6,230[e]
Air Quality (nonradiological)	See Table F-38A	See Table F-38A	See Table F-38A	See Table F-38A
Occupational and Public Health and Safety:				
• MEI Dose (rem/yr)	3.6×10^{-7}	0.00025	0.0041	0.0043
LCF (per year)	1.8×10^{-10}	1.25×10^{-7}	0.000002	0.000002
• Population Dose (person-rem/yr)	0.022	9.1	295	304
LCF (per year)	0.000011	0.0045	0.15	0.154
• Worker Collective Dose (person-rem/yr)	10[g]	263	1,418	1,691
LCF (per year)	0.004	0.10	0.57	0.67
Energy and Water Consumption[j]				
• Electricity (MW-hr/yr)	1,000	659,000	4,104,106[h]	4,764,106
• Fuel (million l/yr)	0	28.4	3.06	31.47
• Steam (million kg/yr)	0	1,700	1,550	3,250
• Coal (tons/yr)	0	210,000	20,440	230,440
• Water (million l/yr)	2.2	88,200	6,796	94,996
Waste Generation				
• High-Level (m^3/yr)	0	(i)	6,330	6,330
• Low-Level (m^3/yr)	22	(i)	35,600	35,622
• Saltstone (m^3/yr)	0	(i)	60,000	60,000
• Transuranic (m^3/yr)	0	(i)	1,038	1,038
• Mixed/Hazardous (m^3/yr)	0	(i)	2,561	2,561

FRR SNF = Foreign Research Reactor Spent Nuclear Fuel

[a] *Based on 1993 site data*

[b] *Other activities include: interim management of nuclear materials, spent nuclear fuel management, Vogtle plant operation, defense waste processing facility operations, stabilization of Pu-solutions, site-wide waste management activities, tritium accelerator facility, disposition of surplus HEU, storage and disposition of weapons-usable fissile materials, and the stockpile stewardship and management program activities*

[c] *Five percent of the total SRS site area of 181,500 acres*

[d] *Increase over baseline during construction activities*

[e] *Increase over baseline during operation activities*

[f] *Baseline working force approximately 20,600 persons*

[g] *The dose is due to the handling of the FRR SNF during receipt and transfer between facilities averaged over 40 years*

[h] *Major portion is the requirement for electricity by the tritium production accelerator facility (3,740,000 MW-hr/yr)*

[i] *Included in "other activities"*

[j] *During operation activities*

The amount of radioactivity that incident-free operation of the spent nuclear fuel facilities would release is a small fraction of the cumulative operational releases at the Savannah River Site and would be well below applicable regulatory standards (see Tables F-38 and F-38A).

Table F-38A Estimated Maximum Nonradiological Cumulative Ground-Level Concentrations of Criteria and Toxic Pollutants at the Savannah River Site Boundary[a]

Pollutant	Averaging Time	Regulatory Standard ($\mu g/m^3$)	Cumulative Concentration ($\mu g/m^3$)[b]
Carbon Monoxide	1-hour	40,000	331.7 (0.83%)
	8-hour	10,000	52.3 (0.52%)
Nitrogen Oxides	Annual	100	19.5 (19.5%)
Sulfur Dioxide	3-hour	1,300	1,159 (89.1%)
	24-hour	365	248 (68.2%)
	Annual	80	17 (21.3%)
Gaseous Fluorides	12-hour	3.7	1.38 (37.3%)
	24-hour	2.9	0.58 (20%)
	1 week	1.6	0.56 (34.8%)
	1 month	0.8	0.066 (8.2%)
Nitric Acid	24-hour	125	9.8 (7.8%)

[a] *Concentrations represent: foreign research reactor spent nuclear fuel management, other DOE-owned spent nuclear fuel management, defense waste processing facility operations, consolidated incineration facility operation, stabilization of Pu-solutions, waste management activities, tritium supply and recycling, disposition of surplus highly enriched uranium, storage and disposition of weapons-usable fissile materials, and stockpile and stewardship management program activities*

[b] *Numbers in parentheses indicate the percentage of the regulatory standard*

F.4.1.6 Irreversible and Irretrievable Commitments of Resources

The irreversible and irretrievable commitment of resources resulting from the construction and operation of facilities for the receipt and storage of foreign research reactor spent nuclear fuel would involve materials that could not be recovered or recycled or that would be consumed or reduced to unrecoverable forms. The construction and operation of facilities for foreign research reactor spent nuclear fuel facilities at the Savannah River Site would consume irretrievable amounts of electrical energy, fuel, concrete, sand, and gravel. Other resources used in construction would probably not be recoverable. These would include finished steel, aluminum, copper, plastics, and lumber. Most of this material would be incorporated in foundations, structures, and machinery. Construction and operation of facilities for foreign research reactor spent nuclear fuel management would also require the withdrawal of water from surface- and groundwater sources, but most of this water would return to onsite streams or the Savannah River after use and treatment.

F.4.1.7 Mitigation Measures

Mitigation is addressed in general terms and describes typical measures that the Savannah River Site could implement. The analyses indicate that the environmental consequences attributable to foreign research reactor spent nuclear fuel management activities at the Savannah River Site would be minimal in most environmental media.

Pollution Prevention: DOE is committed to comply with Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements;" Executive Order 12780, "Federal Acquisition, Recycling and Waste Prevention;" and applicable DOE orders and guidance documents in planning and implementing pollution prevention at the Savannah River Site. The pollution prevention program at the Savannah River Site was initiated in 1990 as a waste minimization program. Currently, the program consists of four major initiatives: solid waste minimization, source reduction and recycling of

wastewater discharges, source reduction of air emissions, and potential procurement of products manufactured from recycled materials. Since 1991, waste (all types) generated at the Savannah River Site has decreased, with the greatest reductions in hazardous and mixed wastes. These reductions are attributable primarily to material substitutions (DOE, 1995g).

All foreign research reactor spent nuclear fuel activities at the Savannah River Site would be subject to a pollution prevention program. Implementation of the program plan would minimize waste generated by these activities (DOE, 1995g).

Cultural Resources: A Programmatic Memorandum of Understanding, ratified on August 24, 1990, between the DOE Savannah River Operations Office, the South Carolina State Historic Preservation Office, and the Advisory Council on Historic Preservation is the instrument for the management of cultural resources at the Savannah River Site. DOE uses this memorandum to identify cultural resources and develop mitigation plans for affected resources in consultation with the State Historic Preservation Office.

DOE would comply with the terms of the memorandum in support of foreign research reactor spent nuclear fuel activities at the Savannah River Site. For example, DOE would survey sites prior to disturbance and reduce impacts to any potentially significant resources discovered through avoidance or removal. Any artifacts encountered would be protected from further disturbance and the elements until removed (DOE, 1995g).

DOE conducted an investigation of Native American concerns over religious rights in the Central Savannah River Valley in conjunction with studies in 1991 related to a New Production Reactor. During this study, three Native American groups expressed concern over sites and items of religious significance on the Savannah River Site. DOE has included these organizations on its environmental mailing list, solicits their comments on NEPA actions on the Savannah River Site, and sends them documents about the Savannah River Site environmental activities, including those related to foreign research reactor spent nuclear fuel management considerations. These Native American groups would be consulted on any actions that may follow subsequent site-specific environmental reviews (DOE, 1995g).

Geology: DOE expects that there would be no impacts to geologic resources at the Savannah River Site under any storage option evaluated. Potential soil erosion in areas of ground disturbance would be minimized through sound engineering practices such as implementing controls for storm water runoff (e.g., sediment barriers), slope stability (e.g., rip-rap placement), and wind erosion (e.g., covering soil stockpiles). Relandscaping would minimize soil loss after construction was completed. These measures would be included in a site-specific Storm Water Pollution Prevention Plan that the Savannah River Site would prepare prior to initiating any construction (DOE, 1995g).

Air Resources: DOE would meet applicable standards and permit limits for all radiological and nonradiological releases to the atmosphere. In addition, the Savannah River Site would follow the DOE policy of maintaining radiological emissions to levels "as low as reasonably achievable" (ALARA). ALARA is an approach to radiation protection to control or manage exposures (both individual and collective) and releases of radioactive material to the environment as low as social, technical, economic, practical, and public policy considerations permit. ALARA is not a dose limit, but rather a process that has as its objective the attainment of dose levels as far below the applicable limits as practicable (DOE, 1995g).

Water Resources: DOE would minimize the potential for adverse impacts on surface water during construction through the implementation of a storm water pollution prevention plan that details controls

for erosion and sedimentation. The plan would also establish measures for prevention of spills of fuel and chemicals and for rapid containment and cleanup (DOE, 1994g).

DOE could minimize water usage during both construction and operation of facilities by instituting water conservation measures such as instructing workers in water conservation (e.g., turn off hoses when not in use), installing flow restrictors, and using self-closing hose nozzles (DOE, 1995g).

Ecological Resources: DOE does not anticipate any impact on wetlands on the Savannah River Site as a result of the spent nuclear fuel program. In any case, it is DOE and the Savannah River Site policy to achieve "no net loss" of wetlands. Pursuant to this goal, DOE has issued a guidance document, "Information for Mitigation Impacts at the Savannah River Site," for project planners that puts forth a practical approach to wetlands protection that begins with avoidance of impacts (if possible), moves to minimization of impacts (if avoidance is impossible), and requires compensatory measures (wetlands restoration, creation, or acquisition) in the event that impacts cannot be avoided (DOE, 1995g).

The analysis indicates that there are no threatened or endangered species or sensitive habitats in the areas considered as representative of potential sites for foreign research reactor spent nuclear fuel activities at the Savannah River Site. However, DOE would perform site-specific predevelopment surveys to ensure that development of new facilities would not impact any of these biological resources (DOE, 1995g).

Noise: DOE anticipates that noise impacts both on and off the Savannah River Site would be minimal. DOE does not foresee noise impacts from the management of foreign research reactor spent nuclear fuel that would warrant mitigation measures beyond those consistent with good construction, engineering, operations, and management practices.

Traffic and Transportation: DOE has a system of onsite buses operating at the Savannah River Site. The Savannah River Site would evaluate the need for upgrades or changes in service that might be required for foreign research reactor spent nuclear fuel management activities and would make changes, as necessary.

DOE would manage changes in traffic volume or patterns during construction through such measures as designating routes for construction vehicles, providing workers with safety reminders, and upgrading onsite police traffic patrols, if necessary.

Occupational and Public Health and Safety: The DOE program for maintaining radiological emissions to levels "as low as reasonably achievable" would minimize any impacts to workers and the public due to atmospheric releases. Likewise, the Site Pollution Prevention Plan and emergency preparedness measures would enhance safety both on and off the Site (DOE, 1995g).

Accidents: The Savannah River Site has in place emergency action plans that would be activated in the case of an accident. These plans contain both onsite provisions (e.g., evacuation plans, response teams, medical and fire response, training and drills, communications equipment) and offsite arrangements (e.g., response plans for medical and fire agencies, coordination with local and State agencies, communication plans). The Savannah River Site plans would be updated to include any new facilities or activities related to spent nuclear fuel management that would involve the Savannah River Site. The execution of the plans in response to an accident would mitigate adverse effects both on the Savannah River Site and in all the surrounding areas (DOE, 1995g).

F.4.2 Idaho National Engineering Laboratory

If the Idaho National Engineering Laboratory is the site to manage all DOE-owned spent nuclear fuel, foreign research reactor spent nuclear fuel would be received and managed at the site until ultimate

disposition. If the Idaho National Engineering Laboratory is not the site to manage DOE-owned spent nuclear fuel, foreign research reactor spent nuclear fuel could be received and managed at the Idaho National Engineering Laboratory until the selected site(s) would be ready to receive the foreign research reactor spent nuclear fuel. The construction of new facilities for managing foreign research reactor spent nuclear fuel is estimated to take about 10 years; this period is referred to as Phase 1. The period following Phase 1 until ultimate disposition is referred to as Phase 2 (approximately 30 years). The amount of spent nuclear fuel that could be received at the Idaho National Engineering Laboratory under the basic implementation of Management Alternative 1 is dictated by the distribution considered in the Programmatic SNF&INEL Final EIS. Accordingly, the Idaho National Engineering Laboratory could receive one-half of the foreign research reactor spent nuclear fuel under the Decentralization and the 1992/1993 Planning Basis alternatives, all of the TRIGA-type foreign research reactor spent nuclear fuel under the Regionalization by Fuel Type alternative, only the foreign research reactor spent nuclear fuel from Western ports under the Regionalization by Geography Alternative, or all foreign research reactor spent nuclear fuel under the Centralization Alternative. As discussed in Section 2.6.4.1, the split of foreign research reactor spent nuclear fuel evenly between the Savannah River Site and the Idaho National Engineering Laboratory under the Decentralization and 1992/1993 Planning Basis alternatives in the Programmatic SNF&INEL Final EIS was not considered to have a practical basis, and was therefore not evaluated in detail.

As a potential Phase 1 site, the Idaho National Engineering Laboratory would receive and manage foreign research reactor spent nuclear fuel at existing dry and wet storage facilities. The existing facilities identified for this purpose would be the FAST facility in CPP-666, the IFSF in CPP-603, and the CPP-749 storage area. Descriptions of these facilities are provided in Appendix F, Section F.3.

The FAST facility is a modern underwater storage facility which has been used in the past for receipt and storage of foreign research reactor spent nuclear fuel. It has the capability to receive and unload spent nuclear fuel casks at a rate of approximately five per week. Storage capacity for up to 8,400 foreign research reactor spent nuclear fuel elements could be provided in a 10-year period by using the spent nuclear fuel storage racks that would be installed. The capability of the FAST facility to receive foreign research reactor spent nuclear fuel in the near term is limited due to the number of activities scheduled through FY 1998. Considering these activities, DOE estimates that 3,600 elements could be received by the end of 1999 at the FAST facility.

The IFSF is a shielded dry storage vault originally constructed for Fort St. Vrain reactor fuel. The storage capacity available is for approximately 9,000 foreign research reactor spent nuclear fuel elements. However, as with the FAST facility, many activities are already scheduled for the facility. Considering these activities, foreign research reactor spent nuclear fuel could not be received until sometime in FY 1997 and could continue at the rate of 50 shipments per year (approximately 1,500 elements) thereafter.

The CPP-749 underground spent nuclear fuel storage area is a dry storage facility with a remote unloading area and vault storage. With some refurbishment it could provide space for 3,600 elements starting in FY 1998 and 7,000 elements after FY 2002. The spent nuclear fuel would go through the IFSF to be placed in baskets and transferred to a compatible storage cask. The refurbishments of existing facilities are part of the ongoing programs at the site to be performed independent of the proposed action in this EIS.

Between these facilities there is sufficient storage space and handling capacity to accommodate the receipt and management of foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory during the Phase 1 period. The storage capacity available and estimated maximum receipt rate

of foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory was shown earlier in Figure F-18.

An additional option to enhance storage capacity during Phase 1 would be to use the existing facilities to unload the transportation casks, and provide storage capacity in dry storage casks which would be placed near the existing facility.

As a Phase 2 site, the Idaho National Engineering Laboratory would continue to receive and manage foreign research reactor spent nuclear fuel at existing facilities until a new dry storage facility becomes operational at the site. Foreign research reactor spent nuclear fuel managed at existing facilities would then be transferred to the new facility where it would remain until ultimate disposition. The new facility would also receive foreign research reactor spent nuclear fuel shipments directly from ports after Phase 1 concluded. Dry storage encompasses both the dry vault design and the dry cask design as described in Section 2.6.5.1.1.

The analysis of environmental impacts from management of foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory is based on the above considerations. The analysis options selected do not represent all possible combinations, but a reasonable set which provides a typical, and in many cases, bounding estimate of the resulting impacts.

The specific analysis options under the basic implementation of Management Alternative 1 are as follows:

2A. The Idaho National Engineering Laboratory would receive foreign research reactor spent nuclear fuel during Phase 1 and manage it at the FAST, the IFSF, and/or the CPP-749 facilities. For the purpose of this analysis, the amount of fuel to be stored is all foreign research reactor spent nuclear fuel that would be received in a 10-year period (17,500 elements). The fuel would be shipped offsite at the end of Phase 1.

2B. Foreign research reactor spent nuclear fuel managed under analysis option 2A would be transferred to a newly constructed dry storage facility where it would be managed until ultimate disposition. Spent nuclear fuel arriving at the United States after Phase 1 concludes would be received and managed at the new dry storage facility until ultimate disposition. For the purpose of this analysis, the amount of spent nuclear fuel that would be stored in the dry storage facility would be all the foreign research reactor spent nuclear fuel eligible under the policy (22,700 elements).

The implementation alternatives of Management Alternative 1 for managing foreign research reactor spent nuclear fuel in the United States, as discussed in Section 2.2.2, introduce additional analysis options that could be considered for the Idaho National Engineering Laboratory as follows:

- Under Implementation Subalternative 1a (Section 2.2.2.1), the amount of spent nuclear fuel to be received in the United States would be reduced to 5,000 elements. In this case, the Idaho National Engineering Laboratory would be likely to receive and manage foreign research reactor spent nuclear fuel in existing facilities during the Phase 1 period. The impacts would be bounded by analysis option 2A above. The dry storage facility considered in analysis option 2B would be sized to accommodate this amount of fuel. The spent nuclear fuel would either be shipped offsite after Phase 1, or it would be managed along with the rest of the spent nuclear fuel that would be managed at the Idaho National Engineering Laboratory.

- Under Implementation Subalternative 1b (Section 2.2.2.1), the Idaho National Engineering Laboratory would receive only HEU from the reactors eligible under the policy. The amount of HEU would be approximately 4.6 MTHM, representing 11,200 elements. The impacts from the storage of this amount of fuel at the Idaho National Engineering Laboratory would be bounded by analysis options 2A and 2B above.

- Under Implementation Subalternative 1c (Section 2.2.2.1), the Idaho National Engineering Laboratory would receive target material in addition to the foreign research reactor spent nuclear fuel considered under the basic implementation of Management Alternative 1. The receipt and management of this material, which represents in uranium content approximately 620 typical foreign research reactor spent nuclear fuel elements, would increase the impacts of analysis options 2A or 2B by a small percentage.

- Under Implementation Subalternative 2a (Section 2.2.2.2), the duration of the policy would be decreased to 5 years and therefore the amount of spent nuclear fuel available for acceptance would also be decreased. The impacts from the management of the decreased amount of spent nuclear fuel at the Idaho National Engineering Laboratory would be bounded by analysis options 2A or 2B above.

- Under Implementation Subalternative 2b, (Section 2.2.2.2), the acceptance of a small portion of the spent nuclear fuel would be extended over an indefinite period of time, but the amount of spent nuclear fuel to be received and managed would remain constant. The impacts would be the same as in analysis options 2A or 2B.

- Under Implementation Alternative 3 (Section 2.2.2.3), DOE and the Department of State would consider alternative financial arrangements. These arrangements would affect the amount of spent nuclear fuel that would be accepted by the United States because the foreign research reactors would consider their own alternatives about whether to send the spent nuclear fuel to the United States. The amount of foreign research reactor spent nuclear fuel in this case cannot be quantified. The upper limit, however, as considered under analysis options 2A or 2B, would be bounding.

- Under Implementation Alternative 4 (Section 2.2.2.4), DOE and the Department of State would consider alternatives for the location where title of the foreign research reactor spent nuclear fuel would be taken. The choices do not affect the impacts at the Idaho National Engineering Laboratory.

- Under Implementation Alternative 5 (Section 2.2.2.5), DOE would consider construction of a new wet storage facility at the Idaho National Engineering Laboratory for Phase 2 until ultimate disposition. The new wet storage facility is described in Section 2.6.5.1.2. For this implementation alternative, an analysis option 2C, which is similar to option 2B, is considered as follows:

2C. The spent nuclear fuel managed under option 2A would be transferred to a newly constructed wet storage facility where it would be managed until ultimate disposition. Spent nuclear fuel arriving in the United States after Phase 1 concludes would be received and managed at the new wet storage facility until ultimate disposition. For the purpose of this analysis, the amount of spent nuclear fuel that would be managed in the wet storage facility would be all the foreign research reactor spent nuclear fuel eligible under the policy (approximately 22,700 elements).

- Under Implementation Alternative 6 (Section 2.2.2.6), DOE and the Department of State would consider chemical separation of foreign research reactor spent nuclear fuel in the United States. As noted in the discussion in Section 2.3.6, chemical separation of both aluminum-based and TRIGA foreign research reactor spent nuclear fuel is evaluated for the Idaho National Engineering Laboratory.

Under Management Alternative 3 (Hybrid Alternative), as discussed in Section 2.4, the Idaho National Engineering Laboratory would receive the foreign research reactor TRIGA spent nuclear fuel. This spent nuclear fuel would be managed at the Idaho National Engineering Laboratory in existing facilities until ultimate disposition. The amount of TRIGA spent nuclear fuel that would be stored is 4,900 elements, 1.0 MTHM, 19 m^3 (670 ft^3).

F.4.2.1 Existing Facilities (Phase 1)

Analysis option 2A utilizes existing facilities for receipt and storage of foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory. The impacts from this analysis option include only those related to operations, specifically: socioeconomics, occupational and public health and safety, utilities and energy, air quality, and waste management. For this analysis, it was assumed that the amount of foreign research reactor spent nuclear fuel to be received at this management site is the maximum and the receipt rate is uniform at approximately 1,800 elements per year.

F.4.2.1.1 Socioeconomics

Potential socioeconomic impacts associated with analysis option 2A would be attributable to staffing requirements at existing facilities (FAST and IFSF). Currently, these facilities are being used to store spent nuclear fuel, so any incremental staffing requirements related to foreign research reactor spent nuclear fuel storage would be insignificant. All personnel required for the operation and support of the existing facilities could be acquired from the current work force at the Idaho National Engineering Laboratory. Use of the current work force would not result in any net socioeconomic impact relative to baseline environmental conditions. In fact, using the current work force would partially compensate for the decline in employment expected from changes in site mission.

F.4.2.1.2 Occupational and Public Health and Safety

Emission-Related Impacts: Doses that could be received by the public during incident-free operation associated with the receipt and management of the foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory would be attributed to emissions of radioactive material that could be carried by wind offsite. The public would be too far from the locations where handling activities or storage would take place to receive any dose from direct exposure. Doses were calculated for the MEI, defined as an individual at the site boundary receiving the maximum exposure, and for the general population within an 80 km (50 mi) radius of the storage facility. These doses would result from incident-free airborne radiological emissions assumed to be released from the unloading of the transportation cask and the storage facility during storage. The methodology and assumptions used for the calculation of the radiological emissions and resulting doses are discussed in Section F.6 of this appendix. Table F-39 summarizes the annual emission-related doses to the public and the associated risks for the MEI and population at the Idaho National Engineering Laboratory. Integrated doses for the duration of a specific period can be obtained by multiplying the annual dose by the number of years in the period.

Table F-39 Annual Public Impacts for Foreign Research Reactor Spent Nuclear Fuel Receipt and Storage in Existing Facilities at the Idaho National Engineering Laboratory (Phase 1)

Facility	MEI Dose (mrem/yr)	MEI Risk (LCF/yr)	Population Dose (person-rem/yr)	Population Risk (LCF/yr)
Receipt/Unloading at:				
• IFSF/CPP-749 (dry storage)	0.00056	2.8×10^{-10}	0.0045	0.0000023
• FAST (wet storage)	0.00038	1.9×10^{-10}	0.0031	0.0000016
Storage at:				
• IFSF/CPP-749 (dry storage)	0	0	0	0
• FAST (wet storage)	3.8×10^{-9}	1.9×10^{-15}	3.1×10^{-8}	1.6×10^{-11}

Handling-Related Impacts: Workers at the site would receive radiation doses during handling operations (i.e., receiving and unloading the transportation cask), transferring the spent nuclear fuel from one facility to another, or preparing the spent nuclear fuel for shipment offsite. Analysis option 2A involves the receipt of 644 shipments of foreign research reactor spent nuclear fuel into existing storage facilities (IFSF/CPP-749 and FAST) during Phase 1, and the preparation of 161 transportation casks for shipment at the end of Phase 1. It was assumed that at the end of a 10-year period, the foreign research reactor spent nuclear fuel would have decayed sufficiently to be accommodated in larger capacity transportation casks, such as those currently used in the United States for commercial spent nuclear fuel. For the purpose of the analysis, the transportation casks used for intrasite shipping are assumed to have a capacity four times as large as the capacity of the transportation casks used for the marine transport of the foreign research reactor spent nuclear fuel to the United States. Calculations were performed for both dry and wet existing storage facilities. The assumptions and methodologies used to calculate the doses to a working crew associated with the handling activities of the foreign research reactor spent nuclear fuel are described in Section F.5 of this appendix.

The collective doses that would be received by the members of the working crew and the associated risk were calculated for Phase 1 operations. The worker MEI doses and risks were not calculated because of the large uncertainties associated with the assumptions for such calculations. However, the upper bound for such a dose would be equal to the administrative or regulatory limit at the site. For DOE radiation workers, the regulatory limit is 5,000 mrem per year. All these workers would be monitored and if any worker's dose approached this limit, he or she would be rotated into a different job to prevent further exposure. This regulatory limit provides a very conservative upper bound on the radiation dose for the worker MEI. If a single worker received the full 5,000 mrem per year dose for the full 13 years of potential foreign research reactor spent nuclear fuel receipt, then the MEI dose would be 65,000 mrem. For this dose, the associated risk of incurring an LCF would be 2.6 percent. The collective dose to the workers handling the transportation casks is 257 person-rem at the dry storage facilities and 250 person-rem at the wet storage facilities. The associated risk of incurring an LCF is 0.10.

F.4.2.1.3 Material, Utility, and Energy Requirements

The material, utility, and energy requirements at the FAST and IFSF are typical of those for wet storage and dry storage, respectively. They are discussed in more detail in Sections F.4.2.2.1.12 and F.4.2.2.2.12. Table F-40 summarizes the estimated annual requirements for these technologies.

Table F-40 Annual Utility and Energy Requirements for Foreign Research Reactor Spent Nuclear Fuel Storage at Existing Facilities at the Idaho National Engineering Laboratory (Phase 1)

Commodity	Baseline Site Usage	FAST	IFSF	Percent Increase
Electricity (MW-hr/year)	208,000	1,490	1,490	0.72 percent
Water (l/year)	6,500,000,000	1.93 million	2.12 million	0.033 percent
Fuel (l/year)	11,123,400	0	0	0 percent

The requirements for all storage options represent a small percentage of current requirements. No new generation or treatment facilities would be necessary. Increases in the Idaho National Engineering Laboratory fuel consumption would be minimal because overall activity would not increase due to changes in the Idaho National Engineering Laboratory mission and the general reduction in employment levels. The overall impacts of any of the storage options at the Idaho National Engineering Laboratory on materials, utilities, and energy resources would be minimal.

The existing capacities and distribution systems at the Idaho National Engineering Laboratory for electricity, steam, water, and domestic wastewater treatment are adequate to support the receipt and storage of foreign research reactor spent nuclear fuel for all storage options.

Some of the electric power at the Idaho National Engineering Laboratory is generated onsite, and the remainder is provided by the Idaho Power Company. The Utah Power and Light Company Antelope Substation, which is located on the Idaho National Engineering Laboratory, connects to the Scoville Substation, from which electricity is distributed to various facilities over a 138-kilovolt loop at the Idaho National Engineering Laboratory.

All water supplies for the Idaho National Engineering Laboratory are obtained from the Snake River Plain aquifer through wells. Pumping totals approximately 7 million m^3 per year (1.8 billion gallons per year). ICPP has a coal-fired steam system. Natural gas is not used at the Idaho National Engineering Laboratory.

F.4.2.1.4 Waste Management

Waste production associated with the operation of the FAST and IFSF facilities is characteristic to wet and dry storage, respectively, and is discussed in detail in Sections F.4.2.2.1.13 and F.4.2.2.2.13.

F.4.2.1.5 Air Quality

Nonradiological Emissions: It is expected that the ambient concentration levels from incident-free operation of existing facilities would not change from baseline concentrations due to the addition of foreign research reactor spent nuclear fuel. The baseline ambient concentrations are given in Table F-41. They are all below applicable standards and guidelines.

Radiological Emissions: Radiological emissions from the receipt and storage of foreign research reactor spent nuclear fuel in the existing facilities at the Idaho National Engineering Laboratory are discussed in Section F.4.2.1.2.

F.4.2.1.6 Water Resources

The use of FAST and ISFS facilities for the interim storage of foreign research reactor spent nuclear fuel would not change the current levels of water and usage of these facilities. Nor would it change thermal discharges from cooling water or the quantity or quality of radioactive and nonradioactive wastewater effluents.

Table F-41 Maximum Impacts to Nonradiological Air Quality from Spent Nuclear Fuel[a,b] at Existing Facilities at the Idaho National Engineering Laboratory (Phase 1)

Pollutant	Averaging Time	Applicable Standard ($\mu g/m^3$)[c]	Maximum Baseline Concentration ($\mu g/m^3$)	Baseline plus Foreign Research Reactor Spent Nuclear Fuel ($\mu g/m^3$)	Percent of Standard
Criteria pollutants					
• Carbon Monoxide	1-hr	40,000	1,200	1,200	3.8
• Nitrogen Dioxide	Annual	100	14.1	14.1	14.1
• Lead	Quarterly	1.5	0.002	0.002	0.1
• Particulate Matter (PM_{10})	24-hr	150	112	112	75
	Annual	50	19	19	38
• Sulfur dioxide	3-hr	1,300	534	534	41.1
	24-hr	365	238	238	65.3
	Annual	80	4.2	4.2	5.3
Other pollutants mandated by Idaho					
• Total Suspended Particulates	24-hr	150	120[d]	120	80
	Annual	60	45	45	75
• Fluorides	Monthly	62,168	0	0	0
	Bimonthly	46,626	0	0	0
	Annual	31,084	0	0	0
Hazardous/toxic air pollutants (carcinogens)					
• Ammonia Hydroxide	8-hr	180	0.33	36	20
• Benzene	Annual	12	0.029	0.029	16
• Formaldehyde	Annual	770	0.012	0.012	16
• Hexone	8-hr	2,100	0	0	0
• Hydrofluoric Acid	8-hr	25	0	0	0
• Tributylphosphate	8-hr	25	0	0	0

[a] *Source: (DOE, 1995g).*

[b] *Listed concentrations are the maximum of those calculated at the Idaho National Engineering Laboratory site boundary, public access roads inside the Idaho National Engineering Laboratory site boundary, and the Craters of the Moon National Monument.*

[c] *To convert to $\mu g/ft^3$, multiply by 0.0283.*

[d] *The background concentration for the 24-hour standard is the same as the background for annual average concentration.*

Interim storage of foreign research reactor spent nuclear fuel in existing facilities would not affect the quality of water resources because it would be stored in contained storage pools or above-grade and below-grade dry storage containers isolated from the environment.

With respect to accident conditions, the Programmatic SNF&INEL Final EIS concluded that on the basis of a bounding accident scenario for high-level waste tank failure, accidental leakage would cause negligible impacts to water resources (DOE, 1995g).

F.4.2.2 New Facilities (Phase 2)

Analysis options 2B and 2C involve the use of new facilities. The environmental impacts analyzed relate to the construction and operation of these new facilities. The impacts include: land use; socioeconomics; cultural resources; aesthetic and scenic resources; geology; air and water quality; ecology; noise; traffic and transportation; occupational and public health and safety; materials, utilities and energy; and waste management.

The impacts are presented in terms of storage technologies: dry storage in Sections F.4.2.2.1 and wet storage in Section F.4.2.2.2. Accident analysis, which is associated primarily with the storage technology rather than specific facilities, is presented in Section F.4.2.3.

F.4.2.2.1 Dry Storage

Analysis option 2B is associated with dry storage of foreign research reactor spent nuclear fuel in new facilities. This analysis option would require the construction of a new dry storage facility at the Idaho National Engineering Laboratory. The dry storage option encompasses both the dry vault design and the dry cask design as described in Section 2.6.5 of this EIS and earlier in this appendix. There are no environmental impact parameters that would discriminate between the two designs. For the purpose of this analysis, the impacts from the larger dry vault design are presented.

F.4.2.2.1.1 Land Use

A new dry storage facility could be located in one of several developed areas, including the ICPP. These areas, which have already been developed for industrial use, occupy about 4,560 ha (11,400 acres). Construction activities, including laydown areas, would disturb 3.7 ha (9 acres) of land. This represents about 0.06 percent of the developed space at these areas. A new dry storage facility would occupy 5,000 m^2 (54,000 ft^2) of land and would move 11,000 m^3 (14,400 yd^3) of soil. Neither construction nor operation of a new dry storage facility at any of the areas would significantly impact land use patterns on the Idaho National Engineering Laboratory.

F.4.2.2.1.2 Socioeconomics

As discussed in Section F.3.1.1 the total capital cost of a new dry storage facility is estimated to be $370 million. Construction activities are projected to take 4 years. Assuming that the capital cost is evenly distributed over this 4-year period, the annual expenditures would be about $92.5 million. This represents approximately 15.4 percent of the estimated FY 1995 total expenditures for the Idaho National Engineering Laboratory (600 million). The relative socioeconomic impact from annual construction expenditures on the region of influence would be positive. The annual operations costs of a new dry storage facility are estimated to be $15.6 million for receipt and handling and $0.6 million for storage. These costs represent approximately 2.6 percent and 0.1 percent of FY 1995 total expenditures for the Idaho National Engineering Laboratory. The relative socioeconomic impact from annual operation expenditures on the region of influence would be small.

Direct employment associated with construction of a new dry storage facility is estimated to be 190 persons. The relative socioeconomic impact from direct and secondary construction employment on the region of influence would be negligible. In addition, when compared to the projected FY 1995 work force at the Idaho National Engineering Laboratory of approximately 11,600 persons, the relative socioeconomic impact of this temporary increase in construction employment would be insignificant. Direct employment associated with receipt and storage operations is estimated to be 30 persons. Upon completion of these activities, direct employment is expected to decrease to 8 persons. The relative socioeconomic impact of this increase in operations employment would be insignificant to both the region of influence and the Idaho National Engineering Laboratory.

F.4.2.2.1.3 Cultural Resources

No direct impacts on any cultural resources would be expected from the construction and operation of a new dry storage facility. Surveys of previously disturbed areas at the Idaho National Engineering Laboratory found no eligible cultural resources. Native American treaty rights that would affect any future land use on the Idaho National Engineering Laboratory would not be impacted (DOE, 1995g). Because activities associated with spent nuclear fuel management would take place within existing facility areas currently engaged in similar activities, DOE does not expect any impacts to important Native American resources from alteration of the visual setting or noise associated with the construction or operation of any new facilities. DOE has developed plans to be in full compliance with cultural resource laws (DOE, 1995g).

F.4.2.2.1.4 Aesthetic and Scenic Resources

Construction and operation of a new dry storage facility would not adversely impact aesthetic or scenic resources. A new dry storage facility would not be visible from any onsite or offsite public access roads. Potential soil erosion and dust generation associated with construction-related activities would be controlled by the implementation of best-management practices. Any visibility impacts from fugitive dust generation by construction-related activities should be insignificant and short term. Facility operations associated with the dry storage of foreign research reactor spent nuclear fuel should not generate any atmospheric emissions which would reduce area visibility (DOE, 1995g).

F.4.2.2.1.5 Geology

There are no unique geologic features or minerals of economic value on the Idaho National Engineering Laboratory that would be adversely impacted by site development. Construction of a new dry storage facility would result in localized impacts to surficial soils, and would necessitate the clearing and grading of 3.7 ha (9 acres). Site preparation, land shaping, and grading activities associated with construction would present a slight to moderate erosion hazard, but would be controlled and minimized by implementing best-management practices. The operation of the new dry storage facility would have no effect on the geologic characteristics at the site.

F.4.2.2.1.6 Air Quality

Nonradiological Emissions: Potential impacts from construction activities at the Idaho National Engineering Laboratory would include fugitive dust from construction activities (e.g., clearing of land, grading, road preparation) and vehicle emissions from the heavy equipment utilized during the construction phase of the project. Construction of a new dry fuel storage facility would be located near the center of the Idaho National Engineering Laboratory. The construction of this facility would require disturbance of approximately 3.7 ha (9 acres) of land. However, the overall construction impacts to the ambient air quality of the region should be minimal due to the short duration (3 months to 6 years). As outlined in Table F-42, the ambient air quality impacts associated with construction-related activities would be minimal and the Idaho National Engineering Laboratory compliance with Federal and State ambient air quality standards would not be adversely affected. Therefore, construction activities would not be expected to have any detrimental effect on the health and safety of the general population.

Table F-42 Estimated Maximum Concentrations of Criteria Pollutants at the Idaho National Engineering Laboratory Attributable to New Dry Storage Construction

Pollutant	Averaging Time	Ambient Standard[a]	Baseline Concentration	Construction Activities
Idaho National Engineering Laboratory Boundary ($\mu g/m^3$)[b]				
• Particulate Matter (PM_{10})	24-hr	150	112	0.0274
	Annual	50	19	0.0014
• Carbon Monoxide	1-hr	40,000	1,200	2.42
	8-hr	10,000	340	0.97
• Sulfur Dioxide	3-hr	1,300	534	0.397
	24-hr	365	238	0.085
	Annual	80	4.2	0.004
• Nitrogen Dioxide	Annual	100	14.1	0.068
Public Roads Boundary ($\mu g/m^3$)				
• Particulate Matter (PM_{10})	24-hr	150	112	0.0050
	Annual	50	19	0.0006
• Carbon Monoxide	1-hr	40,000	1,200	6.69
	8-hr	10,000	340	1.28
• Sulfur Dioxide	3-hr	1,300	534	0.727
	24-hr	365	238	0.117
• Nitrogen Dioxide	Annual	100	14.1	0.211
Craters of the Moon Boundary ($\mu g/m^3$)				
• Particulate Matter (PM_{10})	24-hr	150	112	0.00037
	Annual	50	19	0.00003
• Carbon Monoxide	1-hr	40,000	1,200	0.61
	8-hr	10,000	340	0.08
• Sulfur Dioxide	3-hr	1,300	534	0.054
	24-hr	365	238	0.009
	Annual	80	4.2	0.0006
• Nitrogen Dioxide	Annual	100	14.1	0.009

[a] *Source: DOE, 1995g.*

[b] *To convert to $\mu g/ft^3$, multiply by 0.0283.*

No nonradiological air emissions would be expected during operation of a new dry storage facility. Any emissions would be directly attributable to front-end wet storage activities only.

Radiological Emissions: No radiological emissions would be produced during construction of a new dry storage facility.

Based on fuel drying and storage operations conducted at the Idaho National Engineering Laboratory, potential atmospheric releases from the spent nuclear fuel storage facility would consist of minor amounts of particulate radioactive material and larger amounts of gaseous fission products that could escape from the fuel through cladding defects. The majority of radioactive material responsible for fuel and cask internal surface contamination consists of activation products that plate out on the spent nuclear fuel assemblies during reactor operation. This material is dependent on corrosion of structural materials and generally consists of radionuclides, such as ^{58}Co, ^{60}Co, ^{59}Fe, etc. This contamination activity would have to be controlled during the cask opening and fuel handling operations to prevent internal personnel exposures. Proper facility ventilation (designed to provide airflow from areas of low contamination to progressively higher contamination) would help provide contamination control. High-efficiency

particulate air filters in the facility exhaust would reduce the airborne effluent quantities of this particulate material to quantities that are well within the prescribed limits.

Cask opening and fuel drying operations may also be responsible for the release of significant amounts of ^{3}H, ^{85}Kr, and minor amounts of ^{129}I. The amounts of these radionuclides released during the cask opening operation depends on the following parameters: (1) the number of spent nuclear fuel clad defects, (2) the spent nuclear fuel material and the diffusion rate of these radionuclides through the fuel matrix for the fuel temperature while in the cask, and (3) the time that the spent nuclear fuel is contained within the cask before opening.

Similarly, for fuel drying operations, the temperature of the drying gas (as well as the parameters discussed above) would cause quantities of ^{3}H, ^{85}Kr, and ^{129}I to be released from the fuel. Charcoal or silver zeolite filters could be used to remove the ^{129}I from the exhaust, but the ^{3}H and ^{85}Kr, being gases, or in a gaseous state for the case of tritiated water, would be exhausted to the atmosphere. During spent nuclear fuel storage, small amounts of the gaseous/volatile radionuclides are expected to be released to the environment based on the fuel matrix, clad defects, and storage temperature. Release rates would decrease with storage time due to radioactive decay. It is anticipated that the fuel drying operation would be responsible for the most significant release of these gaseous/volatile radionuclides to the environment.

For this analysis, radiological emissions from the operation of a new dry storage facility for foreign research reactor spent nuclear fuel were calculated based on the methodology and assumptions described in Section F.6. The radiological consequences of air emissions from dry storage operation at the Idaho National Engineering Laboratory are discussed in Section F.4.2.2.1.11. The annual emission releases from the dry storage facility during receipt and unloading and storage are provided in Section F.6.6.1.

F.4.2.2.1.7 Water Resources

The water usage during construction of a new dry storage facility is estimated to be about 7.75 million l (2 million gal). During operations, annual water consumption would be 2.1 million l (550,000 gal) for receipt and handling and 0.4 million l (109,000 gal) for storage. With an annual average water usage of approximately 6,500 million l (1,717 million gal) for the Idaho National Engineering Laboratory, these amounts represent approximately a 0.03 percent increase in annual water usage. Therefore, a new dry storage facility would have minimal impact on water resources at the Idaho National Engineering Laboratory.

Best-management practices during construction would prevent sediment runoff or spills of fuels or chemicals. Therefore, construction activities should have no impact on water quality at the Idaho National Engineering Laboratory. The impact on water quality during operations would also be negligible. Existing water treatment facilities at the Idaho National Engineering Laboratory could accommodate any new domestic and process wastewater streams from a new dry storage facility. The expected total flow volumes at the Idaho National Engineering Laboratory would still be well within the design capacities of treatment systems at the Idaho National Engineering Laboratory. A new dry storage facility would meet National Pollutant Discharge Elimination System limits and reporting requirements, so no impact on the water quality of receiving streams is expected.

F.4.2.2.1.8 Ecology

Terrestrial Resources: DOE expects that construction impacts, which would include the loss of some wildlife habitat due to land clearing and facility development, would be greatest under the Regionalization and Centralization Alternatives under the Programmatic SNF&INEL Final EIS at the Idaho National Engineering Laboratory. Construction impacts from foreign research reactor spent nuclear fuel storage would not be significant because the construction activity would take place either within the boundaries of heavily developed areas or adjacent to those areas. However, construction activities could provide opportunities for the spread of exotic plant species, such as cheatgrass and Russian thistle (DOE, 1995g).

Wetlands: There would be no construction impacts to wetlands, which would be excluded from development, and impacts to threatened and endangered species would be unlikely given the location of previously-developed areas and the maximum size of the affected area of 3.7 ha (9 acres). Construction activities at the Idaho National Engineering Laboratory probably would not affect either of the endangered species found onsite (e.g., bald eagle and peregrine falcon). Both of these birds of prey are associated with riparian areas, wetlands, and larger bodies of water (e.g., reservoirs) and inhabit dry upland areas only temporarily when migrating. Disturbance to other sensitive (but not Federally-listed) species (e.g., the burrowing owl, northern goshawk, ferruginous hawk, Swainson's hawk, gyrfalcon, Townsend's western big-eared bat, and pygmy rabbit) would be possible but unlikely given the scale of the planned construction. Any impacts would be negligible and would last only as long as construction activities continue (DOE, 1995g).

Threatened and Endangered Species: Representative impacts from operations would include the disturbance and displacement of animals (such as the pronghorn antelope) caused by the movement and noise of personnel, equipment, and vehicles. Such impacts would be greatest under the Regionalization by Fuel Type and Geography, and Centralization Alternatives under the Programmatic SNF&INEL Final EIS at the Idaho National Engineering Laboratory, which would involve a generally higher level of operational activity; however, these impacts would be minor (DOE, 1995g). DOE has completed consultations with the U.S. Fish and Wildlife Service regarding threatened and endangered species for the potential construction site of foreign research reactor spent nuclear fuel storage facilities at the Idaho National Engineering Laboratory, as required by the Endangered Species Act. Letters regarding consultation under the Endangered Species Act are included in Volume 2, Appendix B of the Programmatic SNF&INEL Final EIS (DOE, 1995g).

F.4.2.2.1.9 Noise

Noise generated onsite by construction or operation of a new dry storage facility should not adversely affect the public or the Idaho National Engineering Laboratory environment. Noise generated by construction would be site-specific and short lived. A limited number of new construction jobs would be generated, but the resulting temporary increase in worker and truck traffic is expected to be insignificant within the context of existing site traffic loads. Noise generated by operation would not significantly impact the environment because the facility would be located adjacent to previously developed, industrialized areas. Rail shipments of foreign research reactor spent nuclear fuel would be a small fraction of the rail traffic on the Blackfoot-to-Arco Branch of the Union Pacific System line that crosses the Idaho National Engineering Laboratory. There may be a slight increase in truck traffic to and from the potential storage site, but it is not expected to result in a perceptible increase in traffic noise or any change in community reaction to noise along the major access routes to the Idaho National Engineering Laboratory (DOE, 1995g).

F.4.2.2.1.10 Traffic and Transportation

Construction materials, wastes, and excavated materials would be transported both onsite and offsite. These activities would result in increases in operation of personal-use vehicles by commuting construction workers, commercial truck traffic, and in traffic associated with the daily operations of the Idaho National Engineering Laboratory. Again, traffic congestion would not be a significant problem.

Traffic due to operations of a new dry storage facility would not increase site levels because the required workers would be drawn from the existing Idaho National Engineering Laboratory labor force.

F.4.2.2.1.11 Occupational and Public Health and Safety

Emissions-Related Impacts: Doses that could be received by the public during incident-free operation associated with the receipt and management of the foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory would be attributed to emissions of radioactive material that could be carried by the wind offsite. The general public would be too far from the locations where handling or storage take place to receive any dose from direct exposure. Doses were calculated for the MEI, defined as an individual at the site boundary receiving the maximum exposure, and for the general population within an 80 km (50 mi) radius of the storage facility. These doses would result from incident-free airborne radiological emissions assumed to be released from the unloading of the transportation cask and the storage facility during storage. The methodology and assumptions used for the calculation of the radiological emissions and resulting doses are discussed in Section F.5 of this appendix. Table F-43 summarizes the annual emission-related doses to the public and the associated risks for the MEI and population at the Idaho National Engineering Laboratory. Integrated doses for the duration of a specific period can be obtained by multiplying the annual dose by the number of years in the period.

Table F-43 Annual Public Impacts for Foreign Research Reactor Spent Nuclear Fuel Receipt and Storage at the Idaho National Engineering Laboratory (New Dry Storage)

Facility	*MEI Dose (mrem/yr)*	*MEI Risk (LCF/yr)*	*Population Dose (person-rem/yr)*	*Population Risk (LCF/yr)*
Receipt/Unloading at: • New Dry Storage Facility[a]	0.00056	2.8×10^{-10}	0.0045	0.0000023
Storage at: • New Dry Storage Facility	0	0	0	0

[a] *The doses for this new dry storage facility are assumed to be equal to those for IFSF/CPP-749.*

Handling-Related Impacts: Workers at the site would receive radiation doses during handling operations (i.e., receiving and unloading the transportation cask), transferring the spent nuclear fuel from one facility to another, or preparing the spent nuclear fuel for shipment offsite. Analysis option 2B involves the receipt of 644 shipments of foreign research reactor spent nuclear fuel into the existing dry and wet storage facilities (IFSF/CPP-749 and FAST) during Phase 1, the preparation of 161 transportation casks for shipment to a dry storage facility at the end of Phase 1, and the receipt of 193 shipments of foreign research reactor spent nuclear fuel at the new dry storage facility after Phase 1 operations. It was assumed that at the end of a 10-year period, the foreign research reactor spent nuclear fuel would have decayed sufficiently to be accommodated in larger capacity transportation casks, such as those currently used in the United States for commercial spent nuclear fuel. For the purpose of this analysis, the transportation casks used for intrasite shipping are assumed to have a capacity four times as large as the capacity of the

transportation casks used for the marine transport of the foreign research reactor spent nuclear fuel to the United States. Collective doses were calculated for both dry storage designs, the vault and the dry cask. The assumptions and methodology used to calculate the doses are described in Section F.5 of this appendix.

Table F-44 presents the doses that would be received by the members of the working crew and the associated risk if that working crew handled the total number of transportation casks at the Idaho National Engineering Laboratory. The worker MEI doses and risks were not calculated because of the large uncertainties associated with the assumptions for such calculations. However, the upper bound for such a dose would be equal to the administrative or regulatory limit at the site. For DOE radiation workers, the regulatory limit is 5,000 mrem per year. All these workers would be monitored and if any worker's dose approached this limit, he or she would be rotated into a different job to prevent further exposure. This regulatory limit provides a very conservative upper bound on the radiation dose for the worker MEI. If a single worker received the full 5,000 mrem per year dose for the full 13 years of potential foreign research reactor spent nuclear fuel receipt, then the MEI dose would be 65,000 mrem. For this dose, the associated risk of incurring an LCF would be 2.6 percent.

Table F-44 Handling-Related Impacts to Workers at the Idaho National Engineering Laboratory (New Dry Storage)

	Worker Population Dose (person-rem)		*Worker Population Risk (LCF)*	
	New Dry Storage Cask	*New Dry Storage Vault*	*New Dry Storage Cask*	*New Dry Storage Vault*
Phases 1 and 2[a]	424	370	0.17	0.15
Phases 1 and 2[b]	416	363	0.17	0.15

[a] *Phase 1 at IFSF/CPP-749*

[b] *Phase 1 at FAST*

F.4.2.2.1.12 Material, Utility, and Energy Requirements

Construction of a new dry storage facility at the Idaho National Engineering Laboratory would consume 21,800 m^3 (28,500 yd^3) of concrete and 5,200 metric tons (5,750 tons) of steel. The total energy and water requirements during construction are estimated to be 835,000 l (221,000 gal) for fuel, and 7.75 million l (2 million gal) for water. The annual utility and energy requirements during operations are shown in Table F-45. These requirements represent a small percent of current requirements for the Idaho National Engineering Laboratory. No new generation or treatment facilities would be necessary, and connections to existing networks would require only short tie-in lines. Increases in consumption would be minimal because overall activity on the Idaho National Engineering Laboratory is expected to decrease because of changes in site mission and a general reduction in employment.

Table F-45 Annual Utility and Energy Requirements for New Dry Storage at the Idaho National Engineering Laboratory

Commodity	*Baseline Site Usage*	*Dry Storage Usage*	*Percent Increase*
Electricity (MW-hr/yr)	208,000	800 - 1,000	0.48 percent
Fuel (l/yr)	11,123,400	0	0 percent
Water (l/yr)	6,500,000,000	1,590,000[a] 400,000[b]	0.025 percent[a] 0.006 percent[b]

[a] *During receipt and handling*

[b] *During storage*

F.4.2.2.1.13 Waste Management

Construction of a new dry storage facility at the Idaho National Engineering Laboratory would generate 1,800 m^3 (2,400 yd^3) of debris. The annual quantities of waste generated during operations are shown in Table F-46. These quantities represent a very small percent increase above current levels at the Idaho National Engineering Laboratory. Existing waste management storage and disposal activities at the Idaho National Engineering Laboratory could accommodate the waste generated by a new dry storage facility. Therefore, the impact of this waste on existing Idaho National Engineering Laboratory waste management capacities would be minimal.

Table F-46 Annual Waste Generated for New Dry Storage at the Idaho National Engineering Laboratory

Waste Form	*Baseline Site Generation*	*Dry Storage Generation*	*Percent Increase*
High-Level (m^3/yr)	750	none	0 percent
Transuranic (m^3/yr)	712	none	0 percent
Solid Low-Level (m^3/yr)	4,795	22[a] 1[b]	0.5 percent[a] 0.02 percent[b]
Wastewater (l/yr)	540,000,000	1,590,000[a] 400,000[b]	0.29 percent[a] 0.074 percent[b]

[a] *During receipt and handling*

[b] *During storage*

F.4.2.2.2 Wet Storage

Analysis option 2C involves long-term wet storage of foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory. This analysis option would require the construction of a new wet storage facility at the site (Implementation Alternative 5 of Management Alternative 1).

F.4.2.2.2.1 Land Use

A new wet storage facility could be located in one of several developed areas, including the ICPP. These areas, which have already been developed for industrial use, occupy about 4,560 ha (11,400 acres). Construction activities, including laydown areas, would disturb 2.8 ha (7 acres) of land. This represents about 0.06 percent of the developed space at these areas. A new wet storage facility would occupy 3,800 m^2 (41,000 ft^2) of land and would move 18,000 m^3 (24,000 yd^3) of soil. Neither construction nor operation of a new wet storage facility at any of the areas would significantly impact land use patterns on the Idaho National Engineering Laboratory.

F.4.2.2.2.2 Socioeconomics

As discussed in Section F.3.2 the total capital cost of a new wet storage facility is estimated to be $449 million. Construction activities are projected to take 4 years. Assuming that the capital cost is evenly distributed over this 4-year period, the annual expenditures would be about $112.2 million. This represents approximately 18.7 percent of the estimated FY 1995 total expenditures for the Idaho National Engineering Laboratory (600 million). The relative socioeconomic impact from annual construction expenditures on the region of influence would be positive. The annual operations costs of a new wet storage facility are estimated to be $23.3 million for receipt and handling and $3.5 million for storage.

These costs represent about 3.8 percent and 0.6 percent of FY 1995 total expenditures for the Idaho National Engineering Laboratory. The relative socioeconomic impact from annual operation expenditures on the region of influence would be small.

Direct employment associated with construction of a new wet storage facility is estimated to be 157 persons. The relative socioeconomic impact from direct construction employment on the region of influence would be small. In addition, when compared to the projected FY 1995 work force at the Idaho National Engineering Laboratory of approximately 11,600 persons, the relative socioeconomic impact of this temporary increase in construction employment would be insignificant. Direct employment associated with operations of a new wet storage facility is estimated to be 30 persons. The relative socioeconomic impact of this increase in operations employment would be small to both the region of influence and the Idaho National Engineering Laboratory.

F.4.2.2.2.3 Cultural Resources

Impacts to cultural resources would be the same as for new dry storage (Section F.4.2.2.1.3).

F.4.2.2.2.4 Aesthetic and Scenic Resources

Impacts to aesthetic and scenic resources would be the same as for new dry storage (Section F.4.2.2.1.4).

F.4.2.2.2.5 Geology

Impacts to geology would be the same as for new dry storage (Section F.4.2.2.1.5).

F.4.2.2.2.6 Air Quality

Nonradiological Emissions: Construction of a new wet storage facility would necessitate the clearing and grading of approximately 3 ha (7 acres) of land. In comparison, approximately 4 ha (10 acres) of land would be disturbed by new dry storage construction. Therefore, air quality impacts associated with wet storage construction would be bound by those associated with dry storage construction, as presented in Section F.4.2.2.1.6.

No nonradiological emissions from the operation of the new wet storage facility are expected.

Radiological Emissions: Incident-free airborne releases from the new wet storage facility would be limited to radioactive noble gases and some radioactive iodine which could be released from the stored fuel prior to canning. The airborne materials released to the building atmosphere during incident-free operations would be filtered by the building heating and ventilation system. Radioactive and nonradioactive effluent gases would be routed through double-banked high-efficiency particulate air filters prior to release to the environment through an exhaust air system. The high-efficiency particulate air filter would have a minimum efficiency of 99.97 percent for 0.3-micron diameter particulates and would allow in-place dioctyl phthalate testing.

The new wet storage facility would discharge all ventilated gas, except truck exhaust, to the facility's exhaust system. Truck exhaust would be discharged directly to the environment during cask off-loading operations in the truck receiving area. The exhaust air system would employ a detector to monitor ^{137}Cs.

For other building areas which would be sources of airborne radioactive contamination, the heating, ventilation, and air conditioning system would be designed to maintain airflow from areas of low potential contamination into areas of higher potential contamination. These airborne effluents would be required to be below the radioactivity concentration guides listed in DOE Order 5480.1B for both onsite and offsite concentrations (DOE, 1989b).

Air emissions from the new wet storage facility are expected to be similar to the air emissions from the IFSF at the Idaho National Engineering Laboratory. The annual air emission level for the IFSF was designed to result in ground-level concentrations of less than 0.003 percent of DOE Order 5480.1B limits for uncontrolled areas.

Radiological emissions from the operation of the new wet storage facility were calculated based on the methodology and assumptions used in Appendix F, Section F.6. The annual emission releases from the wet storage facility during the receipt and unloading, and storage are provided in Section F.6.6.1.

No radiological emissions would be produced during construction of a new wet storage facility.

F.4.2.2.2.7 Water Resources

The annual water usage during construction and operation of a new wet storage facility is estimated to be about 1.9 million l (502,000 gal) and 2.7 million l (0.72 million gal), respectively. With an annual average water usage of approximately 6,500 million l (1,717 million gal) for the Idaho National Engineering Laboratory, these amounts represent an increase of about 0.03 percent and less than 0.04 percent, respectively. Therefore, a new wet storage facility would have minimal impact on water resources at the Idaho National Engineering Laboratory.

Best-management practices during construction would prevent sediment runoff or spills of fuels or chemicals. Therefore, construction activities should have no impact on water quality at the Idaho National Engineering Laboratory. The impact on water quality during operations would also be negligible. Existing water treatment facilities at the Idaho National Engineering Laboratory could accommodate any new domestic and process wastewater streams from a new wet storage facility. The expected total flow volumes at the Idaho National Engineering Laboratory would still be well within the design capacities of treatment systems at the Idaho National Engineering Laboratory. A new wet storage facility would meet National Pollutant Discharge Elimination System limits and reporting requirements, so no impact on the water quality of receiving streams is expected.

F.4.2.2.2.8 Ecology

Impacts to ecology would be the same as for new dry storage (Section F.4.2.2.1.8).

F.4.2.2.2.9 Noise

Impacts from noise would be the same as for new dry storage (Section F.4.2.2.1.9).

F.4.2.2.2.10 Traffic and Transportation

Impacts from traffic and transportation would be the same as for new dry storage (Section F.4.2.2.1.10).

F.4.2.2.2.11 Occupational and Public Health and Safety

Emission-Related Impacts: Doses that could be received by the public during incident-free operation associated with the receipt and management of the foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory would be attributed to emissions of radioactive material that could be carried by wind offsite. The public would be too far from the locations where handling activities and storage take place to receive any dose from direct exposure. Doses were calculated for the MEI, defined as an individual at the site boundary receiving the maximum exposure, and for the general population within an 80 km (50 mi) radius of the storage facility. These doses would result from incident-free airborne radiological emissions assumed to be released from the unloading of the transportation cask and the storage facility during storage. The methodology and assumptions used for the calculation of the radiological emissions and resulting doses are discussed in Section F.6 of this appendix. Table F-47 summarizes the annual emission-related doses to the public and the associated risks for the MEI and population at the Idaho National Engineering Laboratory for wet storage. Integrated doses for the duration of a specific implementation period can be obtained by multiplying the annual dose by the number of years in the period.

Table F-47 Annual Public Impacts for Receipt and Storage of Foreign Research Reactor Spent Nuclear Fuel at the Idaho National Engineering Laboratory (Implementation Alternative 5 of Management Alternative 1)

Facility	MEI Dose (mrem/yr)	Risk (LCF/yr)	Population Dose (person-rem/yr)	Population Risk (LCF/yr)
Receipt/Unloading at • New Wet Storage Facility	0.00038	1.9×10^{-10}	0.0031	0.0000016
Storage at: • New Wet Storage Facility	3.8×10^{-9}	1.9×10^{-15}	3.1×10^{-8}	1.6×10^{-11}

Handling-Related Impacts: Workers at the site would receive radiation doses during handling operations (i.e., receiving and unloading the transportation cask), transferring the foreign research reactor spent nuclear fuel from one facility to another, or preparing the foreign research reactor spent nuclear fuel for shipment offsite. Analysis option 2C involves the receipt of 644 shipments of foreign research reactor spent nuclear fuel into the existing facilities (IFSF/CPP-749 and FAST) during Phase 1, the preparation of 161 transportation casks for shipment to a wet storage facility at the end of Phase 1, and the receipt of 193 shipments directly from the ports into the new wet storage facility after Phase 1 operations. It was assumed that at the end of a 10-year period, the foreign research reactor spent nuclear fuel would have decayed sufficiently to be accommodated in larger capacity transportation casks, such as those currently used in the United States for commercial spent nuclear fuel. For the purpose of this analysis, the transportation casks used for intrasite shipping are assumed to have a capacity four times as large as the capacity of the transportation casks used for the marine transport of the foreign research reactor spent nuclear fuel to the United States. The assumptions and methodologies used to calculate the doses to a working crew associated with the handling activities of the foreign research reactor spent nuclear fuel are described in Section F.5 of this appendix.

Table F-48 presents the population dose that would be received by the members of the working crew and the associated risk if that working crew handled the total number of transportation casks at the Idaho National Engineering Laboratory. The worker MEI doses and risks were not calculated because of the large uncertainties associated with the assumptions for such calculations. However, the upper bound for such a dose would be equal to the administrative limits at the site. For DOE radiation workers, the regulatory limit is 5,000 mrem per year. All these workers would be monitored and if any worker's dose approached this limit, he or she would be rotated into a different job to prevent further exposure. This

regulatory limit provides a very conservative upper bound on the radiation dose for the worker MEI. If a single worker received the full 5,000 mrem per year dose for the full 13 years of potential foreign research reactor spent nuclear fuel receipt, then the MEI dose would be 65,000 mrem. For this dose, the associated risk of incurring an LCF would be 2.6 percent.

Table F-48 Handling-Related Impacts to Workers at the Idaho National Engineering Laboratory (Implementation Alternative 5 of Management Alternative 1)

Facility	*Worker Population Dose (person-rem)*	*Worker Population Risk (LCF)*
Phase 1: IFSF/CPP-749	257	0.10
Phase 1 and Phase 2	367	0.15
Phase 1: FAST	250	0.10
Phase 1 and Phase 2	360	0.14

F.4.2.2.2.12 Material, Utility, and Energy Requirements

Construction of a new wet storage facility at the Idaho National Engineering Laboratory would consume 12,400 m^3 (16,260 yd^3) of concrete and 3,100 metric tons (3,443 tons) of steel. The total energy and water requirements during construction are estimated to be 600,000 l (159,000 gal) for fuel, and 4.4 million l (1.2 million gal) for water. The annual utility and energy requirements during operations are shown in Table F-49. These requirements represent a small percent of current requirements for the Idaho National Engineering Laboratory. No new generation or treatment facilities would be necessary, and connections to existing networks would require only short tie-in lines. Increases in consumption would be minimal because overall activity at the Idaho National Engineering Laboratory is expected to decrease because of changes in site mission and a general reduction in employment.

Table F-49 Annual Utility and Energy Requirements for New Wet Storage at the Idaho National Engineering Laboratory (Implementation Alternative 5 to Management Alternative 1)

Commodity	*Baseline Site Usage*	*Wet Storage Usage*	*Percent Increase*
Electricity (MW-hr/yr)	208,000	1,000 - 1,500	0.72 percent
Fuel (l/yr)	11,123,400	0	0 percent
Water (l/yr)	6,500,000,000	2,700,000[a]	0.04 percent
		1,500,000[b]	0.02 percent

[a] *During receipt and handling*

[b] *During storage*

F.4.2.2.2.13 Waste Management

Construction of a new wet storage facility at the Idaho National Engineering Laboratory would generate 2,600 m^3 (10,300 yd^3) of debris. The annual quantities of waste generated during operations are shown in Table F-50. These quantities represent a very small percentage increase above current levels at the Idaho National Engineering Laboratory. Existing waste management storage and disposal activities at the Idaho National Engineering Laboratory could accommodate the waste generated by a new wet storage facility. Therefore, the impact of this waste on existing Idaho National Engineering Laboratory waste management capacities would be minimal.

Table F-50 Annual Waste Generated for New Wet Storage at the Idaho National Engineering Laboratory (Implementation Alternative 5 to Management Alternative 1)

Waste Form	Baseline Site Generation	Wet Storage Generation	Percent Increase
High-Level (m^3/yr)	750	none	0 percent
Transuranic (m^3/yr)	712	none	0 percent
Solid Low-Level (m^3/yr)	4,795	16[a] 1[b]	0.33 percent 0.02 percent
Wastewater (l/yr)	540,000,000	1,590,000[a] 400,000[b]	0.3 percent 0.07 percent

[a] *During receipt and handling*

[b] *During storage*

F.4.2.3 Accident Analysis

An evaluation of incident-free operations and hypothetical accidents at the Idaho National Engineering Laboratory is presented here based on the methodology presented in Appendix F, Section F.6. The evaluation assessed the possible radiation exposure to individuals and general population due to the release of radioactive materials. The analyses are based on the same operations carried out at the different potential storage locations and the same accidents at any of the sites evaluated. Information concerning radiation doses to individuals and the general population are the same as set forth in Section F.4.1.3.

Table F-51 presents frequency and consequences in terms of mrem or person-rem, of postulated accidents to the offsite MEI, NPAI, and offsite population for the 95th-percentile meteorological conditions using the assumptions and input values discussed above. The worker doses are calculated only for the 50th-percentile meteorology. This is an individual assumed to be 100 m (330 ft) downwind of the accident. DOE did not estimate the worker population dose.

Table F-51 Frequency and Consequences of Accidents at the Idaho National Engineering Laboratory

	Frequency (per year)	Consequences			
		MEI (mrem)	NPAI (mrem)	Population (person-rem)	Worker (mrem)
Dry Storage Accidents[a]					
• Spent Nuclear Fuel Assembly Breach	0.16	1.3	0.67	15	28
• Dropped Fuel Cask	0.0001	0.074	0.0033	0.83	0.12
• Aircraft Crash w\Fire	1×10^{-6}	180	2.9	2,000	120
Wet Storage Accidents[b]					
• Spent Nuclear Fuel Assembly Breach	0.16	0.0016	0.0036	0.43	0.14
• Accidental Criticality	0.0031	28	30	140	1800
• Aircraft Crash	1×10^{-6}	22	9.8	250	400

[a] *IFSF/CPP-749 or New Dry Storage Facility*

[b] *New Wet Storage and FAST facility*

Multiplying the frequency of each accident times its consequences and converting the radiation doses to LCF yields the annual risks associated with each potential accident at the Idaho National Engineering Laboratory. These annual risks are multiplied by the maximum duration of this implementation alternative to obtain conservative estimates of risks at the Idaho National Engineering Laboratory presented in Table F-52 .

Table F-52 Annual Risks of Accidents at Idaho National Engineering Laboratory

	Risks			
	MEI (LCF/yr)	*NPAI (LCF/yr)*	*Population (LCF/yr)*	*Worker (LCF/yr)*
Dry Storage Accidents[a]				
• Spent Nuclear Fuel Assembly Breach	1.1×10^{-7}	5.5×10^{-8}	0.0012	0.0000018
• Dropped Fuel Cask	3.7×10^{-12}	1.7×10^{-13}	4.2×10^{-8}	4.8×10^{-12}
• Aircraft Crash w\Fire	9.0×10^{-11}	1.5×10^{-12}	0.0000010	4.8×10^{-11}
Wet Storage Accidents[b]				
• Spent Nuclear Fuel Assembly Breach	1.3×10^{-10}	2.9×10^{-10}	0.000035	8.8×10^{-9}
• Accidental Criticality	4.4×10^{-8}	4.7×10^{-8}	0.00022	0.0000022
• Aircraft Crash	1.1×10^{-11}	4.9×10^{-12}	1.3×10^{-7}	1.6×10^{-10}

[a] *IFSF/CPP-749 or New Dry Storage Facility*

[b] *New Wet Storage and FAST Facility*

Table F-53 presents the frequency and consequences of the accidents analyzed for Idaho National Engineering Laboratory for new wet storage (Implementation Alternative 5 of Management Alternative 1). Multiplying the frequency of each accident times its consequences and converting the radiation doses to LCF yields the annual risks associated with each potential accident at the Idaho National Engineering Laboratory. These annual risks are multiplied by the maximum duration of implementation alternative at each site to obtain conservative estimates of risks at the Idaho National Engineering Laboratory. Table F-54 presents the risk estimates from this implementation alternative.

Table F-53 Frequency and Consequences of Accidents at the Idaho National Engineering Laboratory (Implementation Alternative 5 of Management Alternative 1)

	Frequency (per year)	*Consequences*			
		MEI (mrem)	*NPAI (mrem)*	*Population (person-rem)*	*Worker (mrem)*
Wet Storage Accidents[a]					
• Spent Nuclear Fuel Assembly Breach	0.16	0.0016	0.0036	0.43	0.14
• Accidental Criticality	0.0031	28	30	140	1800
• Aircraft Crash	1×10^{-6}	22	9.8	250	400

[a] *New Wet Storage Facility*

Table F-54 Annual Risks of Accidents at the Idaho National Engineering Laboratory (Implementation Alternative 5 of Management Alternative 1)

	Risks			
	MEI (LCF/yr)	*NPAI (LCF/yr)*	*Population (LCF/yr)*	*Worker (LCF/yr)*
Wet Storage Accidents[a]				
• Spent Nuclear Fuel Assembly Breach	1.3×10^{-10}	2.9×10^{-10}	0.000035	8.8×10^{-9}
• Accidental Criticality	4.4×10^{-8}	4.7×10^{-8}	0.00022	0.0000022
• Aircraft Crash	1.1×10^{-11}	4.9×10^{-12}	1.3×10^{-7}	1.6×10^{-10}

[a] *New Wet Storage Facility*

F.4.2.3.1 Secondary Impact of Radiological Accidents at the Idaho National Engineering Laboratory

In the event of an accidental release of radioactivity, there is a potential for impacts to land uses, cultural resources, water quality, ecology, national defense, and local economies (secondary impacts). For this analysis, secondary impacts of radiological accidents involving foreign research reactor spent nuclear fuel have been qualitatively assessed based on the calculations presented in Section F.4.2.3. Radiological accidents that resulted in doses to the MEI of less than the annual Federal radiological exposure limit for the public of 100 mrem (10 CFR Part 20) were considered to have no secondary impacts.

The MEI dose provides a measure of the air concentration and radionuclide deposition at the receptor location. As such, it can be used to express the level of contamination from a given radiological accident. In estimating the human health effects from radiological exposure (as presented in Section F.4.1.3), the MEI dose evaluates four pathways: (1) air immersion, (2) ground surface, (3) inhalation, and (4) ingestion. In estimating the environmental effects from radiological exposure, however, only the air immersion and ground surface pathways need be considered.

At the Idaho National Engineering Laboratory, the radiological accident with the highest MEI dose is the aircraft crash into a dry storage facility with fire (Table F-51). For this accident, the MEI dose would be 180 mrem. For the air immersion and ground surface pathways only, the dose would be 3.1 mrem, which is less than the 100 mrem limit used in this analysis. Therefore, no secondary impacts to land uses, cultural resources, water quality, ecology, national defense, and local economies from radiological accidents involving foreign research reactor spent nuclear fuel storage are expected at the Idaho National Engineering Laboratory.

F.4.2.4 Cumulative Impacts at the Idaho National Engineering Laboratory

This section presents the cumulative impacts of the proposed action, potential impacts of other major contemplated DOE actions and current activities at the Idaho National Engineering Laboratory. The contemplated DOE actions are the proposed construction and operation of an accelerator facility for tritium production (along with associated support facilities) (DOE, 1995d), the management of DOE-owned spent nuclear fuel discussed in Appendix B of the Programmatic SNF&INEL Final EIS (DOE, 1995g), and the storage and disposition of weapons-usable fissile materials at the Idaho National Engineering Laboratory site.

Tables F-55 and F-55A summarize the cumulative impacts for land use, socioeconomics, nonradiological air quality, occupational and public health and safety, energy and water consumption, and waste generation. As shown in the tables, the contribution of foreign research reactor spent nuclear fuel management to the cumulative impacts at the Idaho National Engineering Laboratory would be minimal.

F.4.2.5 Unavoidable Adverse Environmental Impacts

The construction and operation of facilities for the receipt and storage of foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory would result in some adverse impacts to the environment. Changes in designs and other methods of mitigation could eliminate, avoid, or reduce most of these to minimal levels. The following paragraphs identify adverse impacts that mitigation could not reduce to minimal levels or avoid altogether.

The generation of some fugitive dust during construction would be unavoidable, but would be controlled by water and dust suppressants. Similarly, construction activities would result in some minor, yet unavoidable, noise impacts from heavy equipment, generators, and vehicles.

Table F-55 Cumulative Impacts at the Idaho National Engineering Laboratory

Environmental Impact Parameter	*FRR SNF Contribution*	*Current Activities*[a]	*Other Activities*[a]	*Cumulative Impact*
Land Use (acres)	9	11,400[b]	604	12,013[b]
Socioeconomics (persons)	190[c]/30[d]	(e)	1980[c]/1080[d]	2,170[c]/1,110[d]
Air Quality (nonradiological)	See Table F-55A	See Table F-55A	See Table F-55A	See Table F-55A
Occupational and Public Health and Safety				
• MEI Dose (rem/yr)	5.6×10^{-7}	0.000056	0.0000057	0.000062
LCF (per year)	2.8×10^{-10}	2.8×10^{-8}	2.8×10^{-9}	3.1×10^{-8}
• Population Dose (person-rem/yr)	0.0045	0.34	32	32.3
LCF (per year)	2.25×10^{-6}	0.00017	0.016	0.016
• Worker Collective dose (person-rem/yr)	10[f]	30	344	384
LCF (per year)	0.004	0.012	0.137	0.154
Energy and Water Consumption				
• Electricity (MW-hr/yr)	1,000	208,000	3,897,000[g]	4,106,000
• Fuel (million l/yr)	0	11.1	1.35	12.45
• Coal (tons/yr)	0	12,500	13,660	26,160
• Water (million l/yr)	2.2	6,500	1,314	7,816
Waste Generation				
• High-Level (m^3/yr)	0	750	160	910
• Low-Level (m^3/yr)	22	4,795	2,800	7,617
• Transuranic (m^3/yr)	0	712	46	758
• Mixed (m^3/yr)	0	243	8	251

FRR SNF = Foreign Research Reactor Spent Nuclear Fuel

[a] *Other activities include: DOE-owned spent nuclear fuel management, construction and operation of a tritium accelerator facility, and the disposition of weapons-usable fissile materials*

[b] *Two percent of the total Idaho National Engineering Laboratory site area of 570,000 acres*

[c] *Increase over baseline during construction activities*

[d] *Increase over baseline during operation activities*

[e] *Baseline working force is approximately 11,600 persons*

[f] *The dose is due to the handling of FRR SNF during receipt and transfer, averaged over 40 years*

[g] *Major portion is the requirement for electricity by the tritium production accelerator facility (3,740,000 MW-hr/yr)*

The maximum loss of habitat would involve the conversion of approximately 4 ha (10 acres) of previously disturbed habitat that is of low quality and limited use to wildlife.

The amount of radioactivity that incident-free operation of the spent nuclear fuel facilities would release is a small fraction of the cumulative operational releases at the Idaho National Engineering Laboratory and would be well below applicable regulatory standards.

F.4.2.6 Irreversible and Irretrievable Commitments of Resources

The irreversible and irretrievable commitment of resources resulting from the construction and operation of facilities for the receipt and storage of foreign research reactor spent nuclear fuel would involve materials that could not be recovered or recycled or that would be consumed or reduced to unrecoverable forms. The construction and operation of facilities for foreign research reactor spent nuclear fuel facilities at the Idaho National Engineering Laboratory would consume irretrievable amounts of electrical energy,

Table F-55A Estimated Maximum Nonradiological Cumulative Ground-Level Concentrations of Criteria and Toxic Pollutants at the Idaho National Engineering Laboratory Boundary[a]

Pollutant	Averaging Time	Regulatory Standard ($\mu g/m^3$)	Cumulative Concentration ($\mu g/m^3$)[b]	
Carbon Monoxide	1-hour	40,000	1,245	(3.1%)
	8-hour	10,000	354	(3.5%)
Nitrogen Oxides	Annual	100	15	(15%)
Surfur Dioxide	3-hour	1,300	660	(51%)
	24-hour	365	267	(73%)
	Annual	80	7.5	(9.3%)
Particulate Matter (PM_{10})	24-hour	150	82	(55%)
	Annual	50	5	(10%)

[a] *Concentrations represent: foreign research reactor spent nuclear fuel management, other DOE-owned spent fuel management, construction and operation of a tritium supply facility and recycling activities, storage and disposition of weapons-usable fissile material activities, and current activities*

[b] *Numbers in parentheses indicate the percentage of the regulatory standard*

fuel, concrete, sand, and gravel. Other resources used in construction would probably not be recoverable. These would include finished steel, aluminum, copper, plastics, and lumber. Most of this material would be incorporated in foundations, structures, and machinery.

F.4.2.7 Mitigation Measures

Mitigation is addressed in general terms and describes typical measures that the Idaho National Engineering Laboratory could implement. The analyses indicate that the environmental consequences attributable to foreign research reactor spent nuclear fuel management activities at the Idaho National Engineering Laboratory would be minimal in most environmental media.

Pollution Prevention: DOE is committed to comply with Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements;" Executive Order 12873, "Federal Acquisition, Recycling and Waste Prevention;" and applicable DOE orders and guidance documents in planning and implementing pollution prevention at the Idaho National Engineering Laboratory. The DOE views source reduction as the first priority in its pollution prevention program, followed by an increased emphasis on recycling. Waste treatment and disposal are considered only when prevention or recycling is not possible or practical (DOE, 1995g).

Cultural Resources: The lack of detailed specifications associated with the potential construction at the Idaho National Engineering Laboratory under the various storage options prevents the identification of specific project impacts and mitigation measures for particular structures and facilities. Basic compliance under cultural resource law involves five steps that would be essentially the same under all alternatives. These steps are: (a) identification and evaluation of resources in danger of impact, (b) assessment of effects to these resources in consultation with the State Historic Preservation Office and representatives of the Shoshone-Bannock Tribes, (c) development of plans and documents to minimize any adverse effects, (d) consultation with the Advisory Council on Historic Preservation and Tribal representatives as to the appropriateness of mitigation measures, and (e) implementation of mitigation measures. Therefore, if a cultural resource survey has not been performed in an area planned for ground disturbance under one of the storage options, consultation would be initiated with the Idaho State Historic Preservation Office, and

the survey would be conducted prior to any disturbance. If cultural resources were discovered, they would be evaluated according to National Register criteria. Wherever possible, important resources would be left undisturbed. If the impacts are determined to be adverse and it is not feasible to leave the resource undisturbed, then measures would be initiated to reduce impacts. All mitigation plans would be developed in consultation with the State Historic Preservation Office and the Advisory Council on Historic Preservation and would conform to appropriate standards and guidelines established for historic preservation activities by the Secretary of the Interior (DOE, 1995g).

Some actions may affect areas of religious, cultural, or historic value to Native Americans. DOE has implemented a Working Agreement to ensure communication with the Shoshone-Bannock Tribes, especially relating to the treatment of archaeological sites during excavation, as mandated by the Archaeological Resources Protection Act; the protection of human remains, as required under the Native American Graves Protection and Repatriation Act; and the free exercise of religion as protected by the American Indian Religious Freedom Act. In keeping with DOE Native American policy, DOE Order 1230.2, and procedures to be defined in the Final Cultural Resources Management Plan, DOE would conduct Native American consultation during the planning and implementation of the policy. Procedures for dealing with the inadvertent discovery of human remains would be consistent with the Native American Graves Protection and Repatriation Act. If human remains were discovered, DOE would notify all Tribes that have expressed an interest in the repatriation of graves as required under Native American Graves Protection and Repatriation Act, including the Shoshone-Bannock, Shoshone, Painte, and the Northwestern band of the Shoshone Nation. These Tribes would then have an opportunity to claim the remains and associated artifacts in accordance with the requirements of Native American Graves Protection and Repatriation Act (DOE, 1995g).

Traffic and Transportation: All onsite shipments of foreign research reactor spent nuclear fuel would be in compliance with ID Directive 5480.3, "Hazardous Materials Packaging and Transportation Safety Requirements." These requirements provide assurance that, under normal conditions, the Idaho National Engineering Laboratory would meet "as low as reasonably achievable" conditions, credible accident situations (those with probability of occurrence greater than 1×10^{-7} per year) would not result in a loss of shielding or containment or a criticality, and an unintentional release of radioactive material would generate a timely response (DOE, 1995g).

Accidents: The DOE would implement the Idaho National Engineering Laboratory emergency response programs, as appropriate, following the occurrence of an accident to prevent or mitigate consequences. These emergency response programs, implemented in accordance with 5500-DOE series orders, typically involve emergency planning, emergency preparedness, and emergency response actions. Participating government agencies with plans that are interrelated with the Idaho National Engineering Laboratory Emergency Plan for Action include: the State of Idaho, Bingham County, Bonneville County, Butte County, Clark County, Jefferson County, the Bureau of Indian Affairs, and Fort Hall Indian Reservation. When an emergency condition exists at a facility, the Emergency Action Director is responsible for recognition, classification, notification, and protective action recommendations. Each emergency response plan utilizes resources specifically dedicated to assist a facility in emergency management. These resources include, but are not limited, to the following (DOE, 1994h):

- Idaho National Engineering Laboratory Warning Communications Center,
- Idaho National Engineering Laboratory Fire Department,
- Facility Emergency Command Centers,

- DOE Emergency Operations Centers,
- County and State Emergency Command Centers,
- medical, health physics, and industrial hygiene specialists,
- protective clothing and equipment (respirators, breathing air supplies, etc.), and
- periodic training exercises and drills within and between the organizations involved in implementing the response plans.

F.4.3 Hanford Site

If the Hanford Site is the site to manage DOE-owned spent nuclear fuel under the Programmatic SNF&INEL Final EIS, foreign research reactor spent nuclear fuel would be received and managed first at the Savannah River Site and/or the Idaho National Engineering Laboratory for the period required for the Hanford Site to construct and to place in operation new facilities to accommodate the spent nuclear fuel. As discussed in previous sections, this period (Phase 1) is estimated to be about 10 years. At the end of Phase 1 (e.g., start of Phase 2) the Hanford Site would be able to receive and manage foreign research reactor spent nuclear fuel that would be shipped from the Savannah River Site and/or the Idaho National Engineering Laboratory, and directly from the ports for those shipments made after Phase 1 concludes. Management of the foreign research reactor spent nuclear fuel would continue at the Hanford Site until ultimate disposition.

The amount of spent nuclear fuel that would be received and managed at the Hanford Site under Management Alternative 1 is dictated by the distribution considered in the Programmatic SNF&INEL Final EIS. Accordingly in Phase 2, the Hanford Site could receive TRIGA foreign research reactor spent nuclear fuel managed at the Idaho National Engineering Laboratory during Phase 1, Western foreign research reactor spent nuclear fuel under the Regionalization by Geography Alternative, or all foreign research reactor spent nuclear fuel under the Centralization Alternative. As a Phase 2 site, the Hanford Site would receive and manage foreign research reactor spent nuclear fuel at a new dry storage facility constructed on the 200 Area Plateau or the FMEF, which is a partially completed, large, hot cell facility. The new dry storage facility is described in Section 2.6.5.1.1. Description of the FMEF is provided in Appendix F, Section F.3.

The analysis of environmental impacts from management of foreign research reactor spent nuclear fuel at the Hanford Site is based on the above considerations. The analysis options selected do not represent all possible combinations, but a reasonable set that provides a typical, and in some cases, bounding estimate of the resulting impacts.

The specific analysis options are as follows:

3A. The spent nuclear fuel that was managed at the Idaho National Engineering Laboratory and/or the Savannah River Site during Phase 1 would be shipped to the Hanford Site where it would be managed at a new dry storage facility constructed either at the 200 Area Plateau or at the FMEF. Spent nuclear fuel arriving in the United States after Phase 1 concludes would also be received and managed at the new facility until ultimate disposition. For the purposes of this analysis, the total amount of spent nuclear fuel that would be managed in the dry storage facility would be all the foreign research reactor spent nuclear fuel eligible under the policy (22,700 elements). If the Hanford Site receives TRIGA spent nuclear fuel from the Idaho National Engineering Laboratory or only Western spent nuclear fuel, the dry

storage facility would be sized accordingly. The impacts from a smaller size facility would be bounded by the option analyzed.

The implementation alternatives of Management Alternative 1 for managing foreign research reactor spent nuclear fuel in the United States, discussed in Section 2.2.2, introduce additional analysis options that could be considered for the Hanford Site as follows:

- Under Implementation Subalternative 1a (Section 2.2.2.1), the amount of spent nuclear fuel to be received in the United States would be reduced to 5,000 elements. In this case, the Hanford Site would receive the foreign research reactor spent nuclear fuel from the Idaho National Engineering Laboratory and/or the Savannah River Site and manage it in facilities sized accordingly. The impacts from the management of this lesser amount of spent nuclear fuel would be bounded by analysis option 3A (above).

- Under Implementation Subalternative 1b (Section 2.2.2.1), the Hanford Site would receive only HEU from the Idaho National Engineering Laboratory and/or the Savannah River Site. The amount would be approximately 4.6 MTHM, representing 11,200 elements. The impacts from the management of this amount of fuel at the Hanford Site would be bounded by analysis option 3A (above).

- Under Implementation Subalternative 1c (Section 2.2.2.1), the Hanford Site would receive target material in addition to the foreign research reactor spent nuclear fuel considered under the basic implementation of Management Alternative 1. The receipt and management of this material, which represents in uranium content approximately 620 typical foreign research reactor spent nuclear fuel elements, would increase the impacts of analysis option 3A by a small percentage.

- Under Implementation Subalternative 2a (Section 2.2.2.2), the duration of the policy would be decreased to 5 years, and therefore the amount of spent nuclear fuel available for acceptance would also be decreased. In this case, the Hanford Site would receive all foreign research reactor spent nuclear fuel from the Savannah River Site and/or the Idaho National Engineering Laboratory. The impacts from the management of the decreased amount of spent nuclear fuel at the Hanford Site would be bounded by analysis option 3A (above).

- Under Implementation Subalternative 2b, (Section 2.2.2.2), the acceptance of a small portion of the fuel would be extended over an indefinite period of time, but the amount of spent nuclear fuel to be received and stored would remain constant. The impacts would be the same as in option 3A (above).

- Under Implementation Alternative 3 (Section 2.2.2.3), DOE and the Department of State would consider alternative financial arrangements. These arrangements would affect the amount of spent nuclear fuel that would be accepted by the United States as the foreign research reactor operators would consider their own alternatives on whether to send the spent nuclear fuel to the United States. The amount of spent nuclear fuel in this case cannot be quantified; however, the upper limit, as considered under analysis option 3A, would be bounding.

- Under Implementation Alternative 4 (Section 2.2.2.4), DOE and the Department of State would consider alternatives for the location where title of the foreign research reactor spent

nuclear fuel would be taken. The choices do not affect the management impacts at the Hanford Site.

- Under Implementation Alternative 5 (Section 2.2.2.5), DOE would consider construction of a new wet storage facility at the Hanford Site for Phase 2 until ultimate disposition. For this implementation alternative, an analysis option 3B, which is similar to 3A, is considered as follows:

3B. The spent nuclear fuel managed at the Idaho National Engineering Laboratory and/or the Savannah River Site during Phase 1 would be shipped to the Hanford Site where it would be managed at a new wet storage facility constructed at either the 200 Area Plateau or the WNP-4 Spray Pond facility. Spent nuclear fuel arriving in the United States after Phase 1 concludes would also be received and managed at the new facility until ultimate disposition. For the purposes of this analysis, the total amount of spent nuclear fuel to be managed in the wet storage facility would be all the foreign research reactor spent nuclear fuel eligible under the policy (approximately 22,700 elements). If the Hanford Site receives only TRIGA spent nuclear fuel from the Idaho National Engineering Laboratory, or only western fuel, the dry storage facility would be sized accordingly. The impacts from a smaller size facility would be bounded by the option analyzed.

- Under Implementation Alternative 6 (Section 2.2.2.6), DOE and the Department of State would consider chemical separation of foreign research reactor spent nuclear fuel in the United States. Based on the discussion in Section 2.3.6, the Hanford Site would not be considered as a site for chemical separation.

Under Management Alternative 3 (Hybrid Alternative) the Hanford Site is not considered.

F.4.3.1 Existing Facilities

Existing facilities at the Hanford Site include the FMEF and the WNP-4 Spray Cooling Pond for dry and wet storage, respectively, of foreign research reactor spent nuclear fuel. For this analysis, existing facilities at the Hanford Site were considered essentially as new because of the significant modifications that would be required to use them for foreign research reactor spent nuclear fuel storage. Handling and transfer operations at the FMEF and the WNP-4 Spray Cooling Pond would be used to support new dry and wet storage facilities, respectively. The evaluation of potential environmental impacts is presented in Section F.4.3.2 and reflects the foreign research reactor spent nuclear fuel storage options described in Section F.4.3.

F.4.3.2 New Facilities (Phase 2)

Analysis options 3A and 3B involve the use of new or major additions to existing facilities as discussed above. The environmental impacts analyzed relate to the construction and operation of these facilities. The impacts include: land use; socioeconomics; cultural resources; aesthetic and scenic resources; geology; air and water quality; ecology; noise; traffic and transportation; occupational and public health and safety; materials, utilities, and energy; and waste management.

F.4.3.2.1 Dry Storage

Dry storage is associated with analysis option 3A, which would require the construction of a new dry storage facility near the 200 Area Plateau or at the FMEF (FMEF currently has handling and transfer, but

not adequate storage capabilities). The dry storage option encompasses both the dry vault design and the dry cask design as described in Section 2.6.5 and Appendix F, Section F.3. There are no environmental impact parameters that would discriminate between the two designs. For the purpose of this analysis the impacts from the larger dry vault design are presented.

F.4.3.2.1.1 Land Use

A new dry storage facility would be located in either the 200 Area Plateau or at the FMEF in the 400 Area. These areas have been generally developed for industrial use. Construction activities, including laydown areas, would disturb 3.7 ha (9 acres) of land at either area. A new dry storage facility would occupy 5,000 m^2 (54,000 ft^2) of land and would move 11,000 m^3 (14,400 yd^3) of soil. Neither construction nor operation of a new dry storage facility at either area would significantly impact land use patterns on the Hanford Site.

F.4.3.2.1.2 Socioeconomics

As discussed in Section F.3.1.1 the total capital cost of a new dry storage facility is estimated to be $370 million. Construction activities are projected to take 4 years. Assuming that the capital cost is evenly distributed over this 4-year period, the annual expenditures would be about $92.5 million. This represents approximately 7.2 percent of the estimated FY 1995 total expenditures for the Hanford Site (1,288 million). The relative socioeconomic impact from annual construction expenditures on the region of influence would be positive. The annual operations costs of a new dry storage facility are estimated to be $15.6 million for receipt and handling and $0.6 million for storage. These costs represent approximately 1.2 percent and 0.05 percent of FY 1995 total expenditures for the Hanford Site. The relative socioeconomic impact from annual operation expenditures on the region of influence would be small.

Direct employment associated with construction of a new dry storage facility is estimated to be 190 persons. The relative socioeconomic impact from direct and secondary construction employment on the region of influence would be small. In addition, when compared to the projected FY 1995 work force at the Hanford Site of approximately 18,500 persons, the relative socioeconomic impact of this temporary increase in construction employment would be insignificant. Direct employment associated with receipt and storage operations is estimated to be 30 persons. Upon completion of these activities, direct employment is expected to decrease to eight persons. The relative socioeconomic impact of this increase in operations employment would be insignificant to both the region of influence and the Hanford Site.

F.4.3.2.1.3 Cultural Resources

No direct impacts on any cultural resources in the 200 Area Plateau would be expected from construction or operation of the new dry storage facility. This site has been surveyed for cultural resources, and no prehistoric or historic archaeological properties were found. No indirect impacts would be anticipated because no known archaeological sites are present within approximately 4 km (2.5 mi) of the 200 Area Plateau. Because the site is in an industrialized area, construction would not alter the historic significance or association with the Manhattan Project and/or Cold War facilities located nearby.

No direct or indirect impacts are expected to any cultural resources of significance to the Yakama Indian Nation, the Confederated Tribes of the Umatilla Indian Reservation, or the Wanapum Band. This is based

on the location of the 200 Area Plateau relative to sacred and culturally important areas which have been identified through ethno-historical research and interviews with elders of bands that formerly used the Hanford Site (DOE, 1995g).

Modification of FMEF for dry storage would be inside the fence of the 400 Area. No cultural resources are known to exist within that area. Because of its location, no cultural resources on the Hanford Site would be disturbed by construction.

F.4.3.2.1.4 Aesthetic and Scenic Resources

Any changes caused by construction and operation of either dry storage facility would be consistent with the existing overall visual environment of the Hanford Site. Topographic features would obstruct both candidate storage sites from the view of populated areas. Although the new dry storage facility could be seen from the farmland bluffs that overlook the Columbia River to the east, these lands are on private property that is not readily accessible to the public. Potential soil erosion and dust generation associated with construction-related activities would be controlled by the implementation of best-management practices. Any visibility impacts from fugitive dust generation by construction-related activities should be insignificant and short term. Facility operations associated with the dry storage of foreign research reactor spent nuclear fuel should not generate any atmospheric emissions which would reduce area visibility (DOE, 1995g).

F.4.3.2.1.5 Geology

There are no unique geologic features or minerals of economic value on the Hanford Site that would be adversely impacted by site development. Construction of a new dry storage facility would result in localized impacts to surficial soils and would necessitate the clearing and grading of 3.7 ha (9 acres). Site preparation, land shaping, and grading activities associated with construction would present a slight to moderate erosion hazard, but would be controlled and minimized by implementing best-management practices. The operation of the new dry storage facility would have no effect on the geologic characteristics at the site.

F.4.3.2.1.6 Air Quality

Nonradiological Emissions: Potential air quality impacts associated with construction include generation of fugitive dust (particulate matter) and smoke from earth moving and clearing operations and emissions from construction equipment. Sources of fugitive dust include:

- transfer of soil to and from haul trucks and storage piles;
- turbulence created by construction vehicles moving over cleared, unpaved surfaces; and
- wind-induced erosion of exposed surfaces.

Emissions of sulfur dioxide and nitrogen dioxide would result entirely from diesel exhaust. For this analysis, all vehicular emissions were conservatively assumed to occur within 1 year during 200 ten-hour work days. As shown in Table F-56, air quality impacts associated with construction-related activities would be minimal, and compliance with Federal and State ambient air quality standards would not be

adversely affected. Therefore, construction activities would not be expected to have any detrimental effect on the health and safety of the general population.

Table F-56 Estimated Maximum Concentrations of Criteria Pollutants at the Hanford Site Attributable to New Dry Storage Construction

Pollutant	Averaging Time	Ambient Standard[a]	Baseline Concentration[a]	Construction Activities
Hanford Site Boundary ($\mu g/m^3$)				
• Total Suspended Particulate (TSP)	Annual	75	56	0.4
• Particulate Matter (PM_{10})	24-hr	150	81	14
• Particulate Matter (PM_{10})	Annual	50	27	0.4
Workplace (ppmv)				
• Sulfur Dioxide	Annual	52	0.5	0.4
• Nitrogen Dioxide	Annual	100	6,500	200

[a] *Source: DOE, 1995g*

Nonradiological emissions would not be expected during operation of a new dry storage facility for foreign research reactor spent nuclear fuel.

Radiological Emissions: No radiological emissions from construction of a new dry storage facility for foreign research reactor spent nuclear fuel would be expected. Based on fuel drying and storage operations conducted at the Idaho National Engineering Laboratory, potential atmospheric releases from the spent nuclear fuel storage facility would consist of minor amounts of particulate radioactive material and larger amounts of gaseous fission products that could escape from the fuel through cladding defects. The majority of radioactive material responsible for fuel and cask internal surface contamination consists of activation products that plate out on the spent nuclear fuel assemblies during reactor operation. This material is dependent on corrosion of structural materials and generally consists of radionuclides, such as ^{58}Co, ^{60}Co, ^{59}Fe, etc. This contamination activity would have to be controlled during the cask opening and fuel handling operations to prevent internal personnel exposures. Proper facility ventilation (designed to provide airflow from areas of low contamination to progressively higher contamination) would help provide contamination control. High-efficiency particulate air filters in the facility exhaust would reduce the airborne effluent quantities of this particulate material to quantities that are well within the prescribed limits.

Cask opening and fuel drying operations may also be responsible for the release of significant amounts of ^{3}H, ^{85}Kr, and minor amounts of ^{129}I. The amounts of these radionuclides that are released during the cask opening operation depends on the following parameters: (1) the number of spent nuclear fuel clad defects; (2) the spent nuclear fuel material and the diffusion rate of these radionuclides through the fuel matrix for the fuel temperature while in the cask; and (3) the time that the spent nuclear fuel is contained within the cask before opening.

Similarly, for fuel drying operations, the temperature of the drying gas (as well as the parameters discussed above) would cause quantities of ^{3}H, ^{85}Kr, and ^{129}I to be released from the fuel. Charcoal or silver zeolite filters could be used to remove the ^{129}I from the exhaust, but the ^{3}H and ^{85}Kr, being gases, or in a gaseous state for the case of tritiated water, would be exhausted to the atmosphere. During spent nuclear fuel storage small amounts of the gaseous/volatile radionuclides are expected to be released to the environment based on the fuel matrix, clad defects, and storage temperature. Release rates would decrease with storage time due to radioactive decay. It is anticipated that the fuel drying operation would be responsible for the most significant release of these gaseous/volatile radionuclides to the environment.

For this analysis, radiological emissions from the operation of a new dry storage facility for foreign research reactor spent nuclear fuel were calculated based on the methodology and assumptions described in Appendix F, Section F.6. The radiological consequences of air emissions from the operation of a new dry storage facility at the Hanford Site are discussed in Section F.4.3.2.1.11. The annual emission releases from the dry storage facility during receipt and unloading and storage are provided in Section F.6.6.

F.4.3.2.1.7 Water Resources

The water usage during construction of a new dry storage facility is estimated to be about 7.75 million l (2 million gal). During operations, annual water consumption would be 2.1 million l (550,000 gal) for receipt and handling and 0.4 million l (109,000 gal) for storage. With an annual average water usage of approximately 15,000 million l (3,960 million gal) for the Hanford Site, these amounts represent no more than a 0.04 percent increase in annual water usage. Therefore, a new dry storage facility would have minimal impact on water resources at the Hanford Site.

Best-management practices during construction would prevent sediment runoff or spills of fuels or chemicals. Therefore, construction activities should have no impact on water quality at the Hanford Site. The impact on water quality during operations would also be small. Existing water treatment facilities at the Hanford Site could accommodate any new domestic and process wastewater streams from a new dry storage facility. The expected total flow volumes at the Hanford Site would still be well within the design capacities of treatment systems at the Hanford Site. A new dry storage facility would meet National Pollutant Discharge Elimination System limits and reporting requirements, so no impact on the water quality of receiving streams is expected.

F.4.3.2.1.8 Ecology

Terrestrial Resources: Vegetation within construction areas would be destroyed during land-clearing activities. Plant species that are dominant on the 200 Area Plateau include: big sagebrush, cheatgrass, and Sanberg's bluegrass. Total area destroyed would amount to about less than one percent of this community on the Hanford Site. Although the plant communities to be disturbed are well-represented on Hanford Site, they are relatively uncommon regionally because of the widespread conversion of shrub-steppe habitats to agriculture. Disturbed areas are generally recolonized by cheatgrass, a nonnative species, at the expense of native plants. Mitigation of these impacts would include minimizing the area of disturbance and revegetating with native species, including shrubs, and establishing a 3:1 acreage replacement habitat in concert with a habitat enhancement plan presently being developed for Hanford Site in general. Adverse impacts to vegetation on Hanford Site would be limited to the project area and vicinity, and would not affect the viability of any plant populations on the Hanford Site (Bergsman et al., 1994).

Construction of the new dry storage facility would have some adverse affect on animal populations. Less mobile animals, such as invertebrates, reptiles, and small animals within the project area would be destroyed during land-clearing activities. Larger mammals and birds in construction and adjacent areas would be disturbed by construction activities and would move to adjacent suitable habitat, and these individual animals might not survive and reproduce. Project facilities would displace about 3.7 ha (9 acres) of animal habitat for the life of the dry storage facility. Revegetated areas (e.g., construction laydown areas and buried pipeline routes) would be reinvaded by animal species from surrounding undisturbed habitats. The adverse impacts of construction are expected to be limited to the project area and vicinity and should not affect the viability of populations on the Hanford Site.

Very small quantities of radionuclides would be released to the atmosphere during dry storage facility operations. No organisms studied to date are reported to be more sensitive than man to radiation. Therefore, the effects of these releases on terrestrial organisms are expected to be minor (Bergsman et al., 1994).

Any impacts to the vegetation and animal communities would be mitigated by minimizing the amount of land disturbed during construction, employing soil erosion control measures during construction activities, and revegetating disturbed areas with native species. These mitigation measures would limit the amount of direct and indirect disturbance to the construction area and surrounding habitats and would speed the recovery process for disturbed lands (Bergsman et al., 1994).

Operational impacts on terrestrial biotic resources would include exposure of plants and animals to small amounts of radionuclides released during operation of the new dry storage facility. The levels of radionuclide exposure would be below those levels that produce adverse effects (Bergsman et al., 1994).

Wetlands: There are no wetlands on or near either candidate storage site (Bergsman et al., 1994).

Threatened and Endangered Species: Construction and operation of the new dry storage facility would remove 3.7 ha (9 acres) of relatively pristine big sagebrush/cheatgrass/Sanberg's bluegrass habitat. This sagebrush habitat is considered priority habitat by the State of Washington because of its relative scarcity in the State and its use as nesting/breeding habitat by loggerhead shrikes, sage sparrows, sage thrashers, burrowing owls, pygmy rabbits, and sagebrush voles (Bergsman et al., 1994).

Loggerhead shrikes, listed as a Federal candidate (Category 2) and State candidate species, forage on the proposed spent nuclear fuel site and are relatively common on the Hanford Site. This species is sagebrush-dependent, as it is known to select primarily tall big sagebrush as nest sites. Construction of the new dry storage facility would remove big sagebrush habitat which would preclude loggerhead shrikes from nesting there. Foreign research reactor spent nuclear fuel site development would also be expected to reduce the value of the site as foraging habitat for shrikes known to nest in adjacent areas (Bergsman et al., 1994).

Sage sparrows and sage thrashers, both State candidate species, occur in mature sagebrush/bunchgrass habitat at the Hanford Site. The sage sparrow was observed on the proposed site in a survey during spring 1994. These species are known to nest primarily in sagebrush. Construction of the new dry storage facility would preclude both of these species nesting there and reduce the site's suitability as foraging habitat for these species (Bergsman et al., 1994).

Dry storage facility construction is not expected to substantially decrease Hanford Site population of loggerhead shrikes, sage sparrows, or sage thrashers because similar sagebrush habitat is still relatively common on the Hanford Site. However, the cumulative effects of constructing the new dry storage facility, in addition to future developments that further reduce sagebrush habitat (causing further fragmentation of nesting habitat), could negatively affect the long-term viability of populations of these species on the Hanford Site (Bergsman et al., 1994).

Burrowing owls, a State candidate species, are relatively common on Hanford Site and nest in abandoned ground squirrel burrows on the 200 Area Plateau. Construction would remove sagebrush and disturb soil, displacing ground squirrels and thus reducing the suitability of the area for nesting by burrowing owls, and would also displace small mammals, which constitute a portion of the prey base for this species. Dry storage facility construction would not be expected to negatively impact the viability of the population of burrowing owls on the Hanford Site, as their use of ground squirrel burrows as nests is not limited to burrows in big sagebrush habitat (Bergsman et al., 1994).

Pygmy rabbits, a Federal candidate (Category 2) and State-listed threatened species, are known to utilize tall clumps of big sagebrush habitat throughout most of their range. However, this species has not recently been observed on the Hanford Site. Construction of the new dry storage facility would therefore reduce the potential for this species' occurrence by removing habitat suitable for its use (Bergsman et al., 1994).

Sagebrush voles, a State minor species, are common on Hanford Site and select burrow sites near sagebrush; however, this species is common only at higher elevations around the Hanford Site. Construction of the new dry storage facility would remove sagebrush habitat, precluding sagebrush voles from utilizing the site. However, construction would not affect the overall viability of sagebrush vole populations on Hanford Site because the majority of the population is found on the Fitzner/Eberhardt Arid Lands Ecology Preserve (Bergsman et al., 1994).

The closest known nests of ferruginous hawks, a Federal candidate (Category 2) and State threatened species, and Swainson's hawk, a State candidate, are 8.5 km (5 mi) and 6.2 km (3.7 mi), respectively, from the 200 Area Plateau. The potential site comprises a portion of the foraging range of these hawks. Construction of the new dry storage facility is not expected to disrupt the nesting activities of these species. However, construction would displace small mammal populations and thus reduce the prey for these birds. The cumulative effects of constructing the new dry storage facility, in addition to future reductions in sagebrush habitat (causing further fragmentation of foraging habitat), could negatively affect the long-term viability of populations of these two species on the Hanford Site (Bergsman et al., 1994).

Piper's daisy, listed as a State sensitive species, is relatively uncommon but widely distributed across the Hanford Site. Piper's daisy occurs in gravelly soils on the 200 Area Plateau. If construction of the new dry storage facility includes disturbing soils in the gravel pit, Piper's daisy would be eliminated in that area. However, because of the species' wide distribution, construction would not be expected to negatively affect the viability of this species on the Hanford Site (Bergsman et al., 1994).

DOE has completed consultations with the U.S. Fish and Wildlife Service regarding threatened and endangered species for the proposed construction sites of foreign research reactor spent nuclear fuel storage facilities at the Hanford Site, as required by the Endangered Species Act.

The modification of FMEF for dry storage would take place within the fenced 400 Area. This area has already been disturbed and no further ecological impacts would be expected.

F.4.3.2.1.9 Noise

Noise generated onsite by construction and operation of a new dry storage facility should not adversely affect the public or the Hanford Site environment. Based on a noise impact analysis for locating a new production reactor at the Hanford Site, ambient noise levels would not exceed the limits set by Washington State or the Environmental Protection Agency. The analysis indicated that any increased traffic along the major roadways from construction and operation of the new production reactor would result in little or no increase in the annoyance level experienced by communities or individuals. As a result, no significant noise impacts from activities associated with the new dry storage facility construction and operation are expected at receptor locations outside the Hanford Site boundary or at residences along the major highways leading to either candidate storage site.

F.4.3.2.1.10 Traffic and Transportation

Construction materials, wastes, and excavated materials would be transported both onsite and offsite. These activities would result in increases in operation of personal-use vehicles by commuting construction workers, commercial truck traffic, and in traffic associated with the daily operations of the Hanford Site. Again, traffic congestion would not be a significant problem.

Traffic congestion, although moderate at shift changes, would not be noticeably worse due to this level of construction effort.

F.4.3.2.1.11 Occupational and Public Health and Safety

Emissions-Related Impacts: Doses that could be received by the public during incident-free operation associated with the receipt and management of the foreign research reactor spent nuclear fuel at the Hanford Site would be attributed to emissions of radioactive material that could be carried by the wind offsite. The general public would be too far from the locations where handling activities or storage take place to receive any dose from direct exposure. Doses were calculated for the MEI, defined as an individual at the site boundary receiving the maximum exposure, and for the general population within an 80 km (50 mi) radius of the storage facility. These doses would result from incident-free airborne radiological emissions assumed to be released from the unloading of the transportation cask and the storage facility during storage. The methodology and assumptions used for the calculation of the radiological emissions and resulting doses are discussed in Section F.6 of this appendix. Table F-57 summarizes the annual emission-related doses to the public and the associated risks for the MEI and population at the Hanford Site. Integrated doses for the duration of a specific period can be obtained by multiplying the annual dose by the number of years in the period.

Table F-57 Annual Public Impacts for Receipt and Storage of Foreign Research Reactor Spent Nuclear Fuel at the Hanford Site (Dry Storage)

Facility	MEI Dose (mrem/yr)	MEI Risk (LCF/yr)	Population Dose (person-rem/yr)	Population Risk (LCF/yr)
Receipt/Unloading at:				
• FMEF (dry storage)	0.00020	1.0×10^{-10}	0.011	0.0000055
• New Dry Storage Facility	0.00025	1.3×10^{-10}	0.015	0.0000075
Storage at:				
• FMEF (dry storage)	0	0	0	0
• New Dry Storage Facility	0	0	0	0

Handling-Related Impacts: Workers at the site would receive radiation doses during handling operations (i.e., receiving and unloading the transportation cask). Analysis option 3A involves the receipt and unloading of 161 shipments of foreign research reactor spent nuclear fuel from the Idaho National Engineering Laboratory and/or Savannah River Site and 193 shipments directly from ports into a dry storage facility. The assumptions and methodologies used to calculate the doses to a working crew associated with the handling activities of the foreign research reactor spent nuclear fuel are described in Section F.5 of this appendix.

Table F-58 presents the population dose and risk that would be received by the members of the working crew if that working crew handled the total number of transportation casks at the Hanford Site. The worker MEI doses and risks were not calculated because of the large uncertainties associated with the assumptions for such calculations. However, the upper bound for such a dose would be equal to the

Table F-58 Handling-Related Impacts to Workers at the Hanford Site (New Dry Storage)

	Worker Population Dose (Person-rem)	Worker Population Risk (LCF)
	FMEF/New Dry Storage	FMEF/New Dry Storage
Phase 2	266/113[a]	0.11/0.05[a]

[a] *The two numbers represent the cask/vault designs respectively.*

administrative or regulatory limit at the site. For DOE radiation workers, the regulatory limit is 5,000 mrem per year. All these workers would be monitored and if any worker's dose approached this limit, he or she would be rotated into a different job to prevent further exposure. This regulatory limit provides a very conservative upper bound on the radiation dose for the worker MEI. If a single worker received the full 5,000 mrem per year dose for the full 13 years of potential foreign research reactor spent nuclear fuel receipt, then the MEI dose would be 65,000 mrem. For this dose, the associated risk of incurring an LCF would be 2.6 percent.

F.4.3.2.1.12 Material, Utility, and Energy Requirements

Construction of a new dry storage facility at the Hanford Site would consume 21,800 m^3 (28,500 yd^3) of concrete and 5,200 metric tons (5,750 tons) of steel. The total energy and water requirements during construction are estimated to be 835,000 l (221,000 gal) for fuel, and 7.75 million l (2 million gal) for water. The annual utility and energy requirements during operations are shown in Table F-59. These requirements represent a small percent of current requirements for the Hanford Site. No new generation or treatment facilities would be necessary, and connections to existing networks would require only short tie-in lines. Increases in consumption would be minimal because overall activity on the Hanford Site is expected to decrease because of changes in site mission and a general reduction in employment.

Table F-59 Annual Utility and Energy Requirements for New Dry Storage at the Hanford Site

Commodity	Baseline Site Usage	Dry Storage Usage	Percent Increase
Electricity (MW-hr/yr)	340,000	800 - 1,000	0.3 percent
Fuel (l/yr)	83,000,000	0	0 percent
Water (l/yr)	15,000,000,000	1,590,000[a] 400,000[b]	0.01 percent[a] 0.003 percent[b]

[a] *During receipt and handling.*

[b] *During storage.*

F.4.3.2.1.13 Waste Management

Construction of a new dry storage facility at the Hanford Site would generate 1,800 m^3 (2,340 yd^3) of debris. The annual quantities of waste generated during operations are shown in Table F-60. These quantities, represent a very small percent increase above current levels at the Hanford Site. Existing waste management storage and disposal activities at Hanford Site could accommodate the waste generated by a new dry storage facility. Therefore, the impact of this waste on existing Hanford Site waste management capacities would be minimal.

Table F-60 Annual Waste Generated for New Dry Storage at the Hanford Site

Waste Form	Baseline Site Generation	Dry Storage Generation	Percent Increase
High-Level (m^3/yr)	240	none	0 percent
Transuranic (m^3/yr)	170	none	0 percent
Solid Low-Level (m^3/yr)	20,000	22[a] 1[b]	0.11 percent[a] 0.005 percent[b]
Wastewater (l/yr)	210,000,000	1,590,000[a] 400,000[b]	0.75 percent[a] 0.2 percent[b]

[a] *During receipt and handling.*

[b] *During storage.*

F.4.3.2.2 Wet Storage

Analysis option 3B involves long-term wet storage of foreign research reactor spent nuclear fuel at the Hanford Site. This storage option would require the construction of a new wet storage facility.

F.4.3.2.2.1 Land Use

A new wet storage facility would be located on the 200 Area Plateau or in conjunction with the WNP-4 Spray Cooling Pond. These areas have already been developed for industrial use. Construction activities, including laydown areas, would disturb 2.8 ha (7 acres) of land at either area. A new wet storage facility would occupy 3,800 m^2 (41,000 ft^2) of land and would move 18,000 m^3 (24,000 yd^3) of soil. Neither construction nor operation of a new wet storage facility at either area would significantly impact land use patterns on the Hanford Site.

F.4.3.2.2.2 Socioeconomics

As discussed in Section F.3.2 the total capital cost of a new wet storage facility is estimated to be $449 million. Construction activities are projected to take 4 years. Assuming that the capital cost is evenly distributed over this 4-year period, the annual expenditures would be about $112.2 million. This represents approximately 8.7 percent of the estimated FY 1995 total expenditures for the Hanford Site (1,288 million). The relative socioeconomic impact from annual construction expenditures on the region of influence would be positive. The annual operations costs of a new wet storage facility are estimated to be $23.3 million for receipt and handling and $3.5 million for storage. These costs represent about 1.8 percent and 0.3 percent of FY 1995 total expenditures for the Hanford Site. The relative socioeconomic impact from annual operation expenditures on the region of influence would be small.

Direct employment associated with construction of a new wet storage facility is estimated to be 157 persons. The relative socioeconomic impact from direct construction employment on the region of influence would be small. In addition, when compared to the projected FY 1995 work force at Hanford Site of approximately 18,500 persons, the relative socioeconomic impact of this temporary increase in construction employment would be insignificant. Direct employment associated with operations of a new wet storage facility is estimated to be 30 persons. The relative socioeconomic impact of this increase in operations employment would be small to both the region of influence and the Hanford Site.

F.4.3.2.2.3 Cultural Resources

Impacts to cultural resources would be the same as for new dry storage (Section F.4.3.2.1.3).

The potential for impacting cultural resources would be even less for the WNP-4 Spray Pond because the structures are all essentially in place. Thus, there would be no opportunity for discovery of cultural resources during construction.

F.4.3.2.2.4 Aesthetic and Scenic Resources

Impacts to aesthetic and scenic resources would be the same as for new dry storage (Section F.4.3.2.1.4).

F.4.3.2.2.5 Geology

Impacts to geology would be the same as for new dry storage (Section F.4.3.2.1.5).

F.4.3.2.2.6 Air Quality

Nonradiological Emissions: Construction of a new wet storage facility would necessitate the clearing and grading of 2.8 ha (7 acres) of land. In comparison, 3.7 ha (9 acres) of land would be disturbed by new dry storage construction. Therefore, air quality impacts associated with wet storage construction would be bound by those associated with dry storage construction (Section F.4.3.2.1.6).

No nonradiological emissions from the operation of the new wet storage facility are expected.

Radiological-Emissions: Incident-free airborne releases from the new wet storage facility would be limited to radioactive noble gases and some radioactive iodine which could be released from the stored fuel prior to canning. The airborne materials released to the building atmosphere during incident-free operations would be filtered by the building heating and ventilation system. Radioactive and nonradioactive effluent gases would be routed through double-banked high-efficiency particulate air filters prior to release to the environment through an exhaust air system. The high-efficiency particulate air filter would have a minimum efficiency of 99.97 percent for 0.3 micron diameter particulates and would allow in-place dioctyl phthalate testing.

The new wet storage facility would discharge all ventilated gas, except truck exhaust, to the facility's exhaust system. Truck exhaust would be discharged directly to the environment during cask off-loading operation in the truck receiving area. The exhaust air system would employ a detector to monitor ^{137}Cs as an indicator nuclide. For other building areas which would be sources of airborne radioactive contamination, the heating, ventilation, and air conditioning system would be designed to maintain airflow from areas of low potential contamination into areas of higher potential contamination. These airborne effluents would be required to be below the radioactivity concentration guides listed in DOE 5480.1B (DOE, 1989b) for both onsite and offsite concentrations.

Air emissions from the new wet storage facility are expected to be similar to the air emissions from the IFSF at the Idaho National Engineering Laboratory. The annual air emission for the IFSF was designed to result in ground-level concentrations of less than 0.003 percent of DOE 5480.1B limits for uncontrolled areas.

Radiological emissions from the operation of the new wet storage facility were calculated based on the methodology and assumptions used in Appendix F, Section F.6. The annual emission releases from the wet storage facility during the receipt and unloading and storage are provided in Section F.6.6.1.

No radiological emissions would be produced during construction of a new wet storage facility.

F.4.3.2.2.7 Water Resources

The annual water usage during construction and operation of a new wet storage facility is estimated to be about 1.9 million l (502,000 gal) and 2.7 million l (0.72 million gal), respectively. With an annual average water usage of approximately 15,000 million l (3,960 million gal) for the Hanford Site, these amounts represent an increase of about 0.02 percent and less than 0.005 percent, respectively. Therefore, a new wet storage facility would have minimal impact on water resources at the Hanford Site.

Best-management practices during construction would prevent sediment runoff or spills of fuels or chemicals. Therefore, construction activities should have no impact on water quality at the Hanford Site. The impact on water quality during operations would also be negligible. Existing water treatment facilities at the Hanford Site could accommodate any new domestic and process wastewater streams from a new wet storage facility. The expected total flow volumes at the Hanford Site would still be well within the design capacities of treatment systems at the Hanford Site. A new wet storage facility would meet National Pollutant Discharge Elimination System limits and reporting requirements, so no impact on the water quality of receiving streams is expected.

F.4.3.2.2.8 Ecology

Impacts to ecology would be the same as for new dry storage (Section F.4.3.2.1.8).

F.4.3.2.2.9 Noise

Impacts from noise would be the same as for new dry storage (Section F.4.3.2.1.9).

F.4.3.2.2.10 Traffic and Transportation

Impacts from traffic and transportation would be the same as for new dry storage (Section F.4.3.2.1.10).

F.4.3.2.2.11 Occupational and Public Health and Safety

Emissions-Related Impacts: Doses that could be received by the public during incident-free operation associated with the receipt and management of the foreign research reactor spent nuclear fuel at the Hanford Site would be attributed to emissions of radioactive material that could be carried by wind offsite. The public would be too far from the locations where handling activities or storage take place to receive any dose from direct exposure. Doses were calculated for the MEI, defined as an individual at the site boundary receiving the maximum exposure, and for the general population within an 80 km (50 mi) radius of the storage facility. These doses would result from incident-free airborne radiological emissions assumed to be released from the unloading of the transportation cask and the storage facility during storage. The methodology and assumptions used for the calculation of the radiological emissions and

resulting doses are discussed in Section F.5 of this appendix. Table F-61 summarizes the annual emission-related doses to the public and the associated risks for the MEI and population at the Hanford Site. Integrated doses for the duration of a specific implementation period can be obtained by multiplying the annual dose by the number of years in the period.

Table F-61 Annual Public Impacts for Receipt and Storage of Foreign Research Reactor Spent Nuclear Fuel at the Hanford Site (Implementation Alternative 5 of Management Alternative 1)

Facility	MEI Dose (mrem/yr)	MEI Risk (LCF/yr)	Population Dose (person-rem/yr)	Population Risk (LCF/yr)
Receipt/Unloading at:				
• WNP-4 Spray Pond	0.00022	1.1×10^{-10}	0.0058	0.0000029
• New Wet Storage Facility	0.00020	1.0×10^{-10}	0.012	0.000006
Storage at:				
• WNP-4 Spray Pond	5.9×10^{-10}	3.0×10^{-16}	1.6×10^{-8}	8.0×10^{-12}
• New Wet Storage Facility	8.8×10^{-10}	4.4×10^{-16}	6.9×10^{-8}	3.5×10^{-11}

Handling-Related Impacts: Workers at the site would receive radiation doses during handling operations (i.e., receiving and unloading the transportation cask), transferring the foreign research reactor spent nuclear fuel from one facility to another, or preparing the foreign research reactor spent nuclear fuel for shipment offsite. Analysis option 3B involves the receipt of 161 shipments of foreign research reactor spent nuclear fuel from Idaho National Engineering Laboratory and/or Savannah River Site and 193 shipments directly from the ports into a wet storage facility. The assumptions and methodologies used to calculate the doses to a working crew associated with the handling activities of the foreign research reactor spent nuclear fuel are described in Section F.5 of this appendix.

Table F-62 presents the population dose that would be received by the members of the working crew and the associated risks if that working crew handled the total number of transportation casks at the Hanford Site. The worker MEI doses and risks were not calculated because of the large uncertainties associated with the assumptions for such calculations. However, the upper bound for such a dose would be equal to the administrative or regulatory limit at the site. For DOE radiation workers, the regulatory limit is 5,000 mrem per year. All these workers would be monitored and if any worker's dose approached this limit, he or she would be rotated into a different job to prevent further exposure. This regulatory limit provides a very conservative upper bound on the radiation dose for the worker MEI. If a single worker received the full 5,000 mrem per year dose for the full 13 years of potential foreign research reactor spent nuclear fuel receipt, then the MEI dose would be 65,000 mrem. For this dose, the associated risk of incurring an LCF would be 2.6 percent.

F.4.3.2.2.12 Material, Utility, and Energy Requirements

Construction of a new wet storage facility at the Hanford Site would consume 12,400 m^3 (16,260 yd^3) of concrete and 3,100 metric tons (3,443 tons) of steel. The total energy and water requirements during construction are estimated to be 600,000 l (159,000 gal) for fuel, and 4.4 million l (1.2 million gal) for water. The annual utility and energy requirements during operations are shown in Table F-63. These requirements represent a small percent of current requirements for the Hanford Site. No new generation or treatment facilities would be necessary, and connections to existing networks would require only short tie-in lines. Increases in consumption would be minimal because overall activity on the Hanford Site is expected to decrease because of changes in site mission and a general reduction in employment.

Table F-62 Handling-Related Impacts to Workers at the Hanford Site (Implementation Alternative 5 of Management Alternative 1)

	Worker Population Dose (person-rem)	*Worker Population Risk (LCF)*
	New Wet Storage Facility or WNP-4 Spray Pond	*New Wet Storage Facility or WNP-4 Spray Pond*
Phase 2	109	0.04

Table F-63 Annual Utility and Energy Requirements for New Wet Storage at the Hanford Site

Commodity	*Baseline Site Usage*	*Wet Storage Usage*	*Percent Increase*
Electricity (MW-hr/yr)	340,000	1,000-1,500	0.44 percent
Fuel (l/yr)	83,000,000	0	0 percent
Water (l/yr)	15,000,000,000	2,700,000[a] 1,500,000[b]	0.02 percent 0.01 percent

[a] *During receipt and handling*

[b] *During storage*

F.4.3.2.2.13 Waste Management

Construction of a new wet storage facility at the Hanford Site would generate 2,600 m^3 (10,300 yd^3) of debris. The annual quantities of waste generated during operations are shown in Table F-64. These quantities, represent a very small percentage increase above current levels at the Hanford Site. Existing waste management storage and disposal activities at Hanford Site could accommodate the waste generated by a new wet storage facility. Therefore, the impact of this waste on existing Hanford Site waste management capacities would be minimal.

Table F-64 Annual Waste Generated for New Wet Storage at the Hanford Site

Waste Form	*Baseline Site Generation*	*Wet Storage Generation*	*Percent Increase*
High-Level Waste (m^3/yr)	240	none	0 percent
Transuranic Waste (m^3/yr)	170	none	0 percent
Solid Low-Level Waste (m^3/yr)	20,000	16[a] 1[b]	0.08 percent 0.005 percent
Wastewater (l/yr)	210,000,000	1,590,000[a] 400,000[b]	0.75 percent 0.2 percent

[a] *During receipt and handling*

[b] *During storage*

F.4.3.3 Accident Analysis

An evaluation of incident-free operations and hypothetical accidents at the Hanford Site is presented here based on the methodology in Appendix F, Section F.6. The evaluation assessed the possible radiation exposure to individuals and general population due to the release of radioactive materials. The analyses are based on the same operations carried out at the different potential storage locations and the same accidents at any of the sites evaluated. Information concerning radiation doses to individuals and the general population are the same as set forth in Section F.4.1.3.

Table F-65 presents frequency and consequences in terms of mrem or person-rem, of postulated accidents to the offsite MEI, NPAI, and offsite population for the 95th-percentile meteorological conditions using the assumptions and input values discussed above. The worker doses are calculated only for the 50th-percentile meteorology. This is an individual assumed to be 100 m (330 ft) downwind of the accident. DOE did not estimate the worker population dose.

Table F-65 Frequency and Consequences of Accidents at the Hanford Site

	Frequency (per year)	Consequences			
		MEI (mrem)	NPAI (mrem)	Population (person-rem)	Worker (mrem)
Dry Storage Accidents[a]					
• Spent Fuel Assembly Breach	0.16	3.0	0.57	42	50
• Dropped Fuel Cask	0.0001	0.26	0.0085	3.0	0.22
• Aircraft Crash w\Fire[b]	NA	NA	NA	NA	NA
Dry Storage Accidents at FMEF					
• Spent Fuel Assembly Breach	0.16	4.7	2.1	46	0.99
• Dropped Fuel Cask	0.0001	0.2	0.032	3.2	0.0049
• Aircraft Crash w\Fire[b]	NA	NA	NA	NA	NA

NA = Not Applicable

[a] *New Dry Storage Facility*

[b] *Aircraft Crash accidents are not applicable to Hanford Site because their frequency of occurrence is less than one every ten million years.*

Multiplying the frequency of each accident times its consequences and converting the radiation doses to LCF yields the annual risks associated with each potential accident at the Hanford Site. These annual risks are multiplied by the maximum duration of the implementation alternative at the Hanford Site to obtain conservative estimates of risks for the Hanford Site. These risk estimates are presented in Table F-66.

Table F-66 Annual Risks of Accidents at the Hanford Site

	Risks			
	MEI (LCF/yr)	NPAI (LCF/yr)	Population (LCF/yr)	Worker (LCF/yr)
Dry Storage Accidents[a]				
• Spent Nuclear Fuel Assembly Breach	2.4×10^{-7}	4.6×10^{-8}	0.0034	0.0000032
• Dropped Fuel Cask	1.3×10^{-11}	4.3×10^{-13}	1.5×10^{-7}	8.8×10^{-12}
• Aircraft Crash w\Fire[b]	NA	NA	NA	NA
Dry Storage Accidents at FMEF				
• Spent Nuclear Fuel Assembly Breach	3.7×10^{-7}	1.7×10^{-7}	0.0037	6.4×10^{-8}
• Dropped Fuel Cask	8 x 10-12	1.6×10^{-12}	1.6×10^{-7}	2.5×10^{-13}
• Aircraft Crash with Fire[b]	10^{-12}	NA	NA	NA

NA = Not Applicable

[a] *New Dry Storage Facility*

[b] *Aircraft crash accidents are not applicable to Hanford Site because their frequency of occurrence is less that one every ten million years*

Table F-67 presents the frequency and consequences of the accidents analyzed for the Hanford Site for new wet storage (Implementation Alternative 5 of Management Alternative 1). Multiplying the frequency of each accident times its consequences and converting the radiation doses to LCF yields the annual risks associated with each potential accident at the Hanford Site. These annual risks are multiplied by the

Table F-67 Frequency and Consequences of Accidents at the Hanford Site (Implementation Alternative 5 of Management Alternative 1)

	Frequency (per year)	Consequences			
		MEI (mrem)	NPAI (mrem)	Population (person-rem)	Worker (mrem)
New Wet Storage Facility:					
• Spent Nuclear Fuel Assembly Breach	0.16	0.13	0.0033	1.6	0.25
• Accidental Criticality	0.0031	64	14	740	3,600
• Aircraft Crash[a]	NA	NA	NA	NA	NA
WNP-4 Spray Pond:					
• Spent Nuclear Fuel Assembly Breach	0.16	0.15	0.0033	1.3	0.00024
• Accidental Criticality	0.0031	97	76	620	120
• Aircraft Crash[a]	NA	NA	NA	NA	NA

NA = Not Applicable

[a] *Aircraft crash accidents are not applicable to the Hanford Site because their frequency of occurrence is less than one every ten million years.*

maximum duration of this implementation alternative at the Hanford Site to obtain conservative estimates of risks at the Hanford Site. Table F-68 presents the risk estimates for this implementation alternative.

Table F-68 Annual Risks of Accidents at the Hanford Site (Implementation Alternative 5 of Management Alternative 1)

	Risks			
	MEI (LCF/yr)	NPAI (LCF/yr)	Population (LCF/yr)	Worker (LCF/yr)
New Wet Storage Facility:				
• Fuel Assembly Breach	1.1×10^{-8}	2.7×10^{-10}	0.00013	1.6×10^{-8}
• Accidental Criticality	1.0×10^{-7}	2.2×10^{-8}	0.0012	0.0000044
• Aircraft Crash[a]	NA	NA	NA	NA
WNP-4 Spray Pond:				
• Fuel Assembly Breach	1.2×10^{-8}	2.7×10^{-10}	0.00011	1.5×10^{-11}
• Accidental Criticality	1.5×10^{-7}	1.2×10^{-7}	0.00096	1.5×10^{-7}
• Aircraft Crash[a]	NA	NA	NA	NA

NA = Not Applicable

[a] *Aircraft crash accidents are not applicable to the Hanford Site because their frequency of occurrence is less than one every ten million years.*

F.4.3.3.1 Secondary Impact of Radiological Accidents at the Hanford Site

In the event of an accidental release of radioactivity, there is a potential for impacts to land uses, cultural resources, water quality, ecology, national defense, and local economies (secondary impacts). For this analysis, secondary impacts of radiological accidents involving foreign research reactor spent nuclear fuel have been qualitatively assessed based on the calculations presented in Section F.4.3.3. Radiological accidents that resulted in doses to the MEI of less than the annual Federal radiological exposure limit for the public of 100 mrem (10 CFR Part 20) were considered to have no secondary impacts.

The MEI dose provides a measure of the air concentration and radionuclide deposition at the receptor location. As such, it can be used to express the level of contamination from a given radiological accident.

In estimating the human health effects from radiological exposure (as presented in Section F.4.1.3), the MEI dose evaluates four pathways: (1) air immersion, (2) ground surface, (3) inhalation, and (4) ingestion. In estimating the environmental effects from radiological exposure, however, only the air immersion and ground surface pathways need be considered.

At the Hanford Site, the radiological accident with the highest MEI dose is the fuel assembly breach at a dry storage facility located at the FMEF (Table F-65). For this accident, the MEI dose would be 3.9 mrem, which is less than the 100 mrem limit used in this analysis. Therefore, no secondary impacts to land uses, cultural resources, water quality, ecology, national defense, and local economies from radiological accidents involving foreign research reactor spent nuclear fuel storage are expected at the Hanford Site.

F.4.3.4 Cumulative Impacts at the Hanford Site

This section presents the cumulative impacts of the proposed action, potential impacts of other major contemplated DOE actions, and current activities at the Hanford Site. A major portion of the presentation is based on information included in the Programmatic SNF&INEL Final EIS (DOE, 1995g), the Management of Spent Nuclear Fuel from the K Basins Draft EIS (DOE, 1995d) and the Safe Interim Storage of Hanford Tank Wastes Final EIS (DOE, 1995c).

Table F-69 summarizes the cumulative impacts for land use, socioeconomics, air quality, occupational and public health and safety, energy and water consumption and waste generation. The table also presents the contributions from the storage of foreign research reactor spent nuclear fuel on the cumulative impacts at the Hanford Site. For the purposes of this analysis, both the contributions from management of foreign research reactor spent nuclear fuel and the cumulative impacts were maximized by selecting the Centralization Alternative of the Programmatic SNF&INEL Final EIS at the Hanford Site.

As shown in Table F-69, the contribution from management of foreign research reactor spent nuclear fuel to the cumulative impacts at the Hanford Site would be minimal. It is concluded, therefore, that the implementation of any of the alternatives (including the Centralization Alternative) for the DOE spent nuclear fuel management program would not be expected to significantly contribute to cumulative impacts.

F.4.3.5 Unavoidable Adverse Environmental Impacts

Unavoidable impacts associated with foreign research reactor spent nuclear fuel management activities would derive principally from construction activities needed for new storage facilities. There would be displacement of some animals from the construction site and the destruction of plant life within the area scoped for construction [up to 4 ha (10 acres)]. Criteria pollutants and radionuclides, would also be released in up to permitted quantities. Traffic congestion and noise would be expected to increase by a few percent during the construction of major facilities.

F.4.3.6 Irreversible and Irretrievable Commitments of Resources

The irreversible and irretrievable commitment of resources resulting from the construction and operation of facilities for the receipt and storage of foreign research reactor spent nuclear fuel would involve materials that could not be recovered or recycled or that would be consumed or reduced to unrecoverable forms. The construction and operation of facilities for foreign research reactor spent nuclear fuel facilities at the Hanford Site would consume irretrievable amounts of electrical energy, fuel, concrete, sand, and gravel. Other resources used in construction would probably not be recoverable. These would include

Table F-69 Cumulative Impacts at the Hanford Site

Environmental Impact Parameter	*FRR SNF Contribution*	*Other Activities*[a]	*Cumulative Impact*
Land Use (acres)	9	84,343[b]	84,352
Socioeconomics (persons)	190[c]/30[d]	3300/1220[e]	3,490[c]/1250[d]
Air Quality (nonradiological)	See Table F-56	NA	(f)
Occupational and Public Health and Safety			
• MEI Dose (rem/yr)	2.5×10^{-7}	0.0000036	0.0000036
LCF (per year)	1.3×10^{-10}	1.5×10^{-9}	1.5×10^{-9}
• Population dose (person-rem/yr)	0.015	0.22	0.235
LCF (per year)	0.0000075	0.00011	0.00011
• Worker Collective dose (person-rem/yr)	8.9[g]	116.5	125.4
LCF (per year)	0.0035	0.0466	0.05
Energy and Water Consumption			
• Electricity (MW-hr/yr)	1,000	495,600	496,600
• Fuel (million l/yr)	0	94.4	94.4
• Water (million l/yr)	2.2	15,004	15,006
Waste Generation			
• High-Level (m^3/yr)	0	354	354
• Low-Level (m^3/yr)	22	33,310	33,332
• Transuranic (m^3/yr)	0	240	240
• Mixed/hazardous (m^3/yr)	0	402	402

[a] *Other activities include: DOE-owned spent nuclear fuel management, construction and operation of a Laser Interferometer Gravitational-Wave Observatory, decommissioning of unused facilities, site restoration activities interim storage and tank wastes, management of spent nuclear fuel from the K basins, and current activities.*

[b] *Current operational areas constitute 83,767 acres*

[c] *Increase over baseline, during construction activities*

[d] *Increase over baseline, during operation activities*

[e] *Current working force is approximately 18,500 persons*

[f] *Nonradiological ground level cumulative concentrations would be within regulatory standards. 24-hour concentration for fugitive dust may exceed limits during construction of more than one facility simultaneously.*

[g] *The dose is due to the handling of the Foreign Research Reactor Spent Nuclear Fuel during receipt averaged over 30 years*

finished steel, aluminum, copper, plastics, and lumber. Most of this material would be incorporated in foundations, structures, and machinery.

F.4.3.7 Mitigation Measures

Mitigation is addressed in general terms and describes typical measures that Hanford Site could implement. The analyses indicate that the environmental consequences attributable to foreign research reactor spent nuclear fuel management activities at the Hanford Site would be minimal in most environmental media.

Pollution Prevention: DOE is responding to Executive Order 12856 and associated DOE orders and guidelines by reducing the use of toxic chemicals; improving emergency planning, response, and accident notification; and encouraging the development and use of clean technologies and the testing of innovative

pollution prevention technologies. Program components include waste minimization, source reduction and recycling, and procurement practices that preferentially procure products made from recycled materials. The pollution prevention program at the Hanford Site is being formalized in a Hanford Site Waste Minimization and Pollution Prevention Awareness Program Plan (DOE, 1995g).

The foreign research reactor spent nuclear fuel program activities would be conducted in accordance with this plan, and implementation of the pollution prevention and waste minimization plans would minimize impacts of wastes generated during spent nuclear fuel management activities (DOE, 1995g).

Socioeconomics: The level of predicted employment for foreign research reactor spent nuclear fuel activities at the Hanford Site is not large enough in comparison with present Hanford, local, or regional employment to produce a boom-bust impact on the economy (DOE, 1995g).

Cultural Resources: To avoid loss of cultural resources during construction of foreign research reactor spent nuclear fuel facilities on the Hanford Site, a cultural resources survey of the area of interest would be conducted by Pacific Northwest Laboratories Cultural Resources staff. Assuming no such resources were found, construction would proceed. If, however, during construction (earth moving) any cultural resource is discovered, construction activities would be halted and the Pacific Northwest Laboratories Cultural Resources staff called upon to evaluate and determine the appropriate disposition of the find.

To avoid loss of cultural resources during operation, such as unauthorized artifact collection, workers could be educated through programs and briefing sessions to inform them on applicable laws and regulations for site protection. These educational programs would stress the importance of preserving cultural resources and specifics of the laws and regulations for site protection. The exact locations of cultural resources are not identified by the Pacific Northwest Laboratories Cultural Resources group, therefore, any such artifact collection would be in an area discovered by the worker(s) (DOE, 1995g).

Geology: Soil loss would be controlled during construction using standard dust suppression techniques on disturbed soil and by stockpiling with cover where necessary. Following construction, soil loss would be controlled by revegetation and relandscaping of disturbed areas (DOE, 1995g).

Air Resources: To avoid impacts associated with emissions of fugitive dust during construction activities, exposed soils would be treated using standard dust suppression techniques. New facility sources of pollutant emissions to the atmosphere would be designed using best available technology to reduce emissions to "as low as reasonably achievable" levels (DOE, 1995g).

Water Resources: The impacts to surface and groundwater sources could be minimized through recycling of water, where feasible, and with cleanup of excess process water before release to ground or surface water (DOE, 1995g).

Noise: Generation of construction and operations noise would be reduced, as practicable, by using equipment that complies with noise guidelines (40 CFR Parts 201-211). Construction workers and other personnel working in environments exceeding U.S. Environmental Protection Agency-recommended guidelines during spent nuclear fuel storage, construction, or operation would be provided with earmuffs or earplugs approved by the Occupational Safety and Health Administration (29 CFR Part 1910). Because of the remote location of the Hanford Site foreign research reactor spent nuclear fuel activities, there would be no noise impacts with respect to the public for which mitigation would be necessary (DOE, 1995g).

Traffic and Transportation: At sites with increasing traffic concerns, DOE would encourage use of high-occupancy vehicles (such as vans or buses), implementing carpooling and ride-sharing programs, and staggering work hours to reduce peak traffic.

Occupational and Public Health and Safety: Although no radiological impacts on workers or the public were evident from the evaluation of incident-free foreign research reactor spent nuclear fuel activities at Hanford, further improvement in controls to protect both workers and the general public is a continuing activity. The "as low as reasonably achievable" principle would be used for controlling radiation exposure and exposure to hazardous/toxic substances. The Hanford Site would continue to refine its current emergency planning, emergency preparedness, and emergency response programs in place to protect both workers and the public (DOE, 1995g).

Site Utilities and Support Services: No mitigation measures beyond those identified for ground disturbance activities associated with bringing power and water to the foreign research reactor spent nuclear fuel site would appear necessary. In those cases, use of standard dust suppression techniques and revegetation of disturbed areas would mitigate ground disturbance impacts.

Accidents: The Hanford Site maintains an emergency response center and has emergency action plans and equipment to respond to accidents and other emergencies. These plans include training of workers, local emergency response agencies (such as fire departments) and the public communication systems and protocols, readiness drills, and mutual aid agreements. The plans would be updated to include consideration of new foreign research reactor spent nuclear fuel facilities and activities. Design of new facilities to current seismic and other facility protection standards would reduce the potential for accidents, and implementation of emergency response plans would substantially mitigate the potential for impacts in the event of an accident.

F.4.4 Oak Ridge Reservation

If the Oak Ridge Reservation site is the site to manage DOE-owned spent nuclear fuel under the Programmatic SNF&INEL Final EIS, foreign research reactor spent nuclear fuel would be received and managed first at the Savannah River Site and/or the Idaho National Engineering Laboratory for the period required for the Oak Ridge Reservation to construct and to place in operation new facilities to accommodate the spent nuclear fuel. As discussed in previous sections, this period (Phase 1) is estimated to be about 10 years. At the end of Phase 1 (e.g., start of Phase 2), the Oak Ridge Reservation would be able to receive and manage foreign research reactor spent nuclear fuel that would be shipped from the Savannah River Site and/or the Idaho National Engineering Laboratory and directly from the ports for those shipments made after Phase 1 concludes. Management of the foreign research reactor spent nuclear fuel would continue at the Oak Ridge Reservation until ultimate disposition.

The amount of spent nuclear fuel that would be received and managed at the Oak Ridge Reservation under Management Alternative 1 is dictated by the distribution considered in the Programmatic SNF&INEL Final EIS. Accordingly, in Phase 2, the Oak Ridge Reservation could receive the aluminum-based foreign research reactor spent nuclear fuel managed at the Savannah River site during Phase 1, Eastern foreign research reactor spent nuclear fuel under the Regionalization by Geography Alternative, or all foreign research reactor spent nuclear fuel under the Centralization Alternative.

As a Phase 2 site, the Oak Ridge Reservation would receive and manage foreign research reactor spent nuclear fuel at a new dry storage facility to be constructed on the West Bear Creek Valley Site. The location is preferred among the four locations considered in a siting study performed for spent nuclear fuel management (MMES, 1994). Description of the new dry storage facility is provided in Section 2.6.5.1.1.

The analysis of environmental impacts from management of foreign research reactor spent nuclear fuel at the Oak Ridge Reservation is based on the above considerations. The analysis options selected do not represent all possible combinations but a reasonable set that provides a typical, and in some cases, bounding estimate of the resulting impacts.

The specific analysis options are as follows:

4A. The spent nuclear fuel managed at the Idaho National Engineering Laboratory and/or the Savannah River Site during Phase 1 would be shipped to the Oak Ridge Reservation where it would be managed at a new dry storage facility until ultimate disposition. Spent nuclear fuel arriving in the United States after Phase 1 concludes would also be received and managed at the new facility until ultimate disposition. For the purposes of this analysis, the total amount of spent nuclear fuel that would be managed in the new dry storage facility would be all the foreign research reactor spent nuclear fuel eligible under the policy (approximately 22,700 elements).

The implementation alternatives of Management Alternative 1 for managing foreign research reactor spent nuclear fuel in the United States discussed in Section 2.2.2 introduce additional analysis options that could be considered for the Oak Ridge Reservation as follows:

- Under Implementation Subalternative 1a (Section 2.2.2.1), the amount of spent nuclear fuel to be received in the United States would be reduced to 5,000 elements. In this case, the Oak Ridge Reservation would receive the foreign research reactor spent nuclear fuel from the Idaho National Engineering Laboratory or the Savannah River Site and manage it in facilities sized for this amount of spent fuel. The impacts from the management of this amount of spent nuclear fuel would be bounded by analysis option 4A above.

- Under Implementation Subalternative 1b (Section 2.2.2.1), the Oak Ridge Reservation would receive only HEU from the Idaho National Engineering Laboratory and/or the Savannah River Site. The amount of spent nuclear fuel would be approximately 4.6 MTHM, representing 11,200 elements. The impacts from the management of this amount of fuel at the Oak Ridge Reservation would be bounded by analysis option 4A above.

- Under Implementation Subalternative 1c (Section 2.2.2.1), the Oak Ridge Reservation would receive target material in addition to the foreign research reactor spent nuclear fuel considered under the basic implementation of Management Alternative 1. The receipt and management of this material, which represents in uranium content approximately 620 typical foreign research reactor spent nuclear fuel elements, would increase the impacts of analysis option 4A by a small percentage.

- Under Implementation Subalternative 2a (Section 2.2.2.2), the duration of the policy would be decreased to 5 years and, therefore, the amount of spent nuclear fuel available for acceptance would also be decreased. In this case, the Oak Ridge Reservation would receive all foreign research reactor spent nuclear fuel from the Savannah River Site and/or the Idaho National Engineering Laboratory. The impacts from the management of the decreased amount of spent nuclear fuel at the Oak Ridge Reservation would be bounded by analysis option 4A above.

- Under Implementation Subalternative 2b, (Section 2.2.2.2), the acceptance of a small portion of the spent nuclear fuel would be extended over an indefinite period of time, but

the amount of spent nuclear fuel to be received and managed would remain constant. The impacts would be the same as in option 4A above.

- Under Implementation Alternative 3 (Section 2.2.2.3), DOE and the Department of State would consider alternative financial arrangements. These arrangements would affect the amount of spent nuclear fuel that would be accepted by the United States as the foreign research reactor operators would consider their own alternatives on whether to send the spent nuclear fuel to the United States. The amount of fuel, in this case, cannot be quantified, however, the upper limit, as considered under analysis option 4A, would be bounding.

- Under Implementation Alternative 4 (Section 2.2.2.4), DOE and the Department of State would consider alternatives for the location where title of the foreign research reactor spent nuclear fuel would be taken. The choices do not affect the management impacts at the Oak Ridge Reservation.

- Under Implementation Alternative 5 (Section 2.2.2.5), DOE would consider construction of a new wet storage facility at the Oak Ridge Reservation for Phase 2 until ultimate disposition. For this implementation alternative an analysis option 4B, which is similar to 4A, is considered as follows:

4B. The spent nuclear fuel managed at the Idaho National Engineering Laboratory and/or the Savannah River Site during Phase 1 would be shipped to the Oak Ridge Reservation where it would be managed at a new wet storage facility. Spent nuclear fuel arriving in the United States after Phase 1 concludes would also be received and managed at the new facility until ultimate disposition. For the purposes of analysis, the total amount of spent nuclear fuel to be managed in the wet storage facility would be all the foreign research reactor spent nuclear fuel eligible under the policy (approximately 22,700 elements).

- Under Implementation Alternative 6 (Section 2.2.2.6), DOE and the Department of State would consider chemical separation of foreign research reactor spent nuclear fuel in the United States. Based on the discussion in Section 2.3.6, the Oak Ridge Reservation would not be considered as a site for chemical separation.

Under Management Alternative 3 (Hybrid Alternative) the Oak Ridge Reservation is not considered.

F.4.4.1 Existing Facilities

There are no existing facilities for storing foreign research reactor spent nuclear fuel at Oak Ridge Reservation. Consequently, all potential environmental consequences from foreign research reactor spent nuclear fuel storage are related to new facility construction and operation.

F.4.4.2 New Facilities (Phase 2)

Analysis options 4A and 4B involve the use of new facilities as discussed above. The environmental impacts analyzed relate to the construction and operation of these facilities. The impacts include: land use; socioeconomics; cultural resources; aesthetic and scenic resources; geology; air and water quality; ecology; noise; traffic and transportation; occupational and public health and safety; materials, utilities, and energy; and waste management.

F.4.4.2.1 Dry Storage

Analysis option 4A involves long-term storage of foreign research reactor spent nuclear fuel at Oak Ridge Reservation. This analysis option would require the construction of a new dry storage facility. The analysis option encompasses both the dry storage vault design and the dry cask design as described in Section 2.6.5 and earlier in this appendix. There are no environmental impact parameters that would discriminate between the two designs. For the purpose of this analysis, the impacts from the larger dry vault design are presented.

F.4.4.2.1.1 Land Use

A new dry storage facility would be located in a 36-ha (90-acre) area in the eastern portion of West Bear Creek Valley. The majority of the land in this area can be characterized as vacant, unused, and ready for development. Use of West Bear Creek Valley for foreign research reactor spent nuclear fuel storage would be consistent with existing land use plans, which designate this area for general use (MMES, 1994). Construction activities, including laydown areas, would disturb 16 ha (40 acres) of land. This represents about 44 percent of the space designated for foreign research reactor spent nuclear fuel storage; however, this represents only about 0.1 percent of the entire Oak Ridge Reservation. A new dry storage facility would occupy 5,000 m^2 (54,000 ft^2) of land and would move 11,000 m^3 (14,400 yd^3) of soil. Neither construction nor operation of a new dry storage facility at any of the areas would significantly impact land use patterns on the Oak Ridge Reservation.

F.4.4.2.1.2 Socioeconomics

As discussed in Section F.3.1.1 the total capital cost of a new dry storage facility is estimated to be $370 million. Construction activities are projected to take 4 years. Assuming that the capital cost is evenly distributed over this 4-year period, the annual expenditures would be about $92.5 million. This represents approximately 7.8 percent of the estimated FY 1995 total expenditures for the Oak Ridge Reservation ($1,174 million). The relative socioeconomic impact from annual construction expenditures on the region of influence would be positive. The annual operations costs of a new dry storage facility are estimated to be $15.6 million for receipt and handling and $0.6 million for storage. These costs represent approximately 1.3 percent and 0.05 percent of FY 1995 total expenditures for the Oak Ridge Reservation. The relative socioeconomic impact from annual operation expenditures on the region of influence would be small.

Direct employment associated with construction of a new dry storage facility is estimated to be 190 persons. The relative socioeconomic impact from direct and secondary construction employment on the region of influence would be small. In addition, when compared to the projected FY 1995 work force at the Oak Ridge Reservation of approximately 17,000 persons, the relative socioeconomic impact of this temporary increase in construction employment would be insignificant. Direct employment associated with receipt and storage operations is estimated to be 30 persons. Upon completion of these activities, direct employment is expected to decrease to eight persons. The relative socioeconomic impact of this increase in operations employment would be insignificant to both the region of influence and Oak Ridge Reservation.

F.4.4.2.1.3 Cultural Resources

There are no known historical, archaeological, paleontological, or Native American traditional sites in or around the potential storage site. No impacts to cultural resources are expected from ground disturbance, noise, or air emissions during construction or operation of the facility. Consultation with the Tennessee State Historic Preservation Office prior to project implementation is required by Section 106 of the National Historic Preservation Act of 1966. The State Historic Preservation Office may recommend further studies of the potential storage site to verify that no archaeological areas would be disturbed by construction activities (DOE, 1995g).

F.4.4.2.1.4 Aesthetic and Scenic Resources

Construction and operation of a new dry storage facility for foreign research reactor spent nuclear fuel would have similar impact on aesthetic and scenic resources at the Oak Ridge Reservation as the construction of spent nuclear fuel facilities under the Centralization Alternative considered in the Programmatic SNF&INEL Final EIS (DOE, 1995g). The spent nuclear fuel facilities associated with the Centralization Alternative would consist of a series of industrial buildings set within a 36-ha (90-acre) site. The maximum height of the buildings on the site would not exceed 12.8 m (42 ft) above ground level, or two to three stories. Since the buildings would be set into the south face of Pine Ridge, between Pine Ridge and Chestnut Ridge, the site would not be visible from areas outside the Reservation, with the possible exception of a limited section of Gallaher Road on the west side of the Clinch River, looking east along Bear Creek Valley and the Bear Creek Road which is accessible to the public. The site would be screened by appropriate vegetation so that the public views would not be affected. Potential soil erosion and dust generation associated with construction-related activities would be controlled by the implementation of best-management practices. Any visibility impacts from fugitive dust generation by construction-related activities should be insignificant and short term. Facility operations associated with the dry storage of foreign research reactor spent nuclear fuel should not generate any atmospheric emissions which would reduce area visibility.

F.4.4.2.1.5 Geology

For the most part, geologic impacts from construction activities would be limited to soil disturbance; although in some areas, ripping or blasting of limestone, dolomite, or chert layers might be required. No extensive or unique geologic or mineral resources are found in or around the potential storage site, so no geological impacts would be expected (DOE, 1995g). The operation of the new dry storage facility would have no effect on the geologic characteristics at the site.

Because previously undisturbed areas would be used for new construction, some soil impacts from siting a new dry storage facility at the West Bear Creek Valley site would occur as a result of grading. Potential impacts from sediment runoff generated during construction activities would be minimized by implementation of soil erosion and sediment control measures. During operations, impacts to soil resources would be controlled by the planting or landscaping of land surfaces not covered by pavement and buildings (DOE, 1995g).

Major seismic activity and associated mass movement and subsidence are unlikely to occur during the construction or operation because faults in the area have not been active since the late Paleozoic Era (DOE, 1995g).

F.4.4.2.1.6 Air Quality

Nonradiological Emissions: Potential air quality impacts associated with construction include generation of fugitive dust (particulate matter) and smoke from earth moving and clearing operations and emissions from construction equipment. Sources of fugitive dust include:

- transfer of soil to and from haul trucks and storage piles;
- turbulence created by construction vehicles moving over cleared, unpaved surfaces; and
- wind-induced erosion of exposed surfaces.

Construction of this facility would require the clearing of approximately 16 ha (40 acres) of land. However, the overall construction impacts to the ambient air quality of the region should be minimal due to the short duration (3 months to 6 years) of the project. Emissions of sulfur dioxide, nitrogen dioxide, and carbon monoxide are assumed to result entirely from diesel exhaust during the construction process. Respirable particulate matter (e.g., PM_{10}) is assumed to be 64 percent of the total suspended particulates estimated for the construction effort. Additionally, wetting controls are assumed to reduce this amount by 50 percent, which is a very conservative estimate.

Table F-70 presents the air quality impacts associated with the construction of a new dry storage facility at the Oak Ridge Reservation. Additionally, this table shows that the ambient impacts would be minimal and compliance with existing Federal and State ambient air quality standards would not be adversely affected. Therefore, construction activities would not be expected to have any detrimental effect on the health and safety of the general population. The estimated impacts from construction activities were generated using the Environmental Protection Agency regulatory-approved Industrial Source Complex Short-Term Model, Version 2.0, in conjunction with onsite meteorological data from 1991.

Table F-70 Estimated Maximum Concentrations of Criteria Pollutants at the Oak Ridge Reservation Attributable to New Dry Storage Construction

Pollutant	Averaging Time	Ambient Standard[a]	Baseline Concentration[b]	Construction Activities
Oak Ridge Reservation Boundary ($\mu g/m^3$)[c]				
• Particulate Matter (PM_{10})[c]	24-hr	150	84.9	0.5450
	Annual	50	0.43	0.0144
• Carbon Monoxide	1-hr	40,000	2,748.0	26.756
	8-hr	10,000	2,290.8	3.345
• Sulfur Dioxide	3-hr	1,300	170.3	2.356
	24-hr	365	55.2	0.345
	Annual	80	1.1	0.006
• Nitrogen Oxide	Annual	100	2.1	0.098

[a] *64 percent of total suspended particulates is considered to be respirable particulate matter (e.g., PM_{10}) for the construction activities. The standard refers to the actual PM_{10} standard.*

[b] *Source: DOE, 1995g*

[c] *To convert to $\mu g/ft^3$, multiply by 0.0283*

Nonradiological emissions are not expected during operation of a new dry storage facility.

Radiological Emissions: No radiological emissions from construction of a new dry storage facility for foreign research reactor spent nuclear fuel are expected. Based on fuel drying and storage operations

conducted at Idaho National Engineering Laboratory, potential atmospheric releases from the spent nuclear fuel storage facility would consist of minor amounts of particulate radioactive material and larger amounts of gaseous fission products that could escape from the fuel through cladding defects. The majority of radioactive material responsible for fuel and cask internal surface contamination consists of activation products that plate out on the spent nuclear fuel assemblies during reactor operation. This material is dependent on corrosion of structural materials and generally consists of radionuclides such as ^{58}Co, ^{60}Co, ^{59}Fe, etc. This contamination activity would have to be controlled during the cask opening and fuel handling operations to prevent internal personnel exposures. Proper facility ventilation (designed to provide airflow from areas of low contamination to progressively higher contamination) would help provide contamination control. High-efficiency particulate air filters in the facility exhaust would reduce the airborne effluent quantities of this particulate material to quantities that are well within the prescribed limits.

Cask opening and fuel drying operations may also be responsible for the release of significant amounts of ^{3}H, ^{85}Kr, and minor amounts of ^{129}I. The amounts of these radionuclides released during the cask opening operation depends on the following parameters: (1) the number of spent nuclear fuel clad defects; (2) the spent nuclear fuel material and the diffusion rate of these radionuclides through the fuel matrix for the fuel temperature while in the cask, and (3) the time that the spent nuclear fuel is contained within the cask before opening.

Similarly, for fuel drying operations, the temperature of the drying gas (as well as the parameters discussed above) would cause quantities of ^{3}H, ^{85}Kr, and ^{129}I to be released from the fuel. Charcoal or silver zeolite filters could be used to remove the ^{129}I from the exhaust, but the ^{3}H and ^{85}Kr, being gases, or in a gaseous state for the case of tritiated water, would be exhausted to the atmosphere. During spent nuclear fuel storage small amounts of the gaseous/volatile radionuclides are expected to be released to the environment based on the fuel matrix, clad defects, and storage temperature. Release rates would decrease with storage time due to radioactive decay. It is anticipated that the fuel drying operation would be responsible for the most significant release of these gaseous/volatile radionuclides to the environment.

For this analysis, radiological emissions from the operation of a new dry storage facility were calculated based on the methodology and assumptions described in Appendix F, Section F.6. The radiological consequences of air emissions from the operation of the dry storage facilities at the Oak Ridge Reservation are discussed in Section F.4.4.2.1.11. The annual emission releases from the dry storage facility during receipt and unloading and storage are provided in Section F.6.6.1.

F.4.4.2.1.7 Water Resources

The water usage during construction of a new dry storage facility is estimated to be about 7.75 million l (2 million gal). During operations, annual water consumption would be 2.1 million l (550,000 gal) for receipt and handling and 0.4 million l (109,000 gal) for storage. With an annual average water usage of approximately 3,060 million l (808 million gal) for the Oak Ridge Reservation, these amounts represent no more than a 0.07 percent increase in annual water usage. Therefore, a new dry storage facility would have minimal impact on water resources at the Oak Ridge Reservation.

Best-management practices during construction would prevent sediment runoff or spills of fuels or chemicals. Therefore, construction activities should have no impact on water quality at the Oak Ridge Reservation. The impact on water quality during operations would also be negligible. Existing water treatment facilities at the Oak Ridge Reservation could accommodate any new domestic and process wastewater streams from a new dry storage facility. The expected total flow volumes at the Oak Ridge

Reservation would still be well within the design capacities of treatment systems at the Oak Ridge Reservation. A new dry storage facility would meet National Pollutant Discharge Elimination System limits and reporting requirements, so no impact on the water quality of receiving streams is expected.

F.4.4.2.1.8 Ecology

Terrestrial Resources: Radiation doses received by terrestrial biota from foreign research reactor spent nuclear fuel activities would be expected to be similar to those received by man. Although guidelines have not been established for acceptance limits for radiation exposure to species other than man, it is generally agreed that the limits established for humans are also conservative for other species. Evidence indicates that no other living organisms have been identified that are likely to be significantly more radiosensitive than man. Thus, so long as exposure limits protective of man were not exceeded, no significant radiological impact on populations of biota would be expected as a result of foreign research reactor spent nuclear fuel activities at the West Bear Creek Site (DOE, 1995g).

Under the Centralization Alternative, construction of the potential spent nuclear fuel management facility would result in the disturbance of approximately 36 ha (90 acres) [16 ha (40 acres) if foreign research reactor spent nuclear fuel is considered in isolation], or less than 1 percent of the Oak Ridge Reservation. It is assumed that the area to be disturbed includes construction laydown areas, grading, and new buildings, and that the access road or other rights-of-ways have not been included in the total area to be disturbed. Vegetation within the area of the potential site for the spent nuclear fuel management facility would be destroyed during land clearing activities, but may be mitigated by revegetating with native species where possible. Vegetation cover in this area is predominantly oak-hickory forest or pine-hardwood forest. Both forest types are common on the Oak Ridge Reservation and within the region (DOE, 1995g).

Construction of a new dry storage facility would have some adverse effects on animal populations. Less mobile animals, such as amphibians, reptiles, and small mammals, within the project area would be destroyed during land-clearing activities. Larger mammals and birds in construction and adjacent areas would be disturbed by construction activities and would move to nearby suitable habitat. The long-term survival of these animals would depend on whether the area to which they moved was at or below its carrying capacity. Areas that would be revegetated upon completion of construction would be of minimal value to most wildlife, but might be repopulated by more tolerant species (DOE, 1995g).

The Migratory Bird Treaty Act is primarily concerned with the destruction of migratory birds, as well as their eggs and nests. It could be necessary to survey construction sites for the nests of migratory birds prior to construction and/or avoid clearing operations during the breeding season (DOE, 1995g).

Activities associated with operation, such as noise, increased human presence and traffic, and night lighting could affect wildlife living immediately adjacent to the storage site. While these disturbances could cause some sensitive species to move from the area, most animals should be able to adjust (DOE, 1995g).

Wetlands: Construction of a new dry storage facility would likely displace the forested wetlands adjacent to tributaries of Grassy Creek flowing through the potential site. This unavoidable displacement of wetlands would be accomplished in accordance with U.S. Army Corps of Engineers and Tennessee Water Quality Control Administration requirements. The potential also exists to disturb wetlands further downstream through erosion and sedimentation. Such impacts would be controlled through implementation of a soil erosion and sediment control plan. Construction-related discharges to Grassy

Creek would be relatively low and have negligible impacts to wetlands associated with the creek. No impacts to wetlands are anticipated during facility operations (DOE, 1995g).

Construction of a new dry storage facility would require the rechanneling of tributaries to Grassy Creek that cross the potential site, thus causing the loss of this aquatic habitat. In addition, soil erosion due to construction could cause water quality changes (primarily sediment loading) to Grassy Creek and its tributaries. These impacts could be minimized by implementation of soil erosion and sediment control measures. No operational impacts to aquatic resources are anticipated. It is assumed that the potential project would have a water retention pond within the security fence that might provide minimal habitat for amphibians in the area.

Threatened and Endangered Species: No Federally-listed species are expected to be affected. Site surveys would be required to verify the presence of State-listed or other special status species. Land clearing activities could destroy protected plant species, such as purple fringeless orchid and pink lady's-slippers, that may occur within the site. State-listed species including the Cooper's, sharp-shinned, and red-shouldered hawks, the barn owl, and the black vulture, which potentially occur in the area, could be impacted by project activities. Approximately 16 ha (40 acres) of potential nesting and foraging habitat would be lost as a result of construction activities. Because this type of habitat is abundant in the area, the loss would not be expected to affect the viability of populations of these species. However, appropriate steps would be taken to prevent nest disturbance. DOE would consult with the Tennessee Department of Environment and Conservation as appropriate to avoid or mitigate imminent impacts to State-listed species (DOE, 1995g). DOE would also consult with the U.S. Fish & Wildlife Service regarding threatened and endangered species for the proposed construction sites of foreign research reactor spent nuclear fuel storage facilities at the Oak Ridge Reservation. Impacts to threatened and endangered species are not anticipated.

F.4.4.2.1.9 Noise

Noises generated on the Oak Ridge Reservation do not propagate offsite at levels that impact the general population. Thus, the Oak Ridge Reservation noise impacts for both the Centralization and Regionalization by Fuel Type and Geography Alternatives would be those resulting from transportation of personnel and materials to and from the site that affect nearby communities, and those resulting from onsite sources that may affect some wildlife near these sources (DOE, 1995g).

The transportation noises are a function of the size of the work force (e.g., an increased work force would result in increased employee traffic and corresponding increases in deliveries by construction crews). Such noise and activity associated with construction would be expected to have short-term effects on most wildlife. Under the Centralization Alternative, the projected Oak Ridge Reservation work force would increase by about nine percent in the years 2000 to 2002 during peak construction, and decrease thereafter. There would be a corresponding increase in private vehicle and truck trips to the site. The day-night average sound level at 15 m (50 ft) from the roads that provide access to the Oak Ridge Reservation would be expected to increase by less than 1 decibel. No change is expected in the community reaction to noise along these routes. No mitigation of traffic noise impacts is proposed (DOE, 1995g).

F.4.4.2.1.10 Traffic and Transportation

Construction and operation of a new dry storage facility would involve a small increase in the number of employees commuting to the Oak Ridge Reservation and transportation of foreign research reactor spent nuclear fuel and hazardous chemicals within the site.

The maximum reasonably foreseeable scenario for construction and operation traffic occurs under the Centralization Alternative considered in the Programmatic SNF&INEL Final EIS. This would occur in 2001, when there would be about 4,200 full time employees and about 409,500 people in the region of influence. Construction and operation employees would contribute little to the future traffic because they represent such a small percentage of the region of influence population growth (DOE, 1995g). This conclusion would also be valid for a new dry storage facility for foreign research reactor spent nuclear fuel.

F.4.4.2.1.11 Occupational and Public Health and Safety

Emission-Related Impacts: Doses that could be received by the public during incident-free operation associated with the receipt and management of the foreign research reactor spent nuclear fuel at the Oak Ridge Reservation would be attributed to emissions of radioactive material that could be carried by the wind offsite. The general public would be too far from the locations where handling activities or storage take place to receive any dose from direct exposure. Doses were calculated for the MEI, defined as an individual at the site boundary receiving the maximum exposure, and for the general population within an 80 km (50 mi) radius of the storage facility. These doses would result from incident-free airborne radiological emissions assumed to be released from the unloading of the transportation cask and the storage facility during storage. The methodology and assumptions used for the calculation of the radiological emissions and resulting doses are discussed in Section F.6 of this appendix. Table F-71 summarizes the annual emission-related doses to the public and the associated risks for the MEI and population at the Oak Ridge Reservation. Integrated doses for the duration of a specific period can be obtained by multiplying the annual dose by the number of years in the period.

Table F-71 Annual Public Impacts for Foreign Research Reactor Spent Nuclear Fuel Receipt and Storage at the Oak Ridge Reservation (New Dry Storage)

Facility	*MEI Dose (mrem/yr)*	*MEI Risk (LCF/yr)*	*Population Dose (person rem/yr)*	*Population Risk (LCF/yr)*
Receipt/Unloading at: • New Dry Storage Facility	0.089	4.5×10^{-8}	0.085	0.000043
Storage at: • New Dry Storage Facility	0	0	0	0

Handling-Related Impacts: Workers at the site would receive radiation doses during handling operations (i.e., receiving and unloading the transportation cask). Analysis option 4A involves the receipt of 161 shipments of foreign research reactor spent nuclear fuel from the Idaho National Engineering Laboratory or the Savannah River Site and 193 shipments directly from ports into a dry storage facility. The assumptions and methodologies used to calculate the doses to a working crew associated with the handling activities of the foreign research reactor spent nuclear fuel are described in Section F.5 of this appendix.

Table F-72 presents the population dose and risk that would be received by the members of the working crew if that working crew handled the total number of transportation casks at the Oak Ridge Reservation.

The worker MEI doses and risks were not calculated because of the large uncertainties associated with the assumptions for such calculations. However, the upper bound for such a dose would be equal to the administrative or regulatory limit at the site. For DOE radiation workers, the regulatory limit is 5,000 mrem per year. All these workers would be monitored and if any worker's dose approached this limit, he or she would be rotated into a different job to prevent further exposure. This regulatory limit provides a very conservative upper bound on the radiation dose for the worker MEI. If a single worker received the full 5,000 mrem per year dose for the full 13 years of potential foreign research reactor spent nuclear fuel receipt, then the MEI dose would be 65,000 mrem. For this dose, the associated risk of incurring an LCF would be 2.6 percent.

Table F-72 Handling-Related Impacts to Workers at the Oak Ridge Reservation (New Dry Storage)

	Worker Population Dose (Person-rem)	*Worker Population Risk (LCF)*
	New Dry Storage	*New Dry Storage*
Phase 2	266/113[a]	0.11/0.05[a]

[a] *The two numbers represent the cask/vault designs respectively*

F.4.4.2.1.12 Material, Utility, and Energy Requirements

Construction of a new dry storage facility at the Oak Ridge Reservation would consume 21,800 m^3 (28,500 yd^3) of concrete and 5,200 metric tons (5,750 tons) of steel. The total energy and water requirements during construction are estimated to be 835,000 l (221,000 gal) for fuel, and 7.75 million l (2 million gal) for water. The annual utility and energy requirements during operations are shown in Table F-73. These requirements represent a small percent of current requirements for the Oak Ridge Reservation. No new generation or treatment facilities would be necessary, and connections to existing networks would require only short tie-in lines. Increases in consumption would be minimal because overall activity on the Oak Ridge Reservation is expected to decrease because of changes in site mission and a general reduction in employment.

Table F-73 Annual Utility and Energy Requirements for New Dry Storage at the Oak Ridge Reservation

Commodity	*Baseline Site Usage*	*Dry Storage Usage*	*Percent Increase*
Electricity (MW-hr/yr)	335,800	800 - 1,000	0.3 percent
Fuel (l/yr)	3,600[c]	0	0 percent
Water (l/yr)	3,060,000,000	1,590,000[a] 400,000[b]	0.05 percent[a] 0.01 percent[b]

[a] *During receipt and handling*

[b] *During storage*

[c] *Decatherms/yr of natural gas*

F.4.4.2.1.13 Waste Management

Construction of a new dry storage facility at the Oak Ridge Reservation would generate 1,800 m^3 (2,400 yd^3) of debris. The annual quantities of waste generated during operations are shown in

Table F-74. These quantities represent a very small percent increase above current levels at the Oak Ridge Reservation. Existing waste management storage and disposal activities at Oak Ridge Reservation could accommodate the waste generated by a new dry storage facility. Therefore, the impact of this waste on existing Oak Ridge Reservation waste management capacities would be minimal.

Table F-74 Annual Waste Generated for New Dry Storage at the Oak Ridge Reservation

Waste Form	Baseline Site Generation	Dry Storage Generation	Percent Increase
High-Level (m^3/yr)	0	0	0 percent
Transuranic (m^3/yr)	16	0	0 percent
Solid Low-Level (m^3/yr)	6,902	22[a] 1[b]	0.32 percent[a] 0.01 percent[b]
Wastewater (l/yr)	754,000,000	1,590,000[a] 400,000[b]	0.21 percent[a] 0.05 percent[b]

[a] *During receipt and handling*

[b] *During storage*

F.4.4.2.2 Wet Storage

Analysis option 4B involves long-term wet storage of foreign research reactor spent nuclear fuel at the Oak Ridge Reservation. This storage option would require the construction of a new wet storage facility.

F.4.4.2.2.1 Land Use

A new wet storage facility would be located in a 36-ha (90-acres) area in the eastern portion of West Bear Creek Valley. The majority of the land in this area can be characterized as vacant, unused, and ready for development. Use of West Bear Creek Valley for foreign research reactor spent nuclear fuel storage would be consistent with existing land use plans, which designate this area for general use. Construction activities, including laydown areas, would disturb 16 ha (40 acres) of land. This represents about 44 percent of the space designated for foreign research reactor spent nuclear fuel storage; however, this represents only about 0.1 percent of the entire Oak Ridge Reservation. A new wet storage facility would occupy 3,800 m^2 (41,000 ft^2) of land and would move 18,000 m^3 (24,000 yd^3) of soil. Neither construction nor operation of a new wet storage facility at any of the areas would significantly impact land use patterns on Oak Ridge Reservation.

F.4.4.2.2.2 Socioeconomics

As discussed in Section F.3.2 the total capital cost of a new wet storage facility is estimated to be $449 million. Construction activities are projected to take 4 years. Assuming that the capital cost is evenly distributed over this 4-year period, the annual expenditures would be about $112.2 million. This represents approximately 8.2 percent of the estimated FY 1995 total expenditures for the Oak Ridge Reservation (1,174 million). The relative socioeconomic impact from annual construction expenditures on the region of influence would be positive. The annual operations costs of a new wet storage facility are estimated to be $23.3 million for receipt and handling and $3.5 million for storage. These costs represent about 2 percent and 0.3 percent of FY 1995 total expenditures for the Oak Ridge Reservation. The relative socioeconomic impact from annual operation expenditures on the region of influence would be small.

Direct employment associated with construction of a new wet storage facility is estimated to be 157 persons. The relative socioeconomic impact from direct construction employment on the region of influence would be small. In addition, when compared to the projected FY 1995 work force at the Oak Ridge Reservation of approximately 17,000 persons, the relative socioeconomic impact of this temporary increase in construction employment would be insignificant. Direct employment associated with operations of a new wet storage facility is estimated to be 30 persons. The relative socioeconomic impact of this increase in operations employment would be insignificant to both the region of influence and the Oak Ridge Reservation.

F.4.4.2.2.3 Cultural Resources

Impacts to cultural resources would be the same as for new dry storage (Section F.4.4.2.1.3).

F.4.4.2.2.4 Aesthetic and Scenic Resources

Impacts to aesthetic and scenic resources would be the same as for new dry storage (Section F.4.4.2.1.4).

F.4.4.2.2.5 Geology

Impacts to geology would be the same as for new dry storage (Section F.4.4.2.1.5).

F.4.4.2.2.6 Air Quality

Nonradiological Emissions: Construction of a new wet storage facility would necessitate the clearing and grading of approximately 3 ha (7 acres) of land. In comparison, approximately 4 ha (10 acres) of land would be disturbed by new dry storage construction. Therefore, air quality impacts associated with wet storage construction would be bound by those associated with dry storage construction (Section F.4.4.2.1.6).

No nonradiological emissions from the operation of the new wet storage facility are expected.

Radiological Emissions: Incident-free airborne releases from the new wet storage facility would be limited to radioactive noble gases and some radioactive iodine which could be released from the stored fuel prior to canning. The airborne materials released to the building atmosphere during incident-free operations would be filtered by the building heating and ventilation system. Radioactive and nonradioactive effluent gases would be routed through double banked high efficiency particulate air filters prior to release to the environment through an exhaust air system. The high efficiency particulate air filters would have a minimum efficiency of 99.97 percent for 0.3 micron diameter particulates and would allow in-place dioctyl phthalate testing.

The new wet storage facility would discharge all ventilated gas, except truck exhaust, to the facility's exhaust system. Truck exhaust would be discharged directly to the environment during cask off-loading operations in the truck receiving area. The exhaust air system would employ a detector to monitor ^{137}Cs. For other building areas which would be sources of airborne radioactive contamination, the heating, ventilating, and air conditioning system would be designed to maintain airflow from areas of low potential contamination into areas of higher potential contamination. These airborne effluents would be required to be below the radioactivity concentration guides listed in DOE Order 5480.1B for both onsite and offsite

concentrations (DOE, 1989b). Air emissions from the wet storage facility are expected to be similar to the air emissions from the CPP-603 at the Idaho National Engineering Laboratory. The annual air emission for the CPP-603 was designed to result in ground-level concentrations of less than 0.003 percent of DOE 5480.1B limits for uncontrolled areas. Radiological emissions from the operation of the wet storage facility were calculated based on the methodology and assumptions used in Section F.6.

F.4.4.2.2.7 Water Resources

The annual water usage during construction and operations of a new wet storage facility is estimated to be about 1.9 million l (502,000 gal) and 2.7 million l (720,000 gal), respectively. With an annual average water usage of approximately 3,060 million l (808 million gal) for the Oak Ridge Reservation, these amounts represent an increase of about 0.06 percent and 0.09 percent, respectively. Therefore, a new wet storage facility would have minimal impact on water resources at the Oak Ridge Reservation.

Best-management practices during construction would prevent sediment runoff or spills of fuels or chemicals. Therefore, construction activities should have no impact on water quality at the Oak Ridge Reservation. The impact on water quality during operations would also be negligible. Existing water treatment facilities at the Oak Ridge Reservation could accommodate any new domestic and process wastewater streams from a new wet storage facility. The expected total flow volumes at the Oak Ridge Reservation would still be well within the design capacities of treatment systems at the Oak Ridge Reservation. A new wet storage facility would meet National Pollutant Discharge Elimination System limits and reporting requirements, so no impact on the water quality of receiving streams is expected.

F.4.4.2.2.8 Ecology

Impacts to ecology would be the same as for new dry storage (Section F.4.4.2.1.8).

F.4.4.2.2.9 Noise

Impacts from noise would be the same as for new dry storage (Section F.4.4.2.1.9).

F.4.4.2.2.10 Traffic and Transportation

Impacts from traffic and transportation would be the same as for new dry storage (Section F.4.4.2.1.10).

F.4.4.2.2.11 Occupational and Public Health and Safety

Emission-Related Impacts: Doses that could be received by the public during incident-free operation associated with the receipt and management of the foreign research reactor spent nuclear fuel at the Oak Ridge Reservation would be attributed to emissions of radioactive material that could be carried by wind offsite. The public would be too far from the locations where handling activities or storage take place to receive any dose from direct exposure. Doses were calculated for the MEI, defined as an individual at the site boundary receiving the maximum exposure, and for the general population within an 80 km (50 mi) radius of the storage facility. These doses would result from routine airborne radiological emissions assumed to be released from the unloading of the transportation cask and the storage facility during

storage. The methodology and assumptions used for the calculation of the radiological emissions and resulting doses are discussed in Section F.5 of this appendix. Table F-75 summarizes the annual emission-related doses to the public and the associated risks for the MEI and population at the Oak Ridge Reservation. Integrated doses for the duration of a specific implementation period can be obtained by multiplying the annual dose by the number of years in the period.

Table F-75 Annual Public Impacts for Foreign Research Reactor Spent Nuclear Fuel Receipt and Storage at Oak Ridge Reservation (Implementation Alternative 5 of Management Alternative 1)

Facility	MEI DOSE (mrem/yr)	MEI Risk (LCF/yr)	Population Dose (person-rem/yr)	Population Risk (LCF/yr)
Receipt/Unloading at:				
• New Wet Storage Facility	0.060	3.0×10^{-8}	0.061	0.000031
Storage at:				
• New Wet Storage Facility	4.6×10^{-7}	2.3×10^{-13}	5.0×10^{-7}	2.5×10^{-10}

Handling-Related Impacts: Workers at the site would receive radiation doses during handling operations (i.e., receiving and unloading the transportation cask), transferring the foreign research reactor spent nuclear fuel from one facility to another, or preparing the foreign research reactor spent nuclear fuel for shipment offsite. Analysis option 4B involves the receipt of 161 shipments of foreign research reactor spent nuclear fuel from the Idaho National Engineering Laboratory and/or the Savannah River Site, and 193 shipments directly from ports into a wet storage facility. The assumptions and methodologies used to calculate the doses to a working crew associated with the handling activities of the foreign research reactor spent nuclear fuel are described in Section F.5 of this appendix.

Table F-76 presents the population dose and risk that would be received by the members of the working crew if that working crew handled the total number of transportation casks at the Oak Ridge Reservation. The worker MEI doses and risks were not calculated because of the large uncertainties associated with the assumptions for such calculations. However, the upper bound for such a dose would be equal to the administrative limits at the site. For DOE radiation workers, the regulatory limit is 5,000 mrem per year. All these workers would be monitored and if any worker's dose approached this limit, he or she would be rotated into a different job to prevent further exposure. This regulatory limit provides a very conservative upper bound on the radiation dose for the worker MEI. If a single worker received the full 5,000 mrem per year dose for the full 13 years of potential foreign research reactor spent nuclear fuel receipt, then the MEI dose would be 65,000 mrem. For this dose, the associated risk of incurring an LCF would be 2.6 percent.

Table F-76 Handling-Related Impacts to Workers at the Oak Ridge Reservation (Implementation Alternative 5 of Management Alternative 1)

	Worker Population Dose (Person-rem)	Worker Population Risk (LCF)
	New Wet Storage	New Wet Storage
Phase 2	109	0.04

F.4.4.2.2.12 Material, Utility, and Energy Requirements

Construction of a new wet storage facility at Oak Ridge Reservation would consume 12,400 m^3 | (16,260 yd^3) of concrete and 3,100 metric tons (3,443 tons) of steel. The total energy and water requirements during construction are estimated to be 600,000 l (159,000 gal) for fuel, and 4.4 million l | (1.2 million gal) for water. The annual utility and energy requirements during operations are shown in

Table F-77. These requirements represent a small percent of current requirements for the Oak Ridge Reservation. No new generation or treatment facilities would be necessary, and connections to existing networks would require only short tie-in lines. Increases in consumption would be minimal because overall activity on the Oak Ridge Reservation is expected to decrease because of changes in site mission and a general reduction in employment.

Table F-77 Annual Utility and Energy Requirements for Wet Storage at the Oak Ridge Reservation (Implementation Alternative 5 of Management Alternative 1)

Commodity	Baseline Site Usage	Wet Storage Usage	Percent Increase
Electricity (MW-hr/yr)	335,800	800 - 1,000	0.15 percent
Fuel (l/yr)	3,600[a]	0	0 percent
Water (l/yr)	3,060,000,000	2,700,000[b] 1,500,000[c]	0.09 percent 0.05 percent

[a] *Decatherms/yr of natural gas*

[b] *During receipt and handling*

[c] *During storage*

F.4.4.2.2.13 Waste Management

Construction of a new wet storage facility at the Oak Ridge Reservation would generate 2,600 m^3 (10,300 yd^3) of debris. The annual quantities of waste generated during operations are shown in Table F-78. These quantities represent a very small percentage increase above current levels at the Oak Ridge Reservation. Existing waste management storage and disposal activities at the Oak Ridge Reservation could accommodate the waste generated by a new wet storage facility. Therefore, the impact of this waste on existing the Oak Ridge Reservation waste management capacities would be minimal.

Table F-78 Annual Waste Generated for Wet Storage at the Oak Ridge Reservation (Implementation Alternative 5 of Management Alternative 1)

Waste Form	Baseline Site Generation	Wet Storage Generation	Percent Increase
High-Level (m^3/yr)	0	0	0 percent
Transuranic (m^3/yr)	16	0	0 percent
Solid Low-Level (m^3/yr)	6,902	16[a] 1[b]	0.23 percent 0.01 percent
Wastewater (l/yr)	754,000,000	1,590,000[a] 400,000[b]	0.21 percent 0.05 percent

[a] *During receipt and handling*

[b] *During storage*

F.4.4.3 Accident Analysis

An evaluation of incident-free operations and hypothetical accidents at the Oak Ridge Reservation is presented here based on the methodology in Appendix F, Section F.6. The evaluation assessed the possible radiation exposure to individuals and general population due to the release of radioactive materials. The analyses are based on the same operations carried out at the different potential storage

locations and the same accidents at any of the sites evaluated. Information concerning radiation doses to individuals and the general population are the same as set forth in Section F.4.1.3.

Table F-79 presents the frequencies and the consequences in terms of mrem or person-rem, of postulated accidents to the offsite MEI, NPAI, and offsite population for the 95th-percentile meteorological conditions using the assumptions and input values discussed above. The worker doses are calculated only for the 50th-percentile meteorology. This is an individual assumed to be 100 m (330 ft) downwind of the accident. DOE did not estimate the worker population dose.

Table F-79 Frequency and Consequences of Accidents at the Oak Ridge Reservation

	Frequency (per year)	Consequences			
		MEI (mrem)	NPAI (mrem)	Population (person-rem)	Worker (mrem)
Dry Storage Accidents[a]					
• Spent Nuclear Fuel Assembly Breach	0.16	22	42	55	140
• Dropped Spent Nuclear Fuel Cask	0.0001	1.4	0.18	15	0.61
• Aircraft Crash w\Fire	0.000001	2300	180	2900	610

[a] *New Dry Storage Facility*

Multiplying the frequency of each accident times its consequences and converting the radiation doses to LCF yields the annual risks associated with each potential accident at the Oak Ridge Reservation. These annual risks are multiplied by the maximum duration of this implementation alternative at each site to obtain conservative estimates of risks for the Oak Ridge Reservation. These risk estimates are presented in Table F-80.

Table F-80 Annual Risks of Accidents at the Oak Ridge Reservation

	Risks			
	MEI (LCF/yr)	NPAI (LCF/yr)	Population (LCF/yr)	Worker (LCF/yr)
Dry Storage Accidents[a]				
• Spent Nuclear Fuel Assembly Breach	0.0000018	0.0000034	0.0044	0.0000088
• Dropped Spent Nuclear Fuel Cask	7.0×10^{-11}	9.0×10^{-12}	7.5×10^{-7}	2.4×10^{-11}
• Aircraft Crash w/Fire	1.2×10^{-9}	9.0×10^{-11}	0.0000015	2.4×10^{-10}

[a] *New Dry Storage Facility*

Table F-81 presents the frequency and consequences of the accidents analyzed for each site for wet storage (Implementation Alternative 5 of Management Alternative 1). Multiplying the frequency of each accident times its consequences at each site and converting the radiation doses to LCF yields the annual risks associated with each potential accident at the Oak Ridge Reservation. These annual risks are multiplied by the maximum duration of this implementation alternative at each site to obtain conservative estimates of risks at the Oak Ridge Reservation. Table F-82 presents the risk estimates from this implementation alternative.

F.4.4.3.1 Secondary Impact of Radiological Accidents at the Oak Ridge Reservation

In the event of an accidental release of radioactivity, there is a potential for impacts to land uses, cultural resources, water quality, ecology, national defense, and local economies (secondary impacts). For this analysis, secondary impacts of radiological accidents involving foreign research reactor spent nuclear fuel have been qualitatively assessed based on the calculations presented in Section F.4.4.3. Radiological

Table F-81 Frequency and Consequences of Accidents at the Oak Ridge Reservation (Implementation Alternative 5 of Management Alternative 1)

	Frequency (per year)	Consequences			
		MEI (mrem)	NPAI (mrem)	Population (person-rem)	Worker (mrem)
New Wet Storage Facility					
• Spent Nuclear Fuel Assembly Breach	0.16	0.71	0.20	16	0.68
• Accidental Criticality	0.0031	1,500	3,300	1,400	6,800
• Aircraft Crash	0.000001	380	600	2,900	1,900

Table F-82 Annual Risks of Accidents at the Oak Ridge Reservation (Implementation Alternative 5 of Management Alternative 1)

	Risks			
	MEI (LCF/yr)	NPAI (LCF/yr)	Population (LCF/yr)	Worker (LCF/yr)
New Wet Storage Facility				
• Spent Nuclear Fuel Assembly Breach	5.5×10^{-8}	1.6×10^{-8}	0.0013	4.4×10^{-8}
• Accidental Criticality	0.0000024	0.000005	0.0022	0.0000084
• Aircraft Crash	1.9×10^{-10}	3.0×10^{-10}	0.0000015	7.6×10^{-10}

accidents that resulted in doses to the MEI of less than the annual Federal radiological exposure limit for the public of 100 mrem (10 CFR Part 20) were considered to have no secondary impacts.

The MEI dose provides a measure of the air concentration and radionuclide deposition at the receptor location. As such, it can be used to express the level of contamination from a given radiological accident. In estimating the human health effects from radiological exposure (as presented in Section F.4.1.3), the MEI dose evaluates four pathways: (1) air immersion, (2) ground surface, (3) inhalation, and (4) ingestion. In estimating the environmental effects from radiological exposure, however, only the air immersion and ground surface pathways need be considered.

At the Oak Ridge Reservation, the radiological accident with the highest MEI dose is the aircraft crash into a dry storage facility with fire. For this accident, the MEI dose would be 2,300 mrem. For the air immersion and ground surface pathways only, the dose would be 140 mrem, which is greater than the 100 mrem limit used in this analysis. Local contamination would be likely around the dry storage facility, but is expected to be contained entirely within the boundaries of the Oak Ridge Reservation. Cleanup activities should be small and any impacts to land uses, cultural resources, water quality, and ecology would be reversible. No impacts to national defense or local economies would be expected.

F.4.4.4 Cumulative Impacts at the Oak Ridge Reservation

This section presents the cumulative impacts of the proposed action, potential impacts of other contemplated major DOE actions, and current activities at the site. A major portion of the presentation is based on information included in the Programmatic SNF&INEL Final EIS (DOE, 1995g), the Tritium Supply and Recycling Final EIS (DOE, 1995a), and the Disposition of Surplus Highly Enriched Uranium Draft EIS (DOE, 1995e). Other activities considered for the Oak Ridge Reservation which could affect the site environment have not been determined sufficiently at this time to allow impact evaluation. They

include activities associated with the waste management at the site, storage and disposition of weapons-usable fissile materials, and stockpile stewardship and management program.

Tables F-83 and F-83A summarize the cumulative impacts for land use, socioeconomics, air quality, occupational and public health and safety, energy and water consumption, and waste generation at the site. Table F-83 also presents the contribution from the storage of foreign research reactor spent nuclear fuel on the cumulative impacts at the Oak Ridge Reservation. For the purposes of this analysis, both the contributions from management of foreign research reactor spent nuclear fuel and the cumulative impacts were maximized by selecting the Centralization Alternative of the Programmatic SNF&INEL Final EIS at the Oak Ridge Reservation.

As shown in Table F-83, the contribution from storage of foreign research reactor spent nuclear fuel to the cumulative impacts (under the Centralization Alternative) at the Oak Ridge Reservation would be minimal. The Programmatic SNF&INEL Final EIS concludes that the implementation of any of the alternatives (including the Centralization Alternative) for the DOE spent nuclear fuel management program would not be expected to significantly contribute to cumulative impacts (DOE, 1995g). This conclusion is also valid for the implementation of any of the alternatives considered in this EIS for storage of foreign research reactor spent nuclear fuel at the Oak Ridge Reservation.

F.4.4.5 Unavoidable Adverse Environmental Impacts

Construction of the potential foreign research reactor spent nuclear fuel storage facilities would require the disturbance of approximately 16 ha (40 acres) of mostly forested undeveloped land. Although this represents less than one percent of the undeveloped land on the Oak Ridge Reservation, it would eliminate potential foraging and nesting habitat and would destroy plant species in the area. It would also require the dedication of a reasonably level land parcel that could otherwise accommodate other construction projects.

F.4.4.6 Irreversible and Irretrievable Commitments of Resources

Construction and operation of new foreign research reactor spent nuclear fuel storage facilities would require commitments of electrical energy, fuel, concrete, steel, sand, gravel and miscellaneous chemicals. Most of the water that would be withdrawn from the Clinch River to operate the foreign research reactor spent nuclear fuel facilities would be returned to surface water in the Clinch River watershed, although some evaporative losses would be unavoidable. The land dedicated to the foreign research reactor spent nuclear fuel facilities could become available for other urban uses following closure and decommissioning. However, the soils on the site would have to be amended to support land uses such as agriculture, forestry, or wildlife management.

F.4.4.7 Mitigation Measures

Mitigation is addressed in general terms and describes typical measures that the Oak Ridge Reservation could implement. The analyses indicate that the environmental consequences attributable to foreign research reactor spent nuclear fuel management activities at the Oak Ridge Reservation would be minimal in most environmental media.

Pollution Prevention: The DOE Oak Ridge Field Office established a Waste Minimization and Pollution Prevention Awareness Plan to reduce the quantity and toxicity of hazardous, mixed, and radioactive wastes generated at the Oak Ridge Reservation. The plan is designed to reduce the possible pollutant releases to the environment and thus increase the protection of employees and the public. All contractors and users that exceed the U.S. Environmental Protection Agency criteria for small-quantity generators are

Table F-83 Cumulative Impacts at the Oak Ridge Reservation

Environmental Impact Parameter	*FRR SNF Contribution*	*Other Activities*[a]	*Cumulative Impact*
Land Use (acres)	40	14,335[b]	14,375
Socioeconomics (persons)	190[b]/30[c]	3,917[b]/930[c]	4,107[b]/960[c]
Air Quality (nonradiological)	See Table F-83A	See Table F-83A	See Table F-83A
Occupational and Public Health and Safety			
• MEI Dose (rem/yr)	0.00009	0.0155	0.0156
LCF (per year)	4.5×10^{-8}	0.0000077	0.0000078
• Population Dose (person-rem/yr)	0.085	94.5	94.6
LCF (per year)	0.000043	0.047	0.047
• Worker Collective Dose (person-rem/yr)	8.9[d]	261.3	270.2
LCF (per year)	0.0036	0.104	0.108
Energy and Water Consumption			
• Electricity (MW-hr/yr)	1,000	4,981,000[e]	4,982,000
• Natural Gas (million m^3/yr)	0	68.64	68.64
• Coal (tons/yr)	0	35,053	35,053
• Diesel Oil (million l/yr)	0	4.83	4.83
• Water (million l/yr)	2.2	68,172	68,174
Waste Generation			
• High-Level (m^3/yr)	0	0	0
• Low-Level (m^3/yr)	22	34,989	35,011
• Transuranic (m^3/yr)	0	16	16
• Mixed/Hazardous (m^3/yr)	0	119,411	119,411

[a] *Other activities include: DOE-owned spent nuclear fuel management, construction and operation of the Expended Core Facility, the construction and operation of the Advanced Neutron Source Facility, construction and operation of a Tritium production. facility, and surplus highly enriched uranium management activities at the site*

[b] *Increase over baseline (17,000), during construction activities*

[c] *Increase over baseline (17,000), during operation activities*

[d] *The dose is due to the handling of Foreign Research Reactor Spent Nuclear Fuel during receipt averaged over 30 years*

[e] *Major portion of the requirement for electricity by the proposed tritium production facility (3,740,000 MW-hr/yr)*

establishing their own waste minimization and pollution prevention awareness programs. Contractor programs ensure that waste minimization activities are in accordance with Federal, State, and local environmental laws and regulations, and DOE orders (DOE, 1995g).

Additional goals include the promotion and use of nonhazardous materials, establishment of a baseline of waste generation data, calculations of annual reductions of waste generated, and implementation of recycling programs. Goals also include incorporation of waste minimization concepts and technologies in planning and design of new processes and facilities, and in upgrades of existing facilities. A waste minimization task force composed of representatives from each contractor has been established to coordinate waste minimization and pollution awareness activities (DOE, 1995g).

Socioeconomics: To reduce construction- and operation-related impacts, coordination with local communities could address potential impacts from increased labor and capital requirements. The knowledge of the extent and effect of growth due to foreign research reactor spent nuclear fuel

Table F-83A Estimated Maximum Nonradiological Cumulative Ground-Level Concentrations of Criteria and Toxic Pollutants at the Oak Ridge Reservation[a]

Pollutant	Averaging Time	Regulatory Standard ($\mu g/m^3$)	Cumulative Concentration[b] ($\mu g/m^3$)	
Carbon Monoxide	1-hour	40,000	3,696	(9.2%)
	8-hour	10,000	2,495	(24.9%)
Nitrogen Oxides	Annual	100	13	(13%)
Surfur Dioxide	3-hour	1,300	336.6	(25.9%)
	24-hour	365	5.84	(1.6%)
	Annual	80	3.62	(4.52%)
Particulate Matter (PM_{10})	24-hour	150	88.1	(58.7%)
	Annual	50	0.48	(0.96%)
Total Suspended Particulates	Annual	150	119	(79.3%)

[a] *Concentrations represent activities from: foreign research reactor spent nuclear fuel management, DOE-owned spent fuel management, construction and operation of the Expended Core Facility, construction and operation of the Advanced Neutron Source Facility, construction and operation of a tritium supply and recycling facility, and surplus highly enriched uranium management at the site*

[b] *Numbers in parentheses indicate the percentage of the regulatory standard*

management activities could greatly enhance the ability of affected jurisdictions to plan effectively. Effective planning would address change in levels of service for housing, infrastructure, utilities, transportation, and public services and finances (DOE, 1995g).

To alleviate potential impacts associated with the in-migration of labor, local labor force availability could be increased through various employment training and referral systems currently provided by the Oak Ridge Reservation. The goal of these systems would be to reduce the potential for in-migration of labor to support foreign research reactor spent nuclear fuel management activities (DOE, 1995g).

Water Resources: The potential foreign research reactor spent nuclear fuel storage facilities would have to be located and constructed to minimize floodplain impacts and to avoid floodplains to the maximum extent possible, as required by Executive Order 11988 (Floodplain Management) and DOE rule 10 CFR 1022. Site-specific surveys would be performed to determine locations of flooding elevations more accurately (DOE, 1995g).

Ecology: DOE would consult with the Tennessee Department of Environment and Conservation as appropriate to avoid or mitigate imminent impacts to State-listed species (DOE, 1995g).

Accidents: New foreign research reactor spent nuclear fuel storage facilities would be designed to comply with current Federal, State, and local laws, DOE orders, and industrial codes and standards. This would provide facilities that are highly resistant to the effects of severe natural phenomena, including earthquakes, floods, tornadoes, high winds, as well as credible events as appropriate to the site, such as fires and explosions, and manmade threats to its continuing structural integrity for containing materials (DOE, 1995g).

Emergency preparedness plans have also been prepared for existing facilities and would be revised for new facilities to lower the potential consequences of an accident to workers and the public. All workers receive evacuation training to ensure timely and orderly personnel movement away from high-risk areas. Plans and arrangements with local authorities would also be in place to evacuate the general public that may be at risk of exposure to hazardous materials that are accidentally released (DOE, 1995g).

F.4.5 Nevada Test Site

If the Nevada Test Site is the site to manage DOE-owned spent nuclear fuel under the Programmatic SNF&INEL Final EIS, foreign research reactor spent nuclear fuel would be received and managed first at the Savannah River Site and/or the Idaho National Engineering Laboratory for the period required for the Nevada Test Site to construct and to place in operation new facilities to accommodate the spent nuclear fuel. As discussed in previous sections, this period (Phase 1) is estimated to be about 10 years. At the end of Phase 1 (e.g., start of Phase 2), the Nevada Test Site would be able to receive and manage foreign research reactor spent nuclear fuel that would be shipped from the Savannah River Site and/or the Idaho National Engineering Laboratory, and directly from the ports for those shipments made after Phase 1 concludes. Management of the foreign research reactor spent nuclear fuel would continue at the Nevada Test Site until ultimate disposition.

Although the Nevada Test Site has no existing facilities to receive foreign research reactor spent nuclear fuel at the beginning of the policy period, it has facilities that could be modified to receive foreign research reactor spent nuclear fuel within 5 years. These facilities are large hot cells located in the Nevada Research and Development Area on Jackass Flats. Presently these facilities (e.g., E-MAD) have little usage, but some are in acceptable condition. To use the E-MAD facility, a small pool would have to be constructed to be used for transferring the spent nuclear fuel from the transportation casks to containers designed for dry storage. A description of the E-MAD facility is included in Appendix F (Section F.3). The E-MAD facility could be ready within 5 years of the start of the proposed policy period.

The amount of spent nuclear fuel that would be received and managed at the Nevada Test Site under Management Alternative 1, is dictated by the distribution considered in the Programmatic SNF&INEL Final EIS. Accordingly, during Phase 2, the Nevada Test Site could receive the TRIGA spent nuclear fuel managed at the Idaho National Engineering Laboratory during Phase 1, Western foreign research reactor spent nuclear fuel under the Regionalization by Geography Alternative, or all foreign research reactor spent nuclear fuel under the Centralization Alternative.

As a Phase 2 site, the Nevada Test Site would receive and manage foreign research reactor spent nuclear fuel at a newly constructed dry storage facility or a modified E-MAD facility. Description of the new dry storage facility is provided in Section 2.6.5.1.1.

The analysis of potential environmental impacts from management of foreign research reactor spent nuclear fuel at the Nevada Test Site is based on the above considerations. The analysis options selected do not represent all possible combinations, but a reasonable set that provides a typical, and in some cases, bounding estimate of the resulting impacts.

The specific analysis options are as follows:

5A. The spent nuclear fuel managed at the Idaho National Engineering Laboratory and/or the Savannah River Site during Phase 1 would be shipped to the Nevada Test Site, where it would be managed at a new dry storage facility or a modified E-MAD facility. Spent nuclear fuel arriving in the United States after Phase 1 concludes would also be received and managed at the new or E-MAD facility until ultimate disposition. For the purposes of this analysis, the total amount of spent nuclear fuel that would be managed would be all the foreign research reactor spent nuclear fuel eligible under the policy (approximately 22,700 elements).

The implementation alternatives of Management Alternative 1 for managing foreign research reactor spent nuclear fuel in the United States, discussed in Section 2.2.2, introduce additional analysis options that could be considered for the Nevada Test Site as follows:

- Under Implementation Subalternative 1a (Section 2.2.2.1), the amount of spent nuclear fuel to be received in the United States would be reduced to 5,000 elements. In this case, the Nevada Test Site would receive the foreign research reactor spent nuclear fuel from the Idaho National Engineering Laboratory or the Savannah River Site and manage it in facilities sized for the reduced amount of spent nuclear fuel. The impacts from the management of this amount of spent nuclear fuel would be bounded by analysis option 5A above.

- Under Implementation Subalternative 1b (Section 2.3.1), the Nevada Test Site would receive from the Idaho National Engineering Laboratory and/or the Savannah River Site only HEU. The amount of HEU would be approximately 4.6 MTHM, representing 11,200 elements. The impacts from the storage of this amount of fuel would be bounded by analysis option 5A (above).

- Under Implementation Subalternative 1c (Section 2.2.2.1), the Nevada Test Site would receive target material in addition to the foreign research reactor spent nuclear fuel considered under the basic implementation of Management Alternative 1. The receipt and management of this material, which represents in uranium content approximately 620 typical foreign research reactor spent nuclear fuel elements, would increase the impacts of analysis option 5A by a small percentage.

- Under Implementation Subalternative 2a (Section 2.2.2.2), the duration of the policy would be decreased to 5 years and, therefore, the amount of spent nuclear fuel available for acceptance would also be decreased. In such a case, the Nevada Test Site would receive all foreign research reactor spent nuclear fuel from the Savannah River Site and/or the Idaho National Engineering Laboratory. The impacts from the management of the decreased amount of spent nuclear fuel at the Nevada Test Site would be bounded by analysis option 5A above.

- Under Implementation Subalternative 2b (Section 2.2.2.2) the acceptance of a small portion of the spent nuclear fuel would be extended over an indefinite period of time, but the amount of spent nuclear fuel to be received and managed would remain constant. The impacts would be the same as in analysis option 5A.

- Under Implementation Subalternative 3, (Section 2.2.2.3), DOE and the Department of State would consider alternative financial arrangements. The various arrangements would affect the amount of spent nuclear fuel that would be accepted by the United States as the foreign research reactor operators would consider their own alternatives on whether to send the spent nuclear fuel to the United States. The amount of spent fuel, in this case, cannot be quantified; however, the upper limit, as considered under analysis option 5A, would be bounding.

- Under Implementation Alternative 4 (Section 2.2.2.4), DOE and the Department of State would consider alternatives for the location where title of foreign research reactor spent nuclear fuel would be taken. The choices do not affect the management impacts at the Nevada Test Site.

- Under Implementation Alternative 5 (Section 2.2.2.5), DOE would consider construction of a new wet storage facility at the Nevada Test Site for Phase 2 until ultimate disposition. For this implementation alternative an analysis option 5B, which is similar to 5A, is considered as follows:

5B. The spent nuclear fuel managed at the Idaho National Engineering Laboratory and/or the Savannah River Site during Phase 1 would be shipped to the Nevada Test Site where it would be managed at a new wet storage facility. Spent nuclear fuel arriving in the United States after Phase 1 concludes would also be received and managed at the new facility until ultimate disposition. For the purposes of analysis, the total amount of spent nuclear fuel that would be managed in the wet storage facility would be all the foreign research reactor spent nuclear fuel eligible under the policy (approximately 22,700 elements). If the Nevada Test Site receives TRIGA spent nuclear fuel from the Idaho National Engineering Laboratory or only western spent fuel, the wet storage facility would be sized accordingly. The impacts from a smaller size facility would be bounded by the option analyzed.

- Under Implementation Alternative 6 (Section 2.3.6), DOE and the Department of State would consider chemical separation of foreign research reactor spent nuclear fuel in the United States. Based on the discussion in Section 2.3.6, the Nevada Test Site would not be considered as a site for chemical separation.

Under Management Alternative 3 (Hybrid Alternative) the Nevada Test Site is not considered.

F.4.5.1 Existing Facilities

Existing facilities considered for foreign research reactor spent nuclear fuel storage at the Nevada Test Site include the E-MAD facility in Area 25. For this analysis, the E-MAD facility was considered essentially as new because of the significant modifications needed to use it for foreign research reactor spent nuclear fuel storage. These modifications could be completed sometime between 1996 and 2006. The potential environmental impacts associated with the modification would be bounded by the impacts associated with the construction of a dry storage facility presented in Section F.4.5.2. Impacts from the operation of the E-MAD facility are presented below.

F.4.5.1.1 Socioeconomics

Potential socioeconomic impacts associated with storage option 5A would be attributable to staffing requirements at the E-MAD facility. The staffing requirements for dry storage would be about 120 full time employees. Considering that the total work force at the Nevada Test Site is approximately 4,000 (DOE, 1995g), the addition of 120 full time employees for foreign research reactor spent nuclear fuel storage is not expected to have any measurable socioeconomic impact in the region of influence.

F.4.5.1.2 Occupational and Public Health and Safety

Emission-Related Impacts: Doses that could be received by the public during incident-free operation associated with the receipt and management of the foreign research reactor spent nuclear fuel at the Nevada Test Site would be attributed to emissions of radioactive material that could be carried by wind offsite. The public would be too far from the locations where handling activities or storage take place to receive any dose from direct exposure. Doses were calculated for the MEI, defined as an individual at the site boundary receiving the maximum exposure, and for the general population within an 80 km (50 mi) radius of the storage facility. These doses would result from incident-free airborne radiological emissions

assumed to be released from the unloading of the transportation cask and the storage facility during storage. The methodology and assumptions used for the calculation of the radiological emissions and resulting doses are discussed in Section F.5 of this appendix. For the purpose of these calculations, the refurbished E-MAD facility is treated as a generic dry storage facility. The annual emission releases from the dry storage facility during receipt and unloading and storage are provided in Section F.6.6. Table F-84 summarizes the annual emission-related doses to the public and the associated risks for the MEI and population at the Nevada Test Site. Integrated doses for the duration of a specific implementation period can be obtained by multiplying the annual dose by the number of years in the period.

Table F-84 Annual Public Impacts for Foreign Research Reactor Spent Nuclear Fuel Receipt and Storage at the Nevada Test Site

Facility	MEI Dose (mrem/yr)	MEI Risk (LCF/yr)	Population Dose (person-rem/yr)	Population Risk (LCF/yr)
Receipt/Unloading at: • E-MAD (dry storage)	0.00076	3.8×10^{-10}	0.00093	4.7×10^{-7}
Storage at: • E-MAD (dry storage)	0	0	0	0

Handling-Related Impacts: Workers at the site would receive radiation doses during handling operations (i.e., receiving and unloading the transportation cask). Analysis option 5A involves the receipt of 161 shipments of foreign research reactor spent nuclear fuel from the Idaho National Engineering Laboratory or the Savannah River Site and 193 shipments directly from ports into a dry storage facility. The assumptions and methodologies used to calculate the doses to a working crew associated with the handling activities of the foreign research reactor spent nuclear fuel are described in Section F.5 of this appendix.

Table F-85 presents the population dose and risk that would be received by the members of the working crew if that working crew handled the total number of transportation casks at the Nevada Test Site. The worker MEI doses and risks were not calculated because of the large uncertainties associated with the assumptions for such calculations. However, the upper bound for such a dose would be equal to the administrative or regulatory limit at the site. For DOE radiation workers, the regulatory limit is 5,000 mrem per year. All these workers would be monitored and if any worker's dose approached this limit, he or she would be rotated into a different job to prevent further exposure. This regulatory limit provides a very conservative upper bound on the radiation dose for the worker MEI. If a single worker received the full 5,000 mrem per year dose for the full 13 years of potential foreign research reactor spent nuclear fuel receipt, then the MEI dose would be 65,000 mrem. For this dose, the associated risk of incurring an LCF would be 2.6 percent.

Table F-85 Handling-Related Impacts to Workers at the Nevada Test Site

	Worker Population Dose (person-rem)	Worker Population Risk (LCF)
	E-MAD	E-MAD
Phase 2	113	0.05

F.4.5.1.3 Material, Utility, and Energy Requirements

The material, utility, and energy requirements for the E-MAD facility are typical of those for dry storage. Table F-86 presents the estimated material, utility and energy consumption for dry storage.

Table F-86 Annual Utility and Energy Requirements for Dry Storage at the Nevada Test Site

Commodity	*Baseline Site Usage*	*Dry Storage Usage*	*Percent Increase*
Electricity (MW-hr/yr)	176,440	800 - 1,000	0.6 percent
Fuel (l/yr)	[a]	0	0 percent
Water (l/yr)	1,138,000,000	1,590,000[b] 400,000[c]	0.14 percent 0.04 percent

[a] *The majority of the energy used at the Nevada Test Site is provided by electricity. Current usage is not available*

[b] *During receipt and handling*

[c] *During storage*

These requirements represent a small percent of current requirements for the Nevada Test Site. No new generation or treatment facilities would be necessary, and connections to existing networks would require only short tie-in lines. Increases in consumption would be minimal because overall activity on the Nevada Test Site is expected to decrease because of changes in site mission and a general reduction in employment.

F.4.5.1.4 Waste Management

The contribution of waste associated with the operation of the E-MAD facility is typical of that for new dry storage (Section F.4.5.2.1.13).

F.4.5.1.5 Air Quality

The contribution of air emissions associated with the operation of the E-MAD facility is typical to that for new dry storage (Section F.4.5.2.1.5).

F.4.5.1.6 Water Resources

The effect of the operation of the E-MAD facility on the water usage is typical to that for new dry storage (Section F.4.5.2.1.7).

F.4.5.2 New Facilities (Phase 2)

Analysis options 5A and 5B involve the use of new facilities as discussed above. The environmental impacts analyzed relate to the construction and operation of these facilities. The impacts include: land use; socioeconomics; cultural resources; aesthetic and scenic resources; geology; air and water quality; ecology; noise; traffic and transportation; occupational and public health and safety; materials, utilities, and energy; and waste management.

F.4.5.2.1 Dry Storage

Analysis option 5A involves long-term dry storage of foreign research reactor spent nuclear fuel at the Nevada Test Site. This analysis option would require the construction of a new dry storage facility. The analysis option encompasses both the dry vault design and the dry cask design as described in Section 2.6.5 and earlier in this appendix. There are no environmental impact parameters that would discriminate between the two designs.

F.4.5.2.1.1 Land Use

A new dry storage facility would be located in Area 5 in the southeastern portion of the Nevada Test Site. The land in this area can be characterized as sparsely vegetated desert, ready for development. Use of Area 5 for foreign research reactor spent nuclear fuel storage would be consistent with existing land use plans, which designate this area for general use. Construction activities, including laydown areas, would disturb 3.7 ha (9 acres) of land. A new dry storage facility would occupy 5,000 m^2 (54,000 ft^2) of land and would move 11,000 m^3 (14,400 yd^3) of soil. Neither construction nor operation of a new dry storage facility at any of the areas would significantly impact land use patterns on the Nevada Test Site.

F.4.5.2.1.2 Socioeconomics

As discussed in Section F.3.1.1 the total capital cost of a new dry storage facility is estimated to be $370 million. Construction activities are projected to take 4 years. Assuming that the capital cost is evenly distributed over this 4-year period, the annual expenditures would be about $92.5 million. This represents approximately 66 percent of the estimated FY 1995 total expenditures for the Nevada Test Site (141 million). The relative socioeconomic impact from annual construction expenditures on the region of influence would be positive. The annual operations costs of a new dry storage facility are estimated to be $15.6 million for receipt and handling and $0.6 million for storage. These costs represent about 11 percent and 0.5 percent of FY 1995 total expenditures for the Nevada Test Site. The relative socioeconomic impact from annual operation expenditures on the region of influence would be small.

Direct employment associated with construction of a new dry storage facility is estimated to be 190 persons. The relative socioeconomic impact from direct construction employment on the region of influence would not be significant. In addition, when compared to the projected FY 1995 work force at the Nevada Test Site of approximately 4,000 persons, the relative socioeconomic impact of this temporary increase in construction employment would be insignificant. Direct employment associated with receipt and storage operations is estimated to be 30 persons. Upon completion of these activities, direct employment is expected to decrease to eight persons. The relative socioeconomic impact of this increase in operations employment would be insignificant to both the region of influence and the Nevada Test Site.

F.4.5.2.1.3 Cultural Resources

There are no known historical, archaeological, paleontological, or Native American traditional sites in or around the potential storage site. No impacts to cultural resources are expected from ground disturbance, noise, or air emissions during facility construction or operation of the new dry storage facility. Consultation with the Nevada State Historic Preservation Office prior to project implementation is required under Section 106 of the National Historic Preservation Act of 1966. The State Historic Preservation Office may recommend further studies of the proposed storage site to verify that no archaeological areas would be disturbed by construction activities (DOE, 1995g).

F.4.5.2.1.4 Aesthetic and Scenic Resources

Construction and operation of a new dry storage facility for foreign research reactor spent nuclear fuel would have less impact on aesthetic and scenic resources at the Nevada Test Site than the construction of

facilities for spent nuclear fuel management under the Centralization Alternative considered in the Programmatic SNF&INEL Final EIS (DOE, 1995g).

The proposed spent nuclear fuel facilities under Centralization, when fully constructed and under operation, would consist of a series of industrial buildings set within a 36-ha (90-acre) site. The site would not be visible from areas outside the Nevada Test Site. The new dry storage facility for foreign research reactor spent nuclear fuel would be constructed and operated under similar conditions. Potential soil erosion and dust generation associated with construction-related activities would be controlled by the implementation of best-management practices. Any visibility impacts from fugitive dust generation by construction-related activities should be insignificant and short term. Facility operations associated with the dry storage of foreign research reactor spent nuclear fuel should not generate any atmospheric emissions which would reduce area visibility.

F.4.5.2.1.5 Geology

The new dry storage facility for foreign research reactor spent nuclear fuel would be situated on tertiary volcanic or sedimentary rocks near volcanic or intrusive centers where small to medium-size precious metal deposits could be developed. However, because the Nevada Test Site is closed to mining operations, any precious metal deposits that might exist in or around the potential storage site would not be impacted (DOE, 1995g). Further, no mass movement or subsidence and sediment runoff from land disturbances would be expected (DOE, 1995g). The operation of the new dry storage facility would have no effect on the geologic characteristics at the site.

F.4.5.2.1.6 Air Quality

Nonradiological Emissions: Potential air quality impacts at the Nevada Test Site associated with the dry storage facility include the generation of fugitive dust from construction activities (e.g., clearing of land, grading, and road preparation) and vehicle emissions from the heavy equipment utilized during the construction phase of the project. Sources of fugitive dust include:

- transfer of soil to and from haul trucks and storage piles;
- turbulence created by construction vehicles moving over cleared, unpaved surfaces; and
- wind-induced erosion of exposed, barren surfaces.

The construction of this facility would require the clearing of 3.7 ha (7 acres) of land. However, the overall construction impacts to the ambient air quality of the region should be minimal due to the short duration (3 months to 6 years) of the project. Emissions of sulfur dioxide, nitrogen dioxide, and carbon monoxide are assumed to result entirely from diesel exhaust during the construction process. Respirable particulate matter (e.g., PM_{10}) is assumed to be 64 percent of the total suspended particulates estimated for the construction effort. Additionally, wetting controls are assumed to reduce this amount by 50 percent, which is a very conservative estimate.

Table F-87 presents the air quality impacts associated with the construction of the dry storage facility at the Nevada Test Site. Additionally, this table shows that the ambient impacts would be minimal and compliance with existing Federal and State ambient air quality standards would not be adversely affected. Therefore, construction activities would not be expected to have any detrimental effect on the health and safety of the general population. The estimated impacts from construction activities were generated using

Table F-87 Estimated Maximum Concentrations of Criteria Pollutants at the Nevada Test Site Attributable to New Dry Storage Construction

Pollutant	Averaging Time	Ambient Standard[b]	Baseline Concentration[a]	Construction Activities
Boundary (µg/m3):[b, c]				
• Particulate Matter (PM_{10})[a]	24-hour	150	84.90	0.0020
	Annual	50	0.43	0.1107
• Carbon Monoxide	1-hour	40,000	2,748.0	26.756
	8-hour	10,000	2,290.8	3.345
• Sulfur Dioxide	3-hour	1,300	170.3	2.356
	24-hour	365	55.2	0.345
	Annual	80	1.1	0.006
• Nitrogen Oxides	Annual	100	[d]	0.098

[a] *Source: (DOE, 1995g)*

[b] *64 percent of total suspended particulates is considered to be respirable particulate matter (e.g., PM_{10}) for the construction activities. The standard refers to the actual PM_{10} standard.*

[c] *To convert to µg/ft^3, multiply by 0.0283*

[d] *No sources indicated*

the U.S. Environmental Protection Agency's regulatory-approved Industrial Source Complex Short-Term Model, Version 2.0 in conjunction with onsite meteorological data from 1991.

Nonradiological emissions are not expected during operation of the new dry storage facility for foreign research reactor spent nuclear fuel. Any emissions associated with dry storage would be directly attributable to front-end wet storage activities only.

Radiological Emissions: No radiological emissions from construction of a new dry storage facility for foreign research reactor spent nuclear fuel are expected. Based on dry fuel drying and storage operations conducted at Idaho National Engineering Laboratory, potential atmospheric releases from the spent nuclear fuel storage facility would consist of minor amounts of particulate radioactive material and larger amounts of gaseous fission products that could escape from the fuel through cladding defects. The majority of radioactive material responsible for fuel and cask internal surface contamination consists of activation products that plate out on the spent nuclear fuel assemblies during reactor operation. This material is dependent on corrosion of structural materials and generally consists of radionuclides such as ^{58}Co, ^{60}Co, ^{50}Fe, etc. This contamination activity would have to be controlled during the cask opening and fuel handling operations to prevent internal personnel exposures. Proper facility ventilation (designed to provide airflow from areas of low contamination to progressively higher contamination) would help provide contamination control. High-efficiency particulate air filters in the facility exhaust would reduce the airborne effluent quantities of this particulate material to quantities that are well within the prescribed limits.

Cask opening and fuel drying operations may also be responsible for the release of significant amounts of ^{3}H, ^{85}Kr, and minor amounts of ^{129}I. The amount of these radionuclides that are released during the cask opening operation depends on the following parameters: (1) the number of spent nuclear fuel clad defects; (2) the spent nuclear fuel material and the diffusion rate of these radionuclides through the fuel matrix for the fuel temperature while in the cask; and (3) the time that the spent nuclear fuel is contained within the cask before opening.

Similarly, for fuel drying operations, the temperature of the drying gas (as well as the parameters discussed above) would cause quantities of ^{3}H, ^{85}Kr, and ^{129}I to be released from the fuel. Charcoal or silver zeolite filters could be used to remove the ^{129}I from the exhaust, but the ^{3}H and ^{85}Kr, being gases, or a gaseous state for the case of tritiated water, would be exhausted to the atmosphere. During spent nuclear fuel storage, small amounts of the gaseous/volatile radionuclides are expected to be released to the environment based on the fuel matrix, clad defects, and storage temperature. Release rates would decrease with storage time due to radioactive decay. It is anticipated that the fuel drying operation would be responsible for the most significant release of these gaseous/volatile radionuclides to the environment.

For this analysis, radiological emissions from the operation of a new dry storage facility for foreign research reactor spent nuclear fuel were calculated based on the methodology and assumptions described in Appendix F, Section F.5. The radiological consequences of air emissions from the operation of the new dry storage facility at the Nevada Test Site are discussed in Section F.4.5.2.1.11. The annual emission releases from the dry storage facility during receipt and unloading and storage are provided in Section F.6.6.1.

F.4.5.2.1.7 Water Resources

The water usage during construction of a new dry storage facility is estimated to be about 7.75 million l (2 million gal). During operations, annual water consumption would be 2.1 million l (550,000 gal) for receipt and handling and 0.4 million l (109,000 gal) for storage. With an annual average water usage of approximately 1,138 million l (301 million gal) for the Nevada Test Site, these amounts represent no more than a 0.2 percent increase in annual water usage. Therefore, a new dry storage facility would have minimal impacts on water resources at the Nevada Test Site.

Best-management practices during construction would prevent sediment runoff or spills of fuels or chemicals. Therefore, construction activities should have no impact on water quality at the Nevada Test Site. The impact on water quality during operations would also be negligible. Existing water treatment facilities at the Nevada Test Site could accommodate any new domestic and process wastewater streams from a new dry storage facility. The expected total flow volumes at the Nevada Test Site would still be well within the design capacities of treatment systems at the Nevada Test Site. A new dry storage facility would meet National Pollutant Discharge Elimination System limits and reporting requirements, so no impact on the water quality of receiving streams is expected.

F.4.5.2.1.8 Ecology

Terrestrial Resources: Radiation doses received by terrestrial biota from foreign research reactor spent nuclear fuel activities would be expected to be similar to those received by man. Although guidelines have not been established for acceptance limits for radiation exposure to species other than man, it is generally agreed that the limits established for humans are also conservative for other species. Evidence indicates that no other living organisms have been identified that are likely to be substantially more radiosensitive than man. Thus, so long as exposure limits protective of man were not exceeded, no significant radiological impact on populations of biota would be expected as a result of spent nuclear fuel activities at Area 5 (DOE, 1995g).

Wetlands: Under the Centralization Alternative, construction of a new dry storage facility would result in the disturbance of approximately 36 ha (90 acres) [3.7 ha or (9 acres) for foreign research reactor spent

nuclear fuel], or less than 1 percent of site location. No wetlands are expected to be disturbed because none exist in or around the proposed storage site (DOE, 1995g).

Threatened and Endangered Species: The project area is located within the range of the desert tortoise, a Federally-listed threatened species. Recent pre-activity surveys for other nearby projects have not identified the desert tortoise in the general area of the project site. However, a pre-activity survey for this project would be conducted to determine the presence or absence of the desert tortoise and other species of concern. If present, the desert tortoise could be impacted during construction of the new dry storage facility due to increased vehicular traffic, construction of trenches for utilities, and other temporary construction excavations. Prior to and during construction activities, fencing of the area and removal of tortoises within the fence would decrease the potential to bring harm to the desert tortoise (DOE, 1995g).

DOE has completed consultations with the U.S. Fish and Wildlife Service regarding threatened and endangered species for the proposed construction site of foreign research reactor spent nuclear fuel storage facilities at the Nevada Text Site, as required by the Endangered Species Act.

Construction of a new dry storage facility would have some adverse effects on animal populations. Less mobile animals, such as amphibians, reptiles, and small mammals within the project area would be destroyed during land-clearing activities. Larger mammals and birds in construction and adjacent areas would be disturbed by construction activities and would move to nearby suitable habitat. The long-term survival of these animals would depend on whether the area to which they moved was at or below its carrying capacity. Areas that would be revegetated upon completion of construction would be of minimal value to most wildlife but may be repopulated by more tolerant species (DOE, 1995g).

The Migratory Bird Treaty Act is primarily concerned with the destruction of migratory birds, as well as their eggs and nests. It may be necessary to survey construction sites for the nests of migratory birds prior to construction and/or avoid clearing operations during the breeding season (DOE, 1995g).

Activities associated with operation, such as noise, increased human presence and traffic, and night lighting could affect wildlife living immediately adjacent to the site. While these disturbances may cause some sensitive species to move from the area, most animals should be able to adjust.

F.4.5.2.1.9 Noise

Noises generated on the Nevada Test Site do not propagate offsite at levels that impact the general population. Thus, noise impacts for both the Centralization and Regionalization by Fuel Type and/or Geography Alternatives at the Nevada Test Site would be limited to those resulting from the transportation of personnel and materials to and from the site that affect nearby communities, and those resulting from onsite sources that may affect some wildlife near these sources (DOE, 1995g).

The transportation noises are a function of the size of the work force (e.g., an increased work force would result in increased employee traffic and corresponding increases in deliveries by construction crews). Such noise and activity associated with construction would be expected to have short-term effects on most wildlife (DOE, 1995g).

Under the Centralization Alternative, the projected Nevada Test Site work force would increase by about 48 percent in the years 2000 to 2002, during peak construction, and would decrease thereafter. There would be a corresponding increase in truck, private vehicle, and bus trips to the site. The day-night average sound level at 15 m (50 ft) from U. S. Route 95 would be expected to increase by about 1 decibel.

No change is expected in the community reaction to noise along this route. No mitigation of traffic noise impacts is proposed (DOE, 1995g).

F.4.5.2.1.10 Traffic and Transportation

Construction and operation of a new dry storage facility would involve a small increase in the number of employees commuting to the Nevada Test Site and transportation of foreign research reactor spent nuclear fuel and hazardous chemicals within the site.

The maximum reasonably foreseeable scenario for construction and operations traffic occurs under the Centralization Alternative considered in the Programmatic SNF&INEL Final EIS. This would occur in 2001, when there would be about 3,400 full-time employees, and about 1,200,000 people in the region of influence. None of the future baseline levels of service would change due to spent nuclear fuel-related impacts (DOE, 1995g). These conclusions are equally valid for a new dry storage facility for foreign research reactor spent nuclear fuel.

F.4.5.2.1.11 Occupational and Public Health and Safety

Emission-Related Impacts: Doses that could be received by the public during incident-free operation associated with the receipt and management of the foreign research reactor spent nuclear fuel at the Nevada Test Site would be attributed to emissions of radioactive material that could be carried by wind offsite. The general public would be too far from the locations where handling activities or storage take place to receive any dose from direct exposure. Doses were calculated for the MEI, defined as an individual at the site boundary receiving the maximum exposure, and for the general population within an 80 km (50 mi) radius of the storage facility. These doses would result from incident-free airborne radiological emissions assumed to be released from the unloading of the transportation cask and the storage facility during storage. The methodology and assumptions used for the calculation of the radiological emissions and resulting doses are discussed in Section F.5 of this appendix. Table F-88 summarizes the annual emission-related doses to the public and the associated risks for the MEI and population at the Nevada Test Site. Integrated doses for the duration of a specific implementation period can be obtained by multiplying the annual dose by the number of years in the period.

Table F-88 Annual Public Impacts for Foreign Research Reactor Spent Nuclear Fuel Receipt and Storage at the Nevada Test Site (New Dry Storage)

Facility	*MEI Dose (mrem/yr)*	*MEI Risk (LCF/yr)*	*Population Dose (person-rem/yr)*	*Population Risk (LCF/yr)*
Receipt/Unloading at: • New Dry Storage Facility	0.00076	3.8×10^{-10}	0.00093	4.7×10^{-7}
Storage at: • New Dry Storage Facility	0	0	0	0

Handling-Related Impacts: Workers at the site would receive radiation doses during handling operations (i.e., receiving and unloading the transportation cask). Analysis option 5A involves the receipt of 161 shipments of foreign research reactor spent nuclear fuel from the Idaho National Engineering Laboratory and/or the Savannah River Site, and 193 shipments directly from ports to a new dry storage facility. The assumptions and methodologies used to calculate the doses to a working crew associated with

the handling activities of the foreign research reactor spent nuclear fuel are described in Section F.5 of this appendix.

Table F-89 presents the population dose and risk that would be received by the members of the working crew if that working crew handled the total number of transportation casks at the Nevada Test Site. The worker MEI doses and risks were not calculated because of the large uncertainties associated with the assumptions for such calculations. However, the upper bound for such a dose would be equal to the administrative or regulatory limit at the site. For DOE radiation workers, the regulatory limit is 5,000 mrem per year. All these workers would be monitored and if any worker's dose approached this limit, he or she would be rotated into a different job to prevent further exposure. This regulatory limit provides a very conservative upper bound on the radiation dose for the worker MEI. If a single worker received the full 5,000 mrem per year dose for the full 13 years of potential foreign research reactor spent nuclear fuel receipt, then the MEI dose would be 65,000 mrem. For this dose, the associated risk of incurring an LCF would be 2.6 percent.

Table F-89 Handling-Related Impacts to Workers at the Nevada Test Site

	Worker Population Dose (Person-rem)		*Worker Population Risk (LCF)*	
	New Dry Storage Cask	*New Dry Storage Vault*	*New Dry Storage Cask*	*New Dry Storage Vault*
Phase 2	266	113	0.11	0.05

F.4.5.2.1.12 Material, Utility, and Energy Requirements

Construction of a new dry storage facility at the Nevada Test Site would consume 21,800 m^3 (28,500 yd^3) of concrete and 5,200 metric tons (5,750 tons) of steel. The total energy and water requirements during construction are estimated to be 835,000 l (221,000 gal) for fuel, and 7.75 million l (2 million gal) for water.

The annual utility and energy requirements during operations are shown in Table F-90. These requirements represent a small percent of current requirements for the Nevada Test Site. No new generation or treatment facilities would be necessary, and connections to existing networks would require only short tie-in lines. Increases in consumption would be minimal because overall activity on the Nevada Test Site is expected to decrease because of changes in site mission and a general reduction in employment.

Table F-90 Annual Utility and Energy Requirements for New Dry Storage at the Nevada Test Site

Commodity	*Baseline Site Usage*	*Dry Storage Usage*	*Percent Increase*
Electricity (MW-hr/yr)	176,440	800 - 1,000	0.6 percent
Fuel (l/yr)	[a]	0	0 percent
Water (l/yr)	1,138,000,000	1,590,000[b] 400,000[c]	0.14 percent[b] 0.04 percent[b]

[a] *The majority of energy used at the Nevada Test Site is provided by electricity.*

[b] *During receipt and handling*

[c] *During storage*

F.4.5.2.1.13 Waste Management

Construction of a new dry storage facility at the Nevada Test Site would generate 1,800 m^3 (2,400 yd^3) of debris. The annual quantities of waste generated during operations are shown in Table F-91. These quantities represent a very small percent increase above current levels at the Nevada Test Site. Existing waste management storage and disposal activities at the Nevada Test Site could accommodate the waste generated by a new dry storage facility. Therefore, the impact of this waste on existing Nevada Test Site waste management capacities would be minimal.

Table F-91 Annual Waste Generated for New Dry Storage at the Nevada Test Site

Waste Form	Baseline Site Generation	Dry Storage Generation	Percent Increase
High-Level (m^3/yr)	0	none	0 percent
Transuranic (m^3/yr)	0	none	0 percent
Solid Low-Level (m^3/yr)	10,845	22[a] 1[b]	0.20 percent[a] 0.01 percent[b]
Wastewater (l/yr)	11,000,000	1,590,000[a] 400,000[b]	14.4 percent[a] 3.6 percent[b]

[a] *During receipt and handling*

[b] *During storage*

F.4.5.2.2 Wet Storage

Analysis option 5B involves long-term wet storage of foreign research reactor spent nuclear fuel at the Nevada Test Site. This storage option would require the construction of a new wet storage facility.

F.4.5.2.2.1 Land Use

A new wet storage facility would be located in Area 5 in the southeastern portion of the Nevada Test Site. The land in this area can be characterized as sparsely vegetated desert, ready for development. Use of Area 5 for foreign research reactor spent nuclear fuel storage would be consistent with existing land use plans, which designate this area for general use. Construction activities, including laydown areas, would disturb 2.8 ha (7 acres) of land. A new wet storage facility would occupy 3,800 m^2 (41,000 ft^2) of land and would move 18,000 m^3 (24,000 yd^3) of soil. Neither construction nor operation of a new wet storage facility at any of the areas would significantly impact land use patterns on the Nevada Test Site.

F.4.5.2.2.2 Socioeconomics

As discussed in Section F.3.2 the total capital cost of a new wet storage facility is estimated to be $449 million. Construction activities are projected to take 4 years. Assuming that the capital cost is evenly distributed over this 4-year period, the annual expenditures would be about $112.2 million. This represents approximately 79.5 percent of the estimated FY 1995 total expenditures for the Nevada Test Site (141 million). The relative socioeconomic impact from annual construction expenditures on the region of influence would be substantial. The annual operations costs of a new wet storage facility are estimated to be $23.3 million for receipt and handling and $3.5 million for storage. These costs represent about 16.5 percent and 2.5 percent of FY 1995 total expenditures for the Nevada Test Site. The relative socioeconomic impact from annual operation expenditures on the region of influence would be positive.

Direct employment associated with construction of a new wet storage facility is estimated to be 157 persons. The relative socioeconomic impact from direct construction employment on the region of influence would be small. In addition, when compared to the projected FY 1995 work force at the Nevada Test Site of approximately 4,000 persons, the relative socioeconomic impact of this temporary increase in construction employment would be insignificant. Direct employment associated with operations of a new wet storage facility is estimated to be 30 persons. The relative socioeconomic impact of this increase in operations employment would be insignificant to both the region of influence and the Nevada Test Site.

F.4.5.2.2.3 Cultural Resources

Impacts to cultural resources would be the same as for new dry storage (Section F.4.5.2.1.3).

F.4.3.2.2.4 Aesthetic and Scenic Resources

Impacts to aesthetic and scenic resources would be the same as for new dry storage (Section F.4.5.2.1.4).

F.4.5.2.2.5 Geology

Impacts to geology would be the same as for new dry storage (Section F.4.5.2.1.5).

F.4.5.2.2.6 Air Quality

Nonradiological Emissions: Construction of a new wet storage facility would necessitate the clearing and grading of approximately 3 ha (7 acres) of land. In comparison, approximately 4 ha (10 acres) of land would be disturbed by new dry storage construction. Therefore, air quality impacts associated with wet storage construction would be bound by those associated with dry storage construction, as presented in Section F.4.5.2.1.6.

No nonradiological emissions from the operation of the new wet storage facility are expected.

Radiological Emissions: Incident-free airborne releases from the new wet storage facility would be limited to radioactive noble gases and some radioactive iodine which could be released from the stored fuel prior to canning. The airborne materials released to the building atmosphere during incident-free operations would be filtered by the building heating and ventilation system. Radioactive and nonradioactive effluent gases would be routed through double-banked high-efficiency particulate air filters prior to release to the environment through an exhaust air system. The high-efficiency particulate air filter would have a minimum efficiency of 99.97 percent for 0.3 micron diameter particulates and would allow in-place dioctyl phthalate testing.

The new wet storage facility would discharge all ventilated gas, except truck exhaust, to the facility exhaust system. Truck exhaust would be discharged directly to the environment during cask off-loading operations in the truck receiving area. The exhaust air system would employ a detector to monitor ^{137}Cs. For other building areas which would be sources of airborne radioactive contamination, the heating, ventilating, and air conditioning system would be designed to maintain airflow from areas of low potential contamination into areas of higher potential contamination. These airborne effluents would be required to be below the radioactivity concentration guides listed in DOE Order 5480.1B for both onsite and offsite concentrations (DOE, 1989b).

Air emissions from the new wet storage facility are expected to be similar to the air emissions from the CPP-603 at Idaho National Engineering Laboratory. The annual air emission for the CPP-603 was designed to result in ground-level concentrations of less than 0.003 percent of DOE 5480.1B limits for uncontrolled areas. Radiological emissions from the operation of the wet storage facility were calculated based on the methodology and assumptions used in Appendix F, Section F.6. The annual emission releases from the wet storage facility during the receipt and unloading, and storage are provided in Section F.6.6.1.

F.4.5.2.2.7 Water Resources

The annual water usage during construction and operation of a new wet storage facility is estimated to be about 1.9 million l (1.2 million gal) and 2.7 million l (720,000 gal), respectively. With an annual average water usage of approximately 1,138 million l (301 million gal) for the Nevada Test Site, these amounts represent an increase of about 0.17 percent and 0.23 percent, respectively. Therefore, a new wet storage facility would have minimal impact on water resources at the Nevada Test Site.

Best-management practices during construction would prevent sediment runoff or spills of fuels or chemicals. Therefore, construction activities should have no impact on water quality at the Nevada Test Site. The impact on water quality during operations would also be negligible. Existing water treatment facilities at the Nevada Test Site could accommodate any new domestic and process wastewater streams from a new wet storage facility. The expected total flow volumes at the Nevada Test Site would still be well within the design capacities of treatment systems at the Nevada Test Site. A new wet storage facility would meet National Pollutant Discharge Elimination System limits and reporting requirements, so no impact on the water quality of receiving streams is expected.

F.4.5.2.2.8 Ecology

Impacts to the ecology would be the same as for new dry storage (Section F.4.5.2.1.8).

F.4.5.2.2.9 Noise

Impacts from noise would be the same as for new dry storage (Section F.4.5.2.1.9).

F.4.5.2.2.10 Traffic and Transportation

Impacts from traffic and transportation would be the same as for new dry storage (Section F.4.5.2.1.10).

F.4.5.2.2.11 Occupational and Public Health and Safety

Emission-Related Impacts: Doses that could be received by the public during incident-free operation associated with the receipt and management of the foreign research reactor spent nuclear fuel at the Nevada Test Site would be attributed to emissions of radioactive material that could be carried by wind offsite. The general public would be too far from the locations where handling activities or storage take place to receive any dose from direct exposure. Doses were calculated for the MEI, defined as an individual at the site boundary receiving the maximum exposure, and for the general population within an

80 km (50 mi) radius of the storage facility. These doses would result from incident-free airborne radiological emissions assumed to be released from the unloading of the transportation cask and the storage facility during storage. The methodology and assumptions used for the calculation of the radiological emissions and resulting doses are discussed in Section F.6 of this appendix. Table F-92 summarizes the annual emission-related doses to the public and the associated risks for the MEI and population at the Nevada Test Site. Integrated doses for the duration of a specific implementation period can be obtained by multiplying the annual dose by the number of years in the period.

Table F-92 Annual Public Impacts for Foreign Research Reactor Spent Nuclear Fuel Receipt and Storage at the Nevada Test Site (Implementation Alternative 5 of Management Alternative 1)

Facility	MEI Dose (mrem/yr)	MEI Risk (LCF/yr)	Population Dose (person-rem/yr)	Population Risk (LCF/yr)
Receipt/Unloading at:				
• New Wet Storage Facility	0.00052	2.6×10^{-10}	0.00052	2.6×10^{-7}
Storage at:				
• New Wet Storage Facility	4.0×10^{-9}	2.0×10^{-15}	4.7×10^{-9}	2.4×10^{-12}

Handling-Related Impacts: Workers at the site would receive radiation doses during handling operations (i.e., receiving and unloading the transportation cask), transferring the foreign research reactor spent nuclear fuel from one facility to another, or preparing the foreign research reactor spent nuclear fuel for shipment offsite. Analysis option 5B involves the receipt of 161 shipments of foreign research reactor spent nuclear fuel from the Idaho National Engineering Laboratory and/or the Savannah River Site and 193 shipments directly from ports into a new wet storage facility. The assumptions and methodologies used to calculate the doses to a working crew associated with the handling activities of the foreign research reactor spent nuclear fuel are described in Section F.5 of this appendix.

Table F-93 presents the population dose and risk that would be received by the members of the working crew if that working crew handled the total number of transportation casks at the Nevada Test Site. The worker MEI doses and risks were not calculated because of the large uncertainties associated with the assumptions for such calculations. However, the upper bound for such a dose would be equal to the administrative limits at the site. For DOE radiation workers, the regulatory limit is 5,000 mrem per year. All these workers would be monitored and if any worker's dose approached this limit, he or she would be rotated into a different job to prevent further exposure. This regulatory limit provides a very conservative upper bound on the radiation dose for the worker MEI. If a single worker received the full 5,000 mrem per year dose for the full 13 years of potential foreign research reactor spent nuclear fuel receipt, then the MEI dose would be 65,000 mrem. For this dose, the associated risk of incurring an LCF would be 2.6 percent.

Table F-93 Handling-Related Impacts to Workers at the Nevada Test Site (Implementation Alternative 5 of Management Alternative 1)

	Worker Population Dose (Person-rem)	Worker Population Risk (LCF)
	New Wet Storage	New Wet Storage
Phase 2	109	0.04

F.4.5.2.2.12 Material, Utility, and Energy Requirements

Construction of a new wet storage facility at the Nevada Test Site would consume 12,400 m^3 (16,260 yd^3) of concrete and 3,100 metric tons (3,443 tons) of steel. The total energy and water requirements during construction are estimated to be 600,000 l (159,000 gal) for fuel, and 4.4 million l (1.2 million gal) for water. The annual utility and energy requirements during operations are shown in Table F-94. These

requirements represent a small percent of current requirements for the Nevada Test Site. No new generation or treatment facilities would be necessary, and connections to existing networks would require only short tie-in lines. Increases in consumption would be minimal because overall activity on the Nevada Test Site is expected to decrease because of changes in site mission and a general reduction in employment.

Table F-94 Annual Utility and Energy Requirements for Wet Storage at the Nevada Test Site (Implementation Alternative 5 of Management Alternative 1)

Commodity	Baseline Site Usage	Wet Storage Usage	Percent Increase
Electricity (MW-hr/yr)	176,440	800 - 1,000	0.84 percent
Fuel (l/yr)	[a]	0	0 percent
Water (l/yr)	1,139,000,000	2,700,000[b] 1,500,000[c]	0.23 percent 0.13 percent

[a] *The majority of energy used at the Nevada Test Site is provided by electricity.*

[b] *During receipt and handling*

[c] *During storage*

F.4.5.2.2.13 Waste Management

Construction of a new wet storage facility at the Nevada Test Site would generate 2,600 m^3 (10,300 yd^3) of debris. The annual quantities of waste generated during operations are shown in Table F-95. These quantities represent a very small percentage increase above current levels at the Nevada Test Site. Existing waste management storage and disposal activities at the Nevada Test Site could accommodate the waste generated by a new wet storage facility. Therefore, the impact of this waste on the existing the Nevada Test Site waste management capacities would be minimal.

Table F-95 Annual Waste Generated for Wet Storage at the Nevada Test Site (Implementation Alternative 5 of Management Alternative 1)

Waste Form	Baseline Site Generation	Wet Storage Generation	Percent Increase
High-Level (m^3/yr)	0	none	0 percent
Transuranic (m^3/yr)	0	none	0 percent
Solid Low-Level (m^3/yr)	10,845	16[a] 1[b]	0.15 percent 0.01 percent
Wastewater (l/yr)	11,000,000	1,590,000[a] 400,000[b]	14.5 percent 3.6 percent

[a] *During receipt and handling*

[b] *During storage*

F.4.5.3 Accident Analysis

An evaluation of incident-free operations and hypothetical accidents at the Nevada Test Site is presented here based on the methodology in Appendix F, Section F.6. The evaluation assessed the possible radiation exposure to individuals and general population due to the release of radioactive materials. The analyses are based on the same operations carried out at the different potential storage locations and the same accidents at any of the sites evaluated. Information concerning radiological doses to individuals and the general population are the same as set forth in Section F.4.1.3.

Table F-96 presents the frequency and consequences in terms of mrem or person-rem, of postulated accidents to the offsite MEI, NPAI, and offsite population for the 95th-percentile meteorological conditions using the assumptions and input values discussed above. The worker doses are calculated only for the 50th-percentile meteorology. This is an individual assumed to be 100 m (330 ft) downwind of the accident. DOE did not estimate the worker population dose.

Table F-96 Frequency and Consequences of Accidents at the Nevada Test Site

	Frequency (per year)	Consequences			
		MEI (mrem)	NPAI (mrem)	Population (person-rem	Worker (mrem)
Dry Storage Accidents[a]					
• Spent Nuclear Fuel Assembly Breach	0.16	1.7	0.31	1.5	20
• Dropped Fuel Cask	0.0001	0.11	0.0014	0.40	0.089
• Aircraft Crash w/Fire	1×10^{-6}	180	1.2	250	87

[a] *E-MAD and New Dry Storage Facility*

Multiplying the frequency of each accident times its consequences and converting the radiation doses to LCF yields the annual risks associated with each potential accident at the Nevada Test Site. These annual risks are multiplied by the maximum duration of this implementation alternative at each site to obtain conservative estimates of risks for the Nevada Test Site. These risk estimates are presented in Table F-97.

Table F-97 Annual Risks of Accidents at the Nevada Test Site

	Consequences			
	MEI (LCF/yr)	NPAI (LCF/yr)	Population (LCF/yr)	Worker (LCF/yr)
Dry Storage Accidents[a]				
• Spent Nuclear Fuel Assembly Breach	1.4×10^{-7}	2.5×10^{-8}	0.00012	0.0000013
• Dropped Fuel Cask	5.5×10^{-12}	7.0×10^{-14}	2.0×10^{-8}	3.6×10^{-12}
• Aircraft Crash w/Fire	9.0×10^{-11}	6.0×10^{-13}	1.3×10^{-7}	3.5×10^{-11}

[a] *E-MAD and New Dry Storage Facility*

Table F-98 presents the frequency and consequences of the accidents analyzed for each site for wet storage (Implementation Alternative 5 of Management Alternative 1). Multiplying the frequency of each accident times its consequences at each site and converting the radiation doses to LCF yields the annual risks associated with each potential accident at the Nevada Test Site. These annual risks are multiplied by the maximum duration of this implementation alternative at each site to obtain conservative estimates of risks at the Nevada Test Site. Table F-99 presents the risk estimates from this implementation.

F.4.5.3.1 Secondary Impact of Radiological Accidents at the Nevada Test Site

In the event of an accidental release of radioactivity, there is a potential for impacts to land uses, cultural resources, water quality, ecology, national defense, and local economies (secondary impacts). For this analysis, secondary impacts of radiological accidents involving foreign research reactor spent nuclear fuel have been qualitatively assessed based on the calculations presented in Section F.4.5.3. Radiological

Table F-98 Frequency and Consequences of Accidents at the Nevada Test Site (Implementation Alternative 5 of Management Alternative 1)

	Frequency (per year)	Consequences			
		MEI (mrem)	NPAI (mrem)	Population (person-rem)	Worker (mrem)
• Spent Nuclear Fuel Assembly Breach	0.16	0.054	0.0016	0.33	0.10
• Accidental Criticality	0.0031	88	15	54	1,300
• Aircraft Crash	1×10^{-6}	29	4.2	61	290

Table F-99 Annual Risks of Accidents at the Nevada Test Site (Implementation Alternative 5 of Management Alternative 1)

	Consequences			
	MEI (LCF/yr)	NPAI (LCF/yr)	Population (LCF/yr)	Worker (LCF/yr)
• Spent Nuclear Fuel Assembly Breach	4.2×10^{-9}	1.3×10^{-10}	0.000026	6.4×10^{-9}
• Accidental Criticality	1.4×10^{-7}	2.3×10^{-8}	0.000084	0.000016
• Aircraft Crash	1.5×10^{-11}	2.1×10^{-12}	3.1×10^{-8}	1.2×10^{-10}

accidents that resulted in doses to the MEI of less than the annual Federal radiological exposure limit for the public of 100 mrem (10 CFR Part 20) were considered to have no secondary impacts.

The MEI dose provides a measure of the air concentration and radionuclide deposition at the receptor location. As such, it can be used to express the level of contamination from a given radiological accident. In estimating the human health effects from radiological exposure (as presented in Section F.4.1.3), the MEI dose evaluates four pathways: (1) air immersion, (2) ground surface, (3) inhalation, and (4) ingestion. In estimating the environmental effects from radiological exposure, however, only the air immersion and ground surface pathways need be considered.

At the Nevada Test Site, the radiological accident with the highest MEI dose is the aircraft crash into a dry storage facility with fire (Table F-96). For this accident, the MEI dose would be 180 mrem. For the air immersion and ground surface pathways only, the dose would be 1.0 mrem, which is less than the 100 mrem limit used in this analysis. Therefore, no secondary impacts to land uses, cultural resources, water quality, ecology, national defense, and local economies from radiological accidents involving foreign research reactor spent nuclear fuel storage would be expected at the Nevada Test Site.

F.4.5.4 Cumulative Impacts at the Nevada Test Site

The section presents the cumulative impacts of the proposed action, potential impacts of other contemplated DOE actions, and current activities at the site. A major portion of the presentation is based on information included in the Programmatic SNF&INEL Final EIS (DOE, 1995g) and the Tritium Supply and Recycling Final EIS (DOE, 1995a). The Programmatic SNF&INEL Final EIS includes the quantitative impacts from a proposed Expended Core Facility at the site. The Nevada Test Site is also considered in the storage and disposition of weapons-usable fissile materials program which could affect the site environment. The impacts from this program have not been determined sufficiently at this time to allow impact evaluation.

Table F-100 Cumulative Impacts at the Nevada Test Site

Environmental Impact Parameter	*FRR SNF Contribution*	*Other Activities*[a]	*Cumulative Impact*
Land Use (acres)	9	314,393[b]	314,402
Socioeconomics (persons)	190[c]/30[d]	2,662[c]/1,000[d]	2,852[c]/1,030[d]
Air Quality (nonradiological)	See Table F-100A	See Table F-100A	See Table F-100A
Occupational and Public Health and Safety			
• MEI Dose (rem/yr)	7.6×10^{-7}	0.00031	0.00031
LCF (per year)	3.8×10^{-10}	1.55×10^{-7}	1.55×10^{-7}
• Population Dose (person-rem/yr)	0.00093	0.095	0.095
LCF (per year)	4.7×10^{-7}	.00047	0.000047
• Worker Collective Dose (person-rem/yr)	8.9[e]	81	89.9
LCF (per year)	0.0036	0.032	0.035
Energy and Water Consumption			
• Electricity (MW-hr/yr)	1,000	4,019,000[f]	4,020,000
• Fuel (million l/yr)	0	6,129	6,129
• Water (million l/yr)	2.2	2,563	2,565
Waste Generation			
• High-Level (m^3/yr)	0	0	0
• Low-Level (m^3/yr)	22	44,578	44,600
• Mixed/Hazardous (m^3/yr)	0	252	252
• Transuranic (m^3/yr)	0	16	16

[a] *Other activities include existing activities, DOE-owned spent fuel management activities, construction and operation of an Expended Core Facility, and construction and operation of a tritium production facility.*

[b] *Existing developed land area is 314,000 acres*

[c] *Increase over baseline (3,300 persons) during construction activities*

[d] *Increase over baseline (3,300 persons) during operation activities*

[e] *The dose is due to the handling of foreign research reactor spent nuclear fuel during receipt, averaged over 30 years*

[f] *Major portion is the requirement for electricity by the tritium production (accelerator) facility (3,740,000 MW-hr/yr)*

Tables F-100 and F-100A summarize the cumulative impacts for land use, socioeconomics, air quality, occupational and public health and safety, energy and water consumption and waste generation at the site. Table F-100 also presents the contribution from the storage of foreign research reactor spent nuclear fuel to the cumulative impacts at the Nevada Test Site. For the purposes of this analysis, both the contributions from management of foreign research reactor spent nuclear fuel and the cumulative impacts were maximized by selecting the Centralization Alternative of the Programmatic SNF&INEL Final EIS at the Nevada Test Site.

As shown in Table F-100, the contribution from storage of foreign research reactor spent nuclear fuel to the cumulative impacts (under the Centralization Alternative) at the Nevada Test Site would be minimal. The Programmatic SNF&INEL Final EIS concludes that the implementation of any of the alternatives (including the Centralization Alternative) for the DOE spent nuclear fuel management program would not be expected to significantly contribute to cumulative impacts (DOE, 1995g). This conclusion is also valid for the implementation of any of the alternatives considered in this EIS for storage of foreign research reactor spent nuclear fuel at the Nevada Test Site.

Table F-100A Estimated Maximum Nonradiological Cumulative Ground-Level Concentrations of Criteria and Toxic Pollutants at the Nevada Test Site[a]

Pollutant	Averaging Time	Regulatory Standard ($\mu g/m^3$)	Cumulative Concentration[b] ($\mu g/m^3$)	
Carbon Monoxide	1-hour	40,000	2,815	(7%)
	8-hour	10,000	2,306	(23%)
Nitrogen Oxides	Annual	100	4.2	(4.2%)
Sulfur Dioxide	3-hour	1300	173.6	(13.3%)
	24-hour	365	55.5	(15.2%)
	Annual	80	1.1	(1.3%)
Particulate Matter (PM_{10})	24-hr	150	85	(56.6%)
	Annual	50	0.54	(1.1%)

[a] *Concentrations represent activities from: foreign research reactor spent nuclear fuel management, DOE-owned spent nuclear fuel management, construction and operation of an Expended Core Facility, and construction and operation of a tritium production and recycling facilities*

[b] *Number in parentheses indicate the percentage of the Regulatory Standard*

F.4.5.5 Unavoidable Adverse Environmental Impacts

Construction of the potential new foreign research reactor spent nuclear fuel storage facilities would require the disturbance of approximately 4 ha (10 acres) of undeveloped land. Although this represents less than one percent of the undeveloped land on the Nevada Test Site, it would eliminate potential terrestrial wildlife habitat, including habitat potentially suitable for the Federally-listed desert tortoise. It would also require the dedication of a small land parcel potentially suitable for other construction projects, but similar land parcels are abundant on the Nevada Test Site.

F.4.5.6 Irreversible and Irretrievable Commitments of Resources

Construction and operation of new foreign research reactor spent nuclear fuel facilities would require commitments of electrical energy, fuel, concrete, steel, sand, gravel and miscellaneous chemicals. Groundwater to operate the foreign research reactor spent nuclear fuel facilities would be withdrawn from an aquifer that is presently experiencing localized overdraught. Further studies would be necessary to quantify any irreversible effects on future groundwater availability attributable to spent nuclear fuel withdrawals from that aquifer. The land dedicated to the foreign research reactor spent nuclear fuel facilities would become available for other rural uses following closure and decommissioning.

F.4.5.7 Mitigation Measures

Mitigation is addressed in general terms and describes typical measures that the Nevada Test Site could implement. The analyses indicate that the environmental consequences attributable to foreign research reactor spent nuclear fuel management activities at the site would be minimal in most environmental media.

Pollution Prevention: The DOE Nevada Field Office published a Waste Minimization and Pollution Prevention Awareness Plan in June 1991 to reduce the quantity and toxicity of hazardous, mixed, and radioactive wastes generated at DOE Nevada Field Office facilities. The plan is designed to reduce the possible pollutant releases to the environment and thus increase the protection of employees and the

public. All DOE Nevada Field Office contractors and the Nevada Test Site users that exceed the Environmental Protection Agency criteria for small-quantity generators are establishing their own waste minimization and pollution prevention awareness programs that are implemented by the DOE Nevada Field Office plan. Contractor programs ensure that waste minimization activities are in accordance with Federal, State, and local environmental laws and regulations, and DOE orders (DOE, 1995g).

Additional goals include the promotion and use of nonhazardous materials, establishment of a baseline of waste generation data, calculations of annual reductions of waste generated, and implementation of regulatory programs. Goals also include incorporation of waste minimization concepts and technologies in planning and design of new processes and facilities and in upgrades of existing facilities. A waste minimization task force composed of representatives from each contractor and the Nevada Test Site user has been established to coordinate DOE/Nevada Test Site waste minimization and pollution awareness activities (DOE, 1995g).

Socioeconomics: To reduce construction- and operation-related impacts, possible coordination with local communities could address potential impacts from increased labor and capital requirements. The knowledge of the extent and effect of growth due to foreign research reactor spent nuclear fuel management activities could greatly enhance the ability of affected jurisdictions to plan effectively. Effective planning would address changes in levels of service for housing, infrastructure, utilities, transportation, and public services and finances (DOE, 1995g).

To alleviate potential impacts associated with the in-migration of labor, local labor force availability could be increased through various employment training and referral systems currently provided by the Nevada Test Site. The goal of these systems would be to reduce the potential for in-migration of labor to support foreign research reactor spent nuclear fuel management activities (DOE, 1995g).

Cultural Resources: Consultation with the Nevada State Historic Preservation Office prior to project implementation is required under Section 106 of the National Historic Preservation Act of 1966. The State Historic Preservation Office may recommend that further archaeological studies be conducted throughout the construction area to verify that there are no archaeological sites subject to disturbance (DOE, 1995g).

Water Resources: The foreign research reactor spent nuclear fuel facilities would have to be located and constructed to minimize floodplain impacts and to avoid floodplains to the maximum extent possible, as required by Executive Order 11988 (Floodplain Management) and DOE orders. Site-specific surveys would be performed to determine locations of flooding elevations more accurately (DOE, 1995g).

Accidents: The foreign research reactor spent nuclear fuel storage facilities would be designed to comply with current Federal, State, and local laws, DOE orders, and industrial codes and standards. This would provide facilities that are highly resistant to the effects of severe natural phenomena, including earthquakes, floods, tornadoes, and high winds, as well as credible events appropriate to the site, such as fires and explosions and manmade threats to its continuing structural integrity for containing materials (DOE, 1995g).

An emergency preparedness plan would also be developed to lower the potential consequences of an accident to workers and the public. All workers receive evacuation training to ensure timely and orderly personnel movement away from high-risk areas. Plans and arrangements with local authorities would also be in place to evacuate the general public that may be at risk of exposure to hazardous materials accidentally released (DOE, 1995g).

F.5 Occupational Radiation Impacts from Receipt and Handling of Foreign Research Reactor Spent Nuclear Fuel

Occupational exposure to gamma radiation would depend largely on the operational history of the spent nuclear fuel elements to be stored in the facility and the length of time that these elements have been allowed to decay from the time that they were taken out of the reactor until they were placed in the cask for shipment to the storage facility. Normally, the decay time for fuel elements is established so that the gamma heating in the transportation cask is within specification and the radiation field on the outside cask surface is 200 mrem per hour or less. Special shipments can be made, however, with higher cask surface radiation fields, provided other requirements are met. Radiation exposures to personnel during receiving operations and surveys would depend on the level of radiation that is measurable on the exterior (surface) of the transportation cask. These initial operations are anticipated to provide the majority of personnel exposure since the remaining operations would be remote and could take advantage of the shielding built into the facility.

Realistic annual occupational radiation exposure estimates for facility operation can be performed once the following have been established:

- determination of accurate decay-time averaged values for the spent nuclear fuel,
- development of shielding characteristics for transportation casks for the spent nuclear fuel to be shipped to the facility,
- definition of personnel requirements for each of the individual operations to be accomplished within the facility, and
- completion of a time-motion study for the spent nuclear fuel element movement through the preliminary design of the facility.

The analyses in this appendix are based on a best estimate of the above conditions. The potential impacts are given in doses per cask shipment, so that the results can be simply multiplied by the total number of shipments for each potential storage arrangement.

Wet Storage: Occupational radiation exposure from the receipt, handling and storage of foreign research reactor spent nuclear fuel at a wet storage facility is treated in a generic way for all potential management sites, since the activities are essentially identical regardless of where the facility is located. It is based on actual handling experience of spent nuclear fuel at the Idaho National Engineering Laboratory and the Savannah River Site.

The workers involved with each cask were assumed to include the shipping agent, shift foremen, health physics technicians, and equipment operators. The equipment operators include onsite workers who remove each cask from its shipping container and transport it to the receiving bay, and those who perform most of the actual labor involved thereafter, such as transferring the spent nuclear fuel to storage and decontaminating the empty cask prior to returning it to the owners. Thus, while the assessment does not distinguish between them, the operators are a diverse group of workers whose distinct duties make it unlikely that the same operators could receive all of the calculated individual doses discussed below. As a result, it was assumed that the two foremen and two operators involved in handling the spent nuclear fuel casks outside the receiving facility would be different than the two foremen and two operators working inside the facility (the health physics technicians were assumed to be the same). This provides a conservative estimate of 12 workers.

In order to estimate the occupational radiation doses from the handling of foreign research reactor spent nuclear fuel transportation casks at the spent nuclear fuel management sites, it was necessary to develop a curve of dose rate versus distance for these casks. Historical data based on 44 research reactor spent nuclear fuel transportation cask receipts at either the Savannah River Site or the Idaho National Engineering Laboratory were obtained and evaluated. This historical data showed an average measured dose rate of approximately 2.3 mrem per hour at 1 m (3.3 ft) from the surface of the transportation cask. One cask, however, was measured to be 20 mrem per hour at 1 m (3.3 ft). To encompass this historical data, including the highest measured dose rate cask, an analysis was performed that assumed a dose rate of 23 mrem per hour at 1 m (3.3 ft) from the cask surface. It should be noted that, in the unlikely event that a higher dose rate transportation cask was received at the management site, radiological control procedures for as low as reasonably achievable limits would be utilized to ensure that the worker doses would be minimized. Dose rate reduction is usually accomplished by a combination of restrictions on time, distance from the source, and the provision of additional radiation shielding.

The plot of bounding transportation cask dose rate versus distance in Figure F-50 was developed using the ZYLIND computer code and appropriate conservative methodology. ZYLIND (RSIC, 1990) is a shielding computer code that uses the point kernel method to calculate photon dose rates from a cylindrical source and shield geometry. ZYLIND was developed in Germany in 1989 and then released to the Oak Ridge National Laboratory Radiation Shielding Information Center. ZYLIND has been extensively validated by comparison to measured dose rates from several hundred cylindrical containers with radioactive materials. ZYLIND calculated dose rates that were conservative and within 10 to 20 percent of the measured dose rates. ZYLIND allows the photon energy source to be divided into up to 20 energy groups from 0 to 10 million electron volts (Mev), allows up to eight materials regions, and includes mass attenuation and dose buildup information for a wide range of shielding materials.

The methodology used in calculating bounding transportation cask dose rates had four underlying assumptions. First, it was assumed that the dose rate at 1 m (3.3 ft) from the cask surface is 23 mrem per hour. Second, neutron dose rates from foreign research reactor spent nuclear fuel were assumed to be negligible and the only dose was assumed to be due to gamma (photon) radiation. A third assumption was that the foreign research reactor spent nuclear fuel source term inside a cask could be conservatively simulated by a single 1.0 Mev gamma energy group. Traditional NRC source terms (DiNunno et al, 1962) for spent nuclear fuel fission products assume an average gamma energy of 0.7 Mev. By using 1.0 Mev, the average gamma energy is expected to be conservatively bounded. Finally, it was assumed that the use of a point kernel cylindrical source-shield computer code (i.e., ZYLIND) would conservatively calculate the dose rates from a transportation cask.

The principal inputs for the calculation were the ZYLIND computer code manual (Radiation Shielding Information Center ZYLIND) and the U.S. Department of Transportation Certificates of Competent Authority for seven transportation cask designs that are likely to be used for the shipment of foreign research reactor spent nuclear fuel. These seven designs are: TN7, GNS-11, LHRL-120, NAC/LWT, PEGASE (IU-04), BMI-1, and GE-2000. These transportation casks are described in Appendix B, Section B.2. The U.S. Department of Transportation Certificates of Competent Authority provided geometry data on the cask inside cavity dimensions and the thickness and material composition of shielding adjacent to the cavity for each design.

With the cask geometry information, a set of ZYLIND calculations was performed for each design. An initial 1.0 Mev gamma source was estimated and ZYLIND was executed to calculate the dose rate at 1 m (3.3 ft) from the cask surface. This source was iterated upon until the 1 m (3.3 ft) dose rate equaled 23 mrem per hour. After this source was determined, the same source and cask geometry were rerun to calculate the dose rate at distances of from 0-50 m (0-164 ft) from the cask surface. This process was

repeated for each of the transportation cask designs. The resulting dose rates at distance for each cask design were compared and the highest dose rate response at all distances was synthesized from this data to produce Figure F-50.

Table F-101 shows the actual dose rates encountered during receipt and handling for essentially all of the foreign research reactor spent nuclear fuel casks, which are expected to be one to two orders of magnitude lower than the limit, based on actual experience with foreign research reactor spent nuclear fuel in the past.

Table F-102 presents the wet storage collective dose for unloading one transportation cask using time, distance, and personnel data from the Idaho National Engineering Laboratory and the dose rate curve in Figure F-50. The total worker dose per transportation cask was calculated to be 0.31 person-rem. The actual distances for each worker are based on conservative estimates of actual work experience that would reflect an as low as reasonably achievable Radiation Protection Program as required by DOE regulation (10 CFR 835).

Generic Dry Cask Storage: The receipt, handling, and storage occupational radiation doses (deep dose equivalents) for dry storage are also treated in a generic way, since the operation of the general facility designed for dry storage would be the same at any management site. The assessment is based on Pressurized Water Reactor spent nuclear fuel from the reactor's spent nuclear fuel storage pool to an NRC-licensed dry storage facility at the Calvert Cliffs nuclear power plant in Maryland. The system employed is the horizontal module system (NUHOMS), which was selected for this assessment for two reasons: (1) it is a current, regulatory-approved design that is readily available for foreign research reactor spent nuclear fuel dry storage, and (2) the worker dose rates calculated for the system are among the highest of the current systems now in use for storage of commercial spent nuclear fuel. As a result, the system analysis provides a reasonably conservative estimate for storage of foreign research reactor spent nuclear fuel in NUHOMS and a reasonable upperbound assessment for all other foreign research reactor spent nuclear fuel generic dry storage. The Calvert Cliffs Safety Analysis Report does not identify each category of worker associated with receipt, handling, transfer, and storage of spent nuclear fuel. As a result, for this assessment, the doses (deep dose equivalent) were assumed to be the same for all workers (titled "operators" in the assessment). However, it would appear from the work activities that it cannot be the same operators who support each of the activities. As a result, job titles comparable to those considered for wet storage have been defined in order to determine the average worker dose per cask. Therefore, it is assumed that the following categories of workers are involved: foremen (2), health physics technicians (2), equipment operators for the storage pool activities (2), and different equipment operators for the one-site transport and transfer of the spent nuclear fuel from the transfer cask to the dry storage cask (3), welders (2), helium leak test technician (1), and dye penetrant test technician (1). Each of the distances listed is the average distance for all of the workers involved in each one of the 25 specific activities associated with receipt, handling, transfer, and dry storage. Thus, for example, the first activity [loading fuel into the container (dry shielded canister)], would involve four workers (one foreman, one health physics technician, and two operators) in the Spent Fuel Pool area. The results indicate that the collective dose to the working crew of 13 would be 1.5 person-rem per NUHOMS cask transfer. A transfer cask load is approximately equal to the foreign research reactor spent nuclear fuel inventory of eight transportation casks.

IFSF (Dry Vault) Specific Dry Storage: Based on data provided by the Idaho National Engineering Laboratory, Table F-103 was generated to present the occupational dose for unloading one transportation cask into the IFSF. The collective dose to unload one transportation cask into the IFSF was calculated to be 0.32 person-rem. This dose is considered representative of a generic dry vault storage facility.

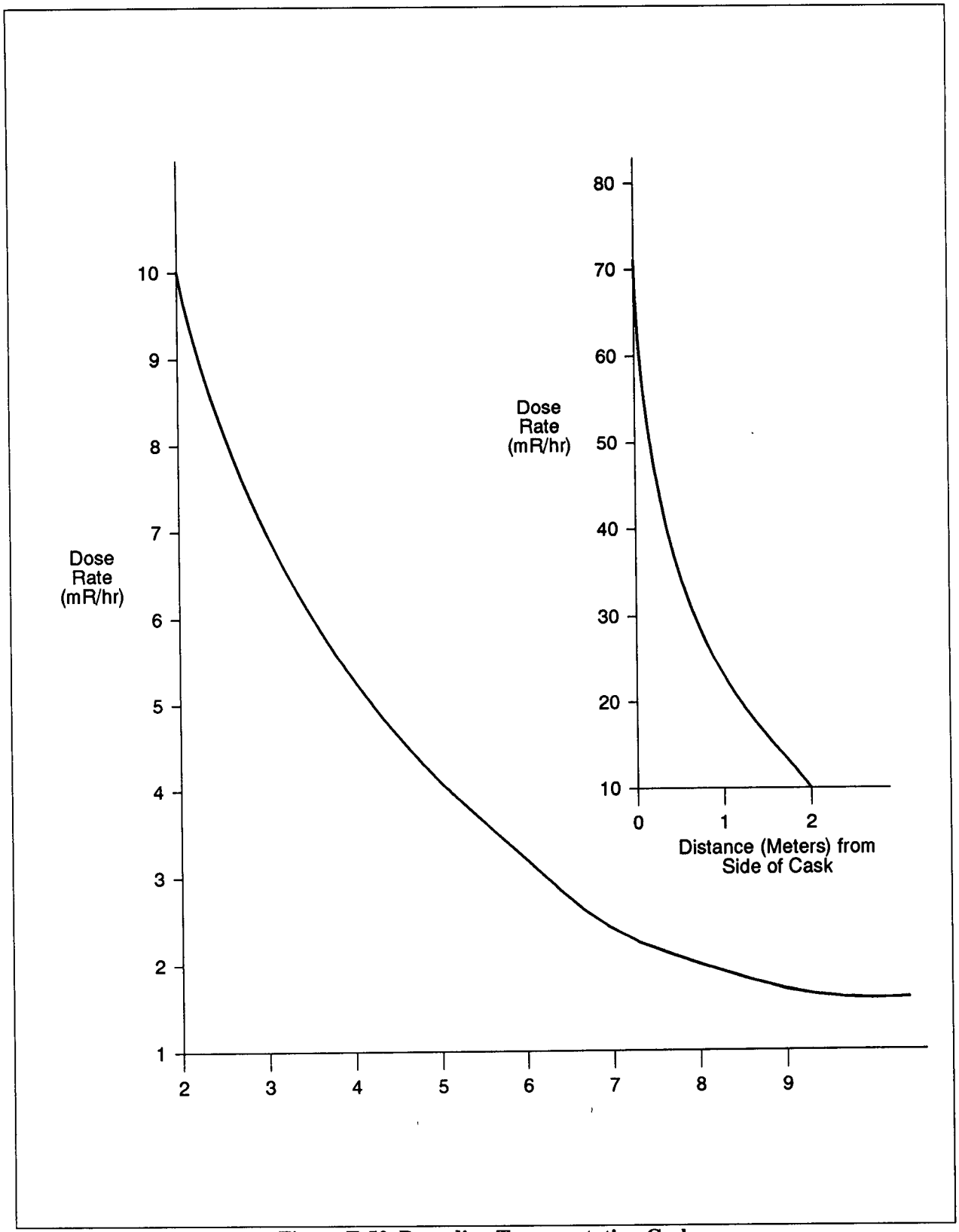


Figure F-50 Bounding Transportation Cask
(Dose Rate at a Distance Normalized to 10 millirem/hour at 2 meters [6.6 feet])

Table F-101 Actual Foreign Research Reactor Spent Nuclear Fuel Transportation Cask Dose Rate Measurements

Date	Cask Model	Fuel	Side Cask Measured Dose Rate (mrem/hr) at 1 m (3.3 ft)
Savannah River Site-Provided Data			
10/2/94	IU04-PEGASE		0.4
10/2/94	PEGASE		2.08
10/2/94	TN-7		8.4
10/2/94	GNS-11		1.2
12/18/87	PEGASE	DR3	1.5
1/26/89	PEGASE	DR3	0.6
12/31/87	PEGASE	ORPHEE	1.4
10/30/86	PEGASE	ORPHEE	0.5
9/1/87	PEGASE	SILOE	1.0
11/5/87	PEGASE	SILOE	0.3
12/30/87	PEGASE	SILOE	0.3
2/7/89	TN-7/2	RHF	15.0
8/16/88	TN-7/2	RHF	20.0
9/25/81	SWED.R2-B/23	AAR	0.9
1/20/89	TN-1	HFR	6.0
7/20/88	TN-1	HFR	0.5
6/8/88	GNS-11	FRJ-2	8.0
8/30/88	GNS-11	FRJ-2	0.8
8/30/88	GNS-11	FRJ-2	10.0
2/27/86	GOSLAR NO.1	FRG	2.0
11/12/86	GOSLAR NO.1	FRG	1.0
2/26/86	GOSLAR NO.2	FRG	0.2
3/10/80	GOSLAR NO.1	ASTRA	0.2
3/14/80	GOSLAR NO.2	ASTRA	0.1
1/29/86	BMI-1	RINC	0.5
2/6/86	BMI-1	RINC	0.4
6/5/84	BMI-1	U.VA.	0.5
6/11/84	BMI-1	U.VA.	0.5
9/11/84	BMI-1	U.MICH.	0.1
10/13/87	BMI-1	U.MICH.	0.1
7/14/81	BMI-1	U.MICH.	1.0
10/6/87	BMI-1	U.MICH.	0.1
Idaho National Engineering Laboratory-Provided Data			
	BMI-1	CORNELL-TRIGA	3.5
	BMI-1	BERKLEY-TRIGA	0.5
	BMI-1	MICHIGAN-TRIGA	1.0
	BMI-1	BERKLEY-TRIGA	0.5
	GE-700	BNL-HFBR	1.0
	GE-700	BNL-HFBR	1.0
	GE-700	BNL-HFBR	1.0
	GE-700	U. OF MISSOURI	0.1
	BMI-1	CORNELL-TRIGA	3.5
	BMI-1	MICHIGAN-TRIGA	0.1
	BMI-1	HANFORD-TRIGA	1.0
	BMI-1	HANFORD-TRIGA	1.0

Table F-102 Worker Dose Assessment for Receipt and Handling of Foreign Research Reactor Spent Nuclear Fuel in Wet Storage

Exposed Workers	A. Exposure Distance (m)	B. Dose Rate (mrem/hr)	C. Exposure Time (minutes/cask)	D. Dose/Cask-Person (mrem)	E. Number of Exposed Workers	F. Collective Dose (Person-rem)
Transport Receipt						
Shipping Agent	8.0	2.1	30	1.1E+00	1	1.1E-03
Subtotal			30	1.1E+00		1.1E-03
Health Physics Tech	1.0	23.0	5	1.9E+00	1	1.9E-03
	2.0	10.0	10	1.7E+00	1	1.7E-03
Subtotal			15	3.6E+00		3.6E-03
Guards	8.0	2.1	30	1.1E+00	1	1.1E-03
Subtotal			30	1.1E+00		1.1E-03
Remove Container Cover						
Foreman	10.0	1.5	20	5.0E+01	1	5.0E-04
	5.0	4.2	10	7.0E+01	1	7.0E-04
Subtotal			30	1.2E+00		1.2E-03
Operators	0.3	50.0	15	1.3E+01	3	3.8E-02
	0.3	50.0	10	8.3E+00	1	8.3E-03
	1.0	23.0	1	3.8E-01	1	3.8E-04
	2.0	10.0	10	1.7E+00	2	3.3E-03
Subtotal			36	2.3E+01		5.0E-02
Survey Cask						
Health Physics Tech	0.3	50.0	45	3.8E+01	1	3.8E-02
Subtotal			45	3.8E+01		3.8E-02
Removal of Impact Limiters						
Foreman	5.0	4.2	50	3.5E+00	1	3.5E-03
	2.0	10.0	10	1.7E+00	1	1.7E-03
Subtotal			60	5.2E+00		5.2E-03
Health Physics Tech	5.0	4.2	45	3.2E+00	1	3.2E-03
	0.3	50.0	15	1.3E+01	1	1.3E-02
Subtotal			60	1.6E+01		1.6E-02
Operators	0.3	50.0	10	8.3E+00	3	2.5E-02
	0.5	36.0	60	3.6E+01	2	7.2E-02
Subtotal			70	4.4E+01		9.7E-02
Move Cask						
Equipment Operators	0.3	50.0	5	4.2E+00	1	4.2E-03
Subtotal			5	4.2E+00		4.2E-03
Removal of Cask from Transport						
Foreman	8.00	2.1	45	1.6E+00	1	1.6E-03
	2.00	10.0	10	1.7E+00	1	1.7E-03
	1.00	23.0	5	1.9E+00	1	1.9E-03
Subtotal			60	5.2E+00		5.2E-03
Health Physics Tech	8.00	2.1	30	1.1E+00	1	1.1E-03
	2.00	10.0	20	3.3E+00	1	3.3E-03
	1.00	23.0	10	3.8E+00	1	3.8E-03
Subtotal			60	8.2E+00		8.2E-03
Equipment Operators	4.00	5.3	59	5.2E+00	2	1.0E-02
	1.00	23.0	1	3.8E-01	1	3.8E-04
Subtotal			60	5.6E+00		1.1E-02

Exposed Workers	A. Exposure Distance (m)	B. Dose Rate (mrem/hr)	C. Exposure Time (minutes/cask)	D. Dose/Cask-Person (mrem)	E. Number of Exposed Workers	F. Collective Dose (Person-rem)
Testing & Verification of Integrity						
Health Physics Tech	5.00	4.2	30	2.1E+00	1	2.1E-03
	2.00	10.0	28	4.7E+00	1	4.7E-03
	0.3	50.0	2	1.7E+00	1	1.7E-03
Subtotal			60	8.4E+00		8.4E-03
Operators	0.30	50.0	30	2.5E+01	2	5.0E-02
	4.00	5.3	30	2.7E+00	2	5.3E-03
Subtotal			60	2.8E+01		5.5E-02
Movement of Cask to Unloading Pool and Immersion						
Operators	0.30	50.0	2	1.7E+00	3	5.0E-03
	NA	0.1	58	9.7E-02	2	1.9E-04
Subtotal			60	1.8E+00		5.2E-03
Cask Unloading/Inspection/Storage						
Foreman	NA	0.1	240	4.0E-01	1	4.0E-04
Subtotal			240	4.0E-01		4.0E-04
Safeguards	NA	0.1	240	4.0E-01	1	4.0E-04
Subtotal			240	4.0E-01		4.0E-04
Operators	NA	0.1	240	4.0E-01	5	2.0E-03
Subtotal			240	4.0E-01		2.0E-03
Removal of Cask from Unloading Pool						
Operators	NA	0.1	60	1.0E-01	2	2.0E-04
Subtotal			60	1.0E-01		2.0E-04
Replacement of Cask of Transport and all subsequent operators assumed to be no exposure greater than background						
	NA	0.0	90	0	5	0
Subtotal				0		0
Total				**4.4E+01 (Max.)**		**3.1E-01**

Table F-103 Worker Dose Assessment for Receipt and Handling of Foreign Research Reactor Spent Nuclear Fuel in a Dry Storage Facility (Irradiated Fuel Storage Facility) or Generic Vault

Exposed Workers	A. Exposure Distance (m)	B. Dose Rate (mrem/hr)	C. Exposure Time (minutes/cask)	D. Dose/Cask-Person (mrem)	E. Number of Exposed Workers	F. Collective Dose (Person-rem)
Transport Receipt						
Shipping Agent	8.0	2.1	30	1.1E+00	1	1.1E-03
Subtotal			30	1.1E+00		1.1E-03
Health Physics Tech	1.0	23.0	5	1.9E+00	1	1.9E-03
	2.0	10.0	10	1.7E+00	1	1.7E-03
Subtotal			15	3.6E+00		3.6E-03
Guards	8.0	2.1	30	1.1E+00	1	1.1E-03
Subtotal			30	1.1E+00	1	1.1E-03
Remove Container Cover						
Foreman	10.0	1.5	20	5.0E-01	1	5.0E-04
	6.0	1.2	10	7.0E-01	1	7.0E-04
Subtotal			30	1.2E+00		1.2E-03
Operators	0.3	50.0	15	1.3E+01	3	3.8E-02
	0.3	50.0	10	8.3E+00	1	8.3E-03

Exposed Workers	A. Exposure Distance (m)	B. Dose Rate (mrem/hr)	C. Exposure Time (minutes/cask)	D. Dose/Cask-Person (mrem)	E. Number of Exposed Workers	F. Collective Dose (Person-rem)
	1.0	23.0	1	3.8E-01	1	3.8E-04
	2.0	10.0	10	1.7E+00	2	3.3E-03
Subtotal			36	2.3E+01		5.0E-02
Survey Cask						
Health Physics Tech	0.3	50.0	45	3.8E+01	1	3.8E-02
Subtotal			45	3.8E+01		3.8E-02
Removal of Impact Limiters						
Foreman	5.0	4.2	50	3.5E+00	1	3.5E-03
	2.0	10.0	10	1.7E+00	1	1.7E-03
Subtotal			60	5.2E+00		5.2E-03
Health Physics Tech	5.0	4.2	45	3.2E+00	1	3.2E-03
	0.3	50.0	15	1.3E+01	1	1.3E-02
Subtotal			60	1.6E+01		1.6E-02
Operators	0.3	50.0	10	8.3E+00	3	2.5E-02
	0.5	36.0	60	3.6E+01	2	7.2E-02
Subtotal			70	4.4E+01		9.7E-02
Removal of Cask from Transport to Transfer Cart						
Foreman	8.0	2.1	45	1.6E+00	1	1.6E-03
	2.0	10.0	10	1.7E+00	1	1.7E-03
	1.0	23.0	5	1.9E+00	1	1.9E-03
Subtotal			60	5.2E+00		5.2E-03
Health Physics Tech	8.00	2.1	30	1.1E+00	1	1.1E-03
	2.00	10.0	20	3.3E+00	1	3.3E-03
	1.00	23.0	10	3.8E+00	1	3.8E-03
Subtotal			80	8.2E+00		8.2E-03
Equipment Operators	4.00	5.3	59	5.2E+00	2	1.0E02
	1.00	23.0	1	3.8E-01	1	3.8E-04
Subtotal			60	5.6E+00		1.1E-02
Testing & Verification of Integrity, Lid Bolt Removal						
Foreman	4.00	5.3	60	5.3E+00	1	5.3E-03
Subtotal			60	5.3E+00		5.3E-03
Health Physics Tech	5.00	4.2	30	2.1E+00	1	2.1E-03
	2.00	10.0	28	4.7E+00	1	4.7E-03
	0.30	50.0	2	1.7E+00	1	1.7E-03
Subtotal			60	8.4E+00		8.4E-03
Operators	0.30	50.0	30	2.5E+01	2	5.0E-02
	4.00	5.3	30	2.7E+00	2	5.3E-03
Subtotal			60	2.8E+01		5.5E-02
Movement of Cask into Handling Cove						
Foreman	4.00	5.3	60	5.3E+00	1	5.3E-03
Subtotal			60	5.3E+00		5.3E-03
Operators	4.0	5.3	10	8.8E-01	2	1.8E-03
	NA	0.1	50	8.3E-02	2	1.7E-04
Subtotal			60	9.7E-01		1.9E-03
Cask Unloading/Inspection/Storage						
Foreman	NA	0.1	480	8.0E-01	1	8.0E-04
Subtotal			480	8.0E-01		8.0E-04
QA Inspector	NA	0.1	480	8.0E-01	1	8.0E-04
Subtotal			480	8.0E-01		8.0E-04

Exposed Workers	A. Exposure Distance (m)	B. Dose Rate (mrem/hr)	C. Exposure Time (minutes/cask)	D. Dose/Cask-Person (mrem)	E. Number of Exposed Workers	F. Collective Dose (Person-rem)
Operators	NA	0.1	480	8.0E-01	2	1.6E-03
Subtotal			480	8.0E-01		1.6E-03
Removal of Cask from Handling Cove						
Foreman	NA	0.1	60	1.0E-01	1	1.0E-04
Subtotal			60	1.0E-01		1.0E-04
Operators	NA	0.1	60	1.0E-01	2	2.0E-04
Subtotal			60	1.0E-01		2.0E-04
Replacement of Cask of Transport and All Subsequent Operators Assumed to be No Exposure Greater than Background	NA	0.0	90	0	5	0
Subtotal			90	0		0
Total				**4.4E+01 (Max.)**		**3.2E-01**

DSC = Dry Shielded Canister

Transfer Between Storage Facilities: The collective doses were calculated for loading fuel into a pod, a dry vault (i.e., the IFSF), and dry cask (i.e., Calvert Cliffs NUHOMS) or during transfer between these facilities. It was assumed that larger commercial spent nuclear fuel transportation casks are used for intersite and intrasite movement of foreign research reactor spent nuclear fuel within the United States. Their capacity is approximately four times that of the foreign research reactor spent nuclear fuel transportation casks from overseas. It was also assumed that the transfer cask for the dry cask design has a capacity which is approximately eight times that of the overseas foreign research reactor spent nuclear fuel transportation casks.

F.6 Evaluation Methodologies and Assumptions for Incident-Free Operations and Hypothetical Accidents at Management Sites

Appendix F.6 describes only the methodologies and assumptions used for estimating radiation exposure (doses) to individuals and the general public from releases of radioactivity during incident-free operations and hypothetical accidents at potential management sites. The descriptions of similar evaluations for ground and marine transportation and port accidents are documented in Appendix E and Appendix D.

F.6.1 Analysis Methods for Evaluation of Radiation Exposure

F.6.1.1 General

An evaluation of incident-free operations and hypothetical accidental radioactive material releases at the proposed storage sites was performed to assess the impact of possible radiation exposure to individuals and the general population. The analysis assumes that the same operations are being carried out at different potential storage locations. The impact of the same radioactive material releases was evaluated at all potential sites. This approach provides a consistent method for comparing the effects of the proposed alternative actions.

F.6.1.2 Exposure Impacts to Be Estimated

The impact of radiation exposure (dose) to the following individuals and the general population is calculated for incident-free operation of the spent nuclear fuel storage facility and for accident conditions:

- ***Worker:*** An individual located 100 m (330 ft) from the radioactive material release point.[2] The dose to the worker is calculated for the 50th-percentile meteorology only (DOE, 1992a).
- ***MEI:*** A theoretical individual living at the storage site boundary and receiving the maximum exposure.
- ***NPAI:*** At some storage sites, highways used by the public may cross the Federal reservation where foreign research reactor spent nuclear fuel operations could be conducted. Consequently, these analyses included evaluation of the exposure to a theoretical motorist who might be stranded on such a highway at the time of an accident. Based on experience from emergency exercises, emergency response teams would be able to evacuate such an individual within 2 hours, so this was the exposure time used in the calculations.
- ***General population*** within an 80 km (50 mi) radius of the facility.

The doses to the NPAI, MEI and general population are calculated for the 50th- and 95th-percentile meteorological conditions. The details of exposure times for MEI, NPAI, worker, and general public are given in Section F.6.4.1.

The radiation dose to individuals and the public resulting from exposure to radioactive contamination was calculated using the following potential pathways:

- external direct exposure from immersion in the airborne radioactive material (air immersion),
- external direct exposure from radioactive material deposited on the ground (ground surface),
- internal exposure from inhalation of radioactive aerosols and suspended particles (inhalation), and
- internal exposure from ingestion of contaminated terrestrial food and animal products (ingestion).

The radiation dose is estimated by the GENII (Version 1.485) computer program (Napier et al., 1988) in a manner recommended by the International Commission on Radiological Protection in Publications 26 and 30 (ICRP, 1977; ICRP, 1979-1982). Committed dose equivalents [3] are calculated for organs such as the gonads, breasts, red bone marrow, lungs, thyroid, bone surface, liver, lower large intestine, upper large

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2 *For elevated release, the worker dose was calculated at a point of maximum dose. The distance at which the maximum dose occurs is frequently greater than 100 m (300 ft) for elevated release.*

3 *The definitions of committed dose equivalents, committed effective dose equivalents, and total effective dose equivalents are consistent with those given in 10 CFR Part 835, "Occupational Radiation Protection; Final Rule," (DOE, 1993a).*

intestine, small intestine, and stomach. Weighting factors are used for various body organs to calculate weighted or committed effective dose equivalent (EDE) from radiation inside the body due to inhalation or ingestion. The committed EDE value is the summation of the committed dose equivalent to the specific organ weighted by the relative risk to that organ compared to an equivalent whole-body exposure.

The program also estimates deep-dose equivalent for the external exposure pathways (immersion in the radioactive material and exposure to ground contamination) and a 50-year committed EDE for the internal exposure pathways. The sum of the deep-dose equivalent for external pathways and the committed EDE for internal pathways is called the cumulative dose or "total EDE" in this EIS and is also estimated by the GENII program.

The exposure from ingestion of contaminated terrestrial food and animal products is calculated on a yearly basis. However, it is expected that continued consumption of contaminated food products by the public would be suspended if the projected dose exceeds the protective action guidelines for use in the event of radiological accidents (EPA, 1991). No reduction of exposure due to protective actions was accounted for in this analysis, however. This results in a conservative approach that may overestimate health effects within an exposed population, but allows for consistent comparisons between alternatives.

F.6.1.3 Evaluation of Health Effects

Health effects are calculated from the exposure results. The risk factors used for calculations of health effects are taken from International Commission on Radiological Protection Publication 60 (ICRP, 1991) (see Table F-104). From this list only the factors associated with the fatal cancers were used in the analysis. Other factors are given as additional information for completeness.

Table F-104 Risk Estimators for Health Effects from Ionizing Radiation

Effect	*Risk Factor (probability/rem)*[a]	
	Worker	*General Population*
Fatal cancer (all organs)	4.0×10^{-4}	5.0×10^{-4}
Weighted nonfatal cancer[b]	8.0×10^{-5}	1.0×10^{-4}
Weighted genetic effects[b]	8.0×10^{-5}	1.3×10^{-4}

[a] *For high individual exposures (20 rem), the risk factors are multiplied by a factor of two.*

[b] *In determining a means of assessing health effects from radiation exposure, the International Commission on Radiological Protection has developed a weighting method for nonfatal cancers and genetic effects. These factors are provided here for information only and were not used in this analysis. Genetic effects can only be applied to population, not to individuals.*

F.6.1.4 Population

Population distributions specific to each site were used for the evaluations. The population distributions were obtained from each site. The population information was obtained in 16 compass directions and 10 radial distances from the likely location of a foreign research reactor spent nuclear fuel storage facility to an 80 km (50 mi) total distance.

F.6.1.5 Meteorology

Meteorology specific to each site was used in the evaluation. The site-specific meteorological data was prepared, or acquired from each candidate storage site, in the form of joint frequency distribution in terms

of percentage of time that the wind blows in specific directions (i.e., south, south-southwest, southwest, etc.) for the given midpoint (or average) wind speed class and atmospheric stability. Accident consequence calculations were performed using 50th- and 95th-percentile meteorological conditions. The 50th-percentile condition represents the median meteorological condition, and is defined as that for which more severe conditions occur 50 percent of the time. The 95th-percentile condition represents relatively low probability meteorological conditions which produce higher calculated exposures, and is defined as that condition which is not exceeded more than 5 percent of the time. GENII determines 50th- and 95th-percentile meteorological conditions using site-specific joint frequency distribution weather data.

F.6.1.6 Computer Programs

The following computer programs were used to evaluate the radiation exposure to the specified individuals and the general population.

GENII: The GENII code (Napier et al., 1988) was used to model both acute and chronic releases to the atmosphere. This code was developed by the Pacific Northwest Laboratory to incorporate the internal dosimetry models recommended in International Commission on Radiological Protection Publication 26 (ICRP, 1977) and Publication 30 (ICRP, 1979-1982) into environmental pathway analysis models in use at the Pacific Northwest Laboratory. This code has been used by the Pacific Northwest Laboratory and other laboratories in site-wide dosimetry calculations. It has been extensively validated and quality assured.

ORIGEN2: ORIGEN2 (Croff, 1980) is a computer code system for calculating the buildup and decay of radioactive materials (fission products, actinides, and activation products). The code input was modeled to describe the HEU and low enriched uranium (LEU) research reactor nuclear fuel system and used neutronic cross-section data that are distinct to these fuels. ORIGEN2 has been used extensively by the Argonne National Laboratory in the RERTR program in estimating nuclide inventories of irradiated fuels. The code and the specific neutronic cross-section parameters for HEU and LEU fuels were acquired from the Argonne National Laboratory. ORIGEN2 is widely used and accepted throughout the nuclear industry.

F.6.2 Screening/Selection of Accidents for Detailed Examination

Accidents considered for inclusion in the detailed analyses are similar to those analyzed in the Programmatic SNF&INEL Final EIS for the spent nuclear fuel storage facility operations (DOE, 1995g). The analyzed accident scenarios in the Programmatic SNF&INEL Final EIS for each potential storage site were reviewed to identify the bounding accidents to be considered in this EIS. The review included accidents initiated by natural phenomena (earthquakes, tornadoes, hurricanes, etc.) and accidents initiated from human or equipment failure (fires, explosions, aircraft crashes, transportation accidents, and terrorism).

A review of accidents indicates that only severe accident conditions could result in a release of radioactive material to the environment or an increase in radiation levels. Some types of accidents, such as procedure violations, spills of small volumes of water containing radioactive particles, and most other types of common human error may occur more frequently than the more severe accidents analyzed. However, these accidents do not involve enough radioactive material or radiation to result in a significant release to the environment or a meaningful increase in radiation levels. Stated another way, the very low consequences associated with these events produce smaller risks than those for the accidents analyzed, even when combined with a higher probability of occurrence. Consequently, they have not been included in the results presented in this EIS.

Accidents initiated at nearby facilities, either by other activities unrelated to spent nuclear fuel handling or storage or during construction of a wet or dry storage facility, would not produce effects more severe than the sequence of events being analyzed. This is because foreign research reactor spent nuclear fuel undergoing examination or in the process of being stored would not need special conditions or uninterrupted operator attention to prevent overheating or to maintain containment or shielding. Therefore, evacuation in response to an accident at some other facility would not compromise integrity of the spent nuclear fuel.

The potential for common-cause accidents at a storage facility has been considered. It is possible for natural phenomena, like an earthquake, to produce more than one accident at a site causing a situation that results in a release of radioactive material into the atmosphere or an increase in radiation levels due to loss of shielding. However, the probability of two or more accidents having maximum consequences occurring concurrently is less than the probability of the individual events. For example, if an earthquake affected the wet storage facility, a crane might fail causing damage to stored spent nuclear fuel, and the water pool might drain. The impacts for this could be conservatively estimated by summing the consequences. Similarly, consequences from spent nuclear fuel facilities within a DOE site could be combined to conservatively estimate site-wide impacts. But again, the probability of a common-cause event resulting in this number of consequences is lower than the probability of individual accidents because, due to separation distances, the severity of impact will vary between facilities. The existing security measures in effect at the management sites would essentially preclude any sabotage or terrorist activity. Further, any acts of terrorism are expected to result in consequences which are bounded by the results of accidents analyzed. Thus, no specific analyses of the results of terrorist acts were conducted.

Based on the above, the review identified the following bounding accident scenarios:

- criticality caused by human error during operation, equipment failure, or earthquake;
- mechanical damage to foreign research reactor spent nuclear fuel during examination and preparation (cropping off the aluminum and nonfuel end of a fuel); and
- accident involving an impact by either an internal or external initiator with and without an ensuing fire.

F.6.3 Accident Scenarios Considered

A total of six bounding accident scenarios for the handling and storage of foreign research reactor spent nuclear fuel were identified for detailed analysis. Each of these accident scenarios was evaluated at each storage location using identical source terms. As described below, three of the bounding accident scenarios apply to wet storage and three apply to dry storage.

F.6.3.1 Wet Storage Bounding Accident Scenarios

Three hypothetical accident scenarios were evaluated for foreign research reactor spent nuclear fuel stored in water pools: (a) fuel element breach (i.e., cutting into the fuel region) or mechanical damage due to operator error, (b) an accidental criticality, and (c) an aircraft crash into the water pool facility. In addition to these three scenarios, a dropped fuel cask was also considered to be a foreseeable accident. However, as will be seen in Section F.6.4.4.4, the consequences of this accident are bounded by the cutting into a fuel region scenario. Therefore, a dropped fuel cask was not evaluated in detail.

F.6.3.2 Dry Storage Bounding Accident Scenarios

Three hypothetical accidents were evaluated for foreign research reactor spent nuclear fuel handled in dry storage: (a) fuel element breach (i.e., cutting into the fuel region) or mechanical damage during examination work and handling, (b) dropping of a fuel cask, and (c) an aircraft crash with ensuing fire in the dry storage facility. No credible mechanism was identified for an accident criticality in dry storage.

F.6.4 Bounding Accident Evaluation

F.6.4.1 Basic Assumptions

The analysis of airborne releases from hypothetical accidents is performed using the GENII Version 1.485 computer program. Unless otherwise stated, the following conditions were used when performing calculations. In most cases, these are the default conditions in the GENII program.

Meteorological Data:

- Fiftieth- and 95th-percentile meteorological conditions for each storage site were defined using site-specific joint frequency distribution weather data.
- The release is assumed to occur at ground level (0 m).
- Mixing layer height is 1,000 m (3,280 ft). Airborne materials freely diffuse in the atmosphere near ground level in what is known as the mixing depth. A stable layer exists above the mixing depth which restricts vertical diffusion above 1,000 m.
- Wet deposition is zero (it is assumed that no rain occurs to accelerate deposition and reduce the size of area affected by the release).
- Dry deposition of the cloud is modeled. During movement of the radioactive plume, a fraction of the radioactive material in the plume is deposited on the ground due to gravitational forces. The deposited material no longer contributes to the air immersion dose from the plume, but now contributes as exposure from ground surface radiation and ingestion.
- The quantity of deposited radioactive material is proportional to the material particle size and deposition velocities (in m/sec) used in the GENII code as follows:

solids = 0.001	halogens = 0.01	noble gases = 0.0
cesium = 0.001	ruthenium = 0.001	

- If radioactive releases occur through a stack, then additional plume dispersion can be accounted for by considering the beneficial effects of jet plume rise. In this analysis, jet plume rise is ignored.
- When released gases have a heat content, the plume can disperse more quickly. In this calculation, buoyant plume effects are ignored.

Inhalation Data:

- Breathing rate is 330 cm^3/sec (20.1 in^3/sec) for the worker and the NPAI; 270 cm^3/sec (16.5 in^3/sec) for people at the site boundary and beyond (the MEI and the general population).
- Particle size is 1.0 micro-meter (micron).
- The internal exposure period is 50 years for the individual organs and tissues evaluated.
- Exposure during passage of the entire plume is assessed for the MEI and the general public. Exposures to the worker and NPAI are discussed below.
- Inhalation exposure factors are based on International Commission on Radiological Protection Publication 30 (ICRP, 1979-1982).

Mitigating Factors:

For the MEI and members of the general public residing at the site boundary and beyond, no allowances are made for any preventive or mitigative actions that would limit their exposure. These individuals are assumed to be exposed to the contaminated plume during the entire period of its passage, as it travels downwind from the accident site. Similarly, no action is taken to prevent these people from continuing their normal daily routine, including ingestion of the potentially contaminated terrestrial food and animal products. It is assumed, however, that the public would spend approximately 30 percent (about 8 hours) of the day within their homes or other buildings. Therefore, the exposure of the general public to radiation from contaminated ground surface is reduced appropriately. Calculations were done on a yearly basis to determine the effective annual dosage from inhalation, external exposure, and ingestion, and an associated dose commitment extending over a 50-year period from initiation of intake (NRC, 1977a).

Onsite workers would be trained to take quick, decisive action during an accident. These individuals would be trained to quickly evacuate the affected area and move to well-defined "relocation" areas on the facility. Therefore, it is assumed that workers would be exposed to only 5 minutes of the radioactive plume as they move to relocation centers. Once the plume has moved offsite and downwind, the workers would be instructed to walk to vehicles waiting to evacuate them from the site. It is assumed that an additional 15 minutes would be required to evacuate the workers from the contaminated area and, therefore, the workers would receive a total of 20 minutes of exposure to radioactive material deposited on the ground. No ingestion of contaminated foods is assumed for these individuals.

Individuals that may be traversing the site in a vehicle (i.e., NPAI) would be evacuated from the affected area within 2 hours. This is based on the availability of security personnel at all locations to oversee the removal of collocated workers and travelers in a safe and efficient manner. Therefore collocated workers and travelers would be exposed to the entire contaminated plume as it travels downwind for a period not to exceed 2 hours. Similarly, the radiation from the deposited radioactive materials would be limited to a 2-hour period. No ingestion of contaminated foods is assumed for these individuals.

Table F-105 provides the individual exposure times used in the accident analyses presented later in this appendix.

Table F-105 Estimated Individual Exposure Times

Exposure Type	*Worker (100 m)*	*NPAI*	*MEI/General Public*
To Plume	5 min	100% of release time up to 120 min	100% of release time
To Fallout on Ground Surface	20 min	120 min	0.70 yr
To Food	NA	NA	1 yr

F.6.4.2 Source Term

The source term is the amount of respirable radioactive material, in terms of Ci (curies), that are released to the air. The airborne source term is typically estimated by the following five-component linear equation:

Source Term = MAR x DR x ARF x RF x LPF

where:

MAR = Material-at-Risk (g or Ci),

DR = Damage Ratio,

ARF = Airborne Release Fraction (or Airborne Release Rate for continuous release),

RF = Respirable Fraction, and

LPF = Leak Path Factor.

MAR: The MAR is the amount of radionuclides (in g or Ci of activity for each radionuclide) available to be acted upon by a given physical stress (i.e., an accident). The MAR is specific to a given process in the facility of interest. It is not necessarily the total quantity of material present, but is that amount of material in the scenario of interest postulated to be available for release.

DR: This is the fraction of material exposed to the effects of the energy/force/stress generated by the postulated event. For the bounding accident scenarios discussed in this document, the value of DR is assumed to be one (i.e., all exposed material is released), unless otherwise specified.

ARF: This is the fraction of the material that becomes airborne due to the accident. Generic ARF values from DOE sources (Elder et al., 1986; DOE, 1994d) are used in this document unless other values more appropriate to a particular accident scenario are used for ARF. The values for ARF are summarized in Table F-106.

RF: This is the fraction of the material, with particle sizes of 10 micro-meters (microns) or less (DOE, 1994d) that could be retained in the respiratory system following inhalation. The term RF is applied only for the inhalation pathway.

LPF: The LPF accounts for the action of removal mechanisms, such as containment systems, filtration, deposition, etc., to reduce the amount of airborne radioactivity that is ultimately released to occupied spaces of the facility or to the environment. An LPF of 1.0 (i.e., no reduction) is assigned in accident scenarios involving a major failure of confinement barriers.

Table F-106 Release Fractions[a] for Various Release Mechanisms

Material	*Release Mechanisms*		
	Fuel breach[a]	*Fire*	*Criticality Accident*[b]
Gas			1.0
Noble Gas	1.0	1.0	
Krypton	0.3	1.0	
Other Noble Gas	0.1	1.0	
Halogens	0.1	1.0	0.25[d]
Iodine-129	0.25		
Solids			
Volatile	0.01[c]	2.5×10^{-4} [d,e]	
Nonvolatile	0.01	2.5×10^{-6} [d,e]	

Source: DOE, 1995g

[a] *As recommended in Elder et al., 1986.*

[b] *Regulatory Guide values (NRC, 1977b, 1979b, and 1988b).*

[c] *Actually semi-volatile (cesium, rhodium, antimony, selenium, technetium, and tellurium); review on a case-by-case basis.*

[d] *Includes release fraction, respirable fraction and plate-out.*

[e] *Data from DOE, 1995g.*

F.6.4.3 Description of Radiological Accident Scenarios and Generic Parameters

As discussed previously, the accident screening and selection process led to selection of six bounding accident scenarios involving radioactive materials. Appropriate assumptions also have been discussed regarding meteorological parameters, dispersion parameters, dose estimates, and emergency response and protective actions. Each of the accident scenarios is described in the following text according to the major headings listed below:

- Description of Accident,
- Development of Radioactive Source Term, and
- Dose Calculations and Results.

The contents of these sections and a summary of the generic parameters used follow.

Description of Accident provides a basis for accident selection and discusses possible initiating events. A qualitative assessment of scenario likelihood is provided.

Development of Radioactive Source Term describes the assumptions that apply to the development of the resulting source term. Specifically, it discusses the various multipliers (defined earlier in this section) that convert the MAR to the source term.

These multipliers have the following values:

- DR is 1.0, unless otherwise specified.
- ARF is taken from Table F-106, or clearly stated if different.
- LPF is 1.0 for a major failure of confinement barriers.

Dose Calculations and Results relates the computer modeling to the specific accident scenario, and documents the results. Specifically, these subsections accomplish the following:

- describe assumptions and unique input parameters (other than the source term) used in the computer model,
- document the computer model output in terms of exposure to radionuclides for individuals and for the general population within a 80 km (50 mi) radius, and
- assess the potential for health effects.

Unless otherwise specified, the meteorological/dispersion parameters and estimated exposure times summarized are used in the dosimetry calculations for specific accident scenarios. Under some circumstances, facility worker exposures could be either greater or less than these nominal values.

F.6.4.4 Accident Scenario Descriptions and Source Terms

F.6.4.4.1 Fuel Element Breach

***Description of Conditions*:** Fuel element mechanical damage due to handling during examination, such as accidentally cutting into the fuel region, was assessed. This hypothetical accident results from inadvertent cutting across the fuel region when cropping off the aluminum and nonfuel ends of a fuel unit. All noble gas isotopes are postulated to be released to the facility building and escape to the environment. The majority of the volatile and solid nuclides are likely to be retained in the fuel or the facility exhaust filters. The resulting airborne release to the environment was evaluated.

***Likelihood*:** The frequency of this scenario is estimated to be 0.16/yr (DOE, 1995g). This frequency estimate is based on historical operation data (one event in 6 years) for a spent nuclear fuel storage facility. This estimate is conservative for the case of foreign research reactor spent nuclear fuel storage because the majority of the spent nuclear fuel elements are expected to be cropped prior to their emplacement in a transportation cask at a foreign research reactor. Nevertheless, this estimate is retained for the evaluation of the potential risk associated with the handling and preparation of foreign research reactor spent nuclear fuel for storage in both a dry and a wet storage facility.

***Source Term*:** Conditions used in developing the source term are as follows:

- Only one spent nuclear fuel element is damaged. This is because only one spent nuclear fuel element is being handled at a time.

If the spent nuclear fuel cutting accident occurs in a dry cell (dry storage), the following assumptions apply:

- All (100 percent) of the noble gases available for release are released to the atmosphere. Here, it was assumed that all noble gases in an irradiated fuel element would be released. This is conservative, since foreign research reactor fuels are dispersion fuels in which the gaseous fission products are essentially trapped within the fuel matrix. This is different than for commercial reactor fuel, where gaseous fission products collect in the gap between the fuel and its sealed metal fuel rod and are readily released if the rod is damaged.

- Twenty-five percent of the halogens in the spent nuclear fuel are released to the environment. This is also conservative for the reason stated above.

- One percent of the particulate fission products is released to the dry cell from the spent nuclear fuel element, and 99.9 percent removed prior to release to the environment by the normally installed high-efficiency particulate air filters. The use of 99.9 percent efficiency is conservative, since normal efficiency of installed high-efficiency particulate air filters is greater than 99.99 percent.

- Cesium (Cs) and Ruthenium (Ru) behave like particulate fission products.

- The release to the environment occurs at a constant rate over a 15-minute period.

If the spent nuclear fuel cutting accident occurs under water (wet storage) the following assumptions apply:

- All (100 percent) of the noble gases available for release are released to the environment.

- Twenty-five percent of the halogens available for release will be released to the pool, and only 10 percent of this amount will be released to the air. This additional reduction is due to the fact that halogen gases dissolve in the water as they escape (leak out) from the failed fuel. Based on solubility alone, it is expected that all iodines are dissolved in the water pool before they get to the pool surface. In spite of this fact, for the purposes of the analyses, it was assumed that 2.5 percent of halogens available for release will be released to the atmosphere.

- There is no particulate fission product release to the environment. All particulates are retained in the pool water.

- Since only gaseous fission products are released to the air inside the facility, installed high-efficiency particulate air filters would not provide additional reduction in the amount of material released to the environment.

- The release to the environment occurs at a constant rate over a 15-minute period.

F.6.4.4.2 Accidental Criticality

Description of Conditions: In this hypothetical accident scenario, an accidental uncontrolled chain reaction producing 1×10^{19} fissions is postulated. The 10^{19} fission criticality is a very conservative assumption for the spent nuclear fuel pool. This assumption is only applicable to liquid processes (such as uranium reprocessing) as stated in Regulatory Guides 3.33 and 3.34 (NRC, 1979a and 1979b). This criticality is assumed to consist of an initial burst of 10^{18} fissions in 0.5 seconds, followed at 10 minute intervals for the next 8 hours by a burst of 2×10^{17} fissions, for a total of 10^{19} fissions. The total yield for a moderated solid system, as applicable to the spent nuclear fuel in a wet pool, is estimated to be on the order of 10^{18} fissions. This is because the initial criticality will disrupt the critical geometry and no further criticality burst will occur.

The criticality occurs in the water pool and the spent nuclear fuel remains covered in the water. The fission products released include those specified in Regulatory Guide 3.34 (NRC, 1979b) from the criticality over an 8-hour period, plus fission products existing in the fuel as a result of its original use in the foreign research reactor. Removal of fission products by the pool water is considered in the analysis.

Criticality is not considered in the dry storage because the licensing design basis for spent nuclear fuel dry storage design facilities precludes the consideration of any criticality accident by design. The design must demonstrate, through rigorous structural and criticality analyses, that the likelihood of a criticality is incredible or unforeseeable. No effective moderator, such as water, exists in a dry storage design; and, even if flooded, it remains subcritical.

Likelihood: The frequency of this scenario is estimated at 3.1×10^{-3} per year (DOE, 1995g). The estimation of this frequency was conservatively based on a statistical evaluation considering that no accidental criticality event with spent nuclear fuel storage has occurred (DuPont, 1983b). This frequency is estimated by considering both the various process-related upset conditions and the natural phenomena hazard (i.e., earthquake and tornadoes) initiated criticality events. The magnitude of fission yield for such a criticality accident was estimated to range from about 5 x 1017 to 1×10^{19} fissions. The historical criticality accidents at different DOE facilities dealing with spent nuclear fuels indicate a much smaller fission yield than that evaluated here. The frequency of an accidental criticality of the magnitude evaluated here is estimated to be between one and two orders of magnitude less than the estimated frequency.

Source Term: Conditions used in developing the source term are as follows:

- The fractions of the fission products from damaged spent nuclear fuel elements released to the building are 100 percent of the noble gases, 25 percent of the halogens, 0.1 percent of the Ru, and 0.05 percent of the Cs and remaining solids (NRC, 1977b, 1979b, and 1988b).
- Fission products from 10 spent nuclear fuel elements damaged in the criticality accident are also released in addition to the gaseous fission products created by the criticality event.
- A high-efficiency particulate air filter removes 99.9 percent of the solid fission products that were released to the air inside the facility before they enter the environment.
- The release to the environment occurs at a constant rate over a 15-minute period. This is conservative as compared to the 8-hour release allowed in Regulatory Guide 3.34 (NRC, 1979b).

F.6.4.4.3 Aircraft Crash

Dry Storage:

Description of Conditions: A hypothetical aircraft accident scenario was developed for the dry storage option. This accident is analyzed only at storage sites that have a likelihood of accident occurrence greater than 10^{-7} per year. The consequences of this accident are expected to bound all other dry storage accident scenarios involving an impact that results in fire. The aircraft crash accident is postulated to cause damage to a single transfer container in the dry unloading cell in a modular vault storage facility. Engineering experience indicates that most of the aircraft structure is stopped by the dry storage building structure. Only a heavy dense jet engine rotor shaft is expected to be capable of penetrating the building and damaging the container. Due to the severity of the impact, it was assumed that the cask is breached and the fuel elements in the cask are damaged. The release of fission products occurs due to the impact and resultant fire (i.e., from aviation fuel).

The accident scenario for a dry cask storage facility is similar to that of a modular vault facility. The aircraft crash analysis is the only accident scenario applicable to a dry cask storage. In this scenario, it is

expected that the concrete structure which houses the storage canisters is sufficiently rugged that it can survive an aircraft accident with no significant damage to the spent nuclear fuel.

Likelihood: The frequency of this scenario is site dependent. DOE, as part of the Programmatic SNF&INEL Final EIS, has performed calculations of aircraft crash hit frequencies at potential storage sites (i.e., Savannah River Site, Idaho National Engineering Laboratory, Oak Ridge Reservation, Hanford Site, and Nevada Test Site) for naval fuel (DOE, 1995g). The reported crash frequencies are: 2×10^{-6} per year for the Savannah River Site, 1×10^{-6} per year for the Oak Ridge Reservation, 4×10^{-7} per year for Nevada Test Site, 7×10^{-8} per year for the Idaho National Engineering Laboratory, and 4×10^{-8} per year for the Hanford Site. These frequency estimates were based on the number of commercial air carriers and military aircraft passing within a 10-mile radius of the proposed storage location at these sites. The calculations for the Idaho National Engineering Laboratory also included potential hazards from a nearby airport. These calculations were performed very conservatively, by considering that all the overflights within the 10-mile radius will pass directly over the storage location at each site.

A new assessment of aircraft impact probabilities for the Idaho National Engineering Laboratory chemical processing plant indicates a frequency of aircraft crash into a dry storage facility the size of the IFSF of about 2.6×10^{-10} per year from overflights and 3.5×10^{-7} per year from airport-related flights near the plant (WINCO, 1994). (The IFSF effective area is five times that considered in the evaluation for the naval fuel storage area, which represents the critical areas containing spent nuclear fuel. Therefore both results are consistent, from the overall crash frequency point of view at the Idaho National Engineering Laboratory.)

In order to provide an understanding of the rationale used in this EIS for this scenario, an overview of the aircraft crash analysis approach is presented. In general, the aircraft crash hit frequency is calculated based on four factors: number of flight operations (takeoff, landing, overflight), aircraft crash rate, facility effective area, and an assumption of crash area distribution. Several models are currently used to estimate the hit frequency. The results of these models are driven by the assumptions regarding the target area and crash area distribution. For example, assuming that overflights (high or low altitude) pass over the facility inherently assumes that the crash area distribution is a straight line. This overestimates the frequency by at least a factor of 10 (approximate width of an airway). In calculating effective area, the analysis considers that an aircraft can hit a facility either directly (falling on the building, footprint area), by skidding into the building (skid area), or in an angular impact (shadow area). Depending on the assumptions of skid length and the angular approach of a crash terminating aircraft, the sum of the latter two areas may contribute between 80 to 95 percent of the total effective area. It is important to note that aircraft that fall vertically with the greatest impact contribute between 1 and 10 percent to the overall crash rate. Therefore, for the majority of cases, the aircraft will hit the ground before it hits the facility.

Based on the above summary, it is considered that frequencies reported in the Programmatic SNF&INEL Final EIS are conservative by at least a factor of 10 for all sites except the Idaho National Engineering Laboratory. Nonetheless, for the purposes of analyses and consistency, this EIS will consider frequencies similar to those used in the Programmatic SNF&INEL Final EIS. The potential aircraft crash frequency at the Oak Ridge Reservation, the Nevada Test Site, the Idaho National Engineering Laboratory, and the Savannah River Site is conservatively set at 10^{-6} per year. This scenario will not be applicable to the Hanford Site, where the estimated frequency is less than 10^{-7} per year.

Source Term: Conditions used in developing the source term are as follows:

- Only one transfer cask containing 20 spent nuclear fuel elements would be damaged by the impact and the resultant fire. This is based on the fact that, if an aircraft hits the building,

only the transfer cask is susceptible to damage by the crash. The stored casks are protected by a three-foot concrete shield, and therefore would not be affected by the crash. Based on a conservative estimate of the duration of the transfer operation, the transfer cask could be damaged by the accident only one percent of the time.

- Of the available fission products, 100 percent of the noble gases, 100 percent of the halogens, 2.5 percent of the cesium, and 0.025 percent of the remaining solids are released to the environment. The overall, respirable fractions of fission products released to the environment are consistent with that given in Table F-106 for a fire scenario.
- The release to the environment occurs at a constant rate over a 15-minute period.
- No filtration by high-efficiency particulate air filters is assumed.

For dry cask storage, it was assumed that the ruggedness of the overall dry cask structure is similar to that of a transportation cask. Based on this assumption, the accident source terms were assumed to be similar to that of aluminum-based spent nuclear fuel source terms for the highest severity accident (cask damage and fire) utilized in the RADTRAN accident analysis (DOE, 1995g). The overall source terms for this scenario include: 63 percent of noble gases, 6×10^{-3} percent of halogens, 1×10^{-3} percent of cesium, 2.4×10^{-4} percent of ruthenium, and 1×10^{-5} percent of other solid fission products available in a dry cask.

Wet Storage:

***Description of Conditions*:** Impact into water pools by aircraft with resulting damage to the spent nuclear fuel elements stored inside the pool was evaluated. The hypothetical accident might damage the fuel either by the aircraft directly striking it or by the aircraft causing sufficient damage to the building to cause part of the building to collapse and strike the fuel. Fission products are released from the spent nuclear fuel units into the water pool, however, the pool water is not released to the environment. An aircraft crash into a water pool would not produce enough force to cause the pool to leak because the walls of the water pool are constructed of thick reinforced concrete with earth surrounding them, making them very strong. In addition, based on the discussion provided above, it was judged unlikely that an aircraft would impact the water pool at an angle steep enough to expose the floor of the pool or the walls of the pool below the water level to direct impact.

***Likelihood*:** The same frequency as discussed above will be used for an aircraft crash into a wet storage facility.

***Source Term*:** Conditions used in developing the source term are as follows:

- It was estimated that about 140 spent nuclear fuel elements would damaged. This estimate was based on the consideration of the size of spent nuclear fuel allowing fuel stacking and an assumption that only one percent of the upper stacked fuel will be damaged.
- Of the available fission products, 100 percent of the noble gases and 25 percent of the halogens are released to the pool water. Due to the presence of pool water, a reduction of the halogen release by a factor of 10 occurs prior to release to the environment.
- The pool water is not expected to be lost and the solid fission products from ruptured and damaged fuel elements remain in the water. However, for the purposes of this analysis, it was conservatively assumed that 0.01 percent of the solid fission products (including Cs and Ru) released from the damaged fuel elements to the pool would be displaced upon

impact. Only one percent of released solid fission products would become airborne and released to the environment. This assumption considers that, upon impact, a percentage of the spent nuclear fuel fails, the solid fission products enter the pool, and only finely crushed particulates are splashed out of the pool in the same timeframe that the aircraft hits the water.

- The release to the environment occurs at a constant rate over a 15-minute period.
- Spent nuclear fuel elements remained covered in the water pool.
- The building confinement is assumed to have failed; no filtration by high-efficiency particulate air filters is assumed.

F.6.4.4.4 Fuel Cask Drop

Dry Storage:

Description of Conditions: Mechanical damage due to handling during examination, such as dropping of the spent nuclear fuel cask during transfer, was assessed. The fuel casks are certified to result in no failure for a specific drop height, (free drop from 9 m [30 ft] height onto an unyielding surface), and under no circumstances will the cask be moved above such height during operations within a storage facility. Nevertheless, it was assumed that, upon cask drop, the seals of the cask would fail, releasing the gaseous fission products from the damaged fuel inside the cask to the facility building and the environment. All of the nonvolatile and solid nuclides are assumed to be retained in the fuel or the facility high-efficiency particulate air filters. The resulting airborne release to the environment was evaluated.

Likelihood: The frequency of this scenario is estimated at 10^{-4} per year (DOE, 1995g). This estimate is considered to be an upper bound for this scenario.

Source Term: Conditions used in developing the source term are as follows:

- Only one fuel cask is involved. This is because only one fuel cask is being handled at a time. For the purposes of this analysis, it was assumed that an equivalent of one spent nuclear fuel element inside the cask is damaged, and its gaseous fission products are released inside the cask. This assumption is conservative, since the fuel is secured inside the cask and the cask is not expected to be damaged.
- All (100 percent) of the gaseous fission products and 25 percent of halogens from the damaged fuel element are released to the atmosphere.
- None of the particulate fission products are released to the environment.
- Cs and Ru behave like particulate fission products.
- The release to the environment occurs at a constant rate over a 15-minute period.

Wet Storage:

The source term for a fuel cask drop is similar to that for the fuel element breach scenario in a wet storage facility. The gaseous fission products released inside the cask are vented under

water (or in the pool). Since the estimated frequency of this scenario is less than that of the fuel element breach, no specific analysis for this scenario was performed.

F.6.5 Incident-Free Operation Source Terms

This section details the assumptions and the evaluation process used to determine the risk of radiological emissions generated during different activities in incident-free operation of a storage facility. The incident-free operation emissions consist of two parts: transient (i.e., emissions from gaseous release during receipt and unloading of the transportation casks), and steady state (i.e., emissions from spent nuclear fuel in storage). Since only mechanically sound spent nuclear fuel elements are shipped, no radioactive releases are expected during transit. To ensure this, the spent nuclear fuel elements are checked prior to shipment to identify and separate any damaged fuel elements. The damaged fuel elements are then encapsulated and prepared for shipment. In spite of the fact that no spent nuclear fuel elements have ever failed during transit, it was assumed that one percent of the spent nuclear fuel elements will arrive failed and release gaseous fission products (noble gases and halogens) into the cask. Depending on the type of storage facility, the receipt and unloading of the transportation casks could occur in a dry cell or a wet pool. Unloading operations in a dry cell causes all gaseous fission products to be released to the building and eventually to the environment. If the unloading process occurs in a wet pool, a majority of the halogen gases will be absorbed in the water; only 10 percent of halogens will be released to the environment. The building high-efficiency particulate air filters will not be effective for halogens and noble gases. During the unloading process, all spent nuclear fuel elements are checked to ensure that they are mechanically sound. If a damaged fuel element is found, it is encapsulated in a can before it is placed in wet or dry storage. The potential annual radiological releases from failed fuel elements during the unloading process were estimated based on the gaseous inventories of bounding fuels (see Appendix B, Section B.1.4) ad the associated number of fuels expected over the acceptance period. The receipt and unloading process of foreign research reactor spent nuclear fuel from abroad is expected to last 13 years (see Section 2.2.1). It was assumed that failed fuel would release 100 percent of its noble gases and 25 percent of its halogens. This assumption is consistent with that used in the accident analysis.

The steady state emissions from a new wet storage facility are assumed to be similar to those released from the RBOF facility at the Savannah River Site. Although the emissions at the RBOF facility may not be a good representation of the foreign research reactor spent nuclear fuel, RBOF has the most foreign research reactor spent nuclear fuel elements stored in its pool; and as such, was considered to provide the best approximation of the expected release. Based on the emission data from RBOF, the steady-state emissions from a wet storage facility are assumed to be about 2×10^{-7} curies of Cesium-137 per year (DOE, 1995g). This is a conservative assumption. For existing wet storage facilities, the radiation exposure to the MEI and the general public were estimated based on the combined radionuclide atmospheric emissions originating from current conditions of the facilities and that expected from foreign research reactor spent nuclear fuel. At Savannah River Site, the average annual atmospheric emissions from the existing fuels at L-reactor disassembly basin are estimated to be 254 curies of tritium and 6.49×10^{-5} curies of Cesium-137 (Shedrow, 1994b) over Phase 1 of the policy period. The assumption is that the foreign research reactor spent nuclear fuel would be stored temporarily (about 10 years) in the wet pool until a more permanent dry storage facility is built. The annual atmospheric radiological emissions from RBOF and BNFP wet pools are similar to those that are currently released from RBOF and which were used for a new facility. The annual atmospheric radiological emissions from the Idaho National Laboratory's FAST wet storage facility were assumed to be similar to that of a new wet storage facility. This facility has been designed and built according to current codes and regulations.

The steady-state emissions from a dry storage facility are considered to be zero. This is because the fuel will be checked to ensure that it is mechanically sound (i.e., no damage) before it is placed into dry storage, and the dry storage canisters that house the fuel are sealed.

F.6.6 Dose Calculations and Results

F.6.6.1 Source Terms

Tables F-107 and F-108 provide the incident-free operation and accident source terms. The source terms for the annual emissions from the unloading process were calculated based on the assumption that a constant annual rate of fuel mix with bounding radionuclide inventories (as defined in Appendix B, Section B.1) is received over the acceptance period. The fission products in a BR-2 type spent nuclear fuel element were used as the MAR in the accident analysis source term calculations (see Appendix B for more details). Four fuel categories were defined in Appendix B: BR-2, NRU, RHF, and TRIGA. BR-2 fuel type constitutes the majority of the foreign research reactor spent nuclear fuels. In addition, since spent nuclear fuels come in different sizes and lengths, use of the BR-2 spent nuclear fuel in the accident analysis means involvement of a larger number of spent nuclear fuels in each accident. For example, in the source term calculations for an aircraft crash accident involving a transfer cask, it was assumed that the cask would contain 20 BR-2 spent nuclear fuel elements. If the cask contained NRU elements, there would be five elements in the cask; and if it contained RHF elements, there would be only four elements per cask. For the generic wet storage case, the bounding spent nuclear fuel is considered to have been cooled at least 300 days prior to shipment. In the case of dry storage, the fuel has been cooled for at least 3 years.

Table F-107 Annual Emission Releases From Storage Facilities

Isotope	Releases During Unloading in		Steady State	
	Dry Cell (Ci)	Wet Pool (Ci)	Dry Storage (Ci)	Wet Storage (Ci)
Tritium	39.6	39.6	---	---
Krypton-85	1.14×10^{3}	1.14×10^{3}	---	---
Iodine-129	4.87×10^{-4}	4.87×10^{-5}	---	---
Iodine-131	9.12×10^{-4}	9.12×10^{-5}	---	---
Xenon-131	2.01×10^{-5}	2.01×10^{-5}	---	---
Cesium-137	---	---	0.0	2.20×10^{-7}

Table F-108 Accident Source Terms (Curies)

Isotope	Dry Storage[a]			Wet Storage		
	Fuel Element Breach	Dropped Fuel Cask	Aircraft Crash with Fire	Accident Criticality[b]	Fuel Element Breach	Aircraft Crash
Tritium	2.40	2.12	42.4	24.0	2.40	336
Krypton 85	68.6	59.7	1,190	686	68.6	9,610
Iodine 129	3.04×10^{-5}	2.93×10^{-5}	2.34×10^{-3}	3.04×10^{-4}	3.04×10^{-6}	4.26×10^{-4}
Iodine 131	8.88×10^{-8}		0.0	2.20	8.88×10^{-9}	1.24×10^{-6}
Xenon 131m	3.71×10^{-5}		0.0	8.24×10^{-2}	3.71×10^{-5}	5.19×10^{-3}
Strontium 89	1.13×10^{-2}		1.42×10^{-6}	5.67×10^{-3}		0.159
Strontium 90	5.78×10^{-3}		2.73×10^{-2}	2.89×10^{-3}		8.09×10^{-2}
Yttrium 90	5.78×10^{-3}		2.73×10^{-2}	2.89×10^{-3}		8.09×10^{-2}
Yttrium 91	2.03×10^{-2}		8.35×10^{-6}	1.01×10^{-2}		0.284
Zirconium 95	2.97×10^{-2}		3.31×10^{-5}	1.49×10^{-2}		0.416
Niobium 95	6.11×10^{-2}		7.15×10^{-5}	3.06×10^{-2}		0.856
Ruthenium 103	2.47×10^{-3}		1.12×10^{-8}	2.47×10^{-3}		3.46×10^{-2}
Rhodium 103m	2.47×10^{-3}		1.12×10^{-8}	2.47×10^{-3}		3.46×10^{-2}

Isotope	Dry Storage[a]			Wet Storage		
	Fuel Element Breach	Dropped Fuel Cask	Aircraft Crash with Fire	Accident Criticality[b]	Fuel Element Breach	Aircraft Crash
Ruthenium 106	5.97×10^{-3}		6.70×10^{-3}	5.97×10^{-3}		8.36×10^{-2}
Rhodium 106m	5.97×10^{-3}		6.70×10^{-3}	5.97×10^{-3}		8.36×10^{-2}
Tin 123	1.19×10^{-4}		8.30×10^{-6}	5.93×10^{-5}		1.66×10^{-3}
Antimony 125	2.47×10^{-4}		7.10×10^{-4}	1.24×10^{-4}		3.46×10^{-3}
Tellurium 125m	5.89×10^{-5}		1.74×10^{-4}	2.94×10^{-5}		8.24×10^{-4}
Tellurium 127m	2.46×10^{-4}		1.55×10^{-5}	1.23×10^{-4}		3.45×10^{-3}
Tellurium 129m	5.25×10^{-5}		2.95×10^{-11}	2.63×10^{-5}		7.35×10^{-4}
Cesium 134	4.56×10^{-3}		1.10	2.28×10^{-3}		6.38×10^{-2}
Cesium 137	5.72×10^{-3}		2.73	2.86×10^{-3}		8.01×10^{-2}
Cerium 141	1.59×10^{-3}		3.53×10^{-10}	7.97×10^{-4}		2.23×10^{-2}
Cerium 144	8.67×10^{-2}		6.25×10^{-2}	4.33×10^{-2}		1.21
Praseodymium 144	8.67×10^{-2}		6.25×10^{-2}	4.33×10^{-2}		1.21
Promethium 147	1.34×10^{-2}		3.78×10^{-2}	6.71×10^{-3}		0.188
Promethium 148m	2.10×10^{-5}		1.70×10^{-10}	1.05×10^{-5}		2.94×10^{-4}
Europium 154	1.72×10^{-4}		7.30×10^{-4}	8.61×10^{-5}		2.41×10^{-3}
Europium 155	3.61×10^{-5}		1.32×10^{-3}	1.81×10^{-5}		5.06×10^{-4}
Uranium 234	2.50×10^{-10}		1.80×10^{-9}	1.27×10^{-10}		3.55×10^{-9}
Uranium 235	3.80×10^{-9}		1.90×10^{-8}	1.90×10^{-9}		5.37×10^{-8}
Uranium 238	9.50×10^{-11}		4.70×10^{-10}	4.70×10^{-11}		1.33×10^{-9}
Plutonium 238	1.78×10^{-5}		8.75×10^{-5}	8.92×10^{-6}		2.50×10^{-4}
Plutonium 239	5.11×10^{-7}		2.57×10^{-6}	2.56×10^{-7}		7.16×10^{-6}
Plutonium 240	3.33×10^{-7}		1.68×10^{-6}	1.67×10^{-7}		4.67×10^{-6}
Plutonium 241	7.89×10^{-5}		3.56×10^{-4}	3.94×10^{-5}		1.10×10^{-3}
Americium 241	1.10×10^{-7}		1.85×10^{-6}	5.50×10^{-8}		1.54×10^{-6}
Americium 242m	2.92×10^{-10}		1.44×10^{-9}	1.46×10^{-10}		4.08×10^{-9}
Americium 243	1.20×10^{-9}		6.00×10^{-9}	6.01×10^{-10}		1.68×10^{-8}
Curium 244	3.69×10^{-7}		2.25×10^{-7}	1.85×10^{-7}		5.17×10^{-6}
Curium 242	4.86×10^{-7}		6.40×10^{-8}	2.43×10^{-7}		6.81×10^{-6}
Krypton 83m				160		
Krypton 85m				150		
Krypton 87				990		
Krypton 88				650		
Krypton 89				42,000		
Xenon 133m				1.80		
Xenon 133				27.0		
Xenon 135m				2,200		
Xenon 135				360		
Xenon 137				49,000		
Xenon 138				13,000		
Iodine 132				275		
Iodine 133				40.0		
Iodine 134				1,100		
Iodine 135				120		

[a] *Source terms are those of modular dry vault storage. The dry cask source terms for accident scenarios are the same or smaller than those of modular dry vault storage, therefore, the modular dry vault storage source term values are considered to be bounding values for the impact evaluations.*

[b] *Particulate source terms (from Strontium 89 to Curium 242) are 1000 times higher, if a facility does not have or has an ineffective, high efficiency particulate air filters. This condition is applicable to the Savannah River Site Wet Storage at RBOF and L-Reactor Disassembly Basin.*

The incident-free operation source terms for chemical separation at the Savannah River Site and the Idaho National Engineering Laboratory were taken from the Interim Management of Nuclear Materials Final EIS (DOE, 1995b) and the Programmatic SNF&INEL Final EIS (DOE, 1995g), respectively. Accident source terms for the chemical separation process were not developed for foreign research reactor spent nuclear fuel. It was considered that the consequences of chemical separation operations-related accidental scenarios are similar to those identified and analyzed in the above documents.

F.6.6.2 Site-Specific Parameters

Several site-specific parameters were required as input to the computer models. The site-specific parameters deal with meteorology, individual and general population food consumption rates, food production locations, and distances and directions of individuals and populations with respect to release locations. The food consumption rates apply only to the MEI and the population dose calculations as indicated in Table F-105. Site-specific food consumption rates consistent with those used in the Programmatic SNF&INEL Final EIS (DOE, 1995g) were utilized. Different contaminated food consumption rates were used at each site because the rate at each site is calculated based on the food production rate within an 80 km (50 mi) radius and the amount of supplemental food (uncontaminated food) that is imported from outside of the 80 km (50 mi) radius. If food production around the site is not sufficient for the population consumption rate, then uncontaminated food is imported. Otherwise, the consumed food is assumed to be contaminated.

F.6.6.3 Results

Tables F-109 through F-116 provide summaries of the consequences, in terms of mrem and/or person-rem, of postulated accident doses to the MEI, NPAI, worker and the public. Except for the worker, where the dose is calculated using the 50th-percentile meteorology, dose calculations were performed for both the 50th- and the 95th-percentile meteorologies using the assumptions and input values discussed above. The accident scenarios and source terms, as described earlier in this appendix, were generically applied to new dry and wet storage facilities. For the existing facilities at each management site, the assumptions and the related source terms were adjusted to conform to the conditions of each facility. Two types of results were provided for the offsite residents (MEI and population). Because protective action guidelines (EPA, 1991) specify mitigative actions to prevent consumption of contaminated food, the dose to offsite residents is reported for all pathways (i.e., external, inhalation, and ingestion) and without the ingestion pathway (i.e., external and inhalation). It should be noted that, as stated earlier, no reduction of exposure to the plume or to contaminated ground surface as a result of early evacuation of offsite populations due to protective action guidelines was accounted for in this analysis.

The analyses were performed for a generic wet and a generic dry storage facility at the Savannah River Site, the Idaho National Engineering Laboratory, the Hanford Site, the Oak Ridge Reservation, and the Nevada Test Site, as well as for site-specific locations (BNFP, L-Reactor Basin area, and RBOF at the Savannah River Site, and FMEF and WNP-4 Spray Pond at the Hanford Site). The consequences of accident scenarios for the IFSF (dry), CPP-749 (dry) and FAST (wet) storage areas at the Idaho National Engineering Laboratory are considered to be equal to those of a generic dry and a generic wet storage facility, respectively. The consequences of accident scenarios for E-MAD at Nevada Test Site are considered to be similar to that of a generic dry storage facility at Nevada Test Site. For the RBOF and the L-Reactor disassembly basin, the criticality accident source terms were adjusted to conform with the conditions assumed in the Basis for Interim Operation reports for these facilities (WSRC, 1995b and 1995c), where no credit was taken for high efficiency particulate air filters after a criticality accident.

Table F-109 Summary of the Accident Analysis Dose Assessments at the Savannah River Site Generic Storage Facilities - All Pathways

			95th-Percentile Meteorology			50th-Percentile Meteorology			
	Frequency (event/yr)	Risk	MEI (mrem)[a]	NPAI (mrem)	Population (person-rem)	MEI (mrem)	NPAI (mrem)	Worker (mrem)	Population (person-rem)
Dry Storage Accidents - H-Area									
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF[b]	0.24 0.038 1.9×10^{-8}	0.068 0.011 5.5×10^{-9}	9.2 1.5 0.00075	0.055 0.0088 4.4×10^{-9}	0.0043 0.00069 3.5×10^{-10}	28 4.5 1.8×10^{-6}	0.62 0.099 0.000050
Dropped Fuel Cask	0.0001	Dose/event Dose/yr LCF[b]	0.018 1.8×10^{-6} 9.0×10^{-13}	0.00034 3.4×10^{-8} 1.7×10^{-14}	0.55 0.000055 2.8×10^{-8}	0.0039 3.9×10^{-7} 2.0×10^{-13}	0.000024 2.4×10^{-9} 1.2×10^{-15}	0.28 0.000028 1.1×10^{-11}	0.011 1.1×10^{-6} 5.5×10^{-10}
Aircraft Crash w/Fire	1×10^{-6}	Dose/event Dose/yr LCF[b]	40 0.000040 2.0×10^{-11}	0.29 2.9×10^{-7} 1.5×10^{-13}	1300 0.0013 6.5×10^{-7}	8.9 8.9×10^{-6} 4.5×10^{-12}	0.019 1.9×10^{-8} 9.5×10^{-15}	120 0.00012 4.8×10^{-11}	87 0.000087 4.4×10^{-8}
New Wet Storage Accidents - H-Area									
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF[b]	0.0070 0.0011 5.5×10^{-10}	0.00039 0.000062 3.1×10^{-11}	0.23 0.037 0.000019	0.0016 0.00026 1.3×10^{-10}	0.000027 4.3×10^{-6} 2.2×10^{-12}	0.14 0.0022 8.8×10^{-10}	0.016 0.00026 1.3×10^{-7}
Accidental Criticality	0.0031	Dose/event Dose/yr LCF[b]	17 0.053 2.7×10^{-8}	9.5 0.030 1.5×10^{-8}	370 1.2 0.00060	4.0 0.012 6.0×10^{-9}	0.69 0.0021 1.1×10^{-9}	1600 5.0 2.0×10^{-6}	15 0.047 0.000024
Aircraft Crash	1×10^{-6}	Dose/event Dose/yr LCF[b]	4.1 4.1×10^{-6} 2.1×10^{-12}	0.98 9.8×10^{-7} 4.9×10^{-13}	150 0.00015 7.5×10^{-8}	0.92 9.2 x 10-7 4.6×10^{-13}	0.061 6.1×10^{-8} 3.1×10^{-14}	400 0.00040 1.6 x 10-10	10 0.000010 5.0×10^{-9}

Table F-109A Summary of the Accident Analysis Dose Assessments at the Savannah River Site Generic Storage Facilities - External and Inhalation Pathways

			95th-Percentile Meteorology		50th-Percentile Meteorology	
	Frequency (event/yr)	Risk	MEI (mrem)[a]	Population (person-rem)	MEI (mrem)	Population (person-rem)
Dry Storage Accidents - H- Area						
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF[b]	0.053 0.0085 4.3×10^{-9}	3.1 0.050 0.000025	0.012 0.0019 9.5×10^{-10}	0.0011 0.00018 9.0×10^{-8}
Dropped Fuel Cask	0.0001	Dose/event Dose/yr LCF	0.00024 2.4×10^{-8} 1.2×10^{-14}	0.015 1.5×10^{-6} 7.5×10^{-10}	0.000055 5.5×10^{-9} 2.8×10^{-15}	0.00090 9.0×10^{-8} 4.5×10^{-11}
Aircraft Crash w/Fire	1×10^{-6}	Dose/event Dose/yr LCF	0.91 9.1×10^{-7} 4.6×10^{-13}	55 0.000055 2.8×10^{-8}	0.20 2.0×10^{-7} 1.0×10^{-13}	0.037 3.7×10^{-8} 1.9×10^{-11}
New Wet Storage Accidents - H-Area						
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF	0.00027 0.000043 2.2×10^{-11}	0.017 0.0027 1.4×10^{-6}	0.000062 9.9×10^{-6} 5.0×10^{-12}	0.0010 0.00016 8.0×10^{-8}
Accidental Criticality	0.0031	Dose/event Dose/yr LCF	9.9 0.031 1.6×10^{-8}	240 0.74 0.00037	2.5 0.0078 3.9×10^{-9}	5.8 0.018 9.0×10^{-6}
Aircraft Crash	1×10^{-6}	Dose/event Dose/yr LCF	0.76 7.6×10^{-7} 3.8×10^{-13}	46 0.000046 2.3×10^{-8}	0.18 1.8×10^{-7} 9.0×10^{-14}	3.1 3.1×10^{-6} 1.6×10^{-9}

[a] *To convert to sieverts from mrem, divide by 100,000; to convert to person-sieverts from person-rem, divide by 100.*

[b] *Point Estimate of Latent Cancer Fatalities event/yr.*

Table F-110 Summary of the Accident Analysis Dose Assessments at the Idaho National Engineering Laboratory Generic Storage Facilities - All Pathways

			95th-Percentile Meteorology			50th-Percentile Meteorology			
	Frequency (event/yr)	Risk	MEI (mrem)[a]	NPAI (mrem)	Population (person-rem)	MEI (mrem)	NPAI (mrem)	Worker (mrem)	Population (person-rem)
Dry Storage Accidents									
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF[b]	1.3 0.21 1.1×10^{-7}	0.67 0.11 5.5×10^{-8}	15 2.4 0.0012	0.093 0.015 7.5×10^{-9}	0.062 0.0099 5.0×10^{-9}	28 4.5 1.8×10^{-6}	0.83 0.13 0.000065
Dropped Fuel Cask	0.0001	Dose/event Dose/yr LCF	0.074 7.4×10^{-6} 3.7×10^{-12}	0.0033 3.3×10^{-7} 1.7×10^{-13}	0.83 0.000083 4.2×10^{-8}	0.0052 5.2×10^{-7} 2.6×10^{-13}	0.00032 3.2×10^{-8} 1.6×10^{-14}	0.12 0.000012 4.8×10^{-12}	0.047 4.7×10^{-6} 2.4×10^{-9}
Aircraft Crash w/Fire	1×10^{-6}	Dose/event Dose/yr LCF	180 0.00018 9.0×10^{-11}	2.9 2.9×10^{-6} 1.5×10^{-12}	2000 0.0020 1.0×10^{-6}	13 0.000013 6.5×10^{-12}	0.27 2.7×10^{-7} 1.4×10^{-13}	120 0.00012 4.8×10^{-11}	110 0.00011 5.5×10^{-8}
Wet Storage Accidents									
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF	0.0016 0.00026 1.3×10^{-10}	0.0036 0.00058 2.9×10^{-10}	0.43 0.069 0.000035	0.0028 0.00045 2.3×10^{-10}	0.00036 0.000058 2.9×10^{-11}	0.14 0.022 8.8×10^{-9}	0.025 0.0040 2.0×10^{-6}
Accidental Criticality	0.0031	Dose/event Dose/yr LCF	28 0.087 4.4×10^{-8}	30 0.093 4.7×10^{-8}	140 0.43 0.00022	3.4 0.011 5.5×10^{-9}	12 0.037 1.9×10^{-8}	1800 5.6 2.2×10^{-6}	12 0.037 0.000019
Aircraft Crash	1×10^{-6}	Dose/event Dose/yr LCF	22 0.000022 1.1×10^{-11}	9.8 9.8×10^{-6} 4.9×10^{-12}	250 0.00025 1.3×10^{-7}	1.6 1.6×10^{-6} 8.0×10^{-13}	0.88 8.8×10^{-7} 4.4×10^{-13}	400 0.00040 1.6×10^{-10}	14 0.00014 7.0×10^{-8}

Table F-110A Summary of the Accident Analysis Dose Assessments at the Idaho National Engineering Laboratory Generic Storage Facilities - External and Inhalation Pathways

			95th-Percentile Meteorology		50th-Percentile Meteorology	
	Frequency (event/yr)	Risk	MEI (mrem)[a]	Population (person-rem)	MEI (mrem)	Population (person-rem)
Dry Storage Accidents						
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF[b]	0.23 0.037 1.9×10^{-8}	2.7 0.43 0.00022	0.017 0.0027 1.4×10^{-9}	0.15 0.024 0.000012
Dropped Fuel Cask	0.0001	Dose/event Dose/yr LCF	0.0010 1.0×10^{-7} 5.0×10^{-14}	0.013 1.3×10^{-6} 6.5×10^{-10}	0.000079 7.9×10^{-9} 4.0×10^{-15}	0.00076 7.6×10^{-8} 3.8×10^{-11}
Aircraft Crash w/Fire	1×10^{-6}	Dose/event Dose/yr LCF	4.0 4.0×10^{-6} 2.0×10^{-12}	0.45 0.000045 2.3×10^{-8}	0.29 2.9×10^{-7} 1.5×10^{-13}	2.6 2.6×10^{-6} 1.3×10^{-9}
Wet Storage Accidents						
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF	0.0012 0.00019 9.5×10^{-11}	0.014 0.0022 1.1×10^{-6}	0.000090 0.000014 7.0×10^{-12}	0.00085 0.00014 7.0×10^{-8}
Accidental Criticality	0.0031	Dose/event Dose/yr LCF	17 0.053 2.7×10^{-8}	26 0.081 0.000041	2.6 0.0081 4.1×10^{-9}	5.4 0.017 8.5×10^{-6}
Aircraft Crash	1×10^{-6}	Dose/event Dose/yr LCF	3.4 3.4×10^{-6} 1.7×10^{-12}	39 0.000039 2.0×10^{-8}	0.25 2.5×10^{-7} 1.3×10^{-13}	2.1 2.1×10^{-6} 1.1×10^{-9}

[a] *To convert to sieverts from mrem, divide by 100,000; to convert to person-sieverts from person-rem, divide by 100.*

[b] *Point Estimate of Latent Cancer Fatalities event/yr.*

Table F-111 Summary of the Accident Analysis Dose Assessments at the Hanford Site Generic Storage Facilities - All Pathways

			95th-Percentile Meteorology			50th-Percentile Meteorology			
	Frequency (event/yr)	Risk	MEI (mrem)[a]	NPAI (mrem)	Population (person-rem)	MEI (mrem)	NPAI (mrem)	Worker (mrem)	Population (person-rem)
Dry Storage Accidents									
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF[b]	3.0 0.48 2.4×10^{-7}	0.57 0.091 4.6×10^{-8}	42 6.7 0.0034	0.15 0.024 1.2×10^{-8}	0.061 0.0098 4.9×10^{-9}	50 8.0 3.2×10^{-6}	2.0 0.32 0.00016
Dropped Fuel Cask	0.0001	Dose/event Dose/yr LCF	0.26 0.000026 1.3×10^{-11}	0.0085 8.5×10^{-7} 4.3×10^{-13}	3.0 0.00030 1.5×10^{-7}	0.011 1.1×10^{-6} 5.5×10^{-13}	0.00031 3.1×10^{-8} 1.6×10^{-14}	0.22 0.000022 8.8×10^{-12}	0.15 0.000015 7.5×10^{-9}
Aircraft Crash w/Fire[c]	NA	---	NA	NA	NA	NA	NA	NA	NA
Wet Storage Accidents									
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF	0.13 0.021 1.1×10^{-8}	0.0033 0.00053 2.7×10^{-10}	1.6 0.26 0.00013	0.0064 0.0010 5.0×10^{-10}	0.00035 0.000056 2.8×10^{-11}	0.25 0.040 1.6×10^{-8}	0.078 0.013 6.5×10^{-6}
Accidental Criticality	0.0031	Dose/event Dose/yr LCF	64 0.20 1.0×10^{-7}	14 0.044 2.2×10^{-8}	740 2.3 0.0012	4.8 0.015 7.5×10^{-9}	12 0.037 1.9×10^{-8}	3600 11 4.4×10^{-6}	55 0.17 0.000085
Aircraft Crash[c]	NA	---	NA	NA	NA	NA	NA	NA	NA

Table F-111A Summary of the Accident Analysis Dose Assessments at the Hanford Site Generic Storage Facilities - External and Inhalation Pathways

			95th-Percentile Meteorology		50th-Percentile Meteorology	
	Frequency (event/yr)	Risk	MEI (mrem)[a]	Population (person-rem)	MEI (mrem)	Population (person-rem)
Dry Storage Accidents						
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF[b]	0.30 0.048 2.4×10^{-8}	6.5 1.0 0.00050	0.015 0.0024 1.2×10^{-9}	0.31 0.050 0.000025
Dropped Fuel Cask	0.0001	Dose/event Dose/yr LCF	0.0039 3.9×10^{-7} 2.0×10^{-13}	0.029 2.9×10^{-6} 1.5×10^{-9}	0.000071 7.1×10^{-9} 3.6×10^{-15}	0.0015 1.5×10^{-7} 7.5×10^{-11}
Aircraft Crash w/Fire[c]	NA	---	NA	NA	NA	NA
Wet Storage Accidents						
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF	0.0016 0.00026 1.3×10^{-10}	0.032 0.0051 2.6×10^{-6}	0.000079 0.000013 6.5×10^{-12}	0.0018 0.00029 1.5×10^{-7}
Accidental Criticality	0.0031	Dose/event Dose/yr LCF	7.9 0.025 1.3×10^{-8}	180 0.56 0.00028	2.0 0.0062 3.1×10^{-9}	27 0.084 0.000042
Aircraft Crash[c]	NA	---	NA	NA	NA	NA

NA = Not Applicable

[a] *To convert to sieverts from mrem, divide by 100,000; to convert to person-sieverts from person-rem, divide by 100.*

[b] *Point Estimate of Latent Cancer Fatalities event/yr.*

[c] *Aircraft crash accidents are not applicable to the Hanford Site since their frequency of occurrence is less than 10^{-7}/yr.*

Table F-112 Summary of the Accident Analysis Dose Assessments at the Oak Ridge Reservation Generic Storage Facilities - All Pathways

			95th-Percentile Meteorology			50th-Percentile Meteorology			
	Frequency (event/yr)	Risk	MEI (mrem)[a]	NPAI (mrem)	Population (person-rem)	MEI (mrem)	NPAI (mrem)	Worker (mrem)	Population (person-rem)
Dry Storage Accidents									
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF[b]	22 3.5 1.8×10^{-6}	42 6.7 3.4×10^{-6}	55 8.8 0.0044	2.1 0.34 1.7×10^{-7}	9.4 1.5 7.5×10^{-7}	140 22 8.8×10^{-6}	8.4 1.3 0.00065
Dropped Fuel Cask	0.0001	Dose/event Dose/yr LCF	1.4 0.00014 7.0×10^{-11}	0.18 0.000018 9.0×10^{-12}	15 0.0015 7.5×10^{-7}	0.14 0.000014 7.0×10^{-12}	0.042 4.2×10^{-6} 2.1×10^{-12}	0.61 0.000061 2.4×10^{-11}	2.3 0.00023 1.2×10^{-7}
Aircraft Crash w/Fire	1×10^{-6}	Dose/event Dose/yr LCF	2300 0.0023 1.2×10^{-9}	180 0.00018 9.0×10^{-11}	2900 0.0029 1.5×10^{-6}	220 0.00022 1.1×10^{-10}	41 0.000041 2.1×10^{-11}	610 0.00061 2.4×10^{-10}	440 0.00044 2.2×10^{-7}
Wet Storage Accidents									
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF	0.71 0.11 5.5×10^{-8}	0.20 0.0032 1.6×10^{-8}	16 2.6 0.0013	0.068 0.011 5.5×10^{-9}	0.046 0.0074 3.7×10^{-9}	0.68 0.11 4.4×10^{-8}	2.5 0.40 0.00020
Accidental Criticality	0.0031	Dose/event Dose/yr LCF	1500 4.7 2.4×10^{-6}	3300 10 5.0×10^{-6}	1400 4.3 0.0022	230 0.71 3.6×10^{-7}	910 2.8 1.4×10^{-6}	6800 21 8.4×10^{-6}	210 0.65 0.00033
Aircraft Crash	1×10^{-6}	Dose/event Dose/yr LCF	380 0.00038 1.9×10^{-10}	600 0.00060 3.0×10^{-10}	2900 0.0029 1.5×10^{-6}	29 0.000029 1.5×10^{-10}	130 0.00013 6.5×10^{-11}	1900 0.0019 7.6×10^{-10}	120 0.00012 6.0×10^{-8}

Table F-112A Summary of the Accident Analysis Dose Assessments at the Oak Ridge Reservation Generic Storage Facilities - External and Inhalation Pathways

			95th-Percentile Meteorology		50th-Percentile Meteorology	
	Frequency (event/yr)	Risk	MEI (mrem)[a]	Population (person-rem)	MEI (mrem)	Population (person-rem)
Dry Storage Accidents						
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF[b]	9.8 1.6 8.0×10^{-7}	29 4.6 0.0023	0.96 0.15 7.5×10^{-8}	4.4 0.70 0.00035
Dropped Fuel Cask	0.0001	Dose/event Dose/yr LCF	0.038 3.8×10^{-6} 1.9×10^{-12}	0.13 0.000013 6.5×10^{-9}	0.0039 3.9×10^{-7} 2.0×10^{-13}	0.021 2.1×10^{-6} 1.1×10^{-9}
Aircraft Crash w/Fire	1×10^{-6}	Dose/event Dose/yr LCF	180 0.00018 9.0×10^{-11}	500 0.00050 2.5×10^{-7}	17 0.000017 8.5×10^{-12}	76 0.000076 3.8×10^{-8}
Wet Storage Accidents						
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF	0.042 0.0067 3.4×10^{-9}	0.14 0.022 0.000011	0.0043 0.00069 3.5×10^{-10}	0.023 0.0037 1.9×10^{-6}
Accidental Criticality	0.0031	Dose/event Dose/yr LCF	1100 3.4 1.7×10^{-6}	1100 3.4 0.0017	180 0.56 2.8×10^{-7}	150 0.47 0.00024
Aircraft Crash	1×10^{-6}	Dose/event Dose/yr LCF	140 0.00014 7.0×10^{-11}	420 0.00042 2.1×10^{-7}	13 0.000013 6.5×10^{-12}	61 0.000061 3.1×10^{-8}

[a] *To convert to sieverts from mrem, divide by 100,000; to convert to person-sieverts from person-rem, divide by 100.*

[b] *Point Estimate of Latent Cancer Fatalities event/yr.*

Table F-113 Summary of the Accident Analysis Dose Assessments at the Nevada Test Site Generic Storage Facilities - All Pathways

			95th-Percentile Meteorology			50th-Percentile Meteorology			
	Frequency (event/yr)	Risk	MEI (mrem)[a]	NPAI (mrem)	Population (person-rem)	MEI (mrem)	NPAI (mrem)	Worker (mrem)	Population (person-rem)
Dry Storage Accidents									
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF[b]	1.7 0.27 1.4×10^{-7}	0.31 0.050 2.5×10^{-8}	1.5 0.24 0.00012	0.052 0.0083 4.2×10^{-9}	0.0046 0.00074 3.7×10^{-10}	20 3.2 1.3×10^{-6}	0.038 0.0060 3.0×10^{-9}
Dropped Fuel Cask	0.0001	Dose/event Dose/yr LCF	0.11 0.000011 5.5×10^{-12}	0.0014 1.4×10^{-7} 7.0×10^{-14}	0.40 0.000040 2.0×10^{-8}	0.0033 3.3×10^{-7} 1.7×10^{-13}	0.000026 2.6×10^{-9} 1.3×10^{-15}	0.089 8.9×10^{-6} 3.6×10^{-12}	0.010 1.0×10^{-6} 5.0×10^{-10}
Aircraft Crash w/Fire	1×10^{-6}	Dose/event Dose/yr LCF	180 0.00018 9.0×10^{-11}	1.2 1.2×10^{-6} 6.0×10^{-13}	250 0.00025 1.3×10^{-7}	5.6 5.6×10^{-6} 2.8×10^{-12}	0.020 2.0×10^{-8} 1.0×10^{-14}	87 0.000087 3.5×10^{-11}	6.2 6.2×10^{-6} 3.1×10^{-9}
Wet Storage Accidents									
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF	0.054 0.0086 4.2×10^{-9}	0.0016 0.00026 1.3×10^{-10}	0.33 0.053 0.000026	0.0017 0.00027 1.4×10^{-10}	0.000029 4.6×10^{-6} 2.3×10^{-12}	0.10 0.016 6.4×10^{-9}	0.0084 0.0013 6.5×10^{-7}
Accidental Criticality	0.0031	Dose/event Dose/yr LCF	88 0.27 1.4×10^{-7}	15 0.047 2.3×10^{-8}	54 0.17 0.000084	6.9 0.021 1.1×10^{-8}	1.1 0.0034 1.7×10^{-9}	1300 4.0 0.000016	1.9 0.0059 3.0×10^{-6}
Aircraft Crash	1×10^{-6}	Dose/event Dose/yr LCF	29 0.000029 1.5×10^{-11}	4.2 4.2×10^{-6} 2.1×10^{-12}	61 0.000061 3.1×10^{-8}	0.92 9.2×10^{-7} 4.6×10^{-13}	0.067 6.7×10^{-8} 3.4×10^{-14}	290 0.00029 1.2×10^{-10}	1.6 1.6×10^{-6} 8.0×10^{-10}

Table F-113A Summary of the Accident Analysis Dose Assessments at the Nevada Test Site Generic Storage Facilities - External and Inhalation Pathways

			95th-Percentile Meteorology		50th-Percentile Meteorology	
	Frequency (event/yr)	Risk	MEI (mrem)[a]	Population (person-rem)	MEI (mrem)	Population (person-rem)
Dry Storage Accidents						
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF[b]	0.78 0.13 6.2×10^{-8}	0.26 0.042 0.000021	0.024 0.0038 1.9×10^{-9}	0.0066 0.0011 5.3×10^{-7}
Dropped Fuel Cask	0.0001	Dose/event Dose/yr LCF	0.0031 3.1×10^{-7} 1.6×10^{-13}	0.0011 1.1×10^{-7} 5.5×10^{-11}	0.00011 1.1×10^{-8} 5.5×10^{-15}	0.000033 3.3×10^{-9} 1.7×10^{-12}
Aircraft Crash w/Fire	1×10^{-6}	Dose/event Dose/yr LCF	13 0.000013 6.5×10^{-12}	4.5 4.5×10^{-6} 2.3×10^{-9}	0.41 4.1×10^{-7} 2.1×10^{-13}	0.12 1.2×10^{-7} 6.0×10^{-11}
Wet Storage Accidents						
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF	0.0036 0.00058 2.9×10^{-10}	0.0013 0.00021 1.1×10^{-7}	0.00012 0.000019 9.5×10^{-12}	0.000037 5.9×10^{-6} 3.0×10^{-9}
Accidental Criticality	0.0031	Dose/event Dose/yr LCF	55 0.17 8.5×10^{-8}	5.4 0.017 8.5×10^{-6}	5.8 0.018 9.0×10^{-9}	0.70 0.0022 1.1×10^{-6}
Aircraft Crash	1×10^{-6}	Dose/event Dose/yr LCF	11 0.000011 5.5×10^{-12}	3.7 3.7×10^{-6} 1.9×10^{-9}	0.35 3.5×10^{-7} 1.8×10^{-13}	0.096 9.6×10^{-8} 4.8×10^{-11}

[a] *To convert to sieverts from mrem, divide by 100,000; to convert to person-sieverts from person-rem, divide by 100.*

[b] *Point Estimate of Latent Cancer Fatalities event/yr.*

Table F-114 Summary of the Accident Analysis Dose Assessments at the Barnwell Nuclear Fuels Plant Wet Storage Facility[a] at the Savannah River Site - All Pathways

			95th-Percentile Meteorology			*50th-Percentile Meteorology*			
	Frequency (event/yr)	*Risk*	*MEI (mrem)*[b]	*NPAI (mrem)*	*Population (Person-rem)*	*MEI (mrem)*	*NPAI (mrem)*	*Worker (mrem)*	*Population (Person-rem)*
Wet Storage Accidents									
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF[c]	0.018 0.0056 2.8×10^{-9}	0.00099 0.00016 8.0×10^{-11}	0.028 0.0045 2.3×10^{-6}	0.0055 0.00088 4.4×10^{-10}	0.00027 0.000043 2.2×10^{-10}	0.00080 0.00013 5.2×10^{-11}	0.0033 0.00053 2.7×10^{-7}
Accidental Criticality	0.0031	Dose/event Dose/yr LCF	80 0.25 1.3×10^{-7}	75 0.23 1.2×10^{-7}	44 0.14 0.000070	42 0.13 6.5×10^{-8}	45 0.14 7.0×10^{-8}	75 0.23 9.2×10^{-8}	5.6 0.017 8.5×10^{-6}
Aircraft Crash	1×10^{-6}	Dose/event Dose/yr LCF	92 0.00092 4.6×10^{-10}	31 0.000031 1.6×10^{-11}	23 0.000023 1.2×10^{-8}	11 0.00011 5.5×10^{-11}	3.9 3.9×10^{-6} 2.0×10^{-12}	70 0.000070 2.8×10^{-10}	2.3 2.3×10^{-6} 1.2×10^{-9}

Table F-114A Summary of the Accident Analysis Dose Assessments at the Barnwell Nuclear Fuels Plant Wet Storage Facility[a] at the Savannah River Site - External and Inhalation Pathways

			95th-Percentile Meteorology		*50th-Percentile Meteorology*	
	Frequency (event/yr)	*Risk*	*MEI (mrem)*[b]	*Population (person-rem)*	*MEI (mrem)*	*Population (person-rem)*
Wet Storage Accidents						
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF[c]	0.00072 0.00012 6.0×10^{-11}	0.0021 0.00034 1.7×10^{-7}	0.00024 0.000038 1.9×10^{-12}	0.00021 0.000034 1.7×10^{-8}
Accidental Criticality	0.0031	Dose/event Dose/yr LCF	64 0.20 1.0×10^{-7}	27 0.084 0.000042	37 0.12 6.0×10^{-8}	3.7 0.012 6.0×10^{-6}
Aircraft Crash	1×10^{-6}	Dose/event Dose/yr LCF	17 0.000017 8.5×10^{-12}	6.9 6.9×10^{-6} 3.5×10^{-9}	2.0 2.0×10^{-6} 1.0×10^{-12}	0.68 6.8×10^{-7} 3.4×10^{-10}

[a] *Emissions will be released through an elevated stack for Accidental Criticality and Fuel Assembly Breach accidents.*

[b] *To convert to sieverts from mrem, divide by 100,000; to convert to person-sieverts from person-rem, divide by 100.*

[c] *Point Estimate of Latent Cancer Fatalities event/yr.*

Table F-115 Summary of the Accident Analysis Dose Assessments at the Receiving Basin for Offsite Fuels and L-Reactor Basin Wet Storage Facilities at the Savannah River Site-All Pathways

			95th-Percentile Meteorology			50th-Percentile Meteorology			
	Frequency (event/yr)	Risk	MEI (mrem)[a]	NPAI (mrem)	Population (person-rem)	MEI (mrem)	NPAI (mrem)	Worker (mrem)	Population (person-rem)
Wet Storage Accidents - RBOF									
Fuel Assembly Breach	0.16	Dose/event	0.0070	0.00039	0.23	0.0016	0.000027	0.14	0.016
		Dose/yr	0.0011	0.000062	0.037	0.00026	4.3×10^{-6}	0.0022	0.00026
		LCF[b]	5.5×10^{-10}	3.1×10^{-11}	0.000019	1.3×10^{-10}	2.2×10^{-12}	8.8×10^{-10}	1.3×10^{-7}
Accidental Criticality	0.0031	Dose/event	130	44	4800	30	2.9	16000	310
		Dose/yr	0.40	0.14	14.9	0.093	0.0090	50	0.96
		LCF	2.0×10^{-7}	7.0×10^{-8}	0.0074	4.7×10^{-8}	4.5×10^{-9}	0.000020	0.00048
Aircraft Crash	1×10^{-6}	Dose/event	4.1	0.98	150	0.92	0.061	400	10
		Dose/yr	4.1×10^{-6}	9.8×10^{-7}	0.00015	9.2×10^{-7}	6.1×10^{-8}	0.00040	0.000010
		LCF	2.1×10^{-12}	4.9×10^{-13}	7.5×10^{-8}	4.6×10^{-13}	3.1×10^{-14}	1.6×10^{-10}	5.0×10^{-9}
Wet Storage Accidents- L-Reactor Basin[c]									
Fuel Assembly Breach/	0.16	Dose/event	0.0093	0.00097	0.14	0.0011	0.00015	0.11	0.022
		Dose/yr	0.0015	0.00016	0.022	0.00018	0.00024	0.018	0.0035
		LCF	7.4×10^{-10}	8.0×10^{-11}	0.000011	8.8×10^{-11}	1.2×10^{-11}	7.1×10^{-9}	1.8×10^{-6}
Accidental Criticality	0.0031	Dose/event	170	120	3000	21	21	14000	440
		Dose/yr	0.527	0.37	9.3	0.065	0.065	43	1.4
		LCF	2.6×10^{-7}	1.9×10^{-7}	0.0047	3.3×10^{-8}	3.3×10^{-8}	0.000017	0.00070
Aircraft Crash	1×10^{-6}	Dose/event	4.2	2.6	93	0.60	0.39	70	14
		Dose/yr	4.2×10^{-6}	2.6×10^{-6}	0.000093	6.0×10^{-7}	3.9×10^{-7}	0.000070	0.000014
		LCF	2.1×10^{-12}	1.3×10^{-12}	4.7×10^{-8}	3.0×10^{-13}	2.0×10^{-13}	2.8×10^{-11}	7.0×10^{-9}

Table F-115A Summary of the Accident Analysis Dose Assessments at the Receiving Basin for Offsite Fuels and L-Reactor Basin Wet Storage Facilities at the Savannah River Site-External and Inhalation Pathways

			95th-Percentile Meteorology		50th-Percentile Meteorology	
	Frequency (event/yr)	Risk	MEI (mrem)[a]	Population (person-rem)	MEI (mrem)	Population (person-rem)
Wet Storage Accidents - RBOF						
Fuel Assembly Breach	0.16	Dose/event	0.00027	0.017	0.000062	0.0010
		Dose/yr	0.000043	0.0027	9.9×10^{-6}	0.00016
		LCF[b]	2.2×10^{-11}	1.4×10^{-6}	5.0×10^{-12}	8.0×10^{-8}
Accidental Criticality	0.0031	Dose/event	38	1900	8.8	120
		Dose/yr	0.12	5.9	0.027	0.37
		LCF	5.9×10^{-8}	0.0029	1.4×10^{-8}	0.00019
Aircraft Crash	1×10^{-6}	Dose/event	0.76	46	0.18	3.1
		Dose/yr	7.6×10^{-7}	0.000046	1.8×10^{-7}	3.1×10^{-6}
		LCF	3.8×10^{-13}	2.3×10^{-8}	9.0×10^{-14}	1.6×10^{-9}
Wet Storage Accidents - L-Reactor Basin[c]						
Fuel Assembly Breach	0.16	Dose/event	0.00034	0.010	0.000041	0.0016
		Dose/yr	0.000054	0.0016	6.6×10^{-6}	0.00026
		LCF	2.7×10^{-11}	8.0×10^{-7}	3.3×10^{-12}	1.3×10^{-7}
Accidental Criticality	0.0031	Dose/event	50	1200	6.5	170
		Dose/yr	0.16	3.72	0.020	0.53
		LCF	7.8×10^{-8}	0.0019	1.1×10^{-8}	0.00026
Aircraft Crash	1×10^{-6}	Dose/event	0.77	28	0.11	4.2
		Dose/yr	7.7×10^{-7}	0.000028	1.1×10^{-7}	4.2×10^{-6}
		LCF	3.9×10^{-13}	1.4×10^{-8}	5.5×10^{-14}	2.1×10^{-9}

[a] *To convert to sieverts from mrem, divide by 100,000; to convert to person-sieverts from person-rem, divide by 100.*

[b] *Point Estimate of Latent Cancer Fatalities event per year.*

Table F-116 Summary of the Accident Analysis Dose Assessments for the Fuel Material Examination Facility Dry Storage and WNP-4 Wet Storage Facilities at the Hanford Site - All Pathways

			95th-Percentile Meteorology			50th-Percentile Meteorology			
	Frequency (event/yr)	Risk	MEI (mrem)[a]	NPAI (mrem)	Population (person-rem)	MEI (mrem)	NPAI (mrem)	Worker (mrem)	Population (person-rem)
Dry Storage Accidents at FMEF[b]									
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF[c]	4.7 0.75 3.7×10^{-7}	2.1 0.34 1.7×10^{-7}	46 7.4 0.0037	0.42 0.067 3.4×10^{-8}	0.25 0.040 2.0×10^{-8}	0.99 0.16 6.4×10^{-8}	5.7 0.91 0.00046
Dropped Fuel Cask	0.0001	Dose/event Dose/yr LCF	0.2 0.00002 8×10^{-12}	0.032 3.2×10^{-6} 1.6×10^{-12}	3.2 0.00032 3.2×10^{-7}	0.017 1.7×10^{-6} 8.5×10^{-13}	0.0017 1.7×10^{-7} 8.5×10^{-14}	0.0049 4.9×10^{-7} 2.5×10^{-13}	0.41 0.000041 2.1×10^{-8}
Aircraft Crash w/Fire[d]	NA	---	NA	NA	NA	NA	NA	NA	NA
Wet Storage Accidents at WNP-4[b]									
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF	0.15 0.024 1.2×10^{-8}	0.0033 0.00053 2.7 x 10-10	1.3 0.21 0.00011	0.018 0.0029 1.5×10^{-9}	0.00060 0.000096 4.8×10^{-11}	0.00024 0.000038 1.5×10^{-11}	0.13 0.021 0.000011
Accidental Criticality	0.0031	Dose/event Dose/yr LCF	97 0.3 1.5×10^{-7}	76 0.24 1.2×10^{-7}	620 1.9 0.00096	20 0.062 3.1×10^{-8}	45 0.14 7.0×10^{-8}	120 0.37 1.5×10^{-7}	160 0.50 0.00025
Aircraft Crash[d]	NA	---	NA	NA	NA	NA	NA	NA	NA

Table F-116A Summary of the Accident Analysis Dose Assessments for the Fuel Material Examination Facility Dry Storage and WNP-4 Wet Storage Facilities at the Hanford Site - External and Inhalation Pathways

			95th-Percentile Meteorology		50th-Percentile Meteorology	
	Frequency (event/yr)	Risk	MEI (mrem)[a]	Population (person-rem)	MEI (mrem)	Population (person-rem)
Dry Storage Accidents at FMEF[b]						
Fuel Assembly Breach	0.016	Dose/event Dose/yr LCFc	0.46 0.074 3.7×10^{-8}	6.6 1.1 0.00055	0.041 0.0066 3.3×10^{-9}	0.79 0.12 0.000060
Dropped Fuel Cask	0.0001	Dose/event Dose/yr LCF	0.0028 2.8×10^{-7} 1.4×10^{-13}	0.04 4.0×10^{-6} 2.0×10^{-9}	0.00025 2.5×10^{-8} 1.2×10^{-14}	0.0057 5.7×10^{-7} 2.9×10^{-10}
Aircraft Crash w/Fire[d]	NA	---	NA	NA	NA	NA
Wet Storage Accidents at WNP-4[b]						
Fuel Assembly Breach	0.16	Dose/event Dose/yr LCF	0.0023 0.00037 1.8×10^{-9}	0.032 0.0051 2.6×10^{-6}	0.00028 0.000045 2.2×10^{-11}	0.0034 0.00054 2.7×10^{-7}
Accidental Criticality	0.0031	Dose/event Dose/yr LCF	32 0.099 5.0×10^{-9}	180 0.56 0.00028	12 0.037 1.9×10^{-8}	120 0.37 0.00019
Aircraft Crash[d]	NA	---	NA	NA	NA	NA

NA = Not Applicable

[a] *To convert to sieverts from mrem, divide by 100,000; to convert to person-sieverts from person-rem, divide by 100.*

[b] *Emissions will be released through an elevated stack for Fuel Assembly Breach, Dropped Fuel Cask, and Accidental Criticality Accidents.*

[c] *Point Estimate of Latent Cancer Fatalities event/yr.*

[d] *Aircraft Crash accidents are not applicable to the Hanford Site since their frequency of occurrence is less than 10^{-7} event/yr.*

Table F-117 provides a summary of the consequences of radiation exposure to the public and to the MEI from emissions in wet storage (generic and existing), and dry storage (generic and existing).

Table F-117 Normal Release Dose Assessments and Latent Cancer Fatalities at Storage Sites

	MEI Dose (mrem/yr)	*MEI Risk (LCF/yr)*	*Population Dose (person-rem/yr)*	*Population Risk (LCF/yr)*
Savannah River Site				
Receipt/Unloading at:				
RBOF	1.1×10^{-4}	5.5×10^{-11}	5.7×10^{-3}	2.8×10^{-6}
L-Reactor Basin	7.3×10^{-5}	3.7×10^{-11}	4.6×10^{-3}	2.3×10^{-6}
BNFP	6.5×10^{-4}	3.3×10^{-10}	4.5×10^{-3}	2.3×10^{-6}
New Dry Storage Facility	1.8×10^{-4}	9.0×10^{-11}	8.6×10^{-3}	4.3×10^{-6}
New Wet Storage Facility	1.1×10^{-4}	5.5×10^{-11}	5.7×10^{-3}	2.8×10^{-6}
Storage at:				
RBOF	1.2×10^{-9}	6.0×10^{-16}	6.2×10^{-8}	3.1×10^{-11}
L-Reactor Basin[a]	3.6×10^{-4}	1.8×10^{-10}	2.2×10^{-2}	1.1×10^{-5}
BNFP	7.5×10^{-9}	3.8×10^{-15}	4.8×10^{-8}	2.4×10^{-11}
New Dry Storage Facility	0	0	0	0
New Wet Storage Facility	1.2×10^{-9}	6.0×10^{-16}	6.2×10^{-8}	3.1×10^{-11}
Idaho National Engineering Laboratory				
Receipt/Unloading at:				
IFSF (dry storage)	5.6×10^{-4}	2.8×10^{-10}	4.5×10^{-3}	2.3×10^{-6}
FAST (wet storage)	3.8×10^{-4}	1.9×10^{-10}	3.1×10^{-3}	1.6×10^{-6}
CPP-749 (dry storage)	5.6×10^{-4}	2.8×10^{-10}	4.5×10^{-3}	2.3×10^{-6}
New Dry Storage Facility	5.6×10^{-4}	2.8×10^{-10}	4.5×10^{-3}	2.3×10^{-6}
New Wet Storage Facility	3.8×10^{-4}	1.9×10^{-10}	3.1×10^{-3}	1.6×10^{-6}
Storage at:				
IFSF (dry storage)	0	0	0	0
FAST (wet storage)	3.8×10^{-9}	1.9×10^{-15}	3.1×10^{-8}	1.6×10^{-11}
CPP-749 (dry storage)	0	0	0	0
New Dry Storage Facility	0	0	0	0
New Wet Storage Facility	3.8×10^{-9}	1.9×10^{-15}	3.1×10^{-8}	1.6×10^{-11}
Hanford Site				
Receipt/Unloading at:				
FMEF (dry storage)	2.0×10^{-4}	1.0×10^{-10}	1.1×10^{-2}	5.5×10^{-6}
WNP-4 Spray Pond (wet storage)	2.2×10^{-4}	1.1×10^{-10}	5.8×10^{-3}	2.9×10^{-6}
New Dry Storage Facility	2.5×10^{-4}	1.3×10^{-10}	1.5×10^{-2}	7.5×10^{-6}
New Wet Storage Facility	2.0×10^{-4}	1.0×10^{-10}	1.2×10^{-2}	6.0×10^{-6}
Storage at:				
FMEF (dry storage)	0	0	0	0
WNP-4 Spray Pond (wet storage)	5.9×10^{-10}	3.0×10^{-16}	1.6×10^{-8}	8.0×10^{-12}
New Dry Storage Facility	0	0	0	0
New Wet Storage Facility	8.8×10^{-10}	4.4×10^{-16}	6.9×10^{-8}	3.5×10^{-11}
Oak Ridge Reservation				
Receipt/Unloading at:				
New Dry Storage Facility	8.9×10^{-2}	4.5×10^{-8}	8.5×10^{-2}	4.3×10^{-5}
New Wet Storage Facility	6.0×10^{-2}	3.0×10^{-8}	6.1×10^{-2}	3.1×10^{-5}
Storage at:				
New Dry Storage Facility	0	0	0	0
New Wet Storage Facility	4.6×10^{-7}	2.3×10^{-13}	5.0×10^{-7}	2.5×10^{-10}

	MEI Dose (mrem/yr)	MEI Risk (LCF/yr)	Population Dose (person-rem/yr)	Population Risk (LCF/yr)
Nevada Test Site				
Receipt/Unloading at:				
E-MAD (dry storage)	7.6×10^{-4}	3.8×10^{-10}	9.3×10^{-4}	4.7×10^{-7}
New Dry Storage Facility	7.6×10^{-4}	3.8×10^{-10}	9.3×10^{-4}	4.7×10^{-7}
New Wet Storage Facility	5.2×10^{-4}	2.6×10^{-10}	5.2×10^{-4}	2.6×10^{-7}
Storage at:				
E-MAD (dry storage)	0	0	0	0
New Dry Storage Facility	0	0	0	0
New Wet Storage Facility	4.0×10^{-9}	2.0×10^{-15}	4.7×10^{-9}	2.0×10^{-12}

[a] *L-Reactor basin doses are due to existing conditions; the foreign research reactor spent nuclear fuel contribution would be six orders of magnitude smaller*

F.6.7 Accident Scenarios Involving Target Materials

A review of the hypothetical accident scenarios analyzed for spent nuclear fuel indicates that only the aircraft crash with fire accident is applicable to the target materials. The frequency of occurrence of an accident involving target materials is estimated to be 3 percent of the 1×10^{-6} per year frequency figure used in the spent nuclear fuel accident analysis. This is because the number of transfer casks that would involve target material is less than 3 percent of that used for 22,700 spent nuclear fuel elements. Therefore, the frequency of this scenario is less than 10^{-7} per year, and is considered to be unforeseeable. Nonetheless, this accident was analyzed and its consequences at potential storage locations were summarized in Table F-118. The frequency of this accident is set conservatively at 10^{-7} per year.

The process by which target materials are prepared for shipment [i.e., drying and canning of the target material solutions, (see Appendix B, Section B.1.5)] releases all gaseous fission products (noble gases and halogens). In addition, the cans in which target materials would be packed do not require any further cutting when they are received in a storage facility. A review of the hypothetical accident scenarios analyzed for spent nuclear fuel indicates that only the aircraft crash with fire accident would be applicable to the target materials. The cans are never cut, and there are no gaseous fission products; therefore, fuel element breach and fuel cask drop scenarios would not be applicable. In addition, should there be an aircraft crash into the wet storage pool where the target material is stored; or, if an accidental criticality in the pool were to occur, the radioactivity releases would be bound by that of the spent nuclear fuel analyzed for these accidents. This is because the amount of radioactive inventory per target material can is very small compared to that in the bounding spent nuclear fuel. In addition, any releases from the target cans would be absorbed in the pool.

Therefore, a scenario involving an aircraft crash into a dry storage facility with ensuing fire was analyzed for the target materials. The scenario assumptions are similar to those described in Section F.6.4.4.3. Because of the size of each can, it was assumed that the transfer cask involved in the accident would contain 40 cans of target materials containing maximum radionuclide inventories, (i.e., 40 cans of 200 grams of ^{235}U per can cooled for at least 3 years). The overall respirable release fraction is assumed to be 5×10^{-3} (Neuhauser and Kanipe, 1993). Table F-119 shows the radioactivity release source terms for this accident.

Table F-118 Summary of the Accident Analysis Dose Assessments for the Aircraft Crash Accident with Fire Involving Target Material - All Pathways

			95 Percent Meteorology			50 Percent Meteorology			
Site[c]	Frequency (event/yr)	Risk	MEI (mrem)[a]	NPAI (mrem)	Population (person-rem)	MEI (mrem)	NPAI (mrem)	Worker (mrem)	Population (person-rem)
NTS		Dose/event	180	28	120	5.6	0.45	2000	3.0
		Dose/yr	0.000018	2.8×10^{-6}	0.000012	5.6×10^{-7}	4.5×10^{-8}	0.00020	3.0×10^{-7}
	1×10^{-7}	LCF[b]	9.0×10^{-12}	1.4×10^{-12}	6.0×10^{-9}	2.8×10^{-13}	2.3×10^{-14}	8.0×10^{-11}	1.5×10^{-10}
ORR		Dose/event	2400	4000	3700	230	910	14000	560
		Dose/yr	0.00024	0.00040	0.00037	0.000023	0.000091	0.0014	0.000056
	1×10^{-7}	LCF	1.2×10^{-10}	2.0×10^{-10}	1.9×10^{-7}	1.2×10^{-11}	4.6×10^{-11}	5.6×10^{-10}	2.8×10^{-8}
INEL		Dose/event	130	63	1500	9.3	5.7	2700	84
		Dose/yr	0.000013	6.3×10^{-6}	0.00015	9.3×10^{-7}	5.7×10^{-7}	0.00027	8.4×10^{-6}
	1×10^{-7}	LCF	6.5×10^{-12}	6.3×10^{-12}	7.5×10^{-8}	4.7×10^{-13}	2.9×10^{-13}	1.1×10^{-10}	4.2×10^{-9}
SRS		Dose/event	26	6.3	970	5.8	0.41	2700	66
		Dose/yr	2.6×10^{-6}	6.3×10^{-7}	0.000097	5.8×10^{-7}	4.1×10^{-8}	0.00027	6.6×10^{-6}
	1×10^{-7}	LCF	1.3×10^{-12}	3.2×10^{-13}	4.9×10^{-8}	2.9×10^{-13}	2.1×10^{-14}	1.1×10^{-10}	3.3×10^{-9}

Table F-118A Summary of the Accident Analysis Dose Assessments for the Aircraft Crash Accident with Fire Involving Target Material - External and Inhalation Pathways

			95 Percent Meteorology		50 Percent Meteorology	
Site[c]	Frequency (event/yr)	Risk	MEI (mrem)[a]	Population (person-rem)	MEI (mrem)	Population (person-rem)
NTS		Dose/event	64	22	2.1	0.57
		Dose/yr	6.4×10^{-6}	2.2×10^{-6}	2.1×10^{-7}	5.7×10^{-8}
	1×10^{-7}	LCF[b]	3.2×10^{-12}	1.1×10^{-9}	1.1×10^{-13}	2.9×10^{-11}
ORR		Dose/event	870	2500	83	560
		Dose/yr	0.000087	0.00025	8.3×10^{-6}	0.000056
	1×10^{-7}	LCF	4.4×10^{-11}	1.3×10^{-7}	4.2×10^{-12}	2.8×10^{-8}
INEL		Dose/event	20	230	1.4	12
		Dose/yr	2.0×10^{-6}	0.000023	1.4×10^{-7}	1.2×10^{-6}
	1×10^{-7}	LCF	1.0×10^{-12}	1.2×10^{-8}	7.0×10^{-14}	6.0×10^{-10}
SRS		Dose/event	4.4	270	1.0	19
		Dose/yr	4.4×10^{-7}	0.000027	1.0×10^{-7}	1.9×10^{-6}
	1×10^{-7}	LCF	2.2×10^{-13}	1.4×10^{-8}	5.0×10^{-12}	9.5×10^{-10}

NTS = Nevada Test Site; ORR = Oak Ridge Reservation; INEL = Idaho National Engineering Laboratory; SRS = Savannah River Site

[a] *To convert to sieverts from mrem, divide by 100,000; to convert to person-sieverts from person-rem, divide by 100.*

[b] *Point Estimate of Latent Cancer Fatalities event/ yr.*

[c] *Aircraft crash accidents are not applicable to the Hanford Site since their frequency of occurrence is much less than 10^{-7} event/yr.*

Table F-119 Target Materials Aircraft Crash with Fire Accident Source Terms

Isotope	*Curies*
Strontium-89	2.4×10^{-4}
Strontium-90	3.1×10^{0}
Yttrium-90	3.1×10^{0}
Yttrium-91	1.4×10^{-3}
Zirconium-95	5.2×10^{-3}
Niobium-95	1.1×10^{-2}
Rubidium-103	2.1×10^{-6}
Rubidium-106	7.9×10^{-1}
Ruthenium-103m	2.1×10^{-6}
Tin-123	1.1×10^{-3}
Antimony-125	8.2×10^{-2}
Tellurium-125m	2.0×10^{-2}
Tellurium-127m	2.2×10^{-3}
Tellurium-129m	6.0×10^{-9}
Cesium-134	6.5×10^{-3}
Cesium-137	3.0×10^{-1}
Cerium-141	7.4×10^{-8}
Cerium-144	7.7×10^{0}
Presidium-144	7.7×10^{0}
Promethium-147	6.3×10^{0}
Promethium-148m	2.5×10^{-9}
Europium-154	1.4×10^{-3}
Europium-155	5.2×10^{-2}
Uranium-234	1.4×10^{-7}
Uranium-235	8.3×10^{-5}
Uranium-238	1.5×10^{-6}
Plutonium-238	3.3×10^{-6}
Plutonium-239	6.2×10^{-4}
Plutonium-240	1.4×10^{-5}
Plutonium-241	1.3×10^{-4}
Americium-241	6.9×10^{-7}
Americium-242m	4.4×10^{-12}
Americium-243	3.1×10^{-12}
Curium-242	6.8×10^{-12}
Curium-244	3.2×10^{-12}

F.7 Costs

The cost of implementing the proposed action is analyzed in this section. For the purpose of the cost analysis, the alternatives described in Section 2.1 of the EIS were adjusted to reflect the Record of Decision on the Programmatic SNF&INEL Final EIS (DOE, 1995g) issued in May 1995. According to this Record of Decision, if foreign research reactor spent nuclear fuel is managed in the United States, the aluminum-based portion would be managed at the Savannah River Site and the TRIGA portion would be managed at the Idaho National Engineering Laboratory. The cost analysis also considers the financing arrangements discussed in Sections 2.2.1.2 and 2.2.2.3 of the EIS that would affect the cost to the United States. The cost information is presented as follows:

F.7.1 Summary of Cost Information

F.7.2 Costs of Individual Program Components

F.7.3 Interpreting the Minimum Program Costs

F.7.4 Interpreting the Other Cost Factors

F.7.1 Summary of Cost Information

This section presents total costs for the proposed policy and implementation alternatives that would impact the costs. The costs are presented in two parts: 1) minimum discounted costs (base case) for the well-defined program components and integration approaches, and 2) "other cost factors" that are likely but sufficiently uncertain that they cannot be directly included in the minimum discounted costs. The costs are shown as net present values in a consistent accounting framework.

Several important factors are used when estimating costs. These factors are as follows:

- *Site- and Implementation-Specific Facilities* - All costs for management in the United States are for facilities that exist or are planned at either the Savannah River Site or the Idaho National Engineering Laboratory. Costs are allocated to the program in proportion to the share of foreign research reactor spent nuclear fuel managed or transferred at each facility. This allocation of capital and operating costs within larger programs results in lower costs to the program than would be the case for the use of facilities dedicated to foreign research reactor spent nuclear fuel.

- *Schedule of Activities* - For all management alternatives (except total management overseas), all spent nuclear fuel is shipped, managed for 40 years, and disposed (either as spent nuclear fuel or as reprocessing waste) on schedules that are appropriate for the selected facilities.

- *Discount Rate* - The base case costs are discounted to 1996 at the rate specified by the Office of Management and Budget for the year ending February 1996. This rate is 4.9 percent real. The base case costs for management outside the United States are discounted at a 3 percent real rate of interest. This rate is estimated to be the long-term real rate of interest that can be expected on a trust fund outside the United States. If the net present value of the costs of the program are received in 1996, a hypothetical trust fund invests the money at the real discount rate so that future expenditures are made out of principal and accrued interest.

- *Net Present Value* - Net present value is a figure-of-merit for decision-making on the basis of life-cycle cost, not a value used for establishing budgets or cash flows. All costs are shown in constant 1996 dollars discounted to 1996. This means that the costs for the duration of the program, expressed as a net present value, are due and payable on January 1, 1996, not in the year the costs are incurred.

- *Timing of Expenses* - All costs are assumed to be incurred on the last day of each year of the 40-year management period. The principal and accrued interest in the trust funds (at the net present value of the program costs) are exactly sufficient to meet the costs as they are incurred.

- *Timing of Payments* - Deferring payments beyond January 1, 1996 increases the payments required (either from reactor operators or the United States Congress) by a factor based on the discount rate and the deferral. Pro-forma full-cost recovery fees are shown for payments made on December 31 of each of the 13 receipt years (1996 through 2008).

- *Inflation and Escalation* - Costs are expressed in constant 1996 dollars in this analysis, so the effects of inflation are eliminated. No costs are escalated in real terms.

- *Ultimate Disposition* - Estimated costs for geologic disposal of intact spent nuclear fuel or waste from chemical separation are included to provide a complete life-cycle cost analysis.

F.7.1.1 Scenarios Analyzed

For the purpose of the cost analysis, six scenarios were analyzed. The scenarios reflect the alternatives that affect cost directly, are consistent with the Record of Decision of the Programmatic SNF&INEL Final EIS (DOE, 1995g) and include the costs for ultimate disposal. The six cost scenarios are:

1. *Management Alternative 1 (Storage)* - Storage of aluminum-based foreign research reactor spent nuclear fuel at the Savannah River Site with new dry or wet storage facilities; storage of TRIGA foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory at existing wet or dry storage facilities.

2. *Management Alternative 1 (revised to incorporate chemical separation)* - Chemical separation of aluminum-based foreign research reactor spent nuclear fuel at the Savannah River Site; storage of TRIGA foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory.

3. *Management Alternative 1 (revised to incorporate a new technology)* — Implementation of a new treatment and/or packaging technology for aluminum-based foreign research reactor spent nuclear fuel and target material at the Savannah River Site; storage of TRIGA foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory.

4. *Target Material* - Storage of target material at the Savannah River Site. This scenario provides the cost differential that can be used to assess the cost of managing target material in addition to the foreign research reactor spent nuclear fuel in Management Alternative 1 storage and chemical separation scenarios.

5. *Management Alternative 2* - Management of all foreign research reactor spent nuclear fuel overseas. This scenario reflects a combination of reprocessing and dry storage overseas. Countries with the capability to accept the waste from reprocessing are assumed to have their spent nuclear fuel reprocessed. The rest use dry storage.

6. *Management Alternative 3* - Chemical separation of a portion of the aluminum-based foreign research reactor spent nuclear fuel at the Savannah River Site; reprocessing of the remainder of aluminum-based foreign research reactor spent nuclear fuel overseas; storage of TRIGA foreign research reactor spent nuclear fuel at the Idaho National Engineering Laboratory.

By varying the quantities of material managed in different ways in the United States and overseas, different cost scenarios can be generated. The costs of these variations are bounded by the costs of the scenarios described above. For instance, a management alternative that includes acceptance of target material into the United States would be represented by a combination of Scenarios 1 and 4 or 2 and 4.

The implementation alternatives under Management Alternative 1 related to alternative amounts of foreign research reactor spent nuclear fuel eligible under the policy (Section 2.2.2.1), and alternative policy durations (Section 2.2.2.2), were not considered separately in the cost analysis because they are bounded

by the cost scenarios analyzed. These implementation alternatives reduce the amount of foreign research reactor spent nuclear fuel eligible under the policy.

The implementation alternative under Management Alternative 1 related to alternative locations for taking title to the foreign research reactor spent nuclear fuel (Section 2.2.2.4) was not considered because it does not affect the cost analysis.

F.7.1.2 Minimum Program Costs

Table F-120 shows the minimum discounted program costs (base case) for the six scenarios defined above. These costs cover all foreign research reactor spent nuclear fuel shipments, management over 40 years, and geologic disposal. Uncertainties (risks) and escalation are zero. The schedule for activities in Europe under Management Alternative 3 is similar to that in the United States but not exactly the same. Reprocessing takes place over 13 years at Dounreay (the same timespan used for chemical separation at the Savannah River Site) although it could be completed at Dounreay in 9 or 10 years. Dounreay's charges for reprocessing are based on 1996 costs, not costs for 1996 through 2008 averaged over the 13-year period (as was done for the Savannah River Site). Geologic disposal takes place in 2025 through 2030 in Europe and 2030 through 2035 in the United States. Costs are discounted at 3 percent for the portion to be managed overseas and at 4.9 percent for the portion to be managed in the United States.

Table F-120 Minimum Program Costs
(Net Present Value, Millions of 1996 Dollars in 1996)

Scenario	Net Present Value
1. Management Alternative 1 (Storage)	725/775[a]
2. Management Alternative 1 (revised to incorporate Chemical Separation)	625
3. Management Alternative 1 (revised to incorporate a New Technology)[b]	625-950
4. Target Material	35
5. Management Alternative 2	1,250
6. Management Alternative 3	675

[a] *Dry/Wet new storage facilities*

[b] *Includes target material*

Because of the uncertainties involved with the implementation of the new technology, the cost for Scenario 3 is presented as a range as discussed in Appendix F, Section F.7.2.9. Also, shipping costs in Scenario 3 include the assumption that of the total number of cask shipments, only 38 cask shipments would be accepted at the West Coast.

F.7.1.3 Other Cost Factors

There are four important sources of cost risk (excluding escalation) that are not part of the minimum costs in Table F-120. Table F-121 shows the likely values (risks) for these factors, taking into account the absolute values of the uncertainties and their probability of occurrence. A brief summary of these cost factors follows the table.

The other cost factors summarized in Table F-121 are as follows:

1. *Systems Integration and Logistics Risks* - Significant risks exist in the details of the policy implementation. The implementation of the policy would involve up to 41 foreign countries, up to 13 years of receipts, dozens of foreign ports, up to ten domestic ports, two U.S.

Table F-121 Other Cost Factors
(Net Present Value, Millions of 1996 Dollars in 1996)

Scenario	Cost Factors				
	Systems Integration & Logistics	*Component Risks*	*Non-Program Risks*	*3% Discount Rate*	*Range*
1. Management Alternative 1 (Storage)[a]	100	75	35	175	385
2. Management Alternative (revised to incorporate Chemical Separation)	100	±15	10	125	200-250
3. Management Alternative 1 (revised to incorporate a New Technology)[b,c]	100	75	35	225	435
4. Target Material	5	5	0	25	35
5. Management Alternative 2	100+	±500	1000	250	350-1850
6. Management Alternative 3	100	±10	150	75	315-335

[a] *It is assumed that risks are the same for dry or wet storage options.*

[b] *It is assumed that risk factors are the same as Management Alternative 1 (Storage).*

[c] *Includes target material.*

management sites, and possibly several new facilities. Technical and procedural bottlenecks could arise in many areas.

2. *Component Risks* - Significant risks exist for specific components of the foreign research reactor spent nuclear fuel program, e.g., the adequacy of the characterization of spent nuclear fuel for interim storage, the methods of spent nuclear fuel disposal, the cost allocation at existing and new facilities, and development of new technology.

3. *Non-Program Risks* - Significant risks exist for components of other programs that affect the implementation of the foreign research reactor spent nuclear fuel EIS, e.g., escalating repository costs, adoption of monitored retrievable storage, and differences in facility utilization plans between this EIS and those of other EISs affecting the Savannah River Site and the Idaho National Engineering Laboratory. For Scenario 5, the risks are that no spent nuclear fuel infrastructure exists in more than half of the eligible countries and that no geologic disposal program exists in most of the eligible countries.

4. *Discount Rate Risks* - Significant risks exist that the discount rate required by the Office of Management and Budget for the year ending February, 1996 (4.9 percent real) will be reduced to a more historically representative level (e.g., 3 percent) in some future annual update. The base case costs for management outside the United States are discounted at a 3 percent rate. The use of a high discount rate is particularly risky because 1) revenues are likely to be fixed (in $/kgTM) early in the program while expenses are variable and uncertain, and 2) revenues received from the reactor operators during the 1996 through 2008 shipping period will almost certainly exceed the costs of management activities during that period. Mathematically, the excess revenues are placed in a trust fund that compounds interest at the discount rate. If the discount rate exceeds the rate at which funds actually compound, then outyear program costs (e.g., disposal) could not be met from the principal and accrued interest in the trust fund. A reduction in the discount rate from 4.9 percent to 3.0 percent has a larger impact on the program than any of the technical or systems integration risks.

F.7.1.4 Potential Total Costs

Table F-122 combines the base case costs with the "other cost factors" to provide a realistic expectation of the potential total costs of the program, excluding escalation. The "other cost factors" are divided into technical factors and discount rate-related factors. This table also shows the cumulative percentage effect on the minimum discounted program costs of real escalation at a rate of 1 percent per year over 40 years.

Table F-122 Potential Total Costs
(Net Present Value, Millions of 1996 Dollars in 1996)

Scenario	Minimum Program Cost	Other Cost Factors (Technical)	Other Cost Factors (Discount Rate)	Potential Total Cost, No Escalation	1% Real Escalation, Cumulative
1. Management Alternative 1 (Storage)	725/775[a]	210	175	≈1,100	+11%
2. Management Alternative 1 (revised to incorporate chemical separation)	625	85-145	125	≈900	+9%
3. Management Alternative 1 (revised to incorporate a new technology)[c]	625-950	210	225	≈1,050-1,400	10%-11%
5. Management Alternative 2	1250	600-1600	250	2,100-3,100	+13%
6. Management Alternative 3[b]	675	225-275	75	≈1,000	+9%

[a] *Dry/Wet new storage facilities.*

[b] *The total cost risk to the United States is less than 1/2 the total cost risk since a large portion of the activities under this alternative would occur overseas.*

[c] *Includes target material.*

Table F-122 shows that the net present value of the potential total costs of implementing the program in the United States, including an estimate of program risks but excluding escalation, range from about $900 for Scenario 2 to $1.4 billion for Scenario 3.

Costs for storing foreign research reactor spent nuclear fuel overseas are highly speculative. In addition, the overseas storage costs are always higher than the more centralized management alternatives because of the extremely high cost of safely and securely managing and disposing of small quantities of spent nuclear fuel in dozens of countries.

The program costs presented in Tables F-120, F-121, and F-122 are in constant 1996 dollars, discounted to 1996. This implies that funds required to cover these costs are received in 1996 and explicitly or implicitly placed in a trust fund. If payments into the trust fund are deferred, then they must be larger than if they had been received on January 1, 1996. For example, if payments are made in 13 equal annual installments every December 31 over the 1996 through 2008 shipping and receiving period, then the constant-dollar payments must increase by 37 percent. A composite of payment schedules, e.g., 13 years for developed country reactor operators and pay-as-you-go (for the United States) for all other costs, including developing country costs, has the effect of increasing the required constant-dollar payments by as much as 25 to 50 percent.

F.7.1.5 Cost to the United States

The cost of the proposed policy to the United States would depend on the type of financing arrangement that DOE adopts in implementing the policy and the discount rate at which revenues from reactor operators accrue interest. Alternative financing arrangements are discussed in Sections 2.2.1.2 and 2.2.2.3 of the EIS. Briefly, the financing arrangements considered are:

1. United States bears the full cost of the program for developing countries and charges a competitive fee to developed countries.

2. United States bears the full cost for all countries (*no* fee).

3. United States charges a *full-cost-recovery* fee to all countries.

4. United States bears the full cost of the program for developing countries and charges a *full-cost-recovery* fee to developed countries.

From a practical standpoint, the U.S. cost under financing arrangement 3 above would be zero. The issue would be whether any foreign countries would participate in the program if full-cost recovery exceeded a competitive fee. The first and fourth arrangements are functionally similar, the U.S. cost resulting from the difference in the *competitive versus the full-cost-recovery fee.* The U.S. cost under the second arrangement (no fee) would be the total program cost as discussed earlier. Any fees established by the United States will take place pursuant to a Federal Register notice after the Record of Decision for this EIS.

Table F-123 shows costs to the United States for the minimum program in each of the cost scenarios analyzed (except target material) under a variety of fee schedules. Adding target material to Scenarios 1, 2, 5, or 6 would increase the cost by 3 to 4 percent. Fees of $2,000/kgTM, $5,000/kgTM, $7,500/kgTM, and $10,000/kgTM, including a pass-through of shipping charges (all expressed in constant 1996 dollars and levelized over 13 years), are used to provide a range of estimates for the cost to the United States. These fees do not imply that reactor operators would pay them for management in Europe or the United States, or that the fee established by the United States will be one of these values. They are used for illustration only and suggest a bounding range, exclusive of technical risk factors, discount rate adjustments, and escalation. The cost to the United States, presented in Table F-123, is the sum of: 1) the cost of managing the foreign research reactor spent nuclear fuel from the developing countries, including shipping, and 2) the difference between the revenues received for management of developed country foreign research reactor spent nuclear fuel and the total program cost of managing developed country foreign research reactor spent nuclear fuel, excluding shipping. Including shipping in the U.S. management costs allows management costs for the United States and the United Kingdom to be presented on a comparable basis.

Table F-123 shows that for minimum discounted program costs and fees charged to developed country reactor operators levelized over 13 years, costs to the United States for management of foreign research reactor spent nuclear fuel (and target material in Scenario 3) could range from several hundred million dollars at a fee of $2,000/kgTM to a profit for fees of $7,500/kgTM to $10,000/kgTM. The cost of managing the spent nuclear fuel from the developing countries (including shipping) adds roughly $100 million more to the cost borne by the United States. Excluding Scenario 5, for which all costs and fees are speculative, the table shows that costs to the United States in Management Alternative 3 are significantly lower than for Management Alternative 1. The savings to the United States exist because the United States bears none of the cost of Spent Nuclear Fuel Management in Europe except the cost of blending down the HEU at Dounreay.

If fees in the $2,000 to $10,000 per kgTM range (levelized $1996 dollars) are established and charged over 13 years, the costs to the United States would be as estimated in Table F-123 (excluding target materials) plus any additional cost factors not incorporated in the minimum program costs. These additional cost factors are: 1) technical risks, 2) discount rate-related risks, and 3) escalation. Table F-122 shows that

Table F-123 Costs to the United States for the Minimum Program Under Various Scenarios and Fee Structures (Millions of 1996 Dollars, Net Present Value of Costs in 1996, Fees Levelized Over 1996-2008 Period)

Scenario[a]	Full-Cost Recovery[b]	Levelized Shipping Fee $/kgTM	Levelized Management Fee (excluding shipping) $/kgTM	Net Present Value For Levelized Fee[c] (Developed Countries Only)				No Fee[d]	
				$2,000/ kgTM	$5,000/ kgTM	$7,500/ kgTM	$10,000/ kgTM	Developed Countries	Total (excluding shipping)
1. Management Alternative 1 (Storage)	100	1,500	6,500	325	100	(75)	(250)	475	575
2. Management Alternative 1 (revised to incorporate Chemical Separation)	90	1,500	5,800	275	50	(125)	(300)	425	525
3. Management Alternative 1 (revised to incorporate a New Technology)	90-110	1,700	5,600-9,200	275-550	50-325	(150)-125	(325)-(50)	425-700	500-800
5. Management Alternative 2[e]	500+							1,250 +	1,750+
6. Management Alternative 3[f]	85	1,500	6,000	225	75	(50)	(175)	300	375

[a] *The total mass (kgTM) of foreign research reactor spent nuclear fuel in the various scenarios is approximately as follows: Aluminum-based plus TRIGA: 115,000 kgTM; from developing countries: 15,000 kgTM; from developed countries: 100,000 kgTM; to Dounreay in Management Alternative 3: 37,000 kgTM. The total mass of target material is approximately 3,400 kgTM aluminum-based equivalent and essentially all from developed countries.*

[b] *Full-cost recovery from developed countries only. The United States bears the costs of the developing countries in these cases.*

[c] *Net present value of costs to the United States for management fees paid in 13 equal annual installments on December 31 of the years 1996 through 2008. Add costs in column labeled "Full-Cost Recovery" to generate total cost to the United States (developed and developing countries).*

[d] *As above, implicitly paid by the taxpayers in 13 equal annual installments (to maintain consistency with the payment period of the reactor operators), excluding shipping. The net present value of shipping in Scenarios 1 [Management Alternative 1 (Storage)] and 2 [Management Alternative 1 (revised to incorporate chemical separation)] is $140 Million. The net present value of shipping to the United States only in Scenario 6 is $90 Million. The net present value of shipping in Scenario 3 [Management Alternative 1 (revised to incorporate a new technology)] is $160 Million.*

[e] *There is no defined basis for the charges to the United States for non-U.S. management. Costs to the United States under Management Alternative 2 assume that the United States absorbs the cost to construct and operate independent foreign research reactor spent nuclear fuel storage installations (including all supporting safety, security, transport, health physics, etc. infrastructure) for the 22 countries with no commercial nuclear power programs and that the United States partially subsidizes the other countries, depending on developmental status, commercial nuclear power infrastructure, and other factors.*

[f] *U.S. component of Management Alternative 3 only. Revenues paid to the United States exclude shipping charges. Costs to the United States for management in Europe consist only of the charge to blend down the HEU to LEU ($20 million). European reactor operators using Dounreay are assumed to bear all other costs.*

technical risks could add roughly $100 to $200 million to the costs borne by the United States. Discount rate-related risks are of a similar size. Escalation risks are more uncertain but could be in the same range.

F.7.2 Costs of Individual Program Components

This section provides details on program costs for each of the scenarios outlined in section F.7.1.

F.7.2.1 Programmatic Cost Assumptions

Table F-124 shows programmatic assumptions about costs and the basis for the cost calculations.

Table F-124 Programmatic Assumptions and Bases

Variable	*Assumption*	*Basis*
Year Dollars	1996	Standardized to first year of program.
Discount Rate for Management in the United States	4.9 percent real	Required by Office of Management and Budget for programs beginning between February 1995 and February 1996.
Discount Rate for Management in Europe	3.0 percent real	Representative of long-run average in larger Western European economies.
Rounding of Totals	$25 million	Highlights differences between programs that typically differ by $100 million. No implication of precision.
Component Contingencies	Included in base costs	Standard costing assumption
Program Risks	Not included in base costs	Logistical complexity of program could add 10-15 percent to total costs.
Uncertainties	Not included in base costs	
Risk-adjustment	Not included in base costs	
Escalation	Not included in base costs	
Costs incurred over what period	40 years (1996 to 2035) in United States 35 years (1996 to 2020) in United Kingdom	Maximum length of interim storage
Repository Shipping	2030 to 2035 in United States 2025 to 2030 in United Kingdom	Storage maximum in United States and United Kingdom
Qualification of fuel types for disposal	$10M per type allocated to the program, 5 types in program	Idaho National Engineering Laboratory estimate. The foreign research reactor spent nuclear fuel program is estimated to be responsible for three types of aluminum-based spent nuclear fuel and two types of TRIGA spent nuclear fuel. The types are related to the repository program characteristics.

F.7.2.2 Individual Program Components

The proposed foreign research reactor spent nuclear fuel program consists of many components. Table F-125 outlines the components of the five cost analysis scenarios described in Section F.7.1. Detailed discussions of the individual program components follow the table.

F.7.2.3 Logistics and Program Management

Under Management Alternative 1, the United States would undertake a program where the maximum requirements begin with the shipping of an estimated 837 casks of foreign research reactor spent nuclear

Table F-125 Applicability of Specific Cost Components to the Cost Analysis Scenarios

Component	Appendix Section	Management Alternative 1 (Storage)	Management Alternative 1 (revised to incorporate Chemical Separation)	Management Alternative 1 (revised to incorporate a New Technology)	Management Alternative 2	Management Alternative 3	Target Material
Programmatic Assumptions	F.7.2.1	x	x		x	x	x
Logistics and Program Management	F.7.2.3	x	x		x	x	x
Shipping Spent Nuclear Fuel to the United States	F.7.2.4	x	x			x	x
Shipping Spent Nuclear Fuel to the United Kingdom	F.7.2.5				x	x	
Interim Storage at the Savannah River Site	F.7.2.6	x					x
Interim Storage at the Idaho National Engineering Laboratory	F.7.2.7	x	x			x	
Chemical Separation at the Savannah River Site	F.7.2.8		x			x	
New Technology	F.7.2.9			x			x
Reprocessing in the United Kingdom	F.7.2.10				x	x	
High-Level Waste Vitrification and Separation Waste Storage	F.7.2.11		x		x	x	
Disposal of Spent Nuclear Fuel	F.7.2.12	x			x		x
Disposal of Vitrified High-Level Waste	F.7.2.13		x		x	x	
Storage or Reprocessing Overseas	F.7.2.14				x	x	

fuel and 140 casks of target material (977 casks in total) from dozens of ports in 41 countries to as many as 10 ports in the United States and one or more border crossings from Canada. Consistent with the Record of Decision for the Programmatic SNF&INEL Final EIS (DOE, 1995g), aluminum-based foreign research reactor spent nuclear fuel would be delivered to the Savannah River Site and TRIGA foreign research reactor spent nuclear fuel would be delivered to the Idaho National Engineering Laboratory. Approximately 815 casks (including target material) would be shipped to the Savannah River Site and 162 to the Idaho National Engineering Laboratory.

Once the foreign research reactor spent nuclear fuel was in transit to the United States and especially once title had been transferred to the United States, numerous regulations covering safety, health, and environmental compliance would take effect. It is estimated that the direct cost of coordinating shipping, ensuring regulatory compliance, providing program documentation, conducting inspections in the United States and overseas, and providing overall program logistical support is about $5 million per year during the active shipping period (exclusive of shipping costs). This cost would be lower if material is shipped to the United Kingdom (Management Alternative 3). For Management Alternative 1, the discounted cost over the 13-year receipt period in the United States would be approximately $50 million. Costs for logistics and program management during the non-receiving period (years 14 through 40) are assumed to be modest and are accounted for as part of the management costs at the U.S. site.

F.7.2.4 Shipping to the United States

Shipping the foreign research reactor spent nuclear fuel and target material to the United States requires an estimated 977 cask shipments. Of this, 837 cask shipments would contain spent nuclear fuel and 140 cask shipments would contain target material.[4] The shipping period would be thirteen years, beginning in 1996. Discounted total shipping costs to and from the United States are estimated at about $140 million for the spent nuclear fuel and about 10 percent more if target material is included.[5] Under Management Alternative 3, where approximately one-third of the spent nuclear fuel casks are shipped to the United Kingdom, costs for shipping the remaining casks to the United States are about $90 million. Costs include cask rental, inland freight by truck in the United States and overseas, ocean transport to and from the United States (except for shipments from Canada, which would go by truck), port handling, security, insurance, administration, and contingencies. Logistics and program management is described in Section F.7.2.3.

The technical requirements and costs associated with shipping differ depending on the point of origin of the spent nuclear fuel. Costs are estimated separately for seven countries and/or regions of the world: Europe, Australia, Japan, Asia (excluding Australia and Japan), Canada, Other Atlantic, and Other Pacific. This section discusses technical issues associated with shipping the foreign research reactor spent nuclear fuel and target material to the United States from each region.

- **Europe** — European regulations for inland freight and ocean freight shipments of spent nuclear fuel have become very strict in recent years and are virtually certain to become more stringent. Requirements for permits, cross-border shipping, consolidation for ocean shipping, and other factors have driven the cost per cask in an unconsolidated movement to far more than that for inland freight in the United States. Considering the European Community's vessel requirements for the spent nuclear fuel shipped in 1995 under the Urgent Relief Environmental Assessment (DOE, 1994i), it is prudent for costing purposes to assume that shipment by chartered vessel rather than regularly scheduled commercial vessel would be required. (Shipment by purpose-built vessel is not likely to be required.) The cost of chartering a ship capable of carrying spent nuclear fuel casks from Europe to the United States' East Coast and handling the casks at the port and on-board is approximately $400,000. This cost can be spread over a maximum of 6 to 8 casks per vessel. For costing purposes, the EIS assumes 6 casks per vessel and two European ports-of-call. European nations account for an estimated 505 casks, 393 containing aluminum-based spent nuclear fuel, 14 containing target material, and 98 containing TRIGA spent nuclear fuel.

- **Australia** — Australia owns a single, large spent nuclear fuel transportation cask and, thus, does not generate a cask rental charge as part of the spent nuclear fuel program. (A charge for a typical transportation cask is assessed, however, to show true costs to undertake the program.) Australia is unlikely to require chartered shipping. Inland freight charges are moderate. Australia would account for 9 casks, all of which would contain aluminum-based foreign research reactor spent nuclear fuel. For cost analysis, the

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4 *The number of casks required for target material could be reduced by more than half if the material was converted to an oxide form prior to shipping. The estimate of 140 casks is based on a conservative estimate of shipping the material as a calcine.*

5 *Shipping target material increases costs much less than proportionately because most of the target material is in Canada.*

Australian cask is assumed to be shipped as part of larger shipments from Asia. These shipments would carry 6 casks per vessel and call on three ports per transit to the United States.

- **Japan** — The Japan Atomic Energy Research Institute owns two casks that would be used for spent nuclear fuel accepted by the United States. Because the Japan Atomic Energy Research Institute is near the port of export for Japan, inland freight charges would be negligible. Japan would likely require chartered vessels (at least as far as Europe for shipments of spent nuclear fuel to the United States via Europe). Shipment by chartered vessel would be approximately $450,000, or $225,000 per cask. It is estimated that Japan would ship approximately 110 casks to the United States (99 aluminum-based and 11 TRIGA). Japan could choose to acquire more casks to reduce its cost per ocean transit. As with Australia, a cask charge is assigned to show true program costs.

- **Asia** (excluding Australia and Japan) — Asian nations (excluding Japan) would be expected to have relatively low inland freight costs. It is unclear if Asian nations would require chartered vessels. Asian nations (excluding Australia and Japan) account for an estimated 62 casks (23 containing aluminum-based spent nuclear fuel, 1 containing target material, and 38 containing TRIGA spent nuclear fuel).

- **Canada** — For cost analysis, all Canadian shipments (approximately 116 casks of aluminum-based spent nuclear fuel and 125 casks of target material) are assumed to come by truck to the Savannah River Site. Cask rental and inland freight charges reflect the shipping times and distances for long overland routes. Shipping by rail is also feasible.

- **Other Atlantic** — All other nations nearer the Atlantic Ocean than the Pacific Ocean are assumed to have characteristics similar to those of Asia (excluding Australia and Japan) but lower ocean shipping costs because of greater proximity to the United States. Shipments from Mexico would come by sea, since the Mexican spent nuclear fuel is located in the southern part of the country. The Other Atlantic nations are not likely to require chartered vessels. Other Atlantic nations account for 38 casks, 23 of which would contain aluminum-based spent nuclear fuel and 15 of which would contain TRIGA spent nuclear fuel.

- **Other Pacific** — All other nations nearer the Pacific Ocean than the Atlantic Ocean are assumed to have characteristics similar to those of Asia (excluding Australia and Japan) but lower ocean shipping costs because of greater proximity to the United States. Because the Other Pacific countries are on the western coast of South America (which is significantly closer to the southeastern United States than the northwestern United States) and because all the spent nuclear fuel from these countries is aluminum-based, the EIS assumes that all shipments from Other Pacific countries will go by sea to an East Coast port via the Panama Canal. The Other Pacific nations would not be likely to require chartered vessels. Other Pacific nations account for 12 casks, all of which would contain aluminum-based spent nuclear fuel.

Table F-126 summarizes the cost of shipping a single spent nuclear fuel cask from various parts of the world to the United States in the configuration considered most likely by this EIS. The base case assumes the use of charter ships. The discounted cost of overseas shipping to the United States (including overland shipping from Canada and including target material) is shown in the table as $158 million (summing the bottom row). Of the 977 shipments, 827 originate either in Canada or in ports nearer the U.S. East Coast

Table F-126 Representative Shipping Costs to/from the United States for a Spent Nuclear Fuel Cask (Thousands of 1996 Dollars per Cask and Millions of 1996 Dollars for the Program, including Target Material)

Activity/Cost	*Europe*	*Australia*	*Japan*	*Other Asia*	*Canada*	*Other Atlantic*	*Other Pacific*
Charter	Y	Y	Y	Y	N/A	Y	Y
U.S. Coast	East	West	West	West	N/A	East	East
Charter Cost $k	400	550	550	500	N/A	300	300
Casks/Charter	6	See Other Asia	6	6	N/A	6	6
Ports-of-Call	2	See Other Asia	1	3	N/A	3	3
Total Rental Charges, $k/Cask	51	48	42	66	21	60	66
Inland Freight, Country, Site, and Overland Route Weighted, $k/Cask	37	38	41	30	25	26	38
Insurance, Security, Administration, Cask Return, $k/Cask	51	49	58	70	36	49	49
$k/Cask, Excluding Contingency	224	253	239	246	86	232	246
Number of Casks (Aluminum)	393	9	99	23	116	23	12
Number of Casks (TRIGA)	98	0	11	38	0	15	0
Number of Casks (Target Material)	14	0	0	1	125	0	0
Number of Casks (Total)	505	9	110	62	241	38	12
of which, from Developing Countries	72	0	0	53	0	38	12
Total Cost, including 15% Contingency, $M	130	2	30	18	24	10	3
Discounted Cost ($M)	95	2	22	13	17	7	2

(including 12 cask shipments from the West Coast of South America). The remaining 150 cask shipments originate in ports nearer the U.S. West Coast. Assuming shipments to the nearest U.S. coast, regardless of the type of spent nuclear fuel, an estimated 113 shipments of TRIGA spent nuclear fuel received at East Coast ports and an estimated 132 shipments of aluminum-based spent nuclear fuel received at West Coast ports would be shipped overland to the appropriate management site. Key issues in analyzing shipping costs follow the table.

- **Use of Chartered Ships** - Chartered vessels are used for conservatism in costing. The cost increase from using charters rather than regularly scheduled commercial vessels (for those countries likely to permit shipping by regularly scheduled commercial liners) is approximately $10 million. Europe and Japan would require charters in any case. Canada would transport by land. These three regions/countries account for more than 80 percent of the proposed shipments. No additional port-related costs are assigned if military ports are used.

- **Casks Per Ocean Shipment** - The costs in Table F-126 assume that European and Japanese shipments are made by a chartered vessel carrying six casks consolidated at two ports in Europe and one in Japan. For Japan, this charter loading implies the acquisition of more casks or the use of commercial casks. The nine casks (total) from Australia are assumed to be part of larger shipments from Asia. Even though Japan and Australia would most likely use their own casks, a cask rental charge is shown to reflect true program costs regardless of where the costs are borne and to reflect the likely requirement for new casks by Japan. Reducing the number of casks per shipment from Japan increases shipping costs by $20 million.

Shipments from the rest of the world (excluding Europe and Canada) are assumed by charter at the rate of 6 casks per vessel and 3 ports-of-call (i.e., two casks per country). Adding ports-of-call increases costs in transit (by about $20,000 per port-of-call and $20,000 per day in transit between ports) but saves money on balance by increasing the number of casks on the ship. Reducing the shipments from Asia (excluding Australia, Japan) and the Other Atlantic and Other Pacific countries to 2 casks and 1 port-of-call would increase program costs by $12 million.

- **Shipping to Distant Coasts and Sites** -- The cost of shipping the foreign research reactor spent nuclear fuel depends on which ports were selected and from where they would be accepting the shipments. The dynamics of the program are that roughly 75 percent of the foreign research reactor spent nuclear fuel is aluminum-based (and therefore would be destined for the Savannah River Site, on the United States' East Coast) and roughly 75 percent of the foreign research reactor spent nuclear fuel (excluding Canadian spent nuclear fuel) is in countries on the Atlantic side of the United States. While the 75 percent aluminum-based spent nuclear fuel and the 75 percent Atlantic spent nuclear fuel are not identical, there is sufficient overlap to create a situation where shipping all the spent nuclear fuel directly to a United States East Coast port and then distributing the TRIGA spent nuclear fuel to the Idaho National Engineering Laboratory by land would be only about 5 percent ($8 million) more expensive than shipping the spent nuclear fuel to the nearest port and then overland to the appropriate site. The cost of overland shipping by truck from an eastern port to the Idaho National Engineering Laboratory for a shipment that would logically arrive at an eastern port is less than the cost of ocean shipping to a western port to minimize the overland transit by truck.

- **Receipt Rates at the Savannah River Site and the Idaho National Engineering Laboratory** -- To accept all the foreign research reactor spent nuclear fuel within the proposed 13-year period requires, on average, cask receipts of almost six casks per month (seven per month if target material is included). Splitting the spent nuclear fuel by fuel type, consistent with the Record of Decision for the Programmatic SNF&INEL Final EIS (DOE, 1995g), implies receipt of 4 to 5 casks per month of aluminum-based spent nuclear fuel at the Savannah River Site and about one cask per month of TRIGA spent nuclear fuel at the Idaho National Engineering Laboratory.[6] About 1 cask per month of target material would also be received at the Savannah River Site.

- **Cask Rental Charges** -- Truck casks rent for approximately $1,500 per day on long-term lease. Shorter-term rentals are appreciably more expensive (EG&G, 1994b). Table F-126 incorporates the $1,500 per day rate for a long-term lease. The use of the smaller truck casks (compared to rail casks) permits savings in ocean shipping, short overland transport (although this could change in response to high charter costs), and security. The cost to acquire a new truck cask has been increasing steadily and is now approaching $2 million. The time from ordering to delivery exceeds 1 year. Because of the limited market for casks and the risk of constructing a cask for which there is no long-term demand, potential cask owners and lessors would place a high fixed charge rate on an investment in new casks for the foreign research reactor program. For a 20-year operating life, the fixed

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6 *The weighted-average number of spent nuclear fuel elements per cask is estimated to be slightly more than 27. The sites are limited by cask receipt rates, not elements per cask. Some casks would have as many as 120 elements. Others would have one element. Most would have about 27 to 30 elements.*

charge rate would be at least 30 percent. For a fixed charge rate of 30 percent, a $2 million cask must rent for $600,000 per year, or approximately $1,650 per day on a yearly lease.

- **Cask Shipment and Rental Periods** -- The average time required to complete a round-trip shipment depends on the area of cask origin, the number of casks shipped at one time, the number of ports-of-call made enroute to the United States, inland shipping in the United States, and turnaround time at the sites. Excluding Canada, round-trip cask shipment periods range from an average of less than 40 days for a cask from the Atlantic coast of South America to the southeast coast of the United States (with an ultimate destination of the Savannah River Site) to more than 60 days for a cask from Australia to the same ultimate destination (either via a Pacific port and an overland transit to the Savannah River Site or via a passage through the Panama Canal to an Atlantic Port).

The base costs cover two ocean transits, port handling in two countries, shipment to and from the cask lessor, and overland transport from the ports to and from the sites and reactor facilities. Cask handling at the sites is estimated separately.

- **Contingencies** -- Over the past few years, the cost of almost all phases of international spent nuclear fuel shipping has risen sharply. Also, European regulations regarding ocean shipping of nuclear cargoes have tightened dramatically. While these costs are built into the values in Table F-126, potentially large additional contingencies are not. These contingencies include escalating cask lease rates; partially filled casks; higher inland freight charges in the United States; dedicated rail shipping in the United States; consolidation limitations in Asia, South America, or Africa; and additional security. On the other hand, the single largest contingency -- the use of charter ships -- has been added to the base case. Consideration of the magnitude of the contingencies suggests a contingency factor of about 15 percent. This factor applies to the shipping component of the program only, not the impacts on the program logistics or integration from delays in shipping, barriers erected by the States, etc. These program-level impacts are discussed separately in Section F.7.4.

F.7.2.5 Shipping to the United Kingdom

Shipping to the United Kingdom is less expensive than shipping to the United States. Cost estimates provided by the United Kingdom Atomic Energy Authority for this EIS are about $30,000 per cask from Europe (Scullion, 1995). This compares to more than $200,000 per cask estimated for shipments from Europe to the United States. The estimates for shipping to the United Kingdom reflect the large savings from the very short ocean transit from continental Europe (and thus the vessel charter cost), the ocean transit and site turn-around periods (and thus the cask rental time), the inland freight charges for shipping a short distance in the United Kingdom, and the reduced administrative, insurance, and security costs for the shorter activity.

It is possible that the estimated cost for shipments to the United Kingdom is understated in comparison to the U.S. costs for at least two reasons. First, no detailed analysis of the cost components similar to that in Table F-126 was conducted and thus some costs, especially indirect costs, such as administration, may have been omitted. Second, costs for shipments to the United States have increased sharply in recent years. Costs for recent shipments to the United States were higher than anticipated and may not be reflected in the estimated costs to ship from Europe to the United Kingdom.

F.7.2.6 Storage at the Savannah River Site

Consistent with the Record of Decision for the Programmatic SNF&INEL Final EIS (DOE, 1995g), approximately 17,800 aluminum-based spent nuclear fuel elements could be received and managed at the Savannah River Site. These elements would be stored or chemically separated. Under Implementation Alternative 1c to Management Alternative 1, target material equal to about 600 aluminum-based elements could also be received and stored at the Savannah River Site. The cost to receive and store the target material is proportional to the ratio of target material (expressed in element-equivalents, e.g., cans) to spent nuclear fuel elements (i.e., about 3.4 percent). Costs in this section refer to the basic implementation of Management Alternative 1 (17,800 spent nuclear fuel elements and no targets).

Storage at the Savannah River Site would consist of two phases: Phase-1 storage in existing facilities and Phase-2 storage in new facilities. Logistically, the base case for Management Alternative 1 (storage) is as follows:

- At the start of the implementation period, aluminum-based spent nuclear fuel would be shipped to the Savannah River Site and wet-stored in RBOF and the L-Reactor disassembly basin.

- At about the same time, construction would begin on a staging and characterization facility and an interim dry or wet storage facility at the Savannah River Site. The staging facility would be designed to receive and transfer all the foreign research reactor spent nuclear fuel (and other nuclear materials, including domestic research reactor spent nuclear fuels). The dry or wet storage facility would be designed to store the spent nuclear fuel (and possibly target material) until the spent nuclear fuel and target material were prepared for shipment to the repository. The new facilities would be commissioned in 2003, accept off-site receipts of foreign research reactor spent nuclear fuel through 2008, and on-site transfers (of all aluminum-based materials, not just foreign research reactor spent nuclear fuel) from the RBOF and the L-Reactor disassembly basin through about 2008 or 2009. If commissioning of the new storage facility is delayed to 2005, transfers from existing basins would continue through about 2010.

- At some point in the 2015 to 2035 time period, the stored spent nuclear fuel would be prepared for repository disposal in as-yet unspecified repository-qualified canisters. Cost estimates are based on a repository packaging and shipping period of 2030 to 2035.

Table F-127 shows the annual costs for storage of 17,800 foreign research reactor spent nuclear fuel elements at the Savannah River Site during Phase 1 and Phase 2, where Phase 2 storage is dry (WSRC, 1995c). Receiving and storing target material would add $20 million (discounted) to expenditures at the Savannah River Site and $35 million (discounted) to the total costs. The key assumptions used to generate the costs in Table F-127 are discussed below.

- Annual operating costs for round-the-clock operations at RBOF and L-Reactor disassembly basin are allocated to the foreign research reactor spent nuclear fuel program in proportion to the share of foreign research reactor spent nuclear fuel mass transferred to or from the basins relative to total cask transfers at RBOF, and L-Reactor disassembly basin in each year until all of the foreign research reactor spent nuclear fuel has been transferred to dry storage (about 2008 or 2009). Unit costs are assumed fixed in each year. Thus, allocable costs scale in proportion to the amount of foreign research reactor material received at the basins.

Table F-127 Storage of Aluminum-Based Spent Nuclear Fuel at the Savannah River Site, Including Phase 2 Dry Storage (Millions of 1996 Dollars)

Year	Basin Costs	Capital Costs-Staging	Operating Costs-Staging	Capital Costs-Storage Facility	Capital Costs-Storage Canisters	Operating Costs-Storage Site	Decontamination & Decommissioning
1996	16	1					
1997	20	5					
1998	23	5					
1999	24	6		1			
2000	21	18		1			
2001	15	22		2			
2002	15	24		2			
2003	15	5	3	1	9	3	
2004	15		3	1	9	3	
2005	19		3	1	9	3	
2006	16		3	1	9	3	
2007	16		3	1	9	3	
2008	16		3	1	9	3	
2009	6	1	3	1		3	
2010		1	1			3	
2011		4	1			2	
2012		4	1			2	
2013		3	1			2	
2014		2	1			2	
2015-2029			1/yr.			2/yr.	
2030-2034			3/yr.			3/yr.	
2035			3			3	9
Total Costs (Undiscounted)	238	103	65	14	55	77	9
NPV	174	74	23	9	34	28	1

- A staging facility would be constructed for operation in 2003 (although it could be deferred until 2005). The primary functions of the staging facility would be to: 1) accept on-site transfers and off-site receipts, 2) characterize the spent nuclear fuel, 3) transfer the spent nuclear fuel from the received casks to interim dry or wet storage, and 4) transfer the spent nuclear fuel from interim dry or wet storage to repository-qualified canisters. If processing of the spent nuclear fuel prior to disposal were required, e.g., melting and diluting the material, additional facilities would be added to the staging facility.

  Excluding a melt-and-dilute facility, the staging facility is estimated to have a discounted cost of $150 million. Because the foreign research reactor spent nuclear fuel program would share the facility with other programs, costs are allocated to the foreign research reactor spent nuclear fuel program in proportion to the average of: 1) foreign research reactor spent nuclear fuel to other spent nuclear fuel received and staged to dry or wet storage over the period of facility operations (2003 through 2035), and 2) foreign research reactor spent nuclear fuel to other spent nuclear fuel staged from storage to repository casks over the period of facility operations. Using this approach, about 43 percent of the capital and operating costs of the facility would be allocable to the foreign research reactor spent nuclear fuel program. Foreign research reactor spent nuclear fuel represents about 57 percent of the total aluminum-based spent nuclear fuel to be managed at the Savannah

River Site over the 1996 through 2035 period (by MTR-equivalents) but only 28 percent of the total aluminum-based spent nuclear fuel received initially at the new staging and characterization facility. The unweighted average of these two percentages is 43 percent. Because most of the foreign research reactor spent nuclear fuel arrives prior to the operation of the new staging and characterization facility, the foreign research reactor spent nuclear fuel bears a disproportionately high share of the operating costs of RBOF and L-Reactor disassembly basin and a disproportionately low share of the capital and operating costs of the new staging and characterization facility.

- A new dry or wet storage facility would be constructed for operation in 2003. A dry storage facility would consist of a pad, fence, canisters, and storage overpacks. It would operate through 2035. The canisters used at the dry facility would not necessarily be qualified for repository disposal. During the storage phase, the canisters would be loaded with approximately 228 elements apiece.[7]

For cost analysis, the spent nuclear fuel is assumed to be taken out of storage over the period 2030 through 2035 for transfer to repository-qualified canisters. The actual timing of the transfers could be earlier but cannot be specified at present. The undiscounted cost of the facility per canister is $530,000 for the canister itself, $110,000 for the storage overpack, and $10,000 for a share of the pad (Stroupe, 1995). Undiscounted fixed costs for the facility, about 57 percent of which would be allocable to the foreign research reactor spent nuclear fuel program, include $24 million for security fencing, other fixed facility costs, licensing, etc.

It is estimated that about 57 percent of the $100 million discounted cost of a wet storage pool constructed from 1996 through 2002 would be allocated to the foreign research reactor spent nuclear fuel program.

Operations and maintenance and safeguards and security costs of about $3.2 million per year are allocated about 57 percent to the foreign research reactor spent nuclear fuel program (WSRC, 1995c). For the wet storage pool, operations and maintenance costs are about $5 million per year higher than at the dry facility. These costs are also allocated about 57 percent to the foreign research reactor spent nuclear fuel program.

The net present value of the allocated expenditures to receive and dry-store the aluminum-based spent nuclear fuel at the Savannah River Site is the sum of the net present values on the bottom row of Table F-127 or about $350 million for dry storage (and about $400 million for wet storage, not shown). Additional expenditures at the Savannah River Site would be incurred to receive and store target material ($20 million) and qualify the aluminum-based spent nuclear fuel for the repository ($25 million). The site-specific components of the other cost factors described in Section F.7.4 (e.g., additional characterization requirements, materials processing prior to repository packaging) would also be extra.

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7 *Aluminum-based elements can be related according to equivalent MTR elements. The precise loading level is 255 MTR-equivalent elements. Excluding the RHF elements from France, the average aluminum-based foreign research reactor spent nuclear fuel element is equal to 1.12 MTR-equivalents. RHF elements are rated at 20 MTR-equivalents each. The weighted-average MTR-equivalent from the MTR type elements and RHF elements is 21,400. The mass of aluminum-based elements is 101,300 kgTM. This value is based on 85 RHF elements at 110 kg (243 lb) each, 2,650 NRU elements (from Canada) at 5.7 kg (12.6 lb) each, and 15,064 MTR-type elements at 5.1 kg (11.2 lb) each. Target material is excluded from these calculations. Including target material would increase the total to 104,700 kgTM excluding the can.*

F.7.2.7 Storage at the Idaho National Engineering Laboratory

In the base scenarios involving United States acceptance of foreign research reactor spent nuclear fuel, approximately 4,900 TRIGA elements would be shipped to the Idaho National Engineering Laboratory for storage in existing facilities.

The Idaho National Engineering Laboratory would store the TRIGA spent nuclear fuel in the IFSF until the spent nuclear fuel was transferred to canisters for shipping to the repository. Table F-128 shows annual operating costs for the Idaho National Engineering Laboratory to dry-store approximately 4,900 TRIGA elements at the IFSF. (The Idaho National Engineering Laboratory could also wet-store the TRIGA elements at the FAST facility for about twice the cost as at IFSF.) The discounted total cost using the IFSF facility for storage is approximately $30 million. Qualification of TRIGA spent nuclear fuel for repository disposal would add another $15 million.

To complete the transfers from existing storage facilities to repository-qualified dry storage canisters, the Idaho National Engineering Laboratory might eventually require a new staging facility similar to that at the Savannah River Site. The Idaho National Engineering Laboratory is deferring construction of this facility until the repository waste acceptance criteria are available some time after 2000. Based on the share of TRIGA spent nuclear fuel relative to all material to be dry-stored at the Idaho National Engineering Laboratory and geologically disposed, the foreign research reactor spent nuclear fuel program would be allocated no more than $10 million of the capital cost of a staging facility whose discounted total cost would be less than $150 million. Allocable operating costs would be the same as shown in the column for repository canister loading. For cost analysis, repository loading and shipping is assumed to take place in 2030. Actual loading could take place earlier but cannot be specified at present.

F.7.2.8 Chemical Separation at the Savannah River Site

Implementation of Management Alternative 1 (revised to incorporate chemical separation) at the Savannah River Site could take place in different ways. One bounding case is to assume that existing and new facilities are used in essentially the same way as in Management Alternative 1 (storage). RBOF and L-Reactor disassembly basin are used for receiving and lag-storage, a new staging and characterization facility is required for repository loading of aluminum-based material received after the completion of chemical separation operations, one of the Canyons (F- or H-Canyon) is used at a moderate rate, new dry or wet storage facilities are required, etc. This option can be viewed as the separation of foreign research reactor spent nuclear fuel within a larger program to store and directly dispose non-foreign aluminum-based spent nuclear fuel.

The other bounding case can be viewed as the separation of foreign research reactor spent nuclear fuel within an accelerated program to chemically separate all of the accumulated aluminum-based materials and medium-term receipts. In this case, RBOF continues to be used for 40 years for receipts, characterization, storage and repository loading; no new staging and characterization facility is constructed; receipts of aluminum-based spent nuclear fuel from domestic sources are accelerated; one of the Canyons (F- or H-Canyon) is used at an accelerated pace; and no new dry or wet storage facilities are required.

In either case, chemical separation continues to around 2008 to 2010, at which point the canyons are shut down. In the first case, however, enough material remains on site and due to be received that a large-scale storage program (including a new staging and characterization facility) is required. In the second case, very little separable material remains on site and only about 5 casks per year are due to be received at the

Table F-128 Storage of TRIGA Spent Nuclear Fuel at the Idaho National Engineering Laboratory (Millions of 1996 Dollars)

Year	Capital Costs -Staging	Transfers	IFSF Operations	Repository Canister Loading	Repository Canisters	Operations & Maintenance	Decontamination &Decommissioning
1996		.4	1				
1997	1	.4	1				
1998		.4	1				
1999		.4	1				
2000		.4	1				
2001		.4	1				
2002		.4	1				
2003		.4	1				
2004		.4	1				
2005		.4	1				
2006		.4	1				
2007		.4	1				
2008		.4	1				
2009			1				
2010			1				
2011			1				
2012			1				
2013	3		1				
2014	4		1				
2015	3		1				
2016-2029			1/yr.				
2030			1	5	10	.1/yr	
2031-2035							2
Total Costs (Undiscounted)	11	5	35	5	10	4	2
NPV	5	4	17	1	2	2	0

time the Canyons are shut down. In this latter case, existing facilities can handle all program functions, including repository canister loading.

The first case is used for cost analysis purposes in this Appendix. This case is more probable, since it is more conservative with respect to selection of separation as an alternative and more conservative with respect to costs.

In either case, uranium (but not plutonium) is chemically separated from fission products at one of the canyons at the Savannah River Site.[8] In this EIS, costs for operations at F-Canyon are used since they are slightly higher than costs at H-Canyon (about $25 million). The credit for recovered uranium is the same in either case.

For either Management Alternative 1 (revised to incorporate chemical separation) (17,800 elements) or Management Alternative 3 (12,200 elements), the following assumptions apply:

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8 *HEU cannot be chemically separated from LEU. Plutonium can be chemically separated from uranium and fission products but it is not the intention of the Savannah River Site or this EIS to do so. The amount of plutonium in the foreign research reactor spent nuclear fuel is negligible.*

- Basin operations continue until all material can be transferred out of the basins to the Canyons. Foreign research reactor spent nuclear fuel is out of the basins in 2006 under Management Alternative 1 (revised to incorporate chemical separation) and 2005 under Management Alternative 3. From 2003 forward, all receipts take place at the new staging and characterization facility.

- Canyon operations would take place over a maximum of 13 years (1998 through 2010). Actual operations could be completed by about 2009 under Management Alternative 1 (revised to incorporate chemical separation) and as soon as the final shipments were received under Management Alternative 3. The selection of a canyon or canyons will be specified in the Interim Management of Nuclear Materials EIS (DOE, 1995b) and a facilities utilization study currently in process at the Savannah River Site. If no processing is selected in either of those studies, none will be selected for foreign research reactor spent nuclear fuels.

- All Canyon operations that apply to foreign research reactor spent nuclear fuel apply to other, similar materials at the Savannah River Site, i.e., domestic research reactor spent nuclear fuel and DOE and government aluminum-based spent nuclear fuel. Canyon capacity is shared according to the MTR-equivalents of material in each category (foreign and non-foreign) on-site in each year.

- All spent nuclear fuel would be separated incrementally to at-risk materials under the Interim Management of Nuclear Materials EIS (DOE, 1995b).[9] Processing of at-risk materials would be completed in 2002 or early 2003. Spare dissolver capacity would be available for aluminum-based spent nuclear fuels at a rate of 720 MTR-equivalents in 1998 and 1999 and 2880 MTR-equivalents thereafter. Aluminum-based spent nuclear fuel could be separated incrementally over the period 1998 through 2002 or early 2003. Costs (at F- and H-Canyon) for all aluminum-based spent nuclear fuels would be $10.4 million in 1996, $13 million in 1997, $18 million in 1998 and 1999, $5 million in 2000, $3 million in 2001, $13 million in 2002, and $32 million per year thereafter.

- Recovered HEU is blended down to LEU for sale to a commercial power reactor operator. The value of the LEU is assumed to be 85 percent of the value of fresh LEU for power reactors. A value of $5,000 per MTR-equivalent is used for the sales revenue.

- A penalty is assessed on any programs that defer phasedown of Canyon operations beyond the point that the Canyon would be "deinventoried." At some point after 2002, separation of research reactor aluminum-based spent nuclear fuel may become the final base mission at a Canyon. If so, continued operations would incur a deferral penalty estimated at $11 million in the first year of deferral, $22 million in the second year, and $33 million per year thereafter.[10]

Table F-129 shows the costs allocated to the foreign research reactor spent nuclear fuel program for activities at the Savannah River Site under Management Alternative 1 (revised to incorporate chemical

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9 *At-risk materials are materials that require stabilization through processing to ensure long-term safety and security.*

10 *A further penalty for deferring "deactivation" is not assessed. The Savannah River Site does not believe that continued operations through about 2008 to 2010 will defer the transition from deinventoried status to deactivated status.*

Table F-129 Chemical Separation Costs at the Savannah River Site Under Management Alternative 1 (Revised to Incorporate Chemical Separation)

Year	Allocated Receiving, Lag Storage, Facilities Support	Spare Dissolver Capacity (MTR-equivalents)	Approximate Foreign Research Reactor Share of Dissolver (percent)	Allocated Canyon Operations Cost	Allocated Canyon Deferral Penalty	Allocated HEU Credit
1996	16	0				
1997	22	0				
1998	25	720	72	13		3
1999	26	720	72	13		3
2000	27	2880	72	4		10
2001	22	2880	72	2		10
2002	23	2880	72	10		10
2003	17	2880	72	23	8	10
2004	16	2880	72	23	16	10
2005	19	2880	72	23	24	10
2006	8	2880	72	23	24	10
2007	0	2880	72	23	24	10
2008	1	2880	72	23	24	10
2009	1	2880	60	19	20	9
2010	1	2880	0	21	20	3
2011-2035	0-2/yr.					
Total Costs (Undiscounted)	242			199	139	107
NPV	178			127	81	70

separation). The foreign research reactor spent nuclear fuel program incurs costs at the percentage shown in the fourth column. This percentage is approximately the spare dissolver capacity allocated to the foreign research reactor program in each year. The change in the percentage at the end occurs because less than proportional dissolver capacity is required to complete the foreign research reactor spent nuclear fuel processing.

Table F-130 shows the same information as Table F-129, adjusted for the shipment of 5,600 aluminum-based elements to Dounreay, Scotland (Management Alternative 3). Table F-130 shows significant cost reductions at the Savannah River Site for basin operations (and related non-processing activities). Separation operations are shown ending in 2007 even though receipts continue through 2008. This is a function of the dissolver capacity available through 2010 and the reduced quantity of foreign research reactor spent nuclear fuel at the Savannah River Site under Management Alternative 3. As a practical matter, the cost impact of stretching out the processing through 2008 is insignificant.

Expenditures at the Savannah River Site for receiving and storing the target material and at the Idaho National Engineering Laboratory for receiving and storing the TRIGA spent nuclear fuel are the same as in the Management Alternative 1 (storage). These values are about $20 million (out of a total of about $35 million) and $50 million, respectively.

F.7.2.9 New Technology

Under Implementation Alternative 7 of Management Alternative 1 (discussed in Section 2.2.2.7 of the EIS), DOE would initiate a development program to select a new treatment and/or packaging technology

Table F-130 Chemical Separation Costs at the Savannah River Site Under Management Alternative 3

Year	Allocated Receiving, Lag Storage, Facilities Support	Spare Dissolver Capacity (MTR-equivalents)	Approximate Foreign Research Reactor Share of Dissolver Capacity (Percent)	Allocated Canyon Operations Cost	Allocated Canyon Deferral Penalty	Allocated HEU Credit
1996	12	0				
1997	17	0				
1998	20	720	62	11		
1999	22	720	62	11		2
2000	22	2880	62	3		2
2001	16	2880	62	2		9
2002	16	2880	62	8		9
2003	13	2880	62	20	7	9
2004	11	2880	62	20	14	9
2005	7	2880	62	20	20	9
2006	0	2880	62	20	20	9
2007	0	2880	6	2	2	1
2008	0	2880	0	0	0	0
2009	0	2880	0	0	0	0
2010	0	2880	0	0	0	0
2011-2035	.1-.5/yr.					
Total Costs (Undiscounted)	173			117	63	68
NPV	129			80	39	47

which would then be constructed and operated to manage the foreign research reactor fuel. A number of different technologies will be considered before one or more are selected for further development.

In addition to the uncertainty as to which technology(ies) will be chosen, there are other cost uncertainties including: the repository disposal fee, the need for new facilities and the requirements needed for managing domestic fuel. To account for these uncertainties, a range of costs have been developed. The costs range from about $950 million (undiscounted) or $625 million (discounted) to about $1.75 billion (undiscounted) or $950 million (discounted).

F.7.2.10 Reprocessing in the United Kingdom

Under Management Alternative 3, approximately 5,600 aluminum-based spent nuclear fuel elements would be shipped to the United Kingdom Atomic Energy Authority's facility at Dounreay, Scotland for reprocessing.[11] The remaining 12,200 aluminum-based elements would be chemically separated at the Savannah River Site (Section F.7.2.8).[12] The TRIGA spent nuclear fuel would be stored at the Idaho National Engineering Laboratory (Section F.7.2.7).

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11 Equal to about 7,900 MTR-equivalents, including 85 RHF elements at 20 MTR-equivalents apiece.

12 Equal to about 13,600 MTR-equivalents, including the 2,650 Canadian NRU elements and all other elements (excluding the French RHF elements) at 1.12 MTR- equivalents apiece.

The number of elements to be reprocessed at Dounreay is based on the number of spent nuclear fuel elements in countries with commercial nuclear power programs and the clear capability to manage the reprocessing wastes.[13] The reprocessing waste from Dounreay is returned to the countries of origin. More generally, Management Alternative 3 can be viewed as chemical separation of approximately 2/3 of the aluminum-based foreign research reactor spent nuclear fuel elements in the United States and 1/3 in the United Kingdom.

Table F-131 shows the United Kingdom Atomic Energy Authority's currently estimated costs to reprocess aluminum-based spent nuclear fuel elements. The cost for conversion assumes a downblending ratio of 2:1 (i.e., one unit of depleted uranium at 0 percent enrichment is added to each unit of separated uranium at 40 percent enrichment to produce two units of uranium at 20 percent enrichment). The costs in Table F-131 are converted from British Pounds to United States Dollars at a rate of 1.55 dollars per pound. Using these costs, the discounted cost to ship, receive, reprocess, and dispose of the wastes from 5,600 aluminum-based spent nuclear fuel elements on a schedule similar to that at the Savannah River Site and to obtain LEU metal fuel is approximately $265 million. At a discount rate of 3 percent, this is equivalent to about $7,000/kgTM, including a charge of about $700/kgTM for blending down the separated HEU to LEU.

Table F-131 Costs at Dounreay (1996 Dollars)

Activity	*Cost*
Transport Casks to/from Dounreay	$31,000/cask @ 2 casks per shipment
Receive & Unload Casks	$7,700/cask
Reprocess and produce cementous intermediate-level waste	$5,750/kgTM (HEU only)
Convert Uranyl Nitrate to Metal	$4,500/kg uranium metal (or $2,800/kg UO_2 for oxide)
Value of Metallic Uranium	$15,000/kg uranium
Store U-235	$1,550/kg U-235
Store intermediate-level waste	$1,550 per 500 l (132 gal) drum per year (containing 10 kg (22 lb) of spent nuclear fuel wastes)
Transport intermediate-level waste to originating country	$2,600/drum
Geologic disposal of intermediate-level waste	$31,000/drum

Source: All Costs (except value of metallic uranium) (Scullion, 1995).

Foreign research reactor operators may prefer to view their costs as the sum of the undiscounted current costs for shipping, reprocessing, and uranyl nitrate conversion to metal (without downblending to LEU) plus the discounted costs for interim storage of uranium, interim storage of reprocessing waste, and geologic disposal of reprocessing waste. Assuming a 3 percent discount rate for the outyear costs, and excluding the value of recovered metal uranium, the reactor operator would estimate a current cost of about $9,500/kgTM, excluding the value of the recovered uranium and $7,200/kgTM including the value of the recovered uranium. At a zero percent discount rate, which is reasonable if the reactor operator wants to incorporate a risk-adjustment for long-term unknowns like geologic disposal, the current costs are about $12,700/kgTM. The value of recovered metal HEU is credited to Dounreay to make it consistent with the value of the recovered LEU at the Savannah River Site. Blend-down at Dounreay would cost about $700/kgTM on a current cost basis. Since these cost estimates are based on current costs (i.e., 1996 dollars in 1996) rather than the current fraction of a series of costs (i.e., 1/13 of 13 years' worth of constant costs over the 1996 through 2008 period at the Savannah River Site), they are exposed to escalation.

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13 Belgium, France, Germany, Italy, Spain, Switzerland, United Kingdom.

In comparing these costs to costs for managing the spent nuclear fuel in the United States, the key technical differences the reactor operator sees are: 1) receipt of converted fresh metal (with or without downblending), and 2) receipt of cementous waste. How the reactor operator prices receipt of the waste product compared to the charge estimated by the United Kingdom Atomic Energy Authority would have a major impact on the attractiveness of doing business with the United Kingdom versus the United States.

Table F-132 shows the annual cash flows from the European component of Management Alternative 3, including downblending to LEU. Escalation is not included in Table F-132. Net present value is calculated at a 3 percent real discount rate.

Table F-132 Annual Cash Flows from Europe Under Management Alternative 3 (Dollars in Millions)

Year	Shipping & Receipt	Reprocessing	Conversion	Product Value[a]	Store U-235	Store Intermediate-Level Waste	Transport Intermediate-Level Waste	Dispose of Intemediate-Level Waste
1996	.7	16.6	3.8	6.5	.1	0	0	0
1997	.7	16.6	3.8	6.5	.1	0	0	0
1998	.7	16.6	3.8	6.5	.1	0	0	0
1999	.7	16.6	3.8	6.5	.1	.8	0	0
2000	.7	16.6	3.8	6.5	.1	1.2	0	0
2001	.7	16.6	3.8	6.5	.1	1.5	0	0
2002	.7	16.6	3.8	6.5	.1	1.9	0	0
2003	.7	16.6	3.8	6.5	.1	2.3	0	0
2004	.7	16.6	3.8	6.5	.1	2.7	0	0
2005	.7	16.6	3.8	6.5	.1	3.1	0	0
2006	.7	16.6	3.8	6.5	.1	3.5	0	0
2007	.7	16.6	3.8	6.5	.1	3.8	0	0
2008	.7	16.6	3.8	6.5	.1	4.2	0	0
2009-2025	0	0	0	0	0	4.2/yr	0	0
2026-2030	0	0	0	0	0	0	1.4/yr	16.6/yr
Total Cash Flows (Undiscounted)	10	215	49	84	2	118	8	100
NPV	8	176	40	69	1	65	3	38

[a] *Cost Savings*

F.7.2.11 High-level Waste Vitrification and Separation Waste Storage

The chemical separation operations at the Savannah River Site generate low-level waste and high-level waste that must be managed. Low-level waste is converted to a saltstone material and stored on-site. High-level waste is converted into a borosilicate glass log (vitrification) at the Defense Waste Processing Facility. Costs for the Defense Waste Processing Facility function, including low-level waste handling, are $1.77 million per Defense Waste Processing Facility log. Each log is equal to 300 MTR-equivalents or about 268 typical aluminum-based foreign research reactor spent nuclear fuel elements. The 17,800 aluminum-based elements in the proposed foreign research reactor spent nuclear fuel program equate to about 21,400 MTR-equivalents, including the 85 French RHF elements at 20 MTR-equivalents per element, but excluding target material. This generates 72 Defense Waste Processing Facility logs. Four Defense Waste Processing Facility logs are inserted into one waste package canister (i.e., 18 canisters of glass logs for the alternative). Each canister has an estimated cost of $480,000. Total discounted costs to prepare the high-level waste for geologic disposal are about $65 million. Disposal costs are extra.

F.7.2.12 Transportation to the Repository

The canisters of foreign research reactor spent nuclear fuel or vitrified high-level waste must be shipped to a geologic repository for ultimate disposal. For cost estimation only, the approximate distances from the Idaho National Engineering Laboratory and the Savannah River Site to the candidate repository at Yucca Mountain, Nevada, were used. (No claim regarding the suitability of Yucca Mountain is implied by this assumption.) Using these distances, and assuming shipments by truck, the undiscounted and discounted total costs of repository shipping are estimated at $19 million and $3 million, respectively for all spent nuclear fuel and about $1 million (undiscounted) if the aluminum-based spent nuclear fuel is converted to vitrified high-level waste (EG&G, 1994b).

Shipping costs are sensitive to aluminum-based spent nuclear fuel canister loadings. At approximately 14.4 kg (31.7 lb) U-235 per canister on average, the foreign research reactor spent nuclear fuel program (excluding target material) requires about 602 canisters for aluminum-based spent nuclear fuel and 16 canisters for TRIGA spent nuclear fuel. Reductions in the canister loading translate directly into more shipments. Shipping costs are not highly sensitive to high-level waste disposal packaging. In the base case, converting all the aluminum-based foreign research reactor spent nuclear fuel to vitrified high-level waste generates about 18 canisters.

F.7.2.13 Disposal of Spent Nuclear Fuel

The base case method of disposing of foreign research reactor spent nuclear fuel is intact in poisoned canisters. Preliminary costs to dispose of intact foreign research reactor spent nuclear fuel were developed for DOE's Office of Civilian Radioactive Waste Management in November, 1995 (TRW, 1995). Table F-133 shows the canister loadings, number of canisters, and canister costs (not repository costs) for the internal criticality packaging strategy of 14.4 kg (31.7 lb) U-235 per disposal canister.

Table F-133 Internal Criticality Packaging Strategy: Number Required and Cost Detail (in Thousands of 1996 Dollars)

Fuel Type	*U-235 Max kg/Element*	*Max (kg/package) U-235*	*Max Element/ Package*	*Package Cost ($1000)*	*Actual Element/ Package*	*Number Elements*	*Number Packages*	*Package Cost $1000*
LE MTR	0.42	43	102	114	48	4,838	101	11,490
HE MTR	0.42	14.4	34	92	24	5,692	237	21,819
Dense MTR	0.84	14.4	17	92	24	296	12	1,134
LE Tube	0.40	43	108	114	48	1,149	24	2,729
HE Tube	0.40	14.4	36	114	48	2,928	61	6,954
LE Cluster	0.49	43	88	215[a]	48	1,695	35	7,557
HE Cluster	0.49	14.4	29	114[a]	24	1,097	46	5,211
RHF	9.20	14.4	1	57.1	1	86	86	4,911
LE TRIGA	0.038	43	1132	315[b]	1008	3,834	4	1,198
HE TRIGA	0.133	14.4	108	92[b]	96	1,106	12	1,060
Total						22,721	618	$64,0964

Source: TRW, 1995

[a] *Cost category shifted up 1 to (approximately) account for the fact that the longer length of the Cluster elements precludes their being stacked in three layers (so that the ratio is only 4 to 1).*

[b] *Cost category shifted down by 2 to account for the fact that the smaller width (diameter) of the TRIGA elements permits 16 to fit into the same cross-sectional area as PWR assembly in the commercial waste package.*

The discounted canister-related cost of the packaging strategy displayed in Table F-133 is $11 million. The cost to dispose of the canisters depends on the size of the canisters and the loading levels. An estimate for disposal of full-size (i.e., commercial-type) spent nuclear fuel canisters prepared by the Idaho National Engineering Laboratory equated to $1.8 million per canister in 1994$ in 1994 (Stroupe, 1995), including transportation to the repository. This translated into $2.07 million per canister in 1996$ in 1996, the baseline cost for this EIS. These canisters contained 120 MTR-equivalents of aluminum-based spent nuclear fuel and 500 TRIGA spent nuclear fuel elements.

For the much smaller canisters and lower loading levels shown in Table F-133, a total undiscounted disposal cost (excluding transportation) of $373 million is estimated (TRW, 1995). This translates into an implied charge per canister of approximately $100 thousand for canisters containing aluminum-based spent nuclear fuel and $150 thousand for canisters containing TRIGA spent nuclear fuel. Assuming that repository development costs (1/3 of total repository charges) are incurred from 1996 through 2029 and repository emplacement costs (2/3 of total repository charges) are incurred in 2030 through 2035, the discounted cost of the disposal program (excluding the canisters) is approximately $110 million. About 95 percent of this charge is for disposal of aluminum-based spent nuclear fuel. Discounted total costs for intact disposal of aluminum-based spent nuclear fuel and TRIGA spent nuclear fuel including canister are approximately $125 million.

Total program costs are highly sensitive to the timing of disposal. Accelerating disposal to the 2015 to 2020 time period (rather than 2030 to 2035) reduces undiscounted costs by $50 million but increases discounted costs by $50 million. The savings arise from fewer years of storage prior to repository loading. The discounted cost penalty arises because the large outyear costs for repository development and emplacement lose 15 years of discounting.

F.7.2.14 Disposal of Vitrified High-level Waste

High-level waste is vitrified in the Savannah River Site Defense Waste Processing Facility. The borosilicate glass logs are inserted into waste packages (i.e., metal canisters similar to that used to dispose of commercial spent nuclear fuel) and disposed geologically. The cost to dispose of each waste package is estimated at $1.61 million, including transportation to the repository. At four Defense Waste Processing Facility logs per waste package, the aluminum-based foreign research reactor spent nuclear fuel would generate about 18 waste packages. Discounted disposal costs would be about $10 million. The discounted cost to dispose of the 35 TRIGA spent nuclear fuel canisters at the same loading as described in Section F.7.2.13 is about $10 million. Discounted costs increase by $15 million and undiscounted costs decrease by $25 million due to accelerating repository disposal by 15 years.

F.7.2.15 Storage or Reprocessing Overseas (Management Alternative 2)

For the purpose of the cost analysis, the primary steps in Management Alternative 2 are as follows:

- Each country retains its spent nuclear fuel.
- The countries with commercial nuclear power reprocessing programs reprocess their spent nuclear fuel. The other countries dry-store their spent nuclear fuel.
- Spent nuclear fuel is geologically disposed in an unspecified manner at multiple sites.

Discounted costs for Management Alternative 2 are estimated (very roughly) at $1.25 billion. Costs for this alternative are highly speculative since there is no basis for estimating how most countries would manage their spent nuclear fuel individually or collectively or what types of facilities or approaches they would (or could) select. Of the 41 countries in the proposed foreign research reactor spent nuclear fuel program, 22 have no commercial nuclear power infrastructure to support either a storage or a reprocessing program. These 22, and most of the remaining 19, have no clear program for geologic disposal. Since no country inside or outside the proposed foreign research reactor spent nuclear fuel program has offered to store or dispose of the spent nuclear fuel from other countries, there is no obvious method by which most of the countries in the program could manage their spent nuclear fuel. The costs shown here assume substantial cost penalties from the establishment of up to 22 new spent nuclear fuel storage installations, including all supporting infrastructure.

Reprocessing at the United Kingdom Atomic Energy Authority's facility at Dounreay, Scotland is already an option for Euratom countries that can accept the return of the reprocessing waste. If the United Kingdom Atomic Energy Authority were to reprocess all the material in the foreign research reactor spent nuclear fuel program, including fuels for which it has no current commercial capability, direct costs would exceed $1 billion. Logistics would be highly problematic, however, since the United Kingdom Atomic Energy Authority would require at least 35 years to complete the task at its currently offered capacity. The limited number of other facilities that could reprocess commercial spent nuclear fuel, e.g., the French facility at Marcoule, have not made any commitments to do so. The technical and cost uncertainties associated with disposal of either spent nuclear fuel or high-level waste are entirely speculative but must be considered extremely high.

Overall, there is no basis for assuming that distributed management of the spent nuclear fuel and, in particular, distributed geologic disposal of the spent nuclear fuel or high-level waste, could be accomplished at a cost remotely resembling that of the United States or any other country with a large-scale commercial nuclear power infrastructure.

F.7.3 Interpreting the Minimum Program Costs

Table F-120 (Section F.7.1.2) showed the minimum discounted program costs for the five bounding scenarios. The table showed that for the discount rates appropriate for the U.K. and U.S. portions of the program, hybrid chemical separation/reprocessing of aluminum-based spent nuclear fuel in the United States and the United Kingdom (Management Alternative 3) was about as costly as chemical separation of aluminum-based spent nuclear fuel in the United States alone. Either of the chemical separation/reprocessing approaches was substantially less costly than storing and directly disposing of all the spent nuclear fuel in the United States.

In interpreting the minimum discounted program costs, note that important components of the costs of multiple alternatives are fixed or nearly fixed. Table F-134 shows this relationship. For example, shipping to the United States is the same whether all the spent nuclear fuel is stored or separated. This means that the differences between the costs for the key management function (i.e., storage and disposal or chemical separation and disposal) are substantially larger (in percentage terms) than the differences between the total costs of an implementation alternative. It also means that risks in the unique components of the various implementation alternatives will have an outsized impact on the relative costs of the alternatives.

Table F-134 shows that the undiscounted costs for Management Alternative 1 (storage) exceed $1.4 billion, excluding target material and all other cost and risk factors. The undiscounted costs for Management Alternative 1 (revised to incorporate chemical separation) are approximately $1 billion. Undiscounted costs for Management Alternative 3 are about $1.1 billion. A substantial portion of the cost

premium for Management Alternative 3 is due to diseconomies of scale in using the Savannah River Site for two-thirds of the aluminum-based foreign research reactor spent nuclear fuel rather than all of the foreign research reactor spent nuclear fuel. Although not shown in Table F-134, use of a 4.9 percent discount rate for the European component of Management Alternative 3 would generate total costs that are indistinguishable from those under Management Alternative 1 (revised to incorporate chemical separation).

Table F-134 Composition of Minimum Program Costs for Spent Nuclear Fuel Management, 1996 Dollars

	Logistics & Program Management	*Shipping to United States*	*P-1 Operations at SRS*	*P-2 Operation at SRS, including Repository Fuels Qualification*	*P-1/P-2 Operations at INEL, including Repository Fuels Qualification*	*Ship & Dispose Spent Nuclear Fuel*	*Reprocess Aluminum-Based Spent Nuclear Fuel (Net)*	*Stabilize, Ship & Dispose High-Level Waste*	*Dounreay (Including Blend Down, Net)*	*Total*
Management Alternative 1 (Storage, Dry)[a] Undiscounted	65	194	238	354	92	486	0	0	0	1428
Discounted	47	141	174	195	47	123	0	0	0	727
Management Alternative 1 revised to incorporate Chemical Separation[a] Undiscounted	65	194	190	55	92	13	231	150	0	989
Discounted	47	141	148	31	47	3	138	68	0	623
Management Alternative 1 revised to incorporate a New Technology[b] Undiscounted	65-70	+218	263	222-376	92	123-715	0	0	0	983-1,734
Discounted	47-52	158	191	129-241	47	54-244	0	0	0	626-933
Management Alternative 3[a] Undiscounted	44	124	136	37	92	13	113	100	417	1076
Discounted	32	90	108	21	47	3	73	45	263	682

[a] *No target material*

[b] *Includes target material*

Variations in the share of aluminum-based spent nuclear fuel that is stored/disposed in the United States versus separated/disposed in the United States shift the program costs within the boundary points established in Table F-134 for implementation alternatives to Management Alternative 1. This shift is non-linear, as summarized below:

- Spent Nuclear Fuel Repository Qualification - The proposed foreign research reactor spent nuclear fuel program would be responsible for the costs to repository-qualify an estimated three types of aluminum-based spent nuclear fuel. The discounted cost to characterize these three fuel types is approximately $25 million. (See Table F-123). If all the aluminum-based foreign research reactor spent nuclear fuel were separated, there would be no repository qualification and no charge to the program. Whether separation of less than

all the aluminum-based spent nuclear fuel eliminates one or more fuel types from qualification requirements would depend on when the fuel was received, where each fuel type appeared on the prioritization for separation, and how long separation continues.

- Canyon Operating Costs - Canyon operating costs allocated to the foreign research reactor spent nuclear fuel program are at a minimum during the years when processing is incremental to processing under the Interim Management of Nuclear Materials EIS (1998 to 2002) and higher afterwards. Switching from incremental costing to average variable costing increases annual costs from as little as $1 million for 2,880 MTR-equivalents to about $32 million. Including the phase-down penalty (Section F.7.2.8) increases the cost by approximately $33 million per year. The timing of the switch from incremental costing to average variable costing (and thus the impact on the foreign research reactor spent nuclear fuel program) depends on decisions made under the Interim Management of Nuclear Materials EIS (DOE, 1995b) and a facilities utilization study underway at the Savannah River Site. The timing of any deferral penalty is subjective. It depends on whether other missions for the Canyons have been identified and whether plans to deinventory the Canyon used by the foreign research reactor spent nuclear fuel program have been developed. It is clear that Canyon operations costs allocable to the foreign research reactor spent nuclear fuel program per year or per MTR-equivalent would be much higher after 2002 than before 2002 but it is not certain how much higher or when they would become higher. This uncertainty prevents a linear estimation of separation costs according to the quantity of material processed. Section F.7.4 discusses this issue in more detail.

- Staging and Characterization Facility Capital Costs -- The Savannah River Site plans to construct a staging facility to transfer spent nuclear fuel from the existing wet basins to interim dry storage and ultimately to repository canisters. The unallocated discounted capital cost of this facility exceeds $150 million. There is no necessarily correct way to allocate the capital costs of this facility since it supports multiple components of multiple programs and is sized according to joint requirements of multiple programs. Section F.7.2.6 described the cost allocation approach used in this EIS. Approaches that could increase the costs allocated to the foreign research reactor spent nuclear fuel program are also plausible.

- Basin Operating Costs -- The Savannah River Site has estimated the costs to operate RBOF and L-Reactor disassembly basin over a roughly 10-year period at a round-the-clock operations level but has no generalized relationship that permits continuous variation in basin costs according to the number of elements received or stored. Costs depend on the timing of the receipts, the amount of characterization and canning, intra-site and inter-site transfer requirements, the variability in year-to-year staffing, and other factors.

Section F.7.4 outlines four additional groups of factors of significance in using the minimum program costs in Table F-120 as a decision basis for the program.

F.7.4 Interpreting the Other Cost Factors

Table F-120 showed the minimum discounted cost for the five bounding scenarios. The costs in Table F-120 include component contingencies but they do not include system risks, component and non-component risks, or the effects of discount rate changes.[14] Table F-121 showed these latter factors for the five scenarios. Detailed discussions are presented below. Real escalation is excluded from all costs in both tables.

F.7.4.1 Systems Integration and Logistics

The minimum program costs include the contingencies related to individual components of the program, e.g., shipping, basin operations, storage, transfers, and disposal. The minimum program costs do not include systems integration or logistics risks. The proposed foreign research reactor spent nuclear fuel program involves 41 foreign countries (a majority of which have no commercial nuclear power program), dozens of foreign ports, 13 years of receipts, up to 10 domestic ports, as many as 250 cross-country spent nuclear fuel shipments, at least two management sites, and developmental technologies (especially repository disposal technologies). Substantial systems integration bottlenecks could arise in many technical areas, e.g., insufficient casks to ship at the required rate or at the estimated loadings; vulnerability-related shutdowns at existing facilities; requirements for on-site canning prior to cask loading; unplanned requirements for dry storage characterization or conditioning; unexpected facilities requirements for meeting the repository waste acceptance criteria; delays in repository acceptance; and so forth, including normal project (not component) contingencies.

Substantial bottlenecks could also arise in many procedural areas, e.g., incompatibilities with Naval programs at the Idaho National Engineering Laboratory; requirements for on-site inspections by the International Atomic Energy Agency; constraints on shipments, duration of shipments, shipment routes, or quantities of materials shipped pursuant to agreements with the states, and so forth. Because the list of technical and procedural issues that could delay and complicate the program is both long and highly plausible, it is realistic to expect costs to increase above the component-level minimums that make up Table F-120. This risk is estimated at 10 to 15 percent of minimum discounted program costs.

F.7.4.2 Program Component Risks

Several key components of the foreign research reactor spent nuclear fuel program are uncertain. This section discusses the most important probability-adjusted uncertainties (risks).

- ***The method of disposal of spent nuclear fuel-*** The base case assumption is that aluminum-based HEU spent nuclear fuel and HEU TRIGA spent nuclear fuel can be loaded into poisoned canisters and disposed at the equivalent of 14.4 kg (31.7 lb) U-235 per canister. This packing density could be unacceptable to the repository program. Processing the uranium into an isotopically neutral mass (1 percent U-235) would require construction of a new melt-and-dilute facility. Construction and operation of this facility

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14 Contingencies refer to costs that are certain to occur based on historical experience with programs of similar maturity. These costs are grouped under the term "contingency" because they cannot be line-itemized. Uncertainties refer to changes in the costs of individual components or the overall program that might occur due to unknown changes in regulations, technical conditions, operational status, etc. They are assigned a probability based on their likelihood. Thus, contingencies will occur--they just cannot be line-itemized; uncertainties may occur-- they are adjusted for their probability of occurrence and expressed as risks.

could add $100 million or more to the cost of spent nuclear fuel disposal. Processing the spent nuclear fuel to avoid severe mass limitations on disposal is considered a high probability event.

- ***The adequacy of limited characterization of the spent nuclear fuel*** - There is technical uncertainty about the requirements for characterizing and conditioning the spent nuclear fuel before storing it. At the Savannah River Site, the characterization stage consists of checking the history of the spent nuclear fuel and its paperwork (documentation), visual inspection, gamma scanning (to verify the presence and amount of fissile material), and a leak detection test ("sipping") to determine if any fission products are escaping from the spent nuclear fuel elements. Canning would be limited to degraded elements only. If more extensive characterization and canning is required, new hot cells may be required. Allocable discounted costs to add and operate a hot cell at the staging facility are on the order of $100 million. The requirement for additional characterization and conditioning is a moderately probable event.

- ***Bottlenecks at the Defense Waste Processing Facility*** - Complete separation of aluminum-based spent nuclear fuel at the Savannah River Site generates about 72 Defense Waste Processing Facility logs at a cost of $1.77 million per log. The Savannah River Site estimates that for capital costs of about $100 million and operating costs of about $40 million per year, it could remove bottlenecks at the Defense Waste Processing Facility such that the cost would decline to $1.0 million per year. For the foreign research reactor spent nuclear fuel program, the allocated cost of the capital and operating requirements to relieve the bottleneck is a few million dollars. The discounted savings would be in the range of $50 million. The likelihood that the foreign research reactor spent nuclear fuel program would realize these savings is low to moderate.

- ***Failure to commercially sell the recovered uranium*** - The Savannah River Site might not be allowed to blend-down the recovered HEU for sale as power reactor fuel. DOE, for example, could choose to safeguard the HEU and isolate its chemical separation operations from the commercial power market. This would cost the foreign research reactor spent nuclear fuel program an additional $70 million. The likelihood that the foreign research reactor spent nuclear fuel program would fail to recover this value is low.

F.7.4.3 Non-Program Risks

The key non-program risk is that the cost of repository disposal increases across the board due to a change in scope (not due to escalation within the existing scope). The repository cost allocation used in this EIS assumes no monitored retrievable storage and one geologic repository. If either of these assumptions is incorrect, the cost of the repository component of the program would increase by about 20 percent. If both are incorrect, the cost of the repository component of the program would increase by about 40 percent. These increases translate into cost increases for geologic disposal of intact foreign research reactor spent nuclear fuel of about 5 to 10 percent. The cost of the chemical separation alternative (including disposal of TRIGA spent nuclear fuel) would increase by about 1 to 2 percent.

Cost escalation in the base repository program would also increase the allocated costs for the foreign research reactor spent nuclear fuel program. This type of cost escalation is highly speculative but could be in the tens of millions of dollars for the storage alternatives. Escalation is treated separately from other cost risks.

A second non-program risk is that one or more of the EISs that relate to materials management and facilities use at the Savannah River Site or the Idaho National Engineering Laboratory (besides the foreign research reactor spent nuclear fuel EIS) leads to legal or regulatory action that delays all site activities and throws the foreign research reactor spent nuclear fuel program off-schedule or out of the planned facilities.

F.7.4.4 Discount Rates

This EIS uses the real discount rate specified by the Office of Management and Budget for long-term government projects evaluated in the year ending February 1996 (OMB, 1995). The specified rate, 4.9 percent, is historically high. It compares to Office of Management and Budget rates of 3.8 percent, 4.5 percent, and 2.9 percent for the years ending in February of 1993, 1994, and 1995, respectively (OMB 1992; OMB, 1993; OMB, 1994). It also compares to measured real, long-term government interest rates of 3.2 percent, 2.9 percent, 4.1 percent, and 3.4 percent (through 1995 quarter 2), respectively for the years 1992, 1993, 1994, and 1995 (FRB Cleveland, 1995). Finally, it compares to a Congressional Budget Office estimate of 2 percent for government projects independent of the period and duration (Hartman, 1990).

Unlike the United States, the United Kingdom issues some debt instruments that are the equivalent of inflation-adjusted treasury securities. In recent years, these have yielded between 2 and 5 percent. The rate as of mid January, 1996 was approximately 3.6 percent. The United Kingdom is also currently considering the required discount rate (i.e., real rate of return) on trust funds to provide for decommissioning commercial nuclear power plants. Although no decision has been reached, the government supports a 6 percent rate while the United Kingdom nuclear utilities support a 2 percent rate.

The appropriate discount rate for the analysis is the risk-free rate at which funds received today can be invested to cover future expenses. Since receipt of the revenues precede expenditures, a conservative rate is low. This is the reverse of the more common situation where a high rate is used to discount future receipts compared to current expenses. Moreover, where fixed and certain revenues precede variable and uncertain expenses, the need for a conservative (i.e., low) discount rate is even greater. At a 3 percent discount rate, the discounted cost of Management Alternative 1 (storage) increases by $175 million (to $900 million). The cost of Management Alternative 1 (revised to incorporate chemical separation) increases by $120 million. The effect on the storage alternative is much greater because the high out-year costs for repository canisters and repository emplacement are much more prominent at the lower discount rate.

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NEPA TEAM

DOE/EIS-0218F
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Volume 2

FINAL ENVIRONMENTAL IMPACT STATEMENT

on a

Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Appendix G
Background Documents

United States Department of Energy
Assistant Secretary for Environmental Management
Washington, DC 20585

THE WHITE HOUSE

Office of the Press Secretary

For Immediate Release September 27, 1993

FACT SHEET
NONPROLIFERATION AND EXPORT CONTROL POLICY

The President today established a framework for U.S. efforts to prevent the proliferation of weapons of mass destruction and the missiles that deliver them. He outlined three major principles to guide our nonproliferation and export control policy:

-- Our national security requires us to accord higher priority to nonproliferation, and to make it an integral element of our relations with other countries.

-- To strengthen U.S. economic growth, democratization abroad and international stability, we actively seek expanded trade and technology exchange with nations, including former adversaries, that abide by global nonproliferation norms.

-- We need to build a new consensus — embracing the Executive and Legislative branches, industry and public, and friends abroad — to promote effective nonproliferation efforts and integrate our nonproliferation and economic goals.

The President reaffirmed U.S. support for a strong, effective nonproliferation regime that enjoys broad multilateral support and employs all of the means at our disposal to advance our objectives.

Key elements of the policy follow.

Fissile Material

The U.S. will undertake a comprehensive approach to the growing accumulation of fissile material from dismantled nuclear weapons and within civil nuclear programs. Under this approach, the U.S. will:

-- Seek to eliminate where possible the accumulation of stockpiles of highly-enriched uranium or plutonium, and to ensure that where these materials already exist they are subject to the highest standards of safety, security, and international accountability.

-- Propose a multilateral convention prohibiting the production of highly-enriched uranium or plutonium for nuclear explosives purposes or outside of international safeguards.

-- Encourage more restrictive regional arrangements to constrain fissile material production in regions of instability and high proliferation risk.

-- Submit U.S. fissile material no longer needed for our deterrent to inspection by the International Atomic Energy Agency.

-- Pursue the purchase of highly-enriched uranium from the former Soviet Union and other countries and its conversion to peaceful use as reactor fuel.

-- Explore means to limit the stockpiling of plutonium from civil nuclear programs, and seek to minimize the civil use of highly-enriched uranium.

-- Initiate a comprehensive review of long-term options for plutonium disposition, taking into account technical, nonproliferation, environmental, budgetary and economic considerations. Russia and other nations with relevant interests and experience will be invited to participate in this study.

The United States does not encourage the civil use of plutonium and, accordingly, does not itself engage in plutonium reprocessing for either nuclear power or nuclear explosive purposes. The United States, however, will maintain its existing commitments regarding the use of plutonium in civil nuclear programs in Western Europe and Japan.

Export Controls

To be truly effective, export controls should be applied uniformly by all suppliers. The United States will harmonize domestic and multilateral controls to the greatest extent possible. At the same time, the need to lead the international community or overriding national security or foreign policy interests may justify unilateral export controls in specific cases. We will review our unilateral dual-use export controls and policies, and eliminate them unless such controls are essential to national security and foreign policy interests.

We will streamline the implementation of U.S. nonproliferation export controls. Our system must be more responsive and efficient, and not inhibit legitimate exports that play a key role in American economic strength while preventing exports that would make a material contribution to the proliferation of weapons of mass destruction and the missiles that deliver them.

Nuclear Proliferation

The U.S. will make every effort to secure the indefinite extension of the Non-Proliferation Treaty in 1995. We will seek to ensure that the International Atomic Energy Agency has the resources needed to implement its vital safeguards responsibilities, and will work to strengthen the IAEA's ability to detect clandestine nuclear activities.

Missile Proliferation

We will maintain our strong support for the Missile Technology Control Regime. We will promote the principles of the MTCR Guidelines as a global missile nonproliferation norm and seek to use the MTCR as a mechanism for taking joint action to combat missile proliferation. We will support prudent expansion of the MTCR's membership to include additional countries that subscribe to international nonproliferation standards, enforce effective export controls and abandon offensive ballistic missile programs. The United States will also promote regional efforts to reduce the demand for missile capabilities.

The United States will continue to oppose missile programs of proliferation concern, and will exercise particular restraint in missile-related cooperation. We will continue to retain a strong presumption of denial against exports to any country of complete space-launch vehicles or major components.

The United States will maintain its general policy of not supporting the development or acquisition of space-launch vehicles in countries outside the MTCR.

For MTCR member countries, we will not encourage new space-launch vehicle programs, which raise questions on both nonproliferation and economic viability grounds. The United States will, however, consider exports of MTCR-controlled items to MTCR member countries for peaceful space launch programs on a case-by-case basis. We will review whether additional constraints or safeguards could reduce the risk of misuse of space launch technology. We will seek adoption by all MTCR partners of policies as vigilant as our own.

Chemical and Biological Weapons

To help deter violations of the Biological Weapons Convention, we will promote new measures to provide increased transparency of activities and facilities that could have biological weapons applications. We call on all nations — including our own — to ratify the Chemical Weapons Convention quickly so that it may enter into force by January 13, 1995. We will work with others to support the international Organization for the Prohibition of Chemical Weapons created by the Convention.

Regional Nonproliferation Initiatives

Nonproliferation will receive greater priority in our diplomacy, and will be taken into account in our relations with countries around the world. We will make special efforts to address the proliferation threat in regions of tension such as the Korean peninsula, the Middle East and South Asia, including efforts to address the underlying motivations for weapons acquisition and to promote regional confidence-building steps.

In Korea, our goal remains a non-nuclear peninsula. We will make every effort to secure North Korea's full compliance with its nonproliferation commitments and effective implementation of the North-South denuclearization agreement.

In parallel with our efforts to obtain a secure, just, and lasting peace in the Middle East, we will promote dialogue and confidence-building steps to create the basis for a Middle East free of weapons of mass destruction. In the Persian Gulf, we will work with other suppliers to contain Iran's nuclear, missile, and CBW ambitions, while preventing reconstruction of Iraq's activities in these areas. In South Asia, we will encourage India and Pakistan to proceed with multilateral discussions of nonproliferation and security issues, with the goal of capping and eventually rolling back their nuclear and missile capabilities.

In developing our overall approach to Latin America and South Africa, we will take account of the significant nonproliferation progress made in these regions in recent years. We will intensify efforts to ensure that the former Soviet Union, Eastern Europe, and China do not contribute to the spread of weapons of mass destruction and missiles.

Military Planning and Doctrine

We will give proliferation a higher profile in our intelligence collection and analysis and defense planning, and ensure that our own force structure and military planning address the potential threat from weapons of mass destruction and missiles around the world.

Conventional Arms Transfers

We will actively seek greater transparency in the area of conventional arms transfers and promote regional confidence-building measures to encourage restraint on such transfers to regions of instability. The U.S. will undertake a comprehensive review of conventional arms transfer policy, taking into account national security, arms control, trade budgetary and economic competitiveness considerations.

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(8-89)
EFG (07-90)

United States Government **Department of Energy**

memorandum

DATE: DEC 28 1994

REPLY TO
ATTN OF: EM-37

SUBJECT: Analysis of a Potential New Processing Facility in the Foreign Research Reactor Spent Nuclear Fuel Environmental Impact Statement

TO: Jill E. Lytle
Deputy Assistant Secretary for Waste Management, EM-30

Based on a series of meetings held between staff from EM-4 and EM-30 during early December, I request that you take immediate action to include in the Foreign Research Reactor (FRR) Spent Nuclear Fuel (SNF) Environmental Impact Statement (EIS) an alternative to initiate development work leading to a decision on whether to construct and operate a new SNF processing facility. The following parameters apply to this additional alternative:

- Any new facility would be capable of changing the FRR SNF into a form suitable for geologic disposal, without necessarily separating the fissile materials. A number of alternative processes would ultimately be considered for use in such a facility. Examples of these potential processes should be briefly discussed in the EIS.
- Due to the need for further research and development before the design of such a facility could be selected, the discussion of a new facility will be highly conceptual and programmatic in nature. Further NEPA analysis would be required prior to any decision to construct such a facility.
- Any new facility would be designed to operate safely and to minimize waste volumes, toxicity, and mobility.
- Any new facility would meet or exceed current environmental requirements.
- The alternative should consider construction of a potential new facility at all five of the sites considered for other FRR SNF management activities.
- The discussion should describe the range of quantities of spent fuel that such a facility might be designed to handle (hypothetically, from as little as just the foreign research reactor spent fuel that might be accepted under the FRR SNF EIS to a maximum of all of DOE's spent fuel).
- The design and operation of a new facility would be consistent with U.S. nuclear weapons nonproliferation policies, including the requirements of Presidential Decision Directive 13 regarding reprocessing.

- This alternative considering development potentially leading to a new SNF processing facility is to be in addition to the analysis of chemical separation of the FRR SNF that is already included in the FRR SNF EIS.
- In addition, consideration should be given to utilizing the National Academy of Science to assess the feasibility of using a new facility to produce a waste form that will meet the waste acceptance criteria for a geologic repository.

I recognize that incorporation of this alternative into the FRR SNF EIS at this stage in the development of the EIS will result in approximately a two week delay in the completion of the draft of the EIS. The draft was originally scheduled to be issued for public review and comment by the end of December 1994 and has recently been delayed about two weeks to resolve internal DOE comments. This change will result in a further delay and release of the draft FRR SNF EIS for public review and comment by no earlier than February 1995. This will probably result in a delay in the completion of the final FRR SNF EIS from June 1995 until July 1995. I understand that any delay in the completion of the FRR SNF EIS is likely to raise some objections among the FRR operators. Nevertheless, I consider that it is essential to evaluate this proposed new processing facility and that the small additional delay is acceptable.

Thomas P. Grumbly
Assistant Secretary for
Environmental Management

DEPARTMENT OF STATE
WASHINGTON

October 26, 1992

Dear Mr. Secretary:

During the 1992 International Meeting on Reduced Enrichment for Research and Test Reactors (RERTR) in Denmark, participants voiced very strong concern regarding the apparent reluctance of the Department of Energy to renew the Off Site Fuels Policy, to take back spent research reactor fuel from abroad.

Since 1978, the United States has encouraged countries to convert from the use of high enriched fuel (HEU) to low enriched fuel (LEU). This effort constitutes a key element of U.S. nuclear non-proliferation policy, which has been accepted with some reluctance by other countries, since it entails additional effort and expense on their part. Historically, the Off Site Fuels Policy has been an integral part of the conversion effort, which is perceived by countries as essential to meet reactor operating licensing requirements for disposition of spent fuel and to assure that their research reactor spent fuel is disposed of in a safe and reliable manner.

I fully recognize that renewal of this program will require DOE to resolve difficult and complex budgetary, environmental and technical issues. However, for a variety of reasons, I believe it is essential for DOE to move promptly to renew its policy of taking back foreign research reactor fuel.

We have worked hard for many years to reestablish the position of the United States as a reliable partner in nuclear commerce. We should not forfeit this effort by appearing uncertain about a policy which we have long supported and which is so critical to our non-proliferation objective of eliminating HEU from commercial use.

Clearly, we also do not want to forfeit the significant nuclear non-proliferation gains which have resulted from the RERTR program and our agreement to take back foreign research reactor spent fuel. Limiting the use and location of HEU abroad serves the security interests of both the United States

The Honorable
James D. Watkins,
Secretary of Energy.

and the international community as a whole. Hence, it is particularly disturbing to hear that some countries are considering halting their conversion programs, and even reverting to the use of HEU fuels in the event the United States does not agree to take back U.S.-supplied LEU spent fuel.

Over the past four years, we have maintained a dialogue with DOE concerning the importance of the spent fuel policy. Given the urgent need to resolve this matter, I strongly urge that DOE move quickly to reassure other governments that their spent fuel needs will be fully addressed and that we will continue to honor our commitments to them.

Sincerely,

Lawrence S. Eagleburger
Acting Secretary

UNITED STATES ARMS CONTROL AND DISARMAMENT AGENCY
Washington, D.C. 20451

THE DIRECTOR

07 DEC 1992

MEMORANDUM FOR THE SECRETARY OF ENERGY

SUBJECT: Reducing Foreign Inventories of U.S.-Supplied Highly Enriched Uranium

For many years the United States has encouraged reduced use of highly enriched uranium (HEU) for civil purposes as a key component of U.S. nuclear nonproliferation policy. This effort has met with some success, and the civil use of HEU has diminished, bringing reduced stockpiles and reduced transportation and diversion risks. An important incentive for foreign users of U.S.-supplied HEU to convert their reactors to low enriched uranium (LEU) fuel was the United States' program to take back the spent fuel.

Recent historic political developments have also presented opportunities for further reducing stockpiles of HEU abroad, thereby further promoting our nuclear nonproliferation objectives. We are arranging to purchase 500 metric tons of HEU from Russia for peaceful uses. South Africa has ended its HEU production and has offered to sell its stockpile to the United States.

I believe we shculd consolidate these gains and encourage further reduction of civil HEU use. It is essential to act soon to avoid damaging the longstanding and successful U.S. program that encouraged foreign operators to convert HEU research reactors fueled by the United States to the use of LEU fuel. Without appropriate action, some foreign operators might decide against conversion and others may switch back to HEU fuel. Moreover, new foreign suppliers of HEU may emerge.

In this regard, I have three recommendations:

1. Conclude contractual arrangements with appropriate foreign organizations to take back U.S.-supplied research reactor fuel following any necessary environmental determination.

2. Examine the feasibility of additional incentives that would be helpful or necessary toward ensuring the conversion

of those reactors for which alternative LEU fuels have been identified. A general review of the conversion program may be appropriate in any event in view of the recent amendment to the Atomic Energy Act which severely restricts future HEU licensing. In regard to that legislation, we would also support efforts to reestablish the LEU target development program for production of medical isotopes.

3. Ensure that the United States will make South Africa an attractive offer for its HEU.

I do not underestimate the difficulties posed by these recommendations. However, actions such as these would maintain and strengthen a longstanding and successful U.S. policy of reducing HEU stockpiles abroad -- a policy which will continue to promote global nuclear nonproliferation objectives.

Ronald F. Lehman II

THE DIRECTOR GENERAL

1993-07-01

Dear Madam Secretary,

Since 1978, the United States has encouraged countries to convert the cores of their research and test reactors from the use of highly enriched uranium (HEU) to nuclear fuels of low enriched uranium (LEU). This effort, initiated by President Carter, was an important element of the U. S. non-proliferation policy throughout most of the 1980s and was fully supported through the Reduced Enrichment for Research and Test Reactors (RERTR) programme by the International Atomic Energy Agency. The expiration of the U. S. Department of Energy's Off-Site Fuels Policy (the Policy) in 1988 has led to a crisis for the operators of research reactors in many countries where the laws are such that continuation of licensing and/or purchase of new nuclear fuels is contingent upon a resolution of spent fuel management problems. This situation is exacerbated for many reactor operators who complied with the wishes of the U. S. and converted their cores to LEU. They now have interim storage pools filled with irradiated HEU fuels and are trying to cope with a greater throughput of LEU fuels. The anticipated announcement that the U.S. DOE will renew the Policy and in due course begin the take back of research reactor fuels of U.S. origin from around the world will be very much welcomed by the Agency and many of its Member States.

However, because of the problems of spent fuel management facing the operators of many research reactors the Agency urges the earliest implementation of the Policy renewal. Some of these research facilities are the only sources of radioisotope production for medical uses in the countries in question, but face imminent closure unless they can resolve their problems of spent fuel management quickly. The Agency has initiated programmes to advise them, but the real solution for most of them is to return their irradiated research reactor fuels of U. S. origin. It is understood that the renewal of the Policy will require the solution of difficult and complex budgetary, environmental, transportation, legal and technical issues. Nevertheless, the Agency is confident that when the resources of the U. S. DOE are brought to bear on these problems that they will be resolved as soon as possible.

The Honourable Hazel O'Leary
Secretary of Energy
Washington, DC 20585
United States of America

Limiting the use and location of HEU fuels throughout the world remains a valuable objective and will serve the security interests of all nations. The Agency stands ready to help in any way it can consistent with its mandate and budgetary constraints.

Yours sincerely,

Hans Blix

THE SECRETARY OF STATE

WASHINGTON

July 2, 1993

Dear Madam Secretary:

I am writing to urge your personal support for renewal by the Department of Energy of the Off Site Fuels Policy for the acceptance of spent research reactor fuel from abroad.

The Department of State has strongly supported this policy because of its importance in gaining foreign cooperation in converting reactors from highly enriched uranium (HEU) to low enriched (LEU) fuel under the aegis of the Reduced Enrichment in Research and Test Reactors (RERTR) Program.

We recall Secretary Watkins confirmed in 1992 that the Department of Energy proposed to renew the Off Site Fuels Policy, but with the caveat that meeting the requirements of the National Environmental Policy Act (NEPA) could take as long as 2 to 3 years. We are concerned, however, about reports of substantial delays in the amendment of the existing Environmental Assessment, an essential early step in the NEPA process.

Foreign research reactor operators are reportedly highly concerned about a perceived change in DOE policy and have threatened to withdraw from further RERTR cooperation and to seek resumption of HEU supply from sources such as Russia.

A breakdown of the international consensus on conversion of research and test reactors to LEU and a return to an HEU fuel economy would undermine 15 years of intensive U.S. non-proliferation efforts on this matter and substantially reduce the ability of the U.S. to influence nuclear policy in bilateral and international fora.

In light of current developments, I urge your support for early reaffirmation by DOE to other governments of our continued commitment as a reliable supplier to fully address their spent fuel needs.

Sincerely,

Warren Christopher

Warren Christopher

The Honorable
Hazel R. O'Leary,
Secretary of Energy.

The Secretary of Energy
Washington, DC 20585

July 13, 1993

The Honorable Warren Christopher
Secretary of State
Washington, D.C. 20520

Dear Mr. Secretary:

This is in response to your letter dated July 2, 1993, urging my support for renewal of the Department of Energy's policy for the acceptance of spent research reactor fuel from abroad.

The Department of Energy remains committed to the Reduced Enrichment for Research and Test Reactors (RERTR) program, and to the proposal to establish a policy for the return of U.S. origin spent fuel from foreign research reactors. In response to your letter, and other inquiries we have received on this subject, we have taken a hard look at how we can expedite actions in these areas. We have decided on a three-tiered approach, as follows:

1. For any foreign research reactor spent fuel returns for which we can mutually agree that a bona fide emergency exists, the Department of Energy will join with you in consulting with the Council on Environmental Quality on the implementation of alternative arrangements for compliance with environmental review requirements pursuant to the emergency provisions of the Council on Environmental Quality"s regulations implementing the National Environmental Policy Act (40 CFR 1506.11).

2. In order to be able to respond to any near-term situation in which the expiration of the Department's acceptance of foreign research reactor spent fuel may threaten the Reduced Enrichment for Research and Test Reactors Program, the Department has begun an expeditious Environmental Assessment of the proposed return of sufficient spent fuel to eliminate that threat. It is proposed that any near-term spent fuel returns would be conducted under the terms and conditions of the enclosed proposed policy and be limited to approximately 550 spent fuel elements which can be stored in existing DOE capacity. This Environmental Assessment is scheduled to be completed by September 1993, and, if appropriate, a proposed Finding of No Significant Impact will be issued for public review by no later than September 30, 1993. Our goal is to complete the National Environmental Policy Act review process of this proposed limited foreign research reactor spent fuel acceptance by the end of this calendar year.

3. For the longer term, the Department will undertake preparation of an Environmental Impact Statement that addresses the proposed return of all U.S. origin foreign research reactor spent fuel, as specified in the enclosed proposed policy. A notice of intent for preparation of this Environmental Impact Statement is in preparation and should be issued in August 1993. The Department intends to issue the draft of the Environmental Impact Statement for public review by no later than the

end of December 1994, and the final Environmental Impact Statement by the end of June 1995.

We cannot continue to address this issue in a business as usual manner. The actions outlined above reflect our determination to move forward promptly and our acknowledgement of the need for a new definition of national security - one that includes both nonproliferation and environmental concerns. To provide added emphasis to the urgency of this effort, the Department requests that the Department of State participate as a cooperating agency in preparation of this environmental documentation.

In conclusion, the Department is committed to work with you and representatives of the Council on Environmental Quality at any time that you consider an emergency situation may be developing. In the meantime, we are proceeding as expeditiously as possible on the actions outlined above.

Sincerely,

Hazel R. O'Leary

Enclosure

DRAFT

Proposed Foreign Research Reactor Spent Nuclear Fuels Acceptance Policy

13 July 1993

PURPOSE - This proposed Department of Energy policy would support United States nonproliferation policy, including one of its key elements, the Reduced Enrichment Research and Test Reactors Program. It would provide opportunities and incentives for research reactor operators in foreign countries holding United States origin spent nuclear fuel containing highly enriched uranium to return that spent nuclear fuel to the United States for storage and eventual geologic disposal. This proposed policy is intended to support the United States nonproliferation objective of eliminating United States origin highly enriched uranium from research reactor use. It is also consistent with Section 903(a) of the Energy Policy Act of 1992, which places further restrictions on the export of highly enriched uranium from the United States. This proposed policy would provide incentives to encourage and assist developing countries (defined below) in returning their United States origin highly enriched uranium research reactor spent nuclear fuel to the United States for storage and disposal. For developed countries, the policy would allow return of United States origin research reactor spent nuclear fuel to the United States for storage and disposal on a full-cost-recovery basis.

PROPOSED POLICY - The United States proposes to adopt a policy under which:

1. For developing countries (i.e., those eligible for assistance under the United Nations Assistance Program), the United States would offer to accept United States origin research reactor spent nuclear fuel containing highly enriched uranium for storage and disposal in the United States. The United States would reimburse the developing country for costs incurred in transportation of the spent nuclear fuel from the developing country to a receipt facility in the United States. Upon acceptance of the spent nuclear fuel in the United States, the United States would assume all responsibility for the spent nuclear fuel, including storage of the spent nuclear fuel in the United States, any preparation of the spent nuclear fuel for disposal, all transportation in the United States subsequent to spent nuclear fuel acceptance, and ultimate geologic disposal of the spent nuclear fuel in the United States.

2. For developed countries, the United States would offer to accept all United States origin research reactor spent nuclear fuel containing highly enriched uranium for storage, preparation for disposal, and eventual geologic disposal in the United States. Such acceptance would be conducted on a full-cost-recovery basis, with the developed country responsible for transportation of the spent nuclear fuel to a designated receipt facility in the United States and paying the United States the full cost of all storage, all transportation within the United States subsequent to spent nuclear fuel acceptance, disposal preparation, and ultimate geologic disposal.

3. To encourage the conversion of foreign research reactors currently using United States origin highly enriched uranium fuels to low enriched uranium fuels, the United States would offer to accept for storage and ultimate disposal certain United States origin low enriched uranium research reactor spent nuclear fuel. Specifically, low enriched uranium research reactor spent nuclear fuel of United States origin would be accepted for a ten year period following implementation of this policy from reactors that have already converted, or that were constructed to use and operate with low enriched uranium fuels. United States origin low enriched uranium research reactor spent nuclear fuel exported to research reactors that convert within five years of the effective date of this policy would also be accepted for a ten-year period following their initial order for low enriched uranium fuel.

   The acceptance of low enriched uranium research reactor spent nuclear fuel from developed and developing countries would be conducted on the same terms as stated in 1 and 2 above for highly enriched uranium research reactor spent nuclear fuel.

CONDITIONS

1. This proposed policy would apply only to receipt of spent research reactor nuclear fuel of United States origin.

2. Ownership of the spent nuclear fuel would be transferred to the United States upon acceptance of the spent nuclear fuel by the United States at a designated receipt and inspection facility in the United States.

3. All transportation within a developing country and to the United States receipt facility would be the responsibility of the developing country, but would be paid for by the United States (subject to United States approval of the transportation arrangements and costs).

   All transportation within a developed country and to the United States receipt facility would be the responsibility of, and would be paid for by, the developed country.

4. Criteria concerning the required condition of the spent nuclear fuel would be published by the United States as part of the announcement of this policy, to clarify conditions for acceptance of the spent nuclear fuel. In general terms, all spent nuclear fuel to be accepted by the United States would be required to be either intact and free of defects or canned to ensure the ability to safely contain and manage the spent nuclear fuel.

5. For developed countries, the fee to be paid to achieve full cost recovery would be established by the Department prior to entering into the agreements to accept the spent nuclear fuel. This fee would be based on estimates of the cost of the storage and disposal activities that would be required. The fee

schedule would be updated annually to account for items such as inflation, and experience with the program.

TERMINATION - This policy of accepting low enriched uranium research reactor spent nuclear fuel would expire ten years after the effective date of this policy (or ten years following placement of an order for low enriched uranium research reactor fuel to replace highly enriched uranium research reactor fuel, if such an order is placed within five years of the effective date of this policy). Therefore, countries and research reactor operators that plan to take advantage of this policy for spent nuclear fuel containing low enriched uranium should begin planning for their own national or regional means of storage and disposal of low enriched uranium research reactor spent nuclear fuel for use following termination of this policy.

The proposed policy for accepting research reactor spent nuclear fuel containing highly enriched uranium of United States origin would encourage all countries to return this United States origin research reactor spent nuclear fuel as soon as possible.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

JUL 0 3 1991

Mr. John J. Easton, Jr.
Assistant Secretary of Energy
International Affairs and Energy Emergencies
U.S. Department of Energy
Washington, DC 20585

Dear Mr. Easton:

I am responding to your letter of May 31, 1991, requesting the comments of the Nuclear Regulatory Commission on issues related to the Department of Energy's consideration of renewing the Off-Site Fuels Policy.

The NRC staff believes that it is in the best interest of the United States to allow spent U.S.-origin high enriched uranium (HEU) fuel from domestic and foreign research reactors to be returned to DOE for processing and storage. Such a take-back policy reduces certain safeguards, physical security and safety concerns associated with the indefinite, long-term storage of irradiated HEU fuel in diverse locations. It would, of course, also alleviate the serious lack of spent fuel storage capacity being experienced by several research facilities, including ones in Japan and several European countries. In this regard, however, we assume that in implementing a resumption of the DOE policy to accept spent HEU fuel, the U.S. would not diminish its pressure on foreign countries to continue their best efforts to convert remaining HEU-fueled research reactors to low enriched uranium (LEU) fuel.

In the same vein, it would appear useful for DOE also to extend, beyond the expiration date of December 31, 1992, its offer to take back spent U.S.-origin LEU research reactor fuel from domestic and foreign users. DOE's current examination of the Off-Site Fuels Policy will no doubt address the question of whether or not this commitment is essential to U.S. efforts to minimize the use of HEU fuel in research reactors abroad. Your analysis of this and other aspects of the policy will be of great interest to NRC and can be expected to influence our future export licensing activities.

I trust that these general comments are useful.

Sincerely,

James M. Taylor
Executive Director for Operations

THE SECRETARY OF STATE

WASHINGTON

December 12, 1995

Dear Madam Secretary:

As we move to the final stages of preparing the Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (the EIS), I want to reaffirm the critical need for implementing this policy. The spent fuel acceptance policy which the EIS supports is central to our goal of preventing the spread of nuclear weapons -- and therefore to a major national security objective of this Administration.

One of the key elements of the President's nonproliferation policy has been to minimize and eventually to eliminate the use of high enriched uranium (HEU) in civil world commerce. I greatly appreciate the efforts that you personally have made to reinvigorate the Reduced Enrichment for Research and Test Reactors (RERTR) program which is designed to convert research reactors around the world from using HEU to LEU fuel.

As you know, the willingness of research reactor operators to support this vital program depends on our willingness to assist them with disposition of the spent fuel produced from nuclear materials which the United States originally supplied. Failure to implement this policy successfully would deal a crippling blow to our efforts to minimize the commercial use of HEU.

I hope that you will proceed soon to publish the final EIS and to begin implementing the policy using available practical and appropriate means to ensure the expeditious implementation of the program.

You and your staff are to be commended for the outstanding effort made in preparing the EIS. The Department of State stands ready to cooperate with you in whatever way we can.

Sincerely,

Warren Christopher

The Honorable
Hazel R. O'Leary,
Secretary of Energy

NEPA TEAM

DOE/EIS-0218F
February 1996

Volume 2

MOL.20010727.0196

FINAL ENVIRONMENTAL IMPACT STATEMENT

on a

Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Appendix H
General Provisions of Transportation Planning for the Shipments of Foreign Research Reactor Spent Nuclear Fuel

United States Department of Energy
Assistant Secretary for Environmental Management
Washington, DC 20585

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Appendix H
General Provisions of Transportation Planning for the Shipments of Foreign Research Reactor Spent Nuclear Fuel

H.1 Overview

This appendix is prepared to provide a description of the transportation, emergency response, security, and communications planning that would typically occur prior to any acceptance of foreign research reactor spent nuclear fuel under Management Alternative 1 or Management Alternative 3. Appendix H expands upon Sections 2.0 (Proposed Action and Alternatives) and 2.7 (Characteristics of Emergency Management and Response) in this Environmental Impact Statement (EIS). The information in this appendix is based on U.S. Department of Energy (DOE), State, Tribal, and local authorities' composite experience in planning for several successful radioactive material shipping campaigns, such as Urgent Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel and Cesium 137 Capsule Return Program shipments. This appendix is not meant to be all-inclusive as each shipping campaign differs slightly because of the material being shipped, the transportation mode, and the level of involvement of State, Tribal, and local governments.

The implementation of Management Alternative 1 or Management Alternative 3 would involve an ongoing and interactive planning process between DOE, States, Tribes, local authorities, other Federal agencies, the shipper of record/shipper's agent, and the carrier. In past shipping campaigns, these participants have developed an overall "Transportation Plan." This Plan is a blueprint for transportation, emergency response, security, and communications operations that would take place prior to, during, and after the completion of a shipment. Agreements between the various parties are detailed in the Plan. What follows is a description of the main elements of such a Plan. Additional information is available in the *DOE Program Manager's Guide to Transportation Planning* (DOE, 1995).

H.2 Transportation Considerations

Transportation planning integrates a wide range of expertise and requirements, including program management, material handling and packaging, transportation operations (traffic management), key governmental involvement, public information, environmental safety and health, and emergency preparedness. Planning would be clarified in a Transportation Plan that would document the planned logistics for foreign research reactor spent nuclear fuel shipments. The focus of this Plan would be operational; e.g., the handling, packaging, and transport of the foreign research reactor spent nuclear fuel shipment through sequential steps resulting in safe transport of this material to a management site. The plan would include organizational responsibilities of DOE, foreign research reactor operator/shipper of record, corridor jurisdictions and other Federal agencies. It would contain information on shipment schedules, the port(s) of entry, the mode of transport from port(s) of entry to a selected management site, an illustration of the shipment route, emergency plans and contacts, and communications strategies. The plan would include graphic representation of schedules of requirements for pre-, during, and post-shipment activities showing number of days to prepare, load, ship, unload and return the empty cask.

H.2.1 Organizational Roles and Responsibilities

DOE Headquarters: DOE Headquarters sets overall policy for the spent nuclear fuel program and for transportation, resolves policy questions, issues guidance, and provides information for use in transportation activities. DOE Headquarters provides a management team that offers general guidance and technical assistance to the field office implementing the program activities. As the responsible government agency for this program, DOE would ensure overall program coordination with involved organizations and agencies as outlined in this appendix. DOE is committed to providing corridor jurisdictions with technical assistance to help prepare for any shipments, and to supporting the management sites in implementing this program if foreign research reactor spent nuclear fuel is accepted into the United States. Prior to the implementation of a foreign research reactor spent nuclear fuel acceptance policy, DOE would coordinate with corridor jurisdiction authorities to resolve issues related to transport, emergency response, security, and communications management. DOE Headquarters would ensure, through contractual agreement, that the foreign research reactor operators comply with DOE's transportation, emergency response, security, and communications provisions, which exceed U.S. Nuclear Regulatory Commission (NRC) and/or U.S. Department of Transportation regulatory requirements.

Management Sites: The management site would be responsible for overall program management for shipments to the storage facility and transfer of spent nuclear fuel elements from the foreign research reactor to the management site. The management site would require shipping activities to be in compliance with applicable regulations and considerations. When necessary based on shipping experience and reactor operator capabilities, DOE would have a team of specialists from the management site travel to foreign research reactor facilities to verify that spent nuclear fuel and shipping arrangements meet DOE's transportation acceptance requirements. The management site would coordinate all communications activities with DOE Headquarters, other Federal agencies, and corridor jurisdiction authorities. Unloading and cross-site movement to a temporary storage facility would be conducted in accordance with management site operating procedures for acceptance and unloading of spent nuclear fuel.

Reactor Operators: The reactor operator would either perform the duties of the "Shipper of Record", as specified below, or contract with a shipping firm to act as the "Shipper of Record."

Shipper of Record: The Shipper of Record would submit a composite transportation physical security plan to the NRC, for domestic transport, which would contain a U.S. Department of Transportation-approved or State-designated route for highway or rail shipments. At DOE's request, the Shipper of Record would also develop its transportation planning document, which would address considerations such as vessel selection, pre-notifications, import authorizations, port arrangements, U.S. customs clearance, carrier arrangements, schedule, and emergency response. The reactor operator and/or the Shipper of Record are often referred to as the licensee. The licensee refers to the license that has been granted by the NRC to handle spent nuclear fuel.

Other Federal Agencies: Other Federal agencies would cooperate with DOE to ensure safe transportation of the foreign research reactor spent nuclear fuel. These agencies include:

> ***Department of Transportation:*** The U.S. Department of Transportation would perform rail track inspections; ensure that each shipment was in compliance with the regulations for the transport of spent nuclear fuel; and serve as the U.S. Competent Authority in the review of foreign transportation packaging certificates. The U.S. Department of Transportation also maintains a list of State-designated alternative highway routes.

NRC: The NRC would be responsible for review and approval of the composite transportation physical security plan, which would include the routes submitted by the foreign research reactor operators or the shipper of record. The NRC could perform radiological monitoring of the transportation packages at the port.

Department of Defense: If a military port-of-entry were utilized, organizational responsibilities would be defined and agreed upon in advance between DOE and the U.S. Department of Defense. Interagency Agreements would be established between DOE and the appropriate U.S. Department of Defense element to define the provisions under which DOE would be allowed to ship through the U.S. Department of Defense port. Security and safeguard measures would comply with military requirements in addition to NRC requirements.

Corridor Jurisdictions: State, Tribal, and local authorities have primary responsibility for the health and welfare of their citizens. Most State, Tribal, and local emergency preparedness organizations have, as a minimum, the basic capabilities to respond to a transportation emergency. In addition, the following authorities could be exercised:

- Corridor jurisdictions could exercise responsibility for vehicle and equipment inspections.
- Corridor jurisdictions would be responsible for notifying DOE of any road, rail or weather conditions that could affect a shipment crossing their jurisdiction.
- Corridor jurisdictions would designate a central point of contact.
- Corridor jurisdictions would interact with local officials on information and emergency planning activities.
- If highway transport were utilized, DOE, corridor jurisdictions, and the carrier would jointly establish policies regarding bad weather/road conditions and safe parking procedures.

Carrier: The carrier would be responsible for safely transporting the spent nuclear fuel packages and transport containers from the port of entry to the management site. If a shipment were to be completed by rail, this responsibility would include ensuring that rail lines and equipment were properly inspected and in good operating order, following NRC approval of the composite transportation physical security plan, and coordinating with the corridor jurisdictions to arrange inspections as required. If shipment were by highway, this responsibility could include obtaining required State permits, using the designated highway route-controlled quantity route, and arranging for vehicle inspections, as required. The carrier would be required to have a transport plan addressing considerations such as emergency recovery, transportation regulation compliance, two-way communication with rail/truck operators, and subcontractor emergency response plans.

H.2.2 Advance Information

Prior to the transport of spent nuclear fuel within or through a State, the Shipper of Record would notify the Governor or the Governor's designee in writing.

H.2.3 Tracking of Shipment

For shipments of foreign research reactor spent nuclear fuel, DOE policy would require that a satellite tracking/communication system be used.

H.2.4 Implementation of United States/International Atomic Energy Agency Agreement

The International Atomic Energy Agency is an agency of the United Nations headquartered in Vienna, Austria. The International Atomic Energy Agency establishes standards for radioactive materials transport. These model regulations may be adopted by individual nations. The emphasis of the International Atomic Energy Agency model regulations is on package integrity. The NRC and the U.S. Department of Transportation both periodically review and revise their regulations to bring them into general accord with the International Atomic Energy Agency regulations.

H.2.5 Packaging Description

The packaging for transporting spent nuclear fuel is designed to provide containment of its contents as required by international and Federal regulation. Type B packages, used to transport spent nuclear fuel, are designed to protect and retain their contents in both normal and severe accident conditions. Foreign-licensed Type B package designs are reviewed and approved for acceptance by the U.S. Department of Transportation. Figure H-1 displays a transportation cask typically used to transport spent nuclear fuel.

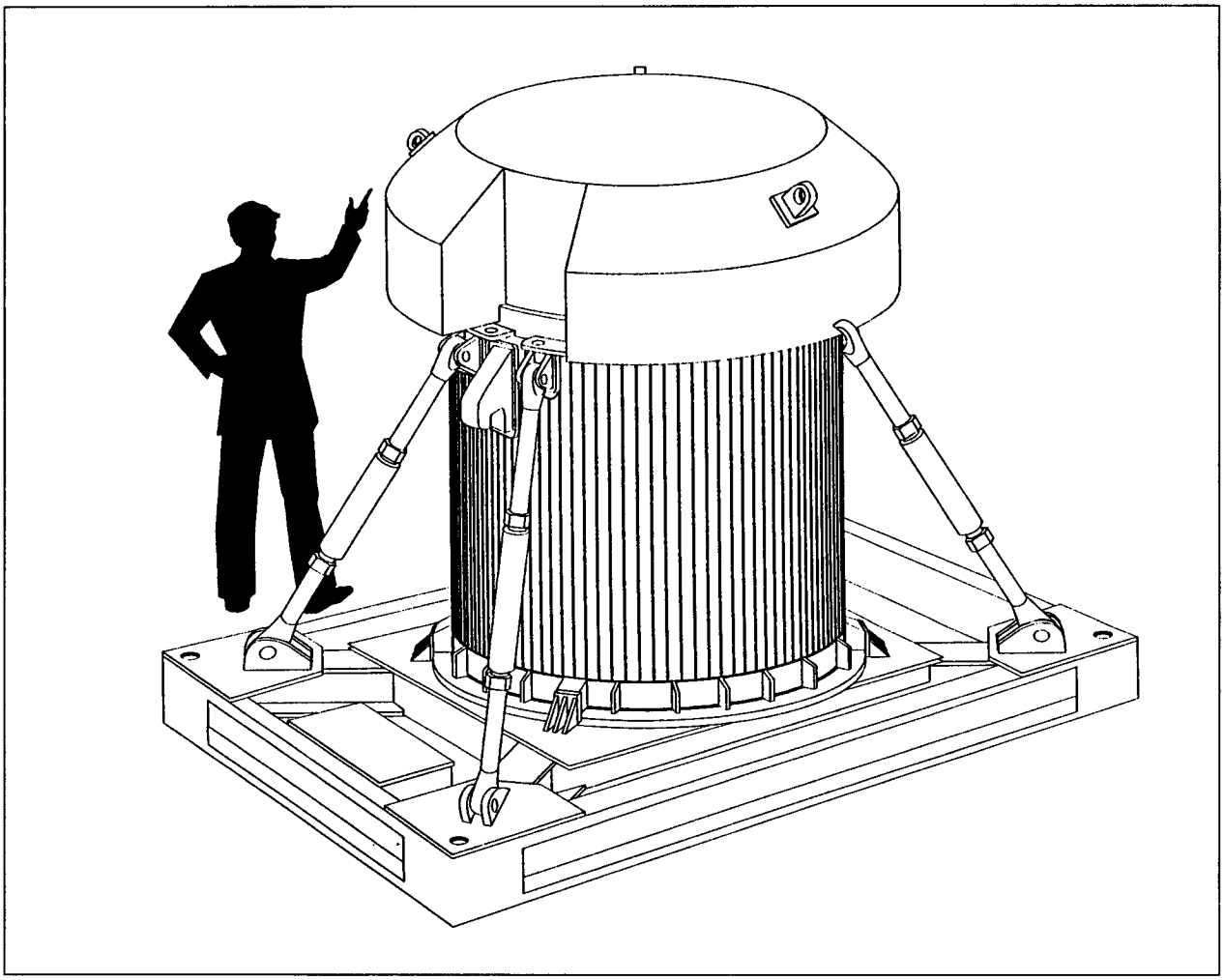

Figure H-1 Typical Spent Nuclear Fuel Transportation Cask

H.3 Emergency Preparedness Considerations

Emergency preparedness for transport of spent nuclear fuel is a vital part of the transportation planning process. Corridor jurisdictions having authority over areas through which these shipments would pass have primary responsibility for protecting the public and the environment and for establishing incident command in the unlikely event that an emergency should occur involving the shipments. DOE would work with State, Tribal, and local authorities to complement existing emergency preparedness capabilities. The carrier for these shipments would be responsible for providing emergency response assistance and recovery/restoration actions, if required. DOE would provide technical operations advice and radiological monitoring assistance to civil authorities and carriers of these shipments, when requested.

H.3.1 Emergency Preparedness

Corridor jurisdiction authorities have primary responsibility for the health and welfare of their citizens. Most States maintain specialized teams capable of responding to hazardous materials incidents. Through the capabilities these teams currently possess for dealing with potential accidents involving other hazardous materials (i.e., hazardous chemicals), they should already have the capability to deal with most plausible accidents involving spent nuclear fuel. Nevertheless, to assist in planning and preparedness for an unlikely but theoretically possible transportation emergency involving any foreign research reactor spent nuclear fuel shipments, DOE would offer a variety of emergency response resources and information to complement existing emergency preparedness programs, and also maintains a comprehensive emergency management system, particularly for radiological emergencies. The emergency management system includes training courses, Regional Coordinating Offices, and DOE Radiological Assistance Program teams.

Corridor Jurisdictions Hazardous Materials or Radiological Response Teams: Most corridor jurisdictions maintain specialized hazardous materials response teams that could be activated to provide technical assistance and mitigation during emergencies. State teams are activated at the request of an Incident Commander or other appropriate State or local authority.

Carrier Emergency Response Assistance: The carrier would provide technical response assistance to corridor jurisdiction responders as required by event scene conditions.

DOE Radiological Assistance Program: DOE's Radiological Assistance Program teams are administered by eight Regional Coordinating Offices. Each Regional Coordinating Office has access to radiological monitoring and assessment capabilities to provide assistance in radiological emergencies. Additional DOE technical experts are available to provide advice on material characteristics and mitigation, packaging and its tie-downs, and radiological monitoring and assessment requirements.

H.3.2 Notifications and Communications

In the unlikely event of a transportation incident involving foreign research reactor spent nuclear fuel, the carrier operator would notify the appropriate State and local authorities, the carrier dispatch center, and the management site communication center. The management site would also inform the appropriate corridor jurisdiction authorities. In any case, State, Tribal, and local authorities would be tied into the transportation plan's communication network arranged for the shipment.

The management site would serve as the designated communication center. DOE policy for transporting foreign research reactor spent nuclear fuel requires that a satellite communication system be used. The carrier may also provide its own transportation tracking system. Further details for the notification, communications, and other responsibilities of the communication center would be outlined in the Shipper of Record's transportation plan.

H.3.3 Emergency Response

If an accident requiring emergency response were to occur, the following emergency-related roles and responsibilities would be provided:

***Carrier Response*:** If an accident were to occur, the carrier operator and/or escort would notify local emergency response personnel as predetermined in both the DOE and Shipper of Record's Transportation Plans. They would also undertake first aid actions and initial incident scene control, provide assistance to first responders, and other emergency actions as defined in the carrier's emergency plan. The carrier operator would provide technical response assistance to State, Tribal, and local responders as required by event scene conditions.

***First Responders*:** Local emergency response personnel would respond to the incident scene when notified by a predetermined notification network initiated by the "Initial Responder." Their first action would be the evaluation of the accident scene (with assistance from the "Initial Responder") for the presence of radiological or other hazards. The response personnel would then act to reduce the hazard and control the event scene. The coordination of the accident scene would typically be under the Incident Command System utilized by local fire departments.

Responders would have information sources available to them in the form of the Department of Transportation *Emergency Response Guidebook* and by available emergency response information accompanying the shipping papers and normally available to responders in the vehicle, or accessible via the satellite communications and tracking system. Response to other hazards identified at the accident scene would be guided by information also contained in the Emergency Response Guidebook or other appropriate protective measures and response guidelines. In all cases, the Incident Commander would be a corridor jurisdiction authority. If States and local responders have additional procedures that provide more specific guidance, responders would follow those procedures.

Local organizations typically involved in first on-scene response include:

- Law enforcement,
- Emergency medical services,
- Cognizant transportation department,
- Hazardous materials team, and
- Fire services.

***Responder Support*:** Response organizations would arrive at the incident scene to support and assist the initial and first on-scene responders as requested by the "First Responders." The Incident Commander would coordinate the actions of these trained personnel coming from agencies within or outside the initial response jurisdiction. Requests for resource augmentation could be performed through local mutual aid associations as part of a response support network. Utilization of response resources would be based upon

communication and coordination with State, Tribal, and local agencies, and shipper/carrier response personnel. For incidents that exceed the capabilities of local, State, or Tribal government, Federal assistance could be requested from DOE. DOE could provide Radiological Assistance Program teams that include personnel and instruments for radiological monitoring, provide medical advice, and request assistance from other Federal agencies.

"Responder Support" assistance could involve traffic and/or access control, support of incident mitigation activities, appropriate notification (hospitals, mutual-aid emergency management system), technical assistance for assessment of health risks, and coordination of emergency health services or technical assistance for assessment of environmental risks and coordination of emergency planning for cleanup and recovery as defined in applicable emergency response plans. Organizations typically involved in responder support include:

- Fire services,
- Law enforcement,
- Cognizant transportation department,
- Hazardous materials team,
- Health protection oversight,
- Environmental oversight, and
- DOE Radiological Assistance Program team.

Package Recovery Actions: If package recovery, repositioning, or placement on another vehicle were required, provisions for necessary service would be prearranged. The carrier would have primary responsibility for package and transporter recovery operations. These activities would not begin until the emergency phase of any accident was terminated, following a decision that no radiological or other hazard was present. Recovery planning is initiated prior to termination of an emergency. DOE would assist the carrier in recovery operations where appropriate. Specific procedures for shipping cask recovery would be included in the shipper of record's agent/carrier's transportation plan. Corridor jurisdictions could exercise highway vehicle inspection authority before permitting the recovery vehicle to continue to a management site. Organizations typically involved in recovery actions include:

- Shipper's representative
- Carrier representatives,
- Management sites representative,
- DOE contractor representatives, and
- State, Tribal, and local authorities.

Cleanup and Incident Scene Restoration: In over forty years of experience with spent nuclear fuel shipments, there has never been an incident in which a spent nuclear fuel transportation cask has released any of its contents, even as a result of an accident. In the unlikely event that there was a release of radioactive material, DOE would be ready to provide whatever assistance was needed to respond to the situation. On the other hand, cleanup of nonradioactive aspects of an accident and scene restoration are a

part of any accident response. The carrier would have primary responsibility for cleanup and site restoration following an emergency and would provide the necessary resources. Cleanup planning could be initiated prior to termination of an emergency. Standards for such actions would be established by regulation and by authorities in the affected jurisdiction(s). Organizations typically involved in cleanup/restoration oversight actions include:

- Carrier representatives,
- Carrier cleanup/restoration representatives,
- Management site representative,
- DOE contractor representatives,
- Federal environmental oversight, and
- State, Tribal, and local authorities.

Carriers are financially responsible for accident response. The carrier is responsible for maintaining $5 million of insurance to cover costs incurred from an accident. Cost incurred by local first responders (firefighters, police, etc.,) to an incident scene are part of the carrier's financial responsibility. Further, the Price-Anderson Amendment Act ensures coverage of cost incurred beyond the $5 million carrier limit for spent nuclear fuel accidents. The Price-Anderson Act was partly established to ensure that funds are available to compensate the public for personal injury and property damage caused by the release of radioactivity (NRC, 1988). Such coverage would only take effect if the Price-Anderson Act conditions are met such as the resultant damage from the release of radioactivity during the accident exceeded the liability protection of the carrier.

H.4 Security Considerations

Domestic transportation of the foreign research reactor spent nuclear fuel would be regulated by the U.S. Department of Transportation and NRC. The objectives of the security measures employed during foreign research reactor spent nuclear fuel shipments would be to minimize the possibilities for radiological sabotage of spent nuclear fuel shipments and facilitate the location and recovery of spent nuclear fuel shipments that could have come under the control of unauthorized persons. The elements of the security systems to be considered when developing a transportation plan and are briefly summarized below.

***Security Packaging*:** Type B packages are used to transport spent nuclear fuel and would have a seal, which is not readily breakable, and which, while intact, would be evidence that the package has not been opened by unauthorized persons.

***General Security Concept*:** The physical security system would include procedures for coping with circumstances that threaten deliberate damage to a spent nuclear fuel shipment and with other safeguards emergencies; instructions for each escort would be developed. These procedures would include detection of the abnormal presence of unauthorized persons, vehicles, or vessels in the vicinity of a spent nuclear fuel shipment or upon detection of a deliberately induced situation that would have the potential for damaging a spent nuclear fuel shipment; monitoring the progress of the spent nuclear fuel shipment to notify the appropriate agencies in the event a safeguards emergency should arise; and maintaining a written log by the escorts and communications center personnel for each spent nuclear fuel shipment. Arrangements would be made with local law enforcement agencies along the routes of road and rail shipments, and at U.S. ports where vessels carrying spent nuclear fuel shipments were docked, for their

response to a security event or a call for assistance. Advance NRC approval of the U.S. Department of Transportation or State-designated alternative routes used for road and rail shipments of spent nuclear fuel, and of any U.S. ports where vessels carrying spent nuclear fuel shipments were scheduled to stop would be required. Shipments would be planned so that scheduled intermediate stops would be avoided to the extent practicable; at least one escort would maintain visual surveillance of the shipment during periods when the shipment vehicle was stopped, or the shipment vessel was docked. Shipment escorts would make calls to the communications center at least every two hours to advise of the status of the shipment for road and rail shipments, and for sea shipments while shipment vessels were docked at U.S. ports. These escorts (other than members of local law enforcement agencies, or ship's officers serving as unarmed escorts) would have successfully completed required training. In addition to NRC licensee requirements, DOE and the licensee could develop extra-regulatory guidelines, as necessary. These guidelines would be established in the overall transportation plan.

***Shipment by Sea*:** The management site would provide a representative at the shipment point of origin to observe the preparation and loading of the material. NRC could also send a representative to the point-of-origin to inspect transport packages and conduct radiological surveys prior to departure.

Advance NRC approval of the routes used for road and rail shipments of spent nuclear fuel, and of any U.S. ports where vessels carrying spent nuclear fuel shipments were scheduled to stop is required. The local law enforcement agencies, at U.S. ports where the ship was docked, would be contacted and arrangements would be made for their response in the event of an emergency situation concerning the spent nuclear fuel.

A shipment vessel, while docked at a U.S. port within a heavily populated area, would be protected by two armed escorts stationed on board the shipment vessel, or stationed on the dock at a location that would permit observation of the shipment vessel; or a member of a local law enforcement agency equipped with normal local law enforcement agency radio communications, who would be stationed on board the shipment vessel, or on the dock at a location that would permit observation of the shipment vessel.

A shipment vessel, while within U.S. territorial waters or while docked at a U.S. port not within a heavily populated area, would be accompanied by an escort (e.g., an officer of the shipment vessel's crew), who would assure that the shipment were unloaded only as authorized by the Shipper of Record.

The escorts would have the capability of communicating with the communications center and local law enforcement agencies through the use of a radiotelephone, or other NRC-approved equivalent means of two-way voice communications.

If a military port were used, applicable requirements would be established in advance among the U.S. Department of Defense, Shipper of Record, DOE, and NRC to provide the appropriate level of security, which would meet or exceed the security provided at commercial ports by the provisions discussed above.

***Shipments by Highway*:** For any shipment of spent nuclear fuel, the Shipper of Record would provide physical protection in compliance with a plan established under requirements prescribed by the NRC or equivalent requirements approved by the Association Administrator for Hazardous Materials Safety. An NRC regulated shipment requires advance approval of the Department of Transportation or State-designated agencies for alternative routes that would be used for highway shipments of spent nuclear fuel. Arrangements would be made with local law enforcement agencies along the transportation route for response to security events or calls for assistance while the shipment was within their jurisdiction. Highway shipments would be accompanied by escorts. Escorts are required by regulations to ride in the shipment vehicle (truck cab) or in separate vehicles maintaining visual sight at all times. Additionally,

escorts would have the capability to communicate with their communications center, each other, and the local law enforcement agency. The local law enforcement agency would be able to direct a prompt response to counter a threat to the spent nuclear fuel. The transport vehicle would be equipped with a feature approved by the NRC, which would allow the driver or on-board escort to immobilize the cab or cargo-carrying portion of the vehicle should an attempt be made to seize control of the vehicle. Both the driver and the on-board escort would have appropriate training.

***Shipment by Rail*:** The NRC requires advance approval of the routes used for rail shipments of spent nuclear fuel. A rail shipment car within a heavily populated area would be accompanied by two armed escorts (who are often members of the local law enforcement agency). At least one escort would be stationed at a location on the train that would permit observation of the shipment car while in motion.

A rail shipment car outside heavily populated areas would be accompanied by at least one escort stationed at a location on the train that would permit observation of the shipment car while in motion. Escorts would have the capability to communicate with the communications center and the cognizant local law enforcement agency.

Reporting of Safeguards Events: The Shipper of Record would notify the NRC Operations Center within one hour of discovery of credible threat (e.g., theft or significant physical damage), entry of unauthorized person, or failure/degradation in a safeguard system. Other notification time criteria would be put in place for less significant safeguards events.

H.5 Communication Considerations

In the case of extended or high visibility shipping campaigns, such as in the implementation of Management Alternative 1 or Management Alternative 3, a written public and media communications plan would be included in the overall Transportation Plan. The communication plan would generally be completed by public affairs personnel at the management sites (in cooperation with State, Tribal, and local authorities). The purpose of this plan is to ensure the exchange of accurate and timely information among the foreign research reactor operators (and their agents, if applicable), the States and Tribes, other Federal agencies, the public, and the media.

H.5.1 Public and Media Communication

The public and media communication plan for a foreign research reactor spent nuclear fuel shipment would establish public information points of contact for each agency and jurisdiction through which a shipment would pass, coordinate public education and information activities in those jurisdictions, promote communication among shipment participants by keeping State, Tribal, and local points of contact informed, and detail the procedures and sources of information in the event of an accident or other incident. To accomplish these goals, the communication plan could include the following:

***Roles and Responsibilities*:** The roles and responsibilities of the management site, the States and Tribes, other Federal agencies, the Shipper of Record or the shipper's agent, the land carrier, the port authorities, and regional State association (if any) would be detailed.

***Congressional and State Notification*:** DOE Headquarters Congressional and Intergovernmental Liaison Office would make appropriate Congressional notifications and respond to requests from Congressional staff and elected officials for additional information. Prior to the transport of spent nuclear fuel within or through a State, the Governor of that State would be notified in writing.

***Stakeholder, State and Tribal Notification*:** The management site, States, and Tribes generally provide for appropriate stakeholder and special interest group notification, as needed, and would respond to requests from stakeholders for additional information consistent with NRC regulations concerning safeguards.

***Media Interactions*:** Media interactions would be coordinated by the management site and would take place prior to the shipment, during the shipment, at the port of entry, after arrival at the management site, and at the completion of the shipment. These activities could range from the press briefings prior to the first shipment to a complete listing of State, Tribal, and local media print and broadcast media, to broad distribution of press releases, radio and TV news spots with accompanying factsheets, videos, and other information materials.

Public Interactions: The management site would interact with the public by answering questions, conducting briefings and meetings, and disseminating material. The States and Tribes often choose to distribute additional information packages through their emergency response organizations, civic and service organizations, local government agencies, or other special interest groups.

***Emergency Procedures*:** In the unlikely event of an accident or an incident, the management site, the Shipper of Record or its agent, and the State, Tribal, and local authorities have a coordinated approach to dealing with information about the emergency, providing timely information to the press and to the pre-established State and local contacts.

References

DOE (U.S. Department of Energy), 1995, *Program Manager's Guide to Transportation Planning*, Office of Transportation, Emergency Management, and Analytical Services of the Office of Environmental Management, Washington, DC, June.

NRC (U.S. Nuclear Regulatory Commission), 1988, *The Price-Anderson System*, NUREG BR-0079, Office of Nuclear Reactor Regulation, Washington, DC.

NEPA TEAM

DOE/EIS-0218F
February 1996

Volume 3

FINAL ENVIRONMENTAL IMPACT STATEMENT

on a

Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Public Comments and Department of Energy Responses
Part 1 – Overview, Governments, and Native American Groups

United States Department of Energy
Assistant Secretary for Environmental Management
Washington, DC 20585

Volume 3 is organized into three sections:

- Section 1 - Overview
- Section 2 - Written Comments and Responses
- Section 3 - Public Hearings

The Overview sets the tone for the document by summarizing the public comment process, by explaining how the receipt of written comments and the public hearing process were handled, and by summarizing the major issues raised by commentors and DOE's responses to these issues.

Section 2 of Volume 3, "Written Comments and Responses" contains all of the written comments received by DOE on the draft EIS. Upon receipt, these documents were assigned a sequential log number to be used in tracking during the comment response process. For presentation in Volume 3, these documents maintained their original log number, but were separated into the following seven distinct "affiliation" categories:

Section 2.1 - Federal Government
Section 2.2 - State Government
Section 2.3 - Local Government
Section 2.4 - Native American Groups
Section 2.5 - Non-Government Organizations
Section 2.6 - Foreign Entities
Section 2.7 - Individuals

Since these documents retained their original log number, the reader should note that while the documents in each respective section are in ascending order, their numbering therein is not sequential.

In order for a reader to find a specific document, a full "List of Commentors" has been included in each book (or part) of Volume 3, immediately following the "Table of Contents." This "List of Commentors" has been compiled alphabetically using either the commentors last name, the name of the submitting organization, or the name of a Federal, State, Tribal, or local government branch. City and State government bodies are listed under "City of" or "State of." Members of Congress are listed by the Senator's or Representative's name, with the government branch following.

To locate a document(s):

1. Find the "List of Commentors" and the name of the individual submitting the comment (or the name of the organization or agency if the comments were submitted on their behalf), and note the page number assigned to the first page of the comment document (i.e., a document from a Native American Group would be number 2.4-1, etc.).

2. Find the Volume 3 book (or part) that contains the section and page number for which you are looking and turn to the appropriate page to find a scanned copy of the document along with the responses to each of the comments delineated therein.

the written comments, the comments received during each of the 17 public hearings. Oral comments provided at these hearings have been summarized, rather than individually identified by each respective speaker. As such, there is not a list of speakers or identification of the commentors at the public hearings. A list of all registered attendees is provided immediately following the summary of each of the public hearings.

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Transcript of Public Hearing Held in Tacoma, Washington on June 19, 1995 on the Draft Environmental Impact Statement on the Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel A.1

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SECTION 1
OVERVIEW

1.0 OVERVIEW OF THE PUBLIC COMMENT AND DOE RESPONSE

On April 21, 1995, DOE published in the *Federal Register* a Notice of Availability of the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (60 FR 19899). In accordance with Council on Environmental Quality and DOE NEPA regulations, the Notice invited interested agencies, organizations, and the general public to provide oral and written comments on the Draft EIS. This Volume 3 of the Final EIS contains DOE's responses to the comments provided during the comment period.

1.1 THE PUBLIC COMMENT PROCESS

The public comment period on the Draft EIS was initially scheduled from April 21, 1995 to June 20, 1995. In response to public requests, the comment period was extended an additional 30 days through July 20, 1995. During this period, DOE held 17 public hearings in the locations most likely to be directly affected by the EIS alternatives, including the 10 candidate ports of entry and 5 candidate spent nuclear fuel management sites. In addition, a public hearing was held in Washington, D.C. The hearing dates and locations are shown in Figure 1. The Draft EIS was made available to the public through mailings, requests to DOE's Environmental Management Information Center, and at DOE Public Reading Rooms and other designated information locations.

1.2 WRITTEN COMMENTS

DOE received approximately 5,040 written comments contained within approximately 1,250 submissions. Written comments were submitted to DOE by mail and facsimile and at many of the public hearings. These written comments were received from individuals, Federal and State agencies, local governments, foreign entities, and non-government organizations such as environmental, public interest and industry groups. All written comments were reviewed and considered in the preparation of the Final EIS and are presented in Section 2 of this Volume 3 of the Final EIS.

1.3 PUBLIC HEARINGS

In an effort to encourage a dialogue between members of the public and government officials at the public hearings, DOE used an informal, interactive format and an independent professional facilitator. The hearings were preceded by an hour-long "open house" at which exhibits, videos, and other information materials were available for review, along with opportunity for one-on-one exchanges with DOE representatives. Comment forms were provided for those wishing to submit written comments at the hearings.

Public hearings began with an explanation of the hearing format by the independent facilitator, followed by a 30-minute overview by a DOE official on the proposed policy and the factors leading to the proposal's development. Following this presentation, attendees were encouraged to ask questions, offer comments, and engage in dialogue. Notetakers summarized the questions and comments and DOE responses at all hearings. A summary of all oral comments and statements from each hearing, along with the DOE responses, is presented in Volume 3, Section 3.

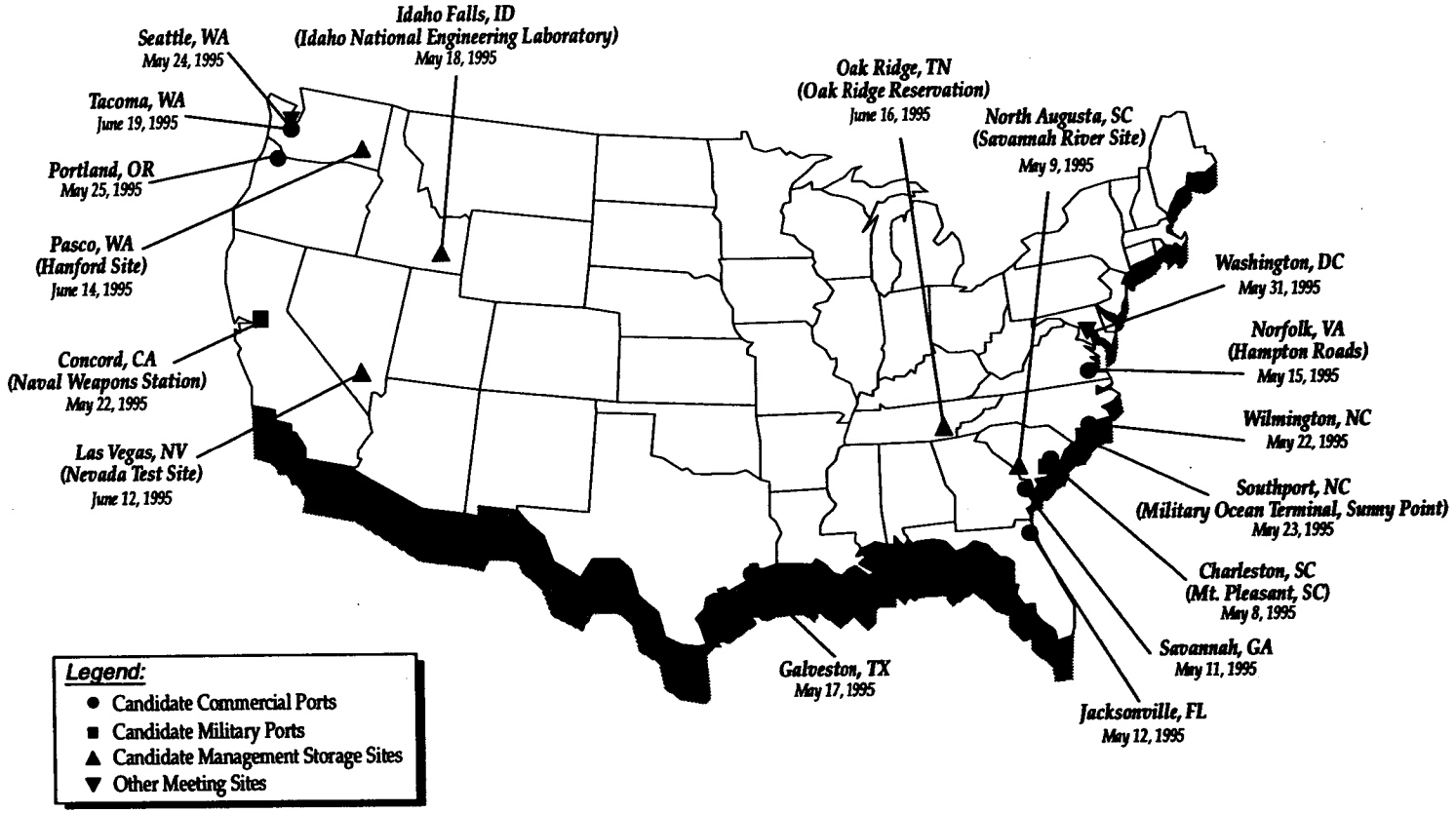

FIGURE 1. LOCATIONS AND DATES OF PUBLIC HEARINGS

Approximately 900 people attended the 17 public hearings. An interactive format was used at all hearings except in Tacoma, Washington. At the Tacoma public hearing, attendees expressed a desire for a more traditional approach in which people presented statements of up to five minutes, with little or no dialogue between commentors and DOE. In addition, the Tacoma hearing attendees requested that a verbatim transcript be made of the meeting. A copy of this transcript is included as Attachment 1 to Volume 3, Section 3.

1.4 *Environmental Protection Agency Rating of EIS*

The U.S. Environmental Protection Agency reviewed and rated the Draft EIS proposed action and each alternative as "lack of objections" (LO), which means that the EPA has not identified any potential environmental impacts requiring modifications to the proposal. A copy of the U.S. Environmental Protection Agency rating is included among the written comments in Section 2.

1.5 *Major Issues Raised By Commentors*

The public comments addressed a wide range of policy, economic, and technical issues. Of the approximately 6,000 written and oral comments received, few were critical of, or directed against, the analytical methods presented in the Draft EIS. The following is a summary characterizing the most frequently raised issues and the corresponding summary of DOE's responses. (In each case, a summary of DOE's response is provided in bold text following the summary of the public comment.) DOE's full response to each specific comment and issue are provided in Sections 2 and 3 of this Volume 3 of the EIS.

1.5.1 *Policy Considerations and Management Alternatives*

Numerous comments and questions were received concerning the need for a policy to manage foreign research reactor spent nuclear fuel. Commentors questioned the need to adopt a policy to manage spent nuclear fuel from allied countries or from countries that are considered sufficiently developed to manage their own spent nuclear fuel. Other commentors questioned the objectives of the stated U.S. nuclear weapons nonproliferation policy and the rationale for considering the proposed policy, pointing out that some of the allied nations under the proposed action do not pose a nuclear weapons proliferation risk. **The purpose of the proposed action is to support a U.S. nuclear weapons nonproliferation policy that seeks to reduce, and eventually eliminate, the use of highly-enriched (nuclear weapons-grade) uranium in civil programs worldwide. It is necessary to deal with spent nuclear fuel from the developed countries for several reasons.**

First, if the United States does not assist the developed countries with management of their spent nuclear fuel, the only mechanism available to them for spent nuclear fuel disposition would be to stay on or reconvert to use of HEU for fuel. Those who can accept the return of reprocessing wastes would disposition their spent nuclear fuel by having it reprocessed, and would recycle the remaining HEU. They would have to seek out sources of new HEU to make up for that burned, and to keep the enrichment level of the recycled uranium high enough to be of use. Since the United States could not ship additional HEU to them, they would likely resort to Russia or China as suppliers. Such actions could destroy all the progress made by the Reduced Enrichment for Research and Test Reactors program in attempting to eliminate the use of HEU in civil programs.

Second, many developed countries manufacture research reactors and sell them to developing countries. If, due to inaction by the United States, research reactors in the developed countries refuse to convert to LEU fuel, or switch back to the use of HEU fuel, their customers in the developing countries would likely insist on obtaining reactors that also use HEU fuel.

Third, inaction by the United States that leads research reactors in developed countries to shut down due to the absence of a timely means of dispositioning of their fuel is likely to lead, rightly or wrongly, to accusations that the United States is failing to comply with its obligations under the *Treaty on the Non-Proliferation of Nuclear Weapons* to assist nonnuclear weapons States with peaceful applications of nuclear energy.

Some commentors further contended that the nuclear weapons nonproliferation objectives do not apply to the foreign research reactor spent nuclear fuel that contains LEU, which is not weapons-grade material. **While it is true that LEU is not weapons-grade material, it is included in the policy because acceptance of LEU fuel would provide incentive for foreign research reactor operators to convert from HEU fuel to LEU fuel use. This incentive would be necessary to offset the considerable expense of conversion and the reductions in reactor capabilities and increased operating costs that generally accompany conversion to LEU fuel. Furthermore, by not accepting LEU, the United States would be penalizing the reactors that converted earlier under the Reduced Enrichment for Research and Test Reactors program, because those reactors are now generating only LEU spent nuclear fuel. Since there is currently no alternative available for disposition of LEU spent nuclear fuel, the reactors that supported the Reduced Enrichment for Research and Test Reactors program would be the first to shut down.**

Some commentors believe that the continued production and export of nuclear materials by the United States appears to be in conflict with the stated U.S. nuclear weapons nonproliferation objectives. Several stated their opposition to the continued sale of new fuel for foreign research reactors and a small number suggested that the United States cease production of all nuclear materials and develop alternative energy sources. **As a result of the passage of the Energy Policy Act of 1992, the United States is prohibited from selling HEU to foreign countries, except under special conditions. Since enactment of this prohibition, no new licenses for the export of HEU have been issued by the United States. The United States is continuing to sell LEU since it is not a nuclear weapons material . Furthermore, by making LEU available, the United States is providing further support for reactor operators who agree to convert from use of HEU. With respect to development of alternative energy sources, DOE currently has on-going programs that are seeking to develop and promote use of various alternative energy sources, such as wind, water, and solar.**

Representatives of foreign research reactor operators enumerated several reasons why the United States should accept and manage foreign research reactor spent nuclear fuel. This generally held position was the result of the expiration of the Off-Site Fuels Policy, under which the United States had accepted foreign research reactor spent nuclear fuel. As a result, many foreign research reactors are running out of storage space for their spent nuclear fuel. The operators assert that this may cause some research reactors to shut down, as these countries do not have, and did not plan for, long-term storage facilities. Foreign research reactor operators point out that the Dounreay, United Kingdom, reprocessing facilities can only handle HEU at this time. As a result, foreign research reactor operators would likely revert to reliance on HEU which would be contrary to U.S. nuclear weapons nonproliferation policy.

Many members of the public and State and local governments supported the objectives of the proposed action, but urged further consideration of Management Alternative 2, which is to facilitate overseas management of the spent nuclear fuel with security precautions to ensure that the spent nuclear fuel is not diverted into a nuclear weapons program. Some also supported the No Action Alternative under which the United States would neither accept nor assist with the management of foreign research reactor spent nuclear fuel. Several Non-Government Organizations also expressed support for the proposed policy and cited the need to eliminate the use and stockpiling of HEU. **DOE and the Department of State have considered these comments in selection of the preferred alternative. DOE's and the Department of State's reasons for not selecting the No Action Alternative or Management Alternative 2 are discussed in Section S.2.3 under the heading "Basis for the Preferred Alternative."**

Many commentors expressed concern about the cost to the United States of managing foreign research reactor spent nuclear fuel. Several opposed full subsidization of developed countries which they consider capable of managing their own spent nuclear fuel. Other commentors favored competitive pricing or charging the foreign research reactor operators a full-cost recovery fee for management of their spent nuclear fuel. Representatives of certain foreign research reactor operators expressed their willingness to pay a cost-based price, and stated that they are not asking U.S. taxpayers to subsidize their fuel cycles. A number of commentors asked for additional information in the Final EIS on life cycle costs, risks, and benefits. **DOE and the Department of State have evaluated several financing options in the EIS, ranging from fees from the research reactor operators that would pay all of the costs of the program to full subsidization of the program by DOE. One of these options would be for developed countries (which represent about 87 percent of the spent nuclear fuel total mass and about 78 percent of the spent nuclear fuel elements) to pay a competitive fee for U.S. management of their spent nuclear fuel. As part of this option, DOE would subsidize the costs of managing the spent nuclear fuel from developing countries. The United States does not believe the developing countries can afford to pay the expense for spent nuclear fuel management either in the United States or in the host country.**

1.5.2 Ultimate Disposition

The ultimate disposition of DOE-owned spent nuclear fuel was a widely expressed policy concern. Many commentors, concerned with a lack of long-term storage options, raised the issue of the availability, or lack thereof, of a permanent geologic repository. Many urged that, before the United States accepts any spent nuclear fuel from foreign research reactors, a permanent repository must be established in this country. Some comments promoted reprocessing as a means to stabilize and prepare the spent nuclear fuel for geologic disposal. **The Nuclear Waste Policy Act of 1982, as amended, establishes a framework for the ultimate disposition of spent nuclear fuel in the United States in a geologic repository. Any foreign research reactor spent nuclear fuel accepted into the United States under the alternatives considered in the EIS would be eligible for disposal in a geologic repository. Under authority of the Act, DOE is currently evaluating the feasibility of locating a geologic repository at Yucca Mountain in Nevada. In the meantime, however, DOE and the Department of State are seeking to stem the use of HEU in civil programs. Under the preferred alternative, if any foreign research reactor spent nuclear fuel were accepted into the United States, it would be treated and/or packaged, and the resulting materials placed in "road ready" storage pending availability of a geologic repository, if it were not otherwise disposed of in the meantime.**

1.5.3 Transportation and Emergency Response

Transportation and emergency preparedness were key concerns expressed during the public comment period. The majority of comments dealt with identification of parties responsible for responding to an accident involving transport of the foreign research reactor spent nuclear fuel, local emergency response capability, marine and ground transportation routing, shipment methods, procedures, and safety criteria. **State and local responders would be the first to respond to a transportation accident involving the foreign research reactor spent nuclear fuel shipments, as they would to any overland shipment involving hazardous materials. State, local and some Tribal governments have the basic capabilities and training that would be required in order to take initial measures to respond to a transportation accident by virtue of their preparation for responding to accidents involving hazardous materials, (i. e., assess the scene, administer emergency care, control the area, and call for a hazardous materials special team). DOE would develop emergency plans with the carrier, port officials, State, local, and Tribal officials and provide training courses for first responders to enhance their capabilities to respond appropriately in the unlikely event of an accident involving these spent nuclear fuel shipments. Technical assistance would also be provided to supplement existing State, Tribal, or local resources if any deficiencies are identified. In the event of an accident, if requested by a State, Tribal, or local government, DOE would send a radiological monitoring assistance team from the closest of eight DOE regional offices located across the country.**

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include communications and meetings between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders.

Many commentors were concerned about the safety of transportation casks. **Spent nuclear fuel is transported in "Type B" transportation casks that are designed and built to preclude release of radioactive material. They are subject to stringent design, fabrication, and operating requirements imposed by the Nuclear Regulatory Commission, and Department of Transportation in the United States and by the International Atomic Energy Agency for international shipments, to withstand very severe accidents without releasing their contents. These casks are required to be able to pass stringent tests, including a 30-foot drop onto an unyielding surface (such surfaces are engineered and built for these tests and do not exist in nature), a drop onto a steel post (a puncture test), and a high temperature fire test. As a result of their very robust design and construction, to date, no "Type B" spent nuclear fuel transportation cask has ever been punctured, nor has one ever released its radioactive contents, even as the result of an accident.**

Comments on land transportation dealt mostly with routing concerns and emergency response. Several commentors requested that DOE provide notification to local officials and private citizens of the specific routes that would be used for truck or rail shipments. Many commentors expressed concern regarding the risks associated with the use of specific routes (major interstates through population centers) and during adverse weather and traffic conditions. Some questioned the safety records of radioactive waste trucking firms and inquired about the safety requirements imposed on these firms and the contract arrangements that DOE would make with the shippers. **As part of the development of a Transportation**

Plan (in which State, Tribal and local officials in addition to DOE, the carrier, shippers agent, the port and other Federal agencies would be involved), highway routes would be identified using criteria developed by the Department of Transportation. These criteria include using the Interstate highway system, selecting the shortest route or time in travel from the U.S. port of entry to the closest Interstate, and using by-passes or beltways to avoid major population centers. States and Tribes may designate alternate routes that are equivalent to the Interstate system in consultation with local officials, and approved by the U.S. Department of Transportation. Rail routing criteria used by the Department include avoiding interchanges and using the best available track. NRC approval of either rail or truck routes selected for use would be required. Official notification of the shipments would be provided to the Governor of each State and Governors or Chairpersons of Indian tribes along the route at least seven days in advance of shipment. In addition, DOE would use a satellite-based tracking system, to notify Tribes and States of the pending shipment and to continuously track shipment progress. In order to maintain security, Governors and Tribal leaders are required by the NRC to only notify State and local officials who would need to know about the shipment, usually emergency management or law enforcement officials. With respect to the safety record of potential trucking firms, DOE has developed and implemented a mandatory Motor Carrier Evaluation Program with twelve evaluation criteria. Under the Motor Carrier Evaluation Program criteria, trucking firms with poor safety records would be excluded from transporting the spent nuclear fuel. The Motor Carrier Evaluation Program would be invoked as one of the requirements in DOE's foreign research reactor spent nuclear fuel acceptance contract. Other requirements would be discussed during the development of the Transportation Plan with the appropriate State, Tribal and local officials.

Many commentors requested coordination with emergency responders in route so that localities can be prepared in the unlikely case of an accident. Many State, Tribal, and local representatives, as well as private citizens, commented that communities along shipping routes and at port and management site locations may have inadequate capabilities to respond to emergencies involving radioactive release. Many expressed the need for DOE funding for training equipment, monitoring for local emergency responders, transportation plans, and real-time shipment tracking that would be accessible to emergency response personnel. A number of commentors suggested that the Final EIS should evaluate the potential impact on local services due to the financial burden associated with emergency response preparedness. **DOE is committed to working with State, Tribal, and local governments to ensure that they are prepared to carry out their responsibilities in the unlikely event of an accident involving shipment of foreign research reactor spent nuclear fuel. Details of emergency preparedness, security, and coordination of DOE with local emergency response authorities would be contained in the Transportation Plan, which would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State, Tribal and local officials. Any additional training or equipment needed would be provided as part of the planning process. In addition to direct Federal assistance to State, Tribal, and local governments for maintaining emergency response programs, there are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advice and assistance to the State, Tribal, and local agencies who might be involved in responding to a radiological incident.**

Another group of commentors expressed concern regarding risks of terrorist activities. Several noted that terrorist activity is a concern of all countries, including the United States, citing the

Oklahoma City bombing incident as an example. Commentors also stated that transporting nuclear material overseas to the United States would unnecessarily expose shipments to an increased possibility of terrorist threat. **In response to these concerns, Section D.5.9 was added to Appendix D of the EIS to specifically address terrorism and sabotage. This section concludes that while the risk of certain terrorist and sabotage attempts cannot be precluded, proper security measures would greatly reduce the risk. All shipments of foreign research reactor spent nuclear fuel would be conducted meeting, or exceeding, all the relevant security requirements in the Code of Federal Regulations. DOE would ensure through the spent nuclear fuel acceptance contracts with the reactor operators that proper security is provided at a port or in transit, based on NRC requirements. Often State or local law enforcement personnel would be employed by the carrier to satisfy these security requirements, which include having armed escorts on board or near the shipment when it is in highly populated areas or at the port in the U.S. In the case of military ports, a high level of security is inherently in place.**

With regard to marine transport, many commentors stated a preference for using special purpose, chartered or military ships rather than regularly-scheduled commercial liners to ship spent nuclear fuel. **The use of commercial liners, chartered ships, and purpose-built ships was considered for the marine transport of the spent nuclear fuel. The analyses in the EIS indicate that the impacts associated with the use of any of the ships evaluated would be small. The impacts of using military ships were not analyzed in the EIS because DOE believes that the added security provided by such ships would not be required to ensure safe transport. DOE's preferred alternative includes the use of military ports as points of entry to the United States.** Independent inspections by State, local, and/or public interest groups prior to and during shipments were suggested by some commentors. **DOE would encourage inspections by authorized State agencies for both radiological and vehicle inspections prior to shipment and after arrival at the management site. These inspections would be coordinated with the States through the transportation planning process.**

1.5.4 Port Selection Criteria and Activities

Many commentors, predominately those from communities at or near potential ports of entry, questioned DOE's port selection process and the methods for application of the selection criteria, especially with respect to populations in and around candidate ports. Particular concerns were that longshoremen may not be adequately trained to handle radioactive materials or that they could be exposed to high levels of radioactivity. As an alternative, military ports were supported as having the necessary experience in handling nuclear material and being more secure. **Section 3151 of Public Law 103-160 (the National Defense Authorization Act for the fiscal year 1994), requires that "the Secretary of Energy shall, if economically feasible and to the maximum extent practicable, provide for the receipt of spent nuclear fuel... at a port of entry in the United States which... had the lowest human population in the area surrounding the port of entry...." While this Act was written specifically to apply only to the receipt and storage of spent nuclear fuel at the Savannah River Site, DOE elected to apply this criterion, among others, to the maximum extent practicable, in identifying all suitable ports of entry for potential receipt of foreign research reactor spent nuclear fuel. In application of the population criterion, DOE considered both the population nearest the potential ports of entry analyzed, and the total population along the transportation routes. Analysis of the list of candidate ports against this criterion did not identify any port as a clear choice. Therefore, DOE selected ports that best**

met all of the criteria discussed in Appendix D to the EIS (e.g., appropriate experience, favorable transit from open ocean, appropriate facilities, access to intermodal transportation, and human population). Both commercial and military ports were evaluated. Based on the results of this analysis, DOE believes that foreign research reactor spent nuclear fuel could be received safely via commercial ports, as it has been in the past. Nevertheless, DOE agrees that the use of military ports would provide additional security over that which would be available in a commercial port. Furthermore, although DOE has committed to provide assistance to State and local authorities to ensure that the longshoremen (or other workers) in a commercial port would have any additional training that might be required to allow them to safely handle the spent nuclear fuel, DOE considers that the personnel at a military ordnance facility would be particularly qualified to handle the spent nuclear fuel by virtue of their training and experience performing their military function. Considerations of all these factors led to designation of the Charleston Naval Weapons Station and Concord Naval Weapons Station as the preferred ports of entry.

DOE notes that, although the maximum allowable radiation dose rate is 200 mrem per hour, this limit is applicable at the surface of the transportation cask, which would be inside of the container. The maximum radiation dose rate limit to those that would be near the container, such as longshoremen, is 10 mrem per hour at a distance of 2 meters (6.6 ft) from the surface of the container. The actual total dose that a longshoreman would get handling a cask would be quite small due to the fact that a handler would not be present at the surface of the container for long, and the total time near the cask would be quite short. The additional barrier imposed by the standard shipping container would also prevent the longshoremen from being in the near vicinity of the cask. The analysis in the EIS indicates that both the dose and dose rate for the port workers would be low.

Concerns over possible storage of spent nuclear fuel at the port of entry were raised by a number of commentors. **DOE's goal would be to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible. Under normal circumstances, the foreign research reactor spent nuclear fuel would remain at the port for only a few hours (e.g., 2 to 4 hours) and no more than 24 hours. In the very unlikely event that the spent nuclear fuel could not be moved within 24 hours, special provisions to move the fuel to a secure area at the port would be made. Part of the overall plan and agreements with the Department of Defense would include these special provisions.**

Several commentors pointed to recent increases in marine traffic and industrial congestion in the port areas and questioned whether the selection criteria would be affected by these factors. Some cited the need to consider site-specific factors such as hurricanes, severe winds, seismic activity, extreme weather conditions, and sinkholes. **In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay. In order to further assure safety, the U.S. Coast Guard would establish a moving zone of exclusion, which would keep all vessels away from the ship bringing the spent nuclear fuel into port. Coast Guard escort boats would accompany the ship to port. As for accidents, the potential consequences of a port or land transport accident due to an earthquake are represented and**

bounded by the potential port and land transportation accidents that are assessed in the EIS. The potential consequences of a port or land transport accident due to an earthquake are represented (and bounded) by the potential port and land transport accidents that are assessed in the EIS. Local hazards, such as earthquakes, volcanoes, and mud slides could be accident initiators; however, they would not increase the consequences of the accident, which were found to be low. Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that analyzed for accidents such as challenges to the transportation cask integrity that could be caused by casks falling from a bridge or down an embankment. These kinds of accidents are within the design standards developed by the NRC and by which cask designs are evaluated. The NRC certifies the designs that contain the appropriate level of safety to protect workers, the public, and the environment from the radioactive material being transported. Analysis of the potential impacts associated with the possible existence of sinkholes along potential rail routes was added to the Final EIS in response to public comment.

1.5.5 Economic Impacts to Candidate Port and Site Communities

Potential economic impacts on affected port and site communities were the subject of many comments. Of particular concern were the socioeconomic impacts to a community in the event of an accidental release of radiation. Examples of potential impacts cited by commentors include disruptions in normal commerce, loss of business, loss of tourism, devaluation of property, and closure of ports and highway routes. Several port authorities were concerned about the potential for declining business due to the perceived stigma associated with handling nuclear waste materials in their ports, while others viewed handling these shipments positively. The costs of emergency response, cleanup, health care, and potential economic losses associated with accidents or releases were key concerns of several State, Tribal, and local officials. **The risk associated with shipments of foreign research reactor spent nuclear fuel through any of the ports identified would be less than the risk associated with the handling of other hazardous cargoes due to the rigid criteria established for spent nuclear fuel transportation casks. In fact, no adverse impacts have been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States. Historically, shipping foreign research reactor spent nuclear fuel through port has not created a stigma or had an adverse economic impact on business, major industries, tourism, or future business development at ports. DOE does not believe that actions such as permanent road closures would be required for the safe and uneventful transportation of foreign research reactor spent nuclear fuel. Costs of emergency response are covered under insurance that is required of hazardous material carriers. If that level of coverage is exceeded, Price-Anderson and other Federal provisions would cover costs.**

1.5.6 Health Effects and Environmental Risks

Many commentors raised concerns about health effects and environmental risks that could result from accidents during marine transport, handling operations at ports, ground transportation, and interim management. Of particular concern were the effects of possible radioactive releases into the ocean and rivers, and on highways and railroads; the impacts to fish, wildlife, ecosystems, and drinking water; and the possibility of an increased risk to workers and the public of cancer and genetic defects. **Human health and safety were primary considerations during the evaluation**

of environmental effects for the proposed alternatives. Conservative estimates of radiological and nonradiological impacts indicate that risks to the population and workers would be low. The analysis in the EIS indicates that the risks associated with an accident at sea or a port accident would be low. The impacts of incident-free receipt, handling, and transportation of foreign research reactor spent nuclear fuel would also be extremely low. In over 40 years of spent nuclear fuel transportation, no "Type B" spent nuclear fuel transportation cask has ever been punctured or released any of its radioactive material contents. DOE believes that spent nuclear fuel transportation casks passing through any of the potential ports of entry or any other part of the country would be highly unlikely (i.e., less than a 1 in 10 million chance) to release their contents or adversely affect air or water quality.

Several commentors questioned the results of the risk analyses in the EIS, suggesting that DOE may have underestimated the risk potential for accidents, radioactive release(s), and exposures to both workers and the public. **DOE believes that the analyses of risk to people during marine transport and for those who live near potential ports of entry, along transportation routes, and near management sites are conservative (i.e., are likely to overstate the actual risks). These estimates were generated using standard computer codes (e.g., RADTRAN) that have been adopted and used by NRC and the Department of Transportation for transportation calculations for over 19 years. These computer codes are available for public review.**

Some commentors expressed concern about potential health impacts resulting from a cask sinking in deep waters. Many challenged the applicability of the severe accident tests applied to the casks (e.g., crash, fire, drop, immersion), stating that the conditions of real-life accidents were of greater magnitude than the conditions in the tests. For example, commentors cited fires that were alleged to have burned longer and hotter than those used to test the transportation cask and pointed out that the water in Puget Sound is deeper than the cask recovery depth cited in the Draft EIS. **The EIS presents an evaluation of the consequences of accident scenarios that would result in the sinking of a spent nuclear fuel transportation cask on the continental shelf (water depth of about 200 meters), and in deep ocean (water depth of more than 200 meters). In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal or inland waters, it would be recovered, even from the deepest portions of the Puget Sound, which reaches depths of 305 meters (1,000 feet). The sequence of testing scenarios (i.e., cask drop onto unyielding surface, cask drop on a steel post [puncture], and cask fire) is required by the Nuclear Regulatory Commission as part of the certification of "Type B" spent nuclear fuel transportation casks. These tests conservatively represent a wide range of accident conditions that could occur during transport. The test results indicate that if such accidents were to occur, the cask most likely would not fail, and would not lead to a loss of containment. The cask drop and puncture tests evaluate the resulting impact on the most vulnerable orientation of the cask, and on an unyielding surface, which would be unlikely to occur while the cask was being transported in an International Standards Organization (ISO) approved container. In reference to shipboard fires, the duration of a fire is directly related to the amount of combustibles carried on board. The number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicate that of 1,073 ship collisions in port worldwide, only 11 led to fires, and of those, only 5 caused extensive damage, with only 1 actually causing buckling of structures.**

In regard to the impact a ship fire might have on a spent nuclear fuel transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to

different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship fire's intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it would be almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of foreign research reactor spent nuclear fuel. The probability of reaching such a temperature is discussed in Attachment D5 to Appendix D of the EIS.

1.5.7 Public Involvement Process

A number of comments dealt with DOE's policies and procedures for conducting the public hearings, the duration of the public comment period, the degree to which comments would be considered by DOE in the decision making process, and general distrust of DOE. Several commentors stated that there was insufficient notice and advertising for the public hearings. Many commentors stated the need for additional time to comment on the Draft EIS. Commentors at the heavily-attended West Coast port hearings tended to favor the more traditional, formal public hearing format, and strongly opposed the use of notetakers to summarize hearing issues. In the Tacoma area, commentors urged DOE to hold another hearing to tape record their comments for the record, without allowing for dialogue with DOE representatives. Many State and local officials requested that DOE provide better advance notification to communities that are being considered as candidate ports or management sites so that they have more time to review the Draft EIS. Many individuals stated they had not received the Draft EIS in a timely manner, and consequently, had little time to review and comment. Several commentors expressed a desire for increased DOE interaction with local officials and more community participation in DOE's planning and decision making processes.

Notice of the availability of the Draft EIS for public review and comment was published in the *Federal Register* (60 FR 19899, April 21, 1995). This notice advised concerned parties, including State, Tribal, and local authorities, of the availability of the Draft EIS and the dates and locations of the public hearings on the Draft EIS. In addition, advertisements of the public hearings were placed in local papers prior to their occurrence. The public hearing format provided an opportunity for interaction between DOE and the public, thus serving to facilitate communication.

In response to public concerns of insufficient time to review the Draft EIS, DOE extended the deadline for submission of written public comments from June 20 to July 20, 1995. DOE considers that this 90-day period was sufficient for public comment. All oral comments presented at each hearing were summarized and have been addressed along with the written comments in Section 3 of this Volume 3 of the Final EIS. DOE considers that these actions have provided ample opportunity for the public to comment. Issues raised by the public during the comment period were considered in selection of the preferred alternative for this proposed action. All comments, written and oral, are part of the public record.

SECTION 2.1
FEDERAL GOVERNMENT

DRAFT

8000
05C:KCY:da

Department of Energy
Attn: Charles R. Head
Office of Spent Fuel Management (EM-37)
Office of Environmental Management
United States Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Mr. Charles Head;

Thank you for the opportunity to comment on the Draft Environmental Impact Statement (DEIS) Concerning Foreign Research Reactor Spent Nuclear Fuel issued 11 April 1995. We offer the following comments on Appendix D, section D.2.1.6 of the DEIS which deals specifically with the Naval Weapons Station Concord.

We feel more discussion of scheduling would be useful. Department of Defense (DOD) explosives safety regulations prohibit concurrent non-explosive operations within safe zones known as explosive safety quantity distances. As a non-explosive operation, there will be no concurrent operations between DOE's project and DOD's explosive transshipment mission. That needs to be stated clearly in the EIS. We also note that it may not always be possible to avoid conflicting activities through scheduling. Unscheduled activities or activities with little advance notice involving our military mission will require re-scheduling of your vessel or routing to another port. A clear understanding of the relative priority of DOE's project with respect to military necessity should be reflected in the EIS. 35-1 35-2

Our continuing ability to perform our DOD operational mission is paramount . We are concerned about how changes to our operational environment, which will occur with the performance of this DOE project at our facility, will interfere with our DOD business operations and schedules. Socio/economic effects, such as public protests, may increase operations costs or otherwise affect our ability to perform our operational mission. In addition, there are press reports of difficulties with the State of Idaho accepting spent fuel. There must be a contingency plan if the intended fuel management site is suddenly unavailable to accept the offloaded waste. Processes to mitigate or eliminate these types of adverse operational conditions should be addressed in the EIS, and must be incorporated into any future memorandums of understanding. 35-3

There are several other comments which address editing details in section D. 2.1.6. on pages D-60 and D-62.

Response to Comment No. 35-1

DOE understands that Concord NWS's primary mission is to support the military through handling munitions and that no handling of the foreign research reactor spent nuclear fuel could occur concurrently with handling explosives. These facts have been incorporated into the EIS.

Response to Comment No. 35-2

DOE understands that scheduling conflicts could arise unexpectedly and that they would be resolved in favor of the port's primary mission of supporting the military.

Response to Comment No. 35-3

Emergency preparedness, security, and coordination of DOE with local emergency response authorities that would be involved with the acceptance and transportation of foreign research reactor spent nuclear fuel will be discussed in detail in the DOE Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

COMMENTOR NO. 35: NAVAL WEAPONS STATION CONCORD (CONT'D.)

a. Naval Weapons Station Concord is not a general purpose and routinely available shipping "port" in the publicly accepted use of the term.. Whenever this station is being directly referred to, please use WPNSTA Concord as a short term rather than "port". 35-4

b. Change the last sentence of the first paragraph on page D-60 to read: "Naval Weapons Station Concord is aligned under the Pacific Division of the Naval Ordnance Center. The Pacific Division is located at Seal Beach, CA and the Naval Ordnance Center is located at Indian Head, MD." 35-5

c. Concord's floating crane is 112 ton, not 110. 35-6

d. The modernization program is for $57 million for completion in 1999, not $50 M for completion in 1997. 35-7

e. Pier 3 load bearing capacity will not change. The upgrade to the pier adds gantry crane rails outside of the existing pier structures and will not change the working area pier load bearing capacity. 35-8

f. The facility in Hawthorne, Nevada, referred to as the "Naval Ordnance" facility is really the Army's and is called the "Hawthorne Army Ammunition Depot" which reports to the Army's Industrial Operations Command, Rock Island, Illinois. 35-9

g. There are several small inaccuracies in the first sentence in the "Other Pertinent Information" paragraph which should be rewritten to read: "Since it is a military facility and an explosives operating area, the entire pier operations waterfront is surrounded by barbed wire fencing with access through military posted gates." 35-10

h. Also in the first "Other Pertinent Information" paragraph, "The existing State highway through the site" was closed off to general public access in February 1995, and the correct term is "the town of Clyde", not "the hamlet of Clydes". 35-11

i. The Coast Guard facility on site does provide some explosive oversight services, however they do not "provide small craft security around the piers during loading and unloading" for explosive operations. If that would be required by DOE for your operations, that would have to be separately addressed with the Coast Guard. 35-12

Again, I appreciate the opportunity to comment on the DEIS. We are prepared to discuss the details of a Memorandum of Understanding when and if that becomes appropriate. As DOE moves through it's decision process, please forward to us any future documents on this project which mentions or refers to the Naval Weapons Station.

Sincerely,

R. B. LANNING
Captain, U. S. Navy
Commanding Officer

Copy to:
PACDIV
NAVORDCEN

RESPONSE TO COMMENT
COMMENTOR NO. 35: NAVAL WEAPONS STATION CONCORD (CONT'D.)

Response to Comment No. 35-4

This correction has been made in Appendix D, Section D.2.1.6 of the EIS.

Response to Comment No. 35-5

This correction has been made in Appendix D, Section D.2.1.6 of the EIS.

Response to Comment No. 35-6

This correction has been made in Appendix D, Section D.2.1.6 of the EIS.

Response to Comment No. 35-7

This correction has been made in Appendix D, Section D.2.1.6 of the EIS.

Response to Comment No. 35-8

This correction has been made in Appendix D, Section D.2.1.6 of the EIS.

Response to Comment No. 35-9

This correction has been made in Appendix D, Section D.2.1.6 of the EIS.

Response to Comment No. 35-10

This correction has been made in Appendix D, Section D.2.1.6 of the EIS.

Response to Comment No. 35-11

This correction has been made in Appendix D, Section D.2.1.6 of the EIS.

Response to Comment No. 35-12

This correction has been made in Appendix D, Section D.2.1.6 of the EIS

COMMENTOR NO. 52: U.S. REPRESENTATIVE ELIZABETH FURSE

Congress of the United States
House of Representatives
Washington, DC 20515-3701
Statement of Representative Elizabeth Furse
Public Hearing on the Acceptance of Foreign Spent Nuclear Fuel
May 25, 1995

No one wants a garbage dump in their back yard. Yet the average American spews out 4.5 pounds of garbage a day. We all want that garbage to go "somewhere else" -- out of sight, out of mind.

That's especially true of the deadly nuclear "garbage" that we and other nations continue to produce every day. In our haste to sell nuclear technology abroad and with concern that spent nuclear fuel could be reconfigured to produce weapons grade plutonium, in the 1950's the United States agreed to take back nuclear waste. We have become the global garbage dump.

But let's just hold on a moment. The acceptance and storage of foreign nuclear waste without first developing a well thought out national waste policy and a long-term storage facility is a bit like diving into a swimming pool without first checking that it's filled with water. You might be just fine or you might be dead.

In addition to deciding whether to accept foreign spent fuel, I also have concerns about the conditions under which such waste is brought into our country. The Military Production Network has identified three criteria that I support for the movement and storage of spent nuclear fuel:

1) The area through which the fuel is transported and the area where the fuel is to be stored needs to be sparsely populated.

2) The port where the fuel is off-loaded needs to be close to the fuel storage site.

3) The storage site must be the most appropriate facility for receiving and storing the spent fuel for long term storage.

The Port of Portland and the potential receiving sites of both Hanford and Idaho National Engineering Laboratory fail to qualify on all three counts. 52-1

Additionally, no spent nuclear fuel from any source, domestic or foreign, should be received through any port without a nuclear waste policy. This policy should address safety training for all workers who have to handle or come in contact with the waste. Communities and local disaster agencies along the shipment route should also receive adequate notification of shipments and assistance with emergency preparedness, including the development of "worst case" disaster plans. Lastly, the receiving facility needs to be designed for long-term storage; we need to be able to move it, treat it (if possible) and store it, contained, at a site secure from terrorist attack. 52-2 52-3

Let us look before we leap.

PRINTED ON RECYCLED PAPER

RESPONSE TO COMMENT
COMMENTOR NO. 52: U.S. REPRESENTATIVE ELIZABETH FURSE

Response to Comment No. 52-1

DOE agrees that the three listed attributes are important in the movement and storage of spent nuclear fuel. However, all of the conditions associated with transportation and storage of this material must be considered as a whole when evaluating a proposed action and some trade-offs need to be made at times. One of the criteria for port selection (Criterion 5; Appendix D, Section D.1.9.5 of the EIS) considers population in port and along the route to the management site. Portland is considered a medium-population density port and is therefore acceptable from a population stand point. In addition, Portland's experience in handling containers and the low integrated population on the route to both the Hanford Site and Idaho National Engineering Laboratory were factors in its inclusion as an acceptable port of entry. Both the Hanford Site and Idaho National Engineering Laboratory are in sparsely populated areas. Therefore, DOE considers the commentor's first criterion to be met. Portland easily meets the second criterion, distance to the management sites, being among the closest ports to both the Idaho National Engineering Laboratory and the Hanford Site. As to the appropriateness of the management sites to handle the foreign research reactor spent nuclear fuel, both the Idaho National Engineering Laboratory and the Hanford Site have extensive experience with handling and storing spent nuclear fuel, so DOE considers that both management sites meet the commentor's third criterion.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 52-2

The nuclear waste policy of the United States is specified in the Nuclear Waste Policy Act of 1982, as amended. DOE agrees that full implementation of this policy will require much future effort. Nevertheless, in the meantime, DOE and the Department of State consider that action must be taken to address the potential for nuclear weapons proliferation stemming from the U.S.-origin HEU in spent nuclear fuel from foreign research reactors.

COMMENTOR NO. 52:
U.S. REPRESENTATIVE ELIZABETH FURSE (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 52:
U.S. REPRESENTATIVE ELIZABETH FURSE (CONT'D.)

Response to Comment No. 52-3

According to U. S. regulations, all workers who handle or come in contact with spent nuclear fuel are required to receive appropriate prior training. Details of emergency preparedness and security measures for port activities, as well as ground transportation, would be contained in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

DOE considers that the foreign research reactor spent nuclear fuel, if managed in the United States, would be movable, recoverable and secure while in storage during the 40-year period covered by this EIS.

Commentor No. 60:
Deutch, John - Deputy Secretary of Defense

THE DEPUTY SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301-1000

8 April 1994

The Honorable Hazel O'Leary
Secretary of Energy
Washington, D.C. 20585

Dear Madam Secretary:

I am writing you to provide the Department of Defense's views regarding the proposed take back of the U.S. origin highly enriched uranium (HEU) spent research reactor fuel.

The Department of Defense fully supports your efforts to take back a limited number of spent fuel elements on an urgent basis. We agree with your assessment that return of these spent fuel elements is important to the future success of the Reduced Enrichment for Research and Test Reactors program. The return of research reactor spent fuel is an important part of the Administration's nonproliferation efforts and its goal of minimizing the civil use of highly enriched uranium.

The price charged to research reactor operators is critical to the success of this endeavor. We share the Department of State's view that the price should not be so high as to discourage foreign reactor operators from returning this HEU to the United States. Too high a price would seriously damage the Administration's nonproliferation efforts.

I appreciate the importance of assuming that we are not subsidizing foreign use of HEU. On the other hand, for over fifteen years, the value of the nonproliferation efforts of this program have been widely recognized. I am aware of your recent decision to set 60-1

07598

Response to Comment
Commentor No. 60:
Deutch, John - Deputy Secretary of Defense

Response to Comment No. 60-1

The Department of Defense's position on competitive fees is noted. Alternative financing arrangements are discussed in Section 2.2.2.3 of the EIS.

COMMENTOR NO. 60: DEUTCH, JOHN
DEPUTY SECRETARY OF DEFENSE (CONT'D.)

$3000 per kilogram as the charge for this return. The Department of Defense joins the Department of State to urge strongly the Department of Energy charge no more than $2000 per kilogram. The expenses are small compared to the national security benefits. 60-1 (Cont'd.)

cc: Secretary of State
UnderSecretary of Energy
UnderSecretary of Defense for Policy

RESPONSE TO COMMENT
COMMENTOR NO. 60: DEUTCH, JOHN
DEPUTY SECRETARY OF DEFENSE (CONT'D.)

COMMENTOR NO. 131: U.S. REPRESENTATIVE GEORGE MILLER

GEORGE MILLER
7TH DISTRICT, CALIFORNIA

Congress of the United States
House of Representatives
Washington, DC 20515-0507

June 5, 1995

Honorable Hazel R. O'Leary
Secretary
Department of Energy
1000 Independence Avenue SW
Washington, D.C. 20585

Dear Secretary O'Leary:

As you consider the Department of Energy's proposal to ship spent nuclear fuel rods through Concord Naval Weapons Station (CNWS) in Concord, California, please consider the attached comments I have prepared on the Draft Environmental Impact Statement.

Sincerely,

George Miller

George Miller
Member of Congress
7th District, California

Attachment

RESPONSE TO COMMENT COMMENTOR NO. 131: U.S. REPRESENTATIVE GEORGE MILLER

COMMENTOR NO. 131: U.S. REPRESENTATIVE GEORGE MILLER (CONT'D.)

GEORGE MILLER
[illegible]

Congress of the United States
House of Representatives
Washington, DC 20515-0507

[illegible]

UNITED STATES CONGRESSMAN GEORGE MILLER
Comments on the Draft Environmental Impact Statement
"Proposed Nuclear Weapons Nonproliferation Policy
Concerning Foreign Research Reactor Spent Fuel"
June 2, 1995

Over the past four decades, the United States has entered into bilateral agreements with a large number of foreign nations concerning the long-term disposal of radioactive wastes. For most of this period, global geo-political instabilities made the storage of nuclear wastes a delicate issue because of the vulnerability of storage areas to potential saboteurs and those who might divert the waste to the illegal production of nuclear weapons.

Since the mid-1960s, our government has provided technological aid to foreign governments concerning their nuclear programs, agreeing to accept spent fuels for long-term storage in the United States as an incentive to persuade these nations not to develop nuclear programs that could promote proliferation of weapons and weapons-grade materials. As a consequence of the pledges made by our government in pursuit of non-proliferation goals, these nations have not developed domestic capabilities for storing nuclear wastes on site. Indeed, several of these nations have enacted laws specifically preventing long-term nuclear waste storage on their own territory.

At the same time, it must be noted that there has been, and remains, substantial controversy over the siting of long-term nuclear storage right here in the United States. Indeed, the Department of Energy is unable to identify, within this Draft Environmental Impact Statement, the siting and conditions for the permanent storage of spent nuclear fuel once it is returned to the United States under the terms of the non-proliferation program. Thus, in many respects, domestic U.S. storage is as controversial and fraught with uncertainties as overseas storage would be. 131-1

Since this program began, there have been dramatic and unforeseen changes in the geo-political alignment affecting international alliances, security agreements, and the role of the United Nations. The underlying rationale for transporting this highly radioactive material over long distances on its way to the United States, and then to uncertain storage sites inside the United States, warrants a full scale review in light of the alteration of the international scene. Some nations that were thought vulnerable or incapable of retaining some of all of the waste generated within their region may have greater storage capabilities today. Some nations are showing greater interest in developing their own storage facilities which, supplemented by U.N. or other international enforcement teams, might be a rational and less costly method for ensuring the stability and security of the materials. In addition, were the storage proposal outlined in the DEIS to proceed, greater efforts should be made to secure the financial participation of other nations in assisting with the cost of the transportation and disposal plan. 131-2 131-3

RESPONSE TO COMMENT COMMENTOR NO. 131: U.S. REPRESENTATIVE GEORGE MILLER (CONT'D.)

Response to Comment No. 131-1

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS). As stated in Sections 2.1 and 4.2.7 of the EIS, if a geologic repository was not prepared to accept the foreign research reactor spent nuclear fuel or the high level radioactive waste form resulting from the chemical separation or other processing of such spent nuclear fuel, by the end of the 40 year program period, DOE would continue to manage the spent nuclear fuel, or the high level waste forms, until such a geologic repository were available.

The storage of this material at DOE facilities offers advantages in safety and security over storage in most foreign nations, especially developing countries. (Sections 2.3 and 4.4.1 of the EIS.)

Response to Comment No. 131-2

DOE and the Department of State maintain a continuing awareness of the threat of nuclear weapons proliferation and of the individual capabilities of the various countries currently holding foreign research reactor spent nuclear fuel to properly care for it. Despite the demise of the Soviet Union, increasing technical capabilities of third world nations, coupled with international tensions, have led DOE and Department of State to conclude that the threat of nuclear weapons proliferation has not diminished. The option of storing foreign research reactor spent nuclear fuel overseas is described in the EIS under Management Alternative 2, Subalternative 1a (Section 2.3 of the EIS). Environmental impacts that would result from implementation of such an alternative are discussed in Section 4.4.1 of the EIS.

Response to Comment No. 131-3

As discussed in Section 2.2.1.2 and 2.2.2.3 of the EIS, several financing options have been considered, ranging from collection of fees from the research reactor operators that would pay all of the costs of the program to full subsidization of the program by DOE. A compromise between these extremes would be for developed countries to be charged a competitive fee to accept and manage their spent nuclear fuel. While it would be beneficial for U.S. taxpayers to secure assistance from developing countries and financial assistance above the level of a competitive fee from developed countries, it is unclear if this can be achieved. In the case of the developed countries (which represent about 78 percent of the spent nuclear fuel elements and about 87 percent of spent nuclear fuel by total mass), there is significant opposition to charging a competitive fee based on current costs as opposed to the costs that prevailed at the time the most recent spent nuclear fuel retrieval programs ended. The U.S. acceptance of the charges for developing countries is a policy decision amongst the agencies involved in the program.

COMMENTOR NO. 131: U.S. REPRESENTATIVE GEORGE MILLER (CONT'D.)

Statement of Congressman George Miller
June 2, 1995
Page Two

The draft EIS anticipates bringing 186 casks to the West Coast (as compared to 651 to the East Coast) via ships for transportation to and storage at several temporary waste sites. One of the proposed ports of entry would be the Concord Naval Weapons Station (CNWS) located in Concord, California. Such a proposal to bring highly radioactive materials into a community, if even for a brief time and under highly controlled circumstances, causes Statement of understandable concern. That concern ripens into anxiety when affected communities and elected officials are not informed in advance that their region is being considered as a recipient of the materials, as occurred in this case with respect to the city of Concord, the County of Contra Costa, other jurisdictions and local officials. 131-4

I strongly encourage representatives of the Department of Energy to participate in public meetings with local elected officials and other residents of these affected communities to address their concerns and respond to their questions about the proposal. In addition, I request an extension of the formal comment period beyond June 22, 1995, in order to assure that all local views on this proposal can be expressed. 131-5

Notification of Local Emergency Service Offices. My concern is mitigated by the assurance that the spent nuclear materials would remain in CNWS for a very brief time – on the order of 24 hours. Clearly, there is no facility at CNWS that would be appropriate to serve as a storage facility on either a long or short term basis. Local officials, including the emergency response team, be alerted *prior* to any shipment of radioactive materials through CNWS and that county personnel be fully briefed on the proposed movement of the materials so as to maximize coordinated planning with the base in order to assure public safety. Local officials should be assured that any emergency costs associated with the trans-shipment of the casks, including any costs stemming from any accidents, will be fully assumed by the Department of Energy. 131-6

Review of Seismic Safety Concerns. The DEIS notes (at 3-28) that CNWS "is located on the edge of a very high seismic zone," but little discussion of the seismic safety issue is discussed. While the likelihood of an earthquake during an unloading procedure may be minimal, potential damage to transportation connections could result in the materials remaining longer at CNWS than initially planned. 131-7

Impacts on San Francisco Bay. The DEIS is virtually silent on the issue of potential risks to shipping and the ecology of San Francisco Bay. Given the uncertain tides, changing weather, frequent obstructions and heavy traffic, the Department should give far greater consideration to implications of bringing highly radioactive materials into a virtually closed Bay in proximity to millions of people. At a minimum, any ships containing casks must be accompanied from the Golden Gate to CNWS by tugs piloted by those with detailed knowledge of the Bay and the Sacramento River. 131-8

RESPONSE TO COMMENT
COMMENTOR NO. 131: U.S. REPRESENTATIVE GEORGE MILLER (CONT'D.)

Response to Comment No. 131-4

Potentially affected communities and officials were informed in advance that their region is being considered. The specific mechanism used to inform potentially affected communities and elected officials in advance is to announce the availability of and widely distribute the draft EIS, hold a public comment period to give the public time to familiarize themselves with the proposed action and comment on it, and to hold public hearings to further publicize the proposed action and provide opportunity for public comment. For this EIS, seventeen public hearings were held. A ninety day public comment period was provided, well in excess of the 45 days required by the applicable regulation. All of these actions precede the issuance of the final EIS, which is required by regulation to precede any decision on implementation of a proposed action by at least 30 days.

Response to Comment No. 131-5

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995.

Response to Comment No. 131-6

As to the request that local officials be alerted, prior to shipment, of radioactive materials going through Concord NWS, U.S. Department of Transportation regulations only require DOE to inform the Governor of each State and any Tribal chair, or their designee, along the transportation route at least seven days in advance of the shipment of hazardous cargoes, including radioactive materials. It would be the responsibility of the Governor to provide any further notification to State and local officials.

Emergency preparedness, security, and coordination of DOE with local emergency response authorities that would be involved with the acceptance and transportation of foreign research reactor spent nuclear fuel would be discussed in detail in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

The commentor wants assurance from DOE that DOE - not local governments - would assume costs related to the transshipment of casks, including costs arising from accidents. Under the Price-Anderson Act, DOE will indemnify contractors for public liability with respect to spent nuclear fuel if there is a nuclear incident, as defined under law. In pertinent part, a nuclear incident is one that causes, for example, injury or sickness or property damage, resulting from radioactive, toxic, explosive, or other hazardous properties of the material. DOE does provide funding to States and Tribes, as described in Section 2.7.3.1 of the EIS, for transportation related issues. Such funding can enhance a jurisdiction's emergency management and planning capabilities.

COMMENTOR NO. 131: U.S. REPRESENTATIVE GEORGE MILLER (CONT'D.)

Congressman George Miller
June 2, 1995
Page Three

Likelihood of Political Controversy at CNWS. The DEIS contains no discussion of the history of demonstrations at CNWS and whether the likelihood of anti-nuclear protests raises any security concerns with respect to the ability to meet the unloading and transportation timetable. Both Contra Costa County and local municipalities should be given assurances that the Department of Energy will pay for the costs of all security related to the Statement of program, including the provision of police during demonstrations in conjunction with the unloading and transportation of the casks. 131-9

I expect that the Department of Energy will be fully responsive to these concerns, and those raised by local governments and residents, about the wisdom of using CNWS as an unloading facility for these materials. In addition, the changed political climate in the world today and the enhanced security facilities available world-wide suggests that alternatives to trans-oceanic shipment of nuclear wastes should be explored as an alternative to bringing the material to the United States which also lacks a finalized long term storage program for high level waste. 131-10

RESPONSE TO COMMENT COMMENTOR NO. 131: U.S. REPRESENTATIVE GEORGE MILLER (CONT'D.)

Response to Comment No. 131-7

Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible. In the unlikely event that a major seismic event isolates Concord NWS and prevents the foreign research reactor spent nuclear fuel from leaving the port, the cask would be placed in a secure location, isolated from personnel. The radiation exposure to personnel from the cask would be low since the radiation exposure rate beyond 100 meters is essentially zero.

Response to Comment No. 131-8

The EIS analyses determined that there would be no significant adverse impacts to the ecology of any of the ports that might be used to receive the material (Section 4.2.4.2.8 of the EIS). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident (Section 2.6.2 of the EIS). Spent nuclear fuel transportation casks passing through Concord NWS, or any other port, cannot leak because the metallic fuel is transported dry, thus it would not affect either the air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality. No significant health, safety, or environmental risk were found to exist at any of the candidate commercial or military ports selected (Section 4.2.2 of the EIS).

The physical constraints of the passage from San Francisco Bay to Concord NWS were considered as part of the port selection process. The passage does meet the requirements of Criterion 2 (Favorable Transit From Open Ocean) for the port selection (Appendix D, Section D.1.9.2 of the EIS).

The analysis in the EIS indicates that the use of any of the ports indicated by the port selection process, including Concord NWS, would not pose any significant risk to either the port personnel or the population in the area of the port, and that the risk associated with an accident is low (Section 4.2.2.3) and the risk associated with incident-free handling of the foreign research reactor spent nuclear fuel casks is also low (Section 4.2.2.2).

Every ship going to Concord NWS is guided to Concord by a certified professional pilot with knowledge of the Bay and Sacramento River who is onboard the incoming ship. The use of certified local pilots is the normal manner of entry into Concord as well as every other major port in the United States, and is superior to the suggested use of escort tugs.

COMMENTOR NO. 131:
U.S. REPRESENTATIVE GEORGE MILLER (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 131:
U.S. REPRESENTATIVE GEORGE MILLER (CONT'D.)

Response to Comment No. 131-9

The impact of the receipt of foreign research reactor spent nuclear fuel on local police departments would be small. While at Concord NWS, the base would provide the security for the foreign research reactor spent nuclear fuel. When it was en-route to the management site, some escort would be required, however this would be the responsibility of the shipper who would make the necessary arrangements and pay any costs.

Dealing with demonstrations is the responsibility of the local and State governments, as well as the military, if such demonstrations occur on military bases. However, if the demonstrations were the result of the receipt of foreign research reactor spent nuclear fuel, DOE would support local, State, or military organizations in dealing with demonstrations.

See also the 2nd paragraph of the response to Comment 131-6, above.

Response to Comment No. 131-10

The commentor's preference for overseas management of the foreign research reactor spent nuclear fuel is noted. This alternative is analyzed in the EIS as Management Alternative 2 (Section 2.3). However, management of this material at DOE facilities offers advantages in safety and security over storage in most foreign nations, especially developing countries. (Sections 2.3 and 4.4.1 of the EIS.)

For the subject of ultimate disposition, see the response to Comment 131-1 above.

COMMENTOR NO. 162: U.S. SENATOR PATTY MURRAY

PATTY MURRAY
WASHINGTON

COMMITTEES:
APPROPRIATIONS
ENERGY, NATURAL, AND URBAN AFFAIRS
BUDGET

United States Senate
WASHINGTON, DC 20510-4704

June 8, 1995

Hazel O'Leary
Secretary
U.S. Department of Energy
1000 Independence Ave., SW
Washington, D.C. 20585

Dear Secretary O'Leary,

We are writing to express our concerns over the alternatives proposed in the Department of Energy's (DOE) Draft Environmental Impact Statement (DEIS) on the management of spent nuclear fuel (SNF) from foreign research reactors. We are concerned about the proposed option of importing the foreign SNF through commercial ports such as Tacoma, WA. 162-1

While the desire to encourage other nations' research reactors to switch to low-enriched uranium (LEU) from highly-enriched uranium (HEU) is an integral component of the United State's overall nuclear nonproliferation policy, importing foreign SNF through commercial ports may not be necessary. The DOE DEIS lists two military ports among the ten possible ports of entry for the SNF. We feel that DOE should limit further consideration of importing SNF to these or other appropriate military ports because of the considerable concern among citizens and city officials about importing SNF through commercial ports.

First, there is significant apprehension about the threats to public health importing this SNF through commercial ports would create. Although DOE has stated that the threats to public health are not significant given the state of the material and the overly cautious design of the storage casks, we are not convinced that no public health threat exists. There is public concern that longshoremen, sailors, and average citizens could potentially become exposed to significant radiation levels. Whether this risk is real or only perceived is irrelevant. Importing foreign SNF through commercial ports would at best threaten public confidence and citizen's sense of security and at worst pose a significant threat to public health. 162-2

Second, the DEIS states: "Primary responsibility for emergency response to a foreign research reactor SNF incident would reside with local authorities.". Although the port and city of Tacoma have emergency response plans for hazardous materials, neither the Police and Fire Departments nor the Port workers are properly equipped or trained to contend with a significant radiation emergency. Properly equipping and training these people would add a significant and unnecessary cost to the overall proposal. In addition, it is not clear that Police Officers, Fire Fighters, and port workers would be willing to undergo such training, knowing that it opens them up to potential future radiation exposure. In fact, port workers in Tacoma may declare their unwillingness to handle the material during even 162-3

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RESPONSE TO COMMENT COMMENTOR NO. 162: U.S. SENATOR PATTY MURRAY

Response to Comment No. 162-1

Based on the low risk as shown by the analysis of impacts associated with accidents and incident-free operations involving foreign research reactor spent nuclear fuel, DOE considers that commercial ports and facilities represent an acceptable option for the transportation of foreign research reactor spent nuclear fuel. Sections 4.2.2.2 and 4.2.2.3 of the EIS provide the analysis on impacts of incident-free operation and consequences of port accidents, respectively.

DOE also considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without the additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all of the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

Response to Comment No. 162-2

The commentor's opposition to the use of commercial ports is noted. DOE considers the real risk to be important. DOE has estimated the real risk, found it to be low, and presented it to the public in a straightforward manner in this EIS.

Although public perceptions of risk cannot be addressed in an EIS, DOE would implement some additional measures to increase public confidence upon port selection (Section 2.7.5 and Appendix H of the EIS).

Response to Comment No. 162-3

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities,

COMMENTOR NO. 162: U.S. SENATOR PATTY MURRAY (CONT'D.)

routine transport procedures, let alone emergencies. 162-3 (Cont'd.)

Third, importing foreign SNF through commercial ports runs contrary to the overall policy objective of reducing the world-wide availability of HEU and other nuclear waste. If lengthy, unnecessary and relatively low-security transportation of SNF occurs through commercial ports, the increased opportunities for theft, hijacks, and sabotage could result in greater accessibility to the SNF than desired. As current events have unfortunately revealed, the United States is not immune to terrorism, either foreign or domestic. Even if this material could not be used in the making of nuclear weapons, and some of it could, the very fact that it is radioactive makes it dangerous. Transporting this material through commercial ports would create an unnecessary threat to national security. 162-4

These concerns present a compelling case for DOE to preclude further consideration of commercial ports like Tacoma, WA for the importation of foreign SNF. While removing HEU and other nuclear waste from the global marketplace is an essential aspect of nuclear nonproliferation, importing this material through military ports may prove more reasonable given the increased protection that could be provided to public health and safety and national security. 162-5

We are also concerned about the proposal to store the foreign SNF at the Hanford Nuclear Reservation. This idea is unacceptable given the current state of affairs at that facility. The current environmental problems associated with the storage of nuclear waste at the Hanford site have resulted in clean up costs near $50 billion. In addition, current budget pressures will make it difficult for DOE to meet its legally enforceable clean up schedule. Additional waste management responsibilities could further hamper the Department's efforts at the site. 162-6

In summary we would appreciate DOE limiting further consideration of this proposal to military ports and adequate storage facilities.

Thank you for your consideration. We look forward to your response.

Sincerely,

Patty Murray
Patty Murray
United States Senator

Norm Dicks
Norm Dicks
U.S. Congressman

Jim McDermott
Jim McDermott
U.S. Congressman

RESPONSE TO COMMENT COMMENTOR NO. 162: U.S. SENATOR PATTY MURRAY (CONT'D.)

prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues would include capabilities and training of first emergency responders. The commentor's assessment that the Tacoma port workers and emergency preparedness personnel would not be willing to participate in any training activities, or routinely handle the cargo, is noted.

Response to Comment No. 162-4

DOE considers that spent nuclear fuel from foreign research reactors could safely be received at commercial ports, as it has in the past, without the additional security that might exist at military ports. Security measures employed at any port would be required to meet or exceed security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not comply with existing security regulations, it would be the responsibility of the shipper to provide the additional security required for compliance. These regulations are adequate to protect spent nuclear fuel from foreign research reactors in the candidate ports. Security and emergency preparedness associated with transportation of spent nuclear fuel from foreign research reactors are discussed in Appendix H, of the EIS.

As discussed in Appendix D, Section D.5.9 of the EIS, while some terrorists activities cannot be precluded, theft of spent nuclear fuel during transit is inherently difficult and unlikely. Appendix D, Section D.5.9 of the EIS discusses the consequences associated with sabotage and terrorist attacks.

Response to Comment No. 162-5

See the response to comment 162-1.

Response to Comment No. 162-6

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE would be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel managed by DOE would be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 165: U.S. SENATOR DIANNE FEINSTEIN

DIANNE FEINSTEIN
CALIFORNIA

COMMITTEE ON FOREIGN RELATIONS
COMMITTEE ON THE JUDICIARY
COMMITTEE ON RULES AND ADMINISTRATION

United States Senate
WASHINGTON, DC 20510-0504

June 5, 1995

Department of Energy
Office of Congressional Affairs
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Dear Friend:

INQUIRY FROM: John Losh (Reference #: rcl-31158)

RE: Nuclear Waste Disposal

I am forwarding the attached constituent inquiry for your review and consideration. I believe that my constituent would benefit from your direct response to the specific issues raised in the enclosed letter.

I would appreciate it if you would return your response, in duplicate, as quickly as possible so that I can share the information with my constituent.

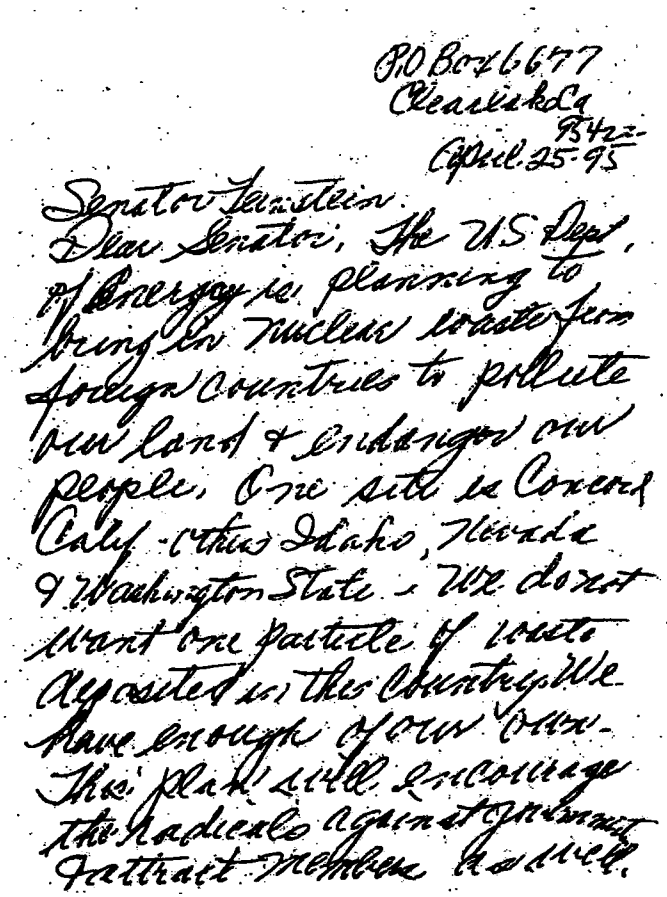
Since my office receives a large volume of mail, refer your return correspondence to the attention of Robert Lum in my Washington office. Please also include the constituent's name and reference number in your response. If you have any further questions, Robert can be reached at (202) 224-3841.

Sincerely,

Dianne Feinstein
United States Senator

DF:rcl
Enclosure

RESPONSE TO COMMENT COMMENTOR NO. 165: U.S. SENATOR DIANNE FEINSTEIN (CONT'D.)



P.O Box 6677
Clearlake Ca
95422-
April 25-95

Senator Feinstein
Dear Senator, The U.S Dept.
of Energy is planning to
bring in nuclear waste from
foreign countries to pollute
our land & endanger our
people. One site is Concord
Calif - (this Idaho, Nevada
& Washington State - We dont
want one particle of waste
deposited in this Country. We
have enough of our own -
This plan will encourage
the Radicals against Government
Patriot members as well.

165-1

Response to Comment No. 165-1

The commentor's opposition to the management of spent nuclear fuel from foreign research reactors in the United States is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

COMMENTOR NO. 165: U.S. SENATOR DIANNE FEINSTEIN (CONT'D.)

I implore you to use
everything in your power
to put a stop to these outrages
When are we going to stop
Our nurturing foreign countries
sacrificing our young men
& spending billions of
our tax dollars that
are needed here to care
for our own people.

Yours truly
Florence J Lesh
John J Lesh

RESPONSE TO COMMENT
COMMENTOR NO. 165:
U.S. SENATOR DIANNE FEINSTEIN (CONT'D.)

COMMENTOR NO. 200: CENTER FOR DISEASE CONTROL, NATIONAL CENTER FOR ENVIRONMENTAL HEALTH

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
Atlanta, GA 30341-3724
June 9, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Mr. Head:

We have completed our review of the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (DOE/EIS-1218D dated March 1995). Technical assistance for this review was provided by the Radiation Studies Branch (RSB), Division of Environmental Hazards and Health Effects, National Center for Environmental Health, Centers for Disease Control and Prevention. We are responding on behalf of the U.S. Public Health Service.

There are two deficiencies which we recommend be corrected, because of the public health implications.

(1) The Statement never defines crew members on freighters hauling uranium as occupationally or non-occupationally exposed. Therefore, the appropriate limit on their exposure is uncertain. *200-1*

(2) The Statement acknowledges two situations where someone could exceed 100 mrem in a year, but proposes no positive steps to prevent this or monitor exposures:

If a truck hauling fuel containers whose contact reading is near the legal limit were stuck in a traffic jam or repeatedly used the same gas station, a member of the general public who loitered within one meter for too long could exceed the limit. This should be easy to prevent. The Department of Energy monitors the movements of the trucks and works closely with State Police and local governments. Use radio communications to keep trucks out of traffic jams, and tell them not to use the same gas station every time (or at least not the same attendant). *200-2*

A crew member on a ship hauling the fuel could exceed 100 mrem if they carried two loads in the same year. If crew members are not occupationally exposed, *200-3*

RESPONSE TO COMMENT
COMMENTOR NO. 200: CENTER FOR DISEASE CONTROL, NATIONAL CENTER FOR ENVIRONMENTAL HEALTH

Response to Comment No. 200-1

A discussion has been inserted in Section 4.2.1.2 of the EIS to indicate that marine workers would be considered non-occupationally exposed workers.

Response to Comment No. 200-2

The text of Section 4.2.3.5 of the EIS has been revised to address the commentor's concern.

Response to Comment No. 200-3

As discussed in Section 4.2.1.5 of the EIS, DOE assumes that the same crew member may be involved in up to nine shipments per year. The mitigation measures that DOE would implement to ensure that no crew member could receive a dose above what is allowed for a member of the general public are also discussed in Section 4.2.1.5 of the EIS.

COMMENTOR NO. 200: CENTER FOR DISEASE CONTROL, NATIONAL CENTER FOR ENVIRONMENTAL HEALTH (CONT'D.)

assuming sailors probably will not make two trips is not satisfactory. Crew members should wear dosimeters and have their exposures recorded. Shipping companies should survey the holds after all containers are loaded, and control stay times during transit. — 200-3 (Cont'd.)

While the DEIS appears to be satisfactory except for the two problems noted above, we offer the following general comments for your consideration.

The Statement uses technical words inconsistently. The Statement should define each term, cite a reference, and adhere to that definition as much as possible. ICRP 60 defines collective dose as the average dose to a specific organ, multiplied by the number of exposed persons. Population dose is not defined at all in ICRP 60, and EDE is no longer used for dose measurements. (See ICRP 60, Appendix A.) The statement about absorbed dose on page 4-4, second paragraph, is technically incorrect. — 200-4

Section E.6.7 says truck and train crew members are not assumed to be occupational radiation workers. Table E-56 on page E-125 compares "collective occupational dose" to "collective general population dose" specifically for truck and train crews. — 200-5

We suggest a careful reading of the text to ensure accuracy and clarity in the Final document.. The following examples from page 4-4 illustrate some of the problems:

The first paragraph uses the words "foreign research reactor spent nuclear fuel" six times in six sentences.

The first sentence in the third paragraph contains faulty parallelism. We suggest a change to something like, "An individual may be exposed to radiation from outside the body, or from inside the body because radioactive materials may enter the body by ingestion or inhalation."

The next to last paragraph on page 4-4 defines Latent Cancer Fatalities (LCF) and concludes, "Non-fatal cancers are . . . in some respects less serious." (In what respects would a non-fatal cancer be *more* serious than a fatal one?)

Section F.6 refers to the ICRP as the "Irradiated Commission on Radiological Protection" instead of "International Commission on Radiological Protection" in several places. — 200-6

The Statement frequently compares involuntary risk (exposure to radiation from spent fuel) to voluntary risk (bicycles, cigarettes, airlines, etc). The comparison may be valid and useful for perspective, but comparisons of this nature generally have a negative effect on the public. Would it be possible to compare the risks from spent fuel to other involuntary risks, such as living near a landfill or a coal burning electric plant? — 200-7

RESPONSE TO COMMENT
COMMENTOR NO. 200: CENTER FOR DISEASE CONTROL, NATIONAL CENTER FOR ENVIRONMENTAL HEALTH (CONT'D.)

Response to Comment No. 200-4

The risk factors in ICRP-60 have been accepted by the NRC and DOE, and are used in this EIS. However, the NRC and DOE have not adopted the terminology used in ICRP-60, nor used it herein. Nevertheless, the text in Section 4.1.3 has been modified to address the commentor's concern.

Response to Comment No. 200-5

Marine transport workers, port workers, and ground transport workers are not trained to be radiation workers, so they are not subject to the limit of 5,000 mrem/yr. These workers are subject to the same limit as are members of the general public: 100 mrem/yr. But these workers are distinct from the general public since they would be directly involved in implementing portions of the proposed action, so the terminology in Appendix E, Table E-56 of the EIS was selected to show that distinction.

Response to Comment No. 200-6

The text in Sections 4.1.2 and 4.1.3 of the EIS have been revised in response to this comment.

Response to Comment No. 200-7

DOE appreciates the commentor's stating that the examples in Section 4.10.3 are voluntary, while the risks due to the proposed action would be involuntary. Nevertheless, the information is valid and the public can use it to put the risks from the proposed action into perspective. DOE considers this information appropriate to share with the public. Those members of the public who do not wish to compare voluntary risks to involuntary risks do not have to do so.

Commentor No. 200: Center for Disease Control, National Center for Environmental Health (Cont'd.)

Thank you for the opportunity to review this draft document. Please ensure that we are included on your list to receive a copy of the Final EIS, and future EIS's which may indicate potential public health impact and are developed under the National Environmental Policy Act (NEPA). If you have questions concerning these comments, you may contact Mr. C.M. Wood, Radiation Studies Branch, at (404) 488-7642, or me at (404) 488-7074.

Sincerely yours,

Kenneth W. Holt

Kenneth W. Holt, M.S.E.H.
Special Programs Group (F-29)
National Center for Environmental Health

Response to Comment
Commentor No. 200: Center for Disease Control, National Center for Environmental Health (Cont'd.)

COMMENTOR NO. 264: ENVIRONMENTAL PROTECTION AGENCY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUN 19 1995

OFFICE OF
ENFORCEMENT AND
COMPLIANCE ASSURANCE

Mr. Charles Head
Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20858

Dear Mr. Head:

In accordance with the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq.) and Section 309 of the Clean Air Act, the Environmental Protection Agency (EPA) has reviewed the Department of Energy Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

264-1

DOE proposes a policy to manage foreign research reactor spent nuclear fuel that was enriched in the U.S. The draft EIS analyses the environmental effects of three management alternatives and a No Action alternative. EPA has reviewed the proposed action and the alternatives and rated each alternative lack of objections (LO). An explanation of EPA's ratings is provided in the attached enclosure.

Thank you for the opportunity to comment. If you have any questions, please contact Susan Offerdal at (202) 260-5059.

Sincerely,

Richard E. Sanderson
Director
Office of Federal Activities

Enclosure

Recycled/Recyclable
Printed with Soy/Canola Ink on paper that contains at least 50% recycled fiber

RESPONSE TO COMMENT
COMMENTOR NO. 264: ENVIRONMENTAL PROTECTION AGENCY

Response to Comment No. 264-1

The United States Environmental Protection Agency's review and lack of objection to each alternative analyzed in the EIS are noted.

COMMENTOR NO. 307: U.S. REPRESENTATIVE RANDY TATE

DEPARTMENT OF ENERGY
ON DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR
THE PROPOSED NUCLEAR WEAPONS NONPROLIFERATION
POLICY CONCERNING FOREIGN RESEARCH REACTOR
NUCLEAR SPENT FUEL

TESTIMONY OF CONGRESSMAN RANDY TATE
AT THE PUBLIC HEARING ON JUNE 19, 1995

Thank you for allowing me the opportunity to testify this evening.

I would like to begin by thanking the Department of Energy (DOE) for holding this public hearing tonight. As you know, DOE originally had scheduled only one hearing on this issue -- in SeaTac. I was concerned with the possible adverse impact of transporting this extremely hazardous material through the Tacoma area and felt it should be discussed by Tacoma residents in Tacoma. That is why we are here tonight.

Let me also state the DOE has willingly complied with my other requests: (1) Make available the Draft Environmental Impact Statement For The Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Nuclear Spent Fuel (DEIS) in two Tacoma public libraries; (2) Send DOE nuclear spent fuel experts to the Tacoma Port-DOE Fact-Finding and Public Comment Meeting held on May 22, 1995; (3) Transcribe tonight's public comments; and (4) Extend the time for public comments to be filed with the DOE to June 30. Every one of these events is significant because they are all based on one fundamental principle of government -- The people of our community deserve and will now be allowed to have ample opportunity to voice their concerns.

Nuclear nonproliferation is a big concern to all of us. What we are discussing tonight is the disposal of enriched uranium from research reactors in about 40 nations around the globe.

RESPONSE TO COMMENT
COMMENTOR NO. 307: U.S. REPRESENTATIVE RANDY TATE

COMMENTOR NO. 307: U.S. REPRESENTATIVE RANDY TATE (CONT'D.)

The U.S. does not need terroristic regimes and unfriendly nations having access to raw materials that can be used to produce nuclear weapons.

As we all know, the Port of Tacoma is one of the ten ports of entry under consideration for receiving these hazardous waste shipments. Shipping spent nuclear fuel through the Port of Tacoma, the sixth largest container port in the country, and the Tacoma community, is not a prudent approach. Hundreds of thousands of our families could be hurt in the event that a tragedy occurs. 307-1

Our community is not prepared to handle some of the circumstances that could potentially occur. What would happen if the shipping cask or the nuclear waste was breached? What are the possible effects on humans and the environment? What agencies are responsible for putting out a fire? An explosion? Or an act of terrorism? What are the plans if a catastrophe takes place?

There are also other issues that need to be addressed such as: Was a full and fair cost-benefit analysis performed? What does the risk assessment study say? Are our allies being asked to share the burden of storing or disposing of this nuclear spent fuel? 307-2

The second critical issue in this debate is the final destination of any nuclear hazardous waste delivered through the Tacoma Port. Hanford is still struggling with the financial burdens of their clean-up. The Idaho National Engineering Laboratory has also expressed concerns with receiving shipments of radioactive waste. 307-3

I look forward to working with the City of Tacoma, the Port of Tacoma, the surrounding community and with other Members of our Congressional delegation on this very important issue. Again, thank you for giving me this opportunity to share my views tonight.

RESPONSE TO COMMENT
COMMENTOR NO. 307: U.S. REPRESENTATIVE RANDY TATE (CONT'D.)

Response to Comment No. 307-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any other ports analyzed in the EIS, is low.

Foreign research reactor spent nuclear fuel has been safely transported in the United States for over 40 years (Section 4.2.3 of the EIS). None of the shipments, including shipments involved in accidents, has ever resulted in a release of the radioactive contents of a spent nuclear fuel transportation cask (Section 4.2.3 of the EIS). In the unlikely event of a severe accident, the analysis performed for the EIS indicates that some radioactive material could be released from the cask and distributed into the environment. However, the analysis in Section 4.2.2.2 and Appendix D, Section D.5 of the EIS determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident. Close in to the accident, near the cask would likely require some cleanup, but the overall impact on the water and air quality in the port would be very small.

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk. Section D.5.9 has been added to Appendix D of the EIS to address terrorism and sabotage. All shipments of foreign research reactor spent nuclear fuel would be conducted meeting or exceeding all security requirements in the Code of Federal Regulations (10 CFR Part 73). Appendix H has been added to the final EIS in response to public comments to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

Response to Comment No. 307-2

A cost-benefit analysis in the traditional sense was not performed. No request was made to attempt to quantify the benefits of avoiding nuclear weapons proliferation or the conversion of weapons-grade material by terrorists. Rather, it has been assumed by essentially all the governments involved in the program that removing HEU from civilian commerce and converting all foreign research reactors to LEU was worth the cost.

The risk assessment study says that the risks to shipping, handling, managing, and disposing of spent nuclear fuel, either as spent nuclear fuel or as high-level waste, are extremely low.

COMMENTOR NO. 307: U.S. REPRESENTATIVE RANDY TATE (CONT'D.)

RESPONSE TO COMMENT COMMENTOR NO. 307: U.S. REPRESENTATIVE RANDY TATE (CONT'D.)

As discussed in Section 2.2.1.2 and 2.2.2.3 of the EIS, several financing options have been considered, ranging from collection of fees from the research reactor operators that would pay all of the costs of the program to full subsidization of the program by DOE. One of these options would be for developed countries (which represent about 87 percent of the spent nuclear fuel total mass and about 78 percent of the spent nuclear fuel elements) to pay a competitive fee for U.S. management of their spent nuclear fuel. This fee would be based on, among other things, a comparison with the charges these countries would incur for reprocessing at Dounreay. The United States would absorb the full costs of the program for developing countries and absorb the amount above a competitive fee for developed countries.

Response to Comment No. 307-3

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to Hanford Site.

COMMENTOR NO. 312: U.S. REPRESENTATIVE NORM DICKS

NORM DICKS
8TH DISTRICT, WASHINGTON
COMMITTEES:
SELECT COMMITTEE ON INTELLIGENCE
APPROPRIATIONS
SUBCOMMITTEES:
DEFENSE
INTERIOR
MILITARY CONSTRUCTION

2467 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515-4708
PHONE: (202) 225-5916

DISTRICT OFFICES:
SUITE 2244
1717 PACIFIC AVE.
TACOMA, WA 98402-3234
PHONE: (206) 593-6536

SUITE 301
500 PACIFIC AVENUE
BREMERTON, WA 98337
PHONE: (206) 479-4011

Congress of the United States
House of Representatives

June 19, 1995

U.S. Department of Energy
Environmental Impact Panel Members
Tacoma Public Meeting
June 19, 1995

Re: Proposed shipments of spent fuel through the Port of Tacoma

As the United States Congressman representing portions of the Tacoma-Pierce County area, I have received numerous communications from constituents and from public officials from this area strongly protesting the use of the Port of Tacoma as one of the points of entry for spent fuel shipments from foreign reactors. Let me take this opportunity to join them in their opposition and to urge the Department of Energy to look elsewhere for a more appropriate candidate site.

My objections to the use of the Port of Tacoma as a port of entry are related to the nature of the Port and to the selection process, which I believe was overly biased in favor of bringing these materials into the United States. 312-1

To begin with, the Port of Tacoma is the fastest growing container port on the West Coast and, as such, is a primary economic force in Pierce County and the entire Pacific Northwest region. In addition, it is a major transshipment port for military cargo during a mobilization, acting synergistically with Fort Lewis and McChord AFB. Over the past several years, I have been supportive of actions which enhance the Port's commercial intermodal capability and competitiveness as well as the military capability that remains in reserve. Likewise, I have attempted to discourage the Port from pursuing opportunities unrelated to those missions. In this regard, I believe that the spent fuel mission would detract from this direction, and that it would require the unnecessary expenditure of scarce resources for the enhanced safety and security requirements of the fuel shipments.

Moreover, I am not convinced that the Department of Energy's EIS process resulted in a thorough-enough evaluation of alternatives that are readily available outside the United States. After review of the draft EIS document, I believe that closer examination of Alternative No. 2 should have been conducted, which appears to offer the clear advantage of encouraging a longer-term solution to the issues of storage and re-processing. With at least 8 nations other than the United States interested in a similar objective and willing to 312-2

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RESPONSE TO COMMENT
COMMENTOR NO. 312: U.S. REPRESENTATIVE NORM DICKS

Response to Comment No. 312-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' status with respect to their clients. This is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions. As such, there should be no adverse commercial or economic reaction to the use of the port. Historically, there were no adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

Tacoma was one of 161 ports (153 commercial and eight military ports) considered. These ports were evaluated against selection criteria, resulting in 10 ports that met all of the criteria. Appendix D, Sections D.1.8 and D.1.9 of the EIS present a detailed discussion of the process and results.

The benefit to the citizens of the United States from the proposed action, including those in potential ports of entry, along transportation routes, or near potential management sites, is less risk that weapons grade uranium from civil programs could be diverted into the production of nuclear weapons that might be used against us or our allies. On the other hand, the analyses recorded in Section 4 of the EIS demonstrate that the risks associated with the proposed action are low.

Response to Comment No. 312-2

The commentor's preference for Management Alternative 2 is noted. This alternative is discussed in Sections 2.3 and 4.4 of the EIS.

COMMENTOR NO. 312:
U.S. REPRESENTATIVE NORM DICKS (CONT'D.)

participate in this program, I believe greater priority should have been given to this international option in the EIS process. I will be discussing this and other related matters with Assistant Secretary Grumbly in the near future, but I wanted to express my strong opposition at this time to proceeding with the evaluation of the Port of Tacoma option based upon what I consider to be faulty assumptions in the EIS process. 312-2 (Cont'd.)

With best wishes,

Sincerely,

Norm Dicks

NORM DICKS
Member of Congress

RESPONSE TO COMMENT
COMMENTOR NO. 312:
U.S. REPRESENTATIVE NORM DICKS (CONT'D.)

COMMENTOR NO. 949: EM-SSAB-INEL

Recommendation on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

June 20, 1995

The Environmental Management Site Specific Advisory Board for the Idaho National Engineering Laboratory (EM SSAB-INEL) recommends Management Alternative 1 as the preferred alternative for the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. 949-1

One minority perspective to the recommendation of Alternative 1 is articulated below, and one minority perspective is articulated within the alternative. Both are written in italics.

Alternative 1 proposed that the United States should accept and manage foreign research reactor (FRR) spent nuclear fuel (SNF) containing uranium of U.S. origin. The Board recommends this alternative with the following caveats:

- Any appropriate spent fuel containing highly enriched uranium (HEU) and low enriched uranium (LEU) would be accepted only for a period of ten years. 949-2
- Developing nations would be subsidized, but the United States would charge a competitive rate to other nations for FRR SNF management activities. 949-3
- The aluminum-based and TRIGA (Training, Research, Isotope, General Atomics) FRR SNF would be managed at the Savannah River Site and the Idaho National Engineering Laboratory. 949-4

  Minority perspective provided by one Board member: In taking aluminum-based and TRIGA SNF from other countries the Board should encourage involved/appropriate federal agencies to negotiate with countries regarding acceptable storage of FRR SNF, or absorbing SNF into their existing reprocessing streams. 949-5
- The United States would take title to the SNF at specified ports of entry. 949-6
- Regularly scheduled commercial ships should be used to provide marine transport of the FRR SNF. 949-7
- Once in the United States' possession, ground transport should take place by rail or highway, not by barge. 949-8
- Dry storage technologies should be used as often as possible, especially in any new construction. 949-9
- Near term chemical separation, blending HEU down to LEU, should take place in the United States, but only at facilities currently performing activities of this nature. No new reprocessing activities should be initiated, and only the FRR SNF should undergo blending down to LEU. No domestic fuel should be reprocessed. 949-10

The EM SSAB-INEL also urges continued focus on a permanent geologic repository. The Board has also submitted to DOE a recommendation on the SNF and INEL Draft EIS. The comments in that recommendation regarding the management and transportation of SNF remain applicable. We urge the DOE to refer to that recommendation as well. 949-11

Minority perspective provided by one Board member:

"I support a modified Foreign Research Reactor Spent Nuclear Fuel Environmental Impact Statement No Action Alternative which includes onsite storage of SNF at the facility of origin, and absolutely no reprocessing. The proliferation threat discussion is like listening 949-12 949-13

RESPONSE TO COMMENT
COMMENTOR NO. 949: EM-SSAB-INEL

Response to Comment No. 949-1

The commentor's support for accepting and managing foreign research reactor spent nuclear fuel in the United States, is noted. Acceptance of foreign research reactor spent nuclear fuel in the U.S. is considered under Management Alteratives 1 or 3, described in Section 2.2 and 2.4 of the EIS, respectively.

Response to Comment No. 949-2

The commentor's suggestion that the acceptance period for the foreign research reactor spent nuclear fuel under Management Alternative 1 be only 10 years is noted. Management Alternative 1, as described in Section 2.2 of the EIS, allows for a period of 13 years for the acceptance of the foreign research reactor spent nuclear fuel, the last 3 years would allow for the cooling of the spent nuclear fuel discharged towards the end of the 10-year policy period.

Response to Comment No. 949-3

The commentor's support for the financing arrangement considered under the basic implementation of Management Alternative 1 (Section 2.2.1.2 of the EIS) is noted.

Response to Comment No. 949-4

The commentor's suggestion that aluminum-based and TRIGA fuel should be managed at the Savannah River Site and the Idaho National Engineering Laboratory is noted. The suggestion is in line with the Record of Decision for the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement, which was issued by DOE on May 30, 1995.

Response to Comment No. 949-5

The commentor's preference for a hybrid alternative is noted. One example hybrid alternative is considered as Management Alternative 3, which is discussed in Sections 2.4 and 4.5 of the EIS.

Response to Comment No. 949-6

The commentor's suggestion that the United States should take title to the foreign research reactor spent nuclear fuel at the port of entry is noted. This alternative location is considered under implementation alternative 4, which is discussed in Section 2.2.2.4 of the EIS.

to a couple of old farmers arguing over whether to shut the barn door after the horses have run out. Solutions to radioactive waste management will never be developed unless the generators bear full responsibility for health, safety, and costs of permanent disposal in the country of origin. Moreover, without this responsibility, there will be no incentive to stop generating more radioactive waste.

949-13 (Cont'd.)

DOE failed to present a credible Programmatic Spent Nuclear Fuel Management Environmental Impact Statement for current SNF inventories. The fundamental flaws in the EIS are recognized by US District Court, which quickly issued an injunction against additional shipments to INEL upon request by the State of Idaho. These two management plans are inextricably related and both contain the same fundamental flaws, not the least of which is DOE's denial that significant quantities of SNF is dumped in shallow land burial at the Radioactive Waste Management Complex.

949-14

Response to Comment No. 949-7

The commentor's recommendation of the use of commercial ships is noted. Section 4.2.1.3 of the EIS discusses the impacts of marine transportation modes, and demonstrates that the risks are low.

Response to Comment No. 949-8

The commentor's preference for rail or highway transport instead of barge transport is noted. Barge transport is discussed in Section 4.2.3.6 of the EIS.

Response to Comment No. 949-9

The commentor's suggestion that dry storage should be the preferred storage technology for new construction is noted. Dry storage is the storage technology proposed under the basic implementation of Management Alternative 1 as described in Section 2.2 of the EIS.

Response to Comment No. 949-10

The commentor's preference for domestic chemical separation at facilities currently performing such activities is noted. At this time, however, there are no facilities in the United States that are actively chemically separating spent nuclear fuel.

In the near future, the chemical separation facilities at the Savannah River Site might resume operations for the foreign research reactor spent nuclear fuel or for another purpose. These options are discussed in Section 2.2.2.6 of the EIS.

DOE announced a Record of Decision on May 30, 1995 for the Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs EIS. Chemical separation at Idaho National Engineering Laboratory was not included in this Record of Decision, so additional site-specific NEPA documentation would be required to restart the chemical separation facilities at this management site.

Response to Comment No. 949-11

The commentor's support for a permanent geologic repository is noted. The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel in a geologic repository are discussed qualitatively in Section 4.2.7 of the EIS. A detailed, quantitative discussion of these impacts would have to be the subject of future NEPA documentation. The Board's comments on the DOE Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs draft EIS were responded to in Volume 3 of the final version of that EIS.

COMMENTOR NO. 949: EM-SSAB-INEL (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 949: EM-SSAB-INEL (CONT'D.)

Response to Comment No. 949-12

The commentor's preference for a modified No Action Alternative with research reactor site storage and no reprocessing is noted. This preference is similar to Management Alternative 2, Subalternative 1a (Section 2.3 of the EIS) with an important difference. The difference is that under Subalternative 1a, the United States would assist foreign research reactors in storing their spent nuclear fuel at any location outside the United States in a manner consistent with our nuclear weapons nonproliferation objectives. If the United States adopts a No Action Alternative, our credibility with foreign research reactor operators would likely be effected, such that the United States would not have an influence on disposition of foreign research reactor spent nuclear fuel or the resulting international commerce in weapons-grade materials (Section 4.6 of the EIS).

Response to Comment No. 949-13

Prior to 1989, it was United States policy to accept foreign research reactor spent nuclear fuel for disposition in the United States (Section 1.1 of the EIS). Many foreign research reactor operators have no immediate means of disposing of their spent nuclear fuel (Section 1.2 of the EIS). Thus, the intent of the proposed policy is to remove as much U.S. - origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). Ultimate disposition is a high-priority consideration which is discussed qualitatively in Section 4.2.7 of the EIS.

Response to Comment No. 949-14

The commentor's concerns regarding the Department of Energy Programmatic Spent Nuclear Fuel and Idaho National Engineering Laboratory Environmental Restoration and Waste Management EIS (SNF & INEL EIS) is noted. Public comments received on that EIS, including those provided by the commentor, were addressed in Volume 3 of the Final SNF & INEL EIS. The issue of spent nuclear fuel being buried at the Radioactive Waste Management Complex (RWMC) at the Idaho National Engineering Laboratory has not been denied; nor was it addressed in the SNF & INEL EIS, which was already printed at the time the issue was raised. DOE has acknowledged that an estimated 130 kilograms of irradiated fuel materials is buried at the RWMC.

It should be noted that DOE must reach settlement in any court actions concerning spent nuclear fuel before the Record of Decision involving shipment of more spent nuclear fuel to the Idaho National Engineering Laboratory can be implemented. It should also be noted that the US District Court did not issue a new injunction when the Final SNF & INEL EIS was issued. The District Court which required preparation of the SNF & INEL EIS also required that all challenges to the EIS must be resolved prior to the June 1993 injunction being filed. A Consent Order was issued by the District Court on October 17, 1995 which vacated (except for paragraph 4 regarding CPP-603 fuel movements) the prior order of December 22,1993.

COMMENTOR NO. 1118:
U.S. REPRESENTATIVE RANDY TATE

RANDY TATE
9TH DISTRICT, WASHINGTON

DEPUTY MAJORITY WHIP

COMMITTEES:
GOVERNMENT REFORM AND OVERSIGHT
TRANSPORTATION AND INFRASTRUCTURE
AVIATION SUBCOMMITTEE
SURFACE TRANSPORTATION SUBCOMMITTEE

Congress of the United States
House of Representatives
Washington, DC 20515

WASHINGTON OFFICE:
1118 LONGWORTH HOUSE OFFICE BUILDING
WASHINGTON, DC 20515
(202) 225-8901
FAX (202) 225-3484

DISTRICT OFFICES:
SUITE 98210
33306 FIRST WAY SOUTH
FEDERAL WAY, WA 98003
(206) 661-1459
FAX (206) 661-1783

10525 CANYON ROAD EAST #C1
PUYALLUP, WA 98373
(206) 538-1322
FAX (206) 535-2676

July 14, 1995

VIA FACSIMILE

Secretary Hazel O'Leary
Department of Energy
1000 Independence Avenue SW, Room 7B138
Washington, DC 20585

Dear Secretary O'Leary,

I am writing concerning the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Nuclear Spent Fuel (DEIS).

As you may know, the Port of Tacoma resides in my district and is one of the potential ports of entry. I am very concerned with the potential human and environmental risks of bringing this highly radioactive nuclear waste through the Port of Tacoma.

I am seriously concerned that the Department of Energy (DOE) has not given thorough consideration to the viable option of having the nuclear byproduct delivered to foreign nations for reprocessing or storage overseas. It is my understanding that several European nations, as well as Japan, have the facilities and are interested in obtaining the fuel rods. Would U.S. international policy be best served by reprocessing or storing overseas? Are there any legitimate national security concerns if our foreign allies accept delivery? What scientific capability and expertise do our allies have that applies to this situation? What cost savings are associated with reprocessing or storing this material overseas? These are just a few of the relevant questions that apply to the option of facilitating management overseas of this nuclear waste that need to be answered.

1118-1
1118-2
1118-3
1118-4

Please provide me with answers to the above-mentioned questions and an explanation of the Energy Department's analysis that has already been performed on the options of facilitating management overseas of this foreign nuclear waste.

The Energy Department has not comprehensively studied whether it is truly in the interest of the United States to become the dumping ground for foreign nations' nuclear waste. Storage of our own hazardous material is already a very costly and politically sensitive issue. To take in foreign waste will serve only to exacerbate these problems. If there is more than one economically and environmentally viable alternative that serves our national security interests, it must be fully explored. The residents of the Ninth District of Washington and our state should be able to expect as much of our federal government

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RESPONSE TO COMMENT
COMMENTOR NO. 1118:
U.S. REPRESENTATIVE RANDY TATE

Response to Comment No. 1118-1

Overseas management of spent nuclear fuel from foreign research reactors is one of the management alternatives evaluated in this EIS (Management Alternative 2). Section 2.3 of the EIS describes the advantages and disadvantages of overseas storage and reprocessing, while Section 4.4 of the EIS provides an evaluation of the policy considerations and environmental impacts resulting from overseas management.

Response to Comment No. 1118-2

This concept is also discussed in the EIS, in Sections 1.1, 2.3, 4.4.1 and 4.4.2. Since the answers to the questions are different for storage and reprocessing, they have been addressed separately below.

Overseas Storage: For overseas storage of the spent nuclear fuel, as discussed in Sections 1.1, 2.3 and 4.4.1 of the EIS, the answer is that United States policy would not be well served because there are direct national security concerns. The storage of foreign research reactor spent nuclear fuel overseas would not comply with United States nuclear weapons nonproliferation policy, as specified in Presidential Decision Directive 13, in that such an action would encourage the stockpiling of weapons usable materials overseas. As explained in Section 4.4.1, even if the United States helped foreign nations build the best storage facilities possible, all that would be required to allow the material to be diverted into a nuclear weapons program would be a change in government, or a change in government policy. Although this is unlikely to happen in the developed countries, it could and has happened in less developed countries to whom we have provided research reactor fuel in the past.

Some individuals have suggested that a solution to potential instabilities in the governments of developing nations is for the United States to ship the spent nuclear fuel from the developing countries to one or more of the developed countries. Unfortunately, none of the developed countries has offered to accept the spent nuclear fuel. In all likelihood, the citizens of the developed countries would object to importation of spent nuclear fuel into their countries for storage, just as some citizens of the United States have done. This is especially true considering the fact that the enriched uranium was produced by the United States and for years the United States had a published policy of accepting the spent nuclear fuel for disposal. The United Kingdom, specifically, has stated that it will not accept spent nuclear fuel for storage unless such storage is pursuant to a contract to reprocess the spent nuclear fuel, with the reprocessing wastes leaving the United Kingdom. In fact, several reactor authorities in developed countries have stated that they would revert to the use of HEU fuel if we do not assist them with their spent nuclear fuel management problem. Other reactors in developed countries would have to shut down due to local legal restrictions against further storage of spent nuclear fuel in their countries. This

COMMENTOR NO. 1118: U.S. REPRESENTATIVE RANDY TATE (CONT'D.)

I thank you in advance for your attention to this matter. If you have any questions, please do not hesitate to call. I look forward to your prompt response.

Sincerely,

Randy

Randy Tate
Member of Congress

cc: Louise Bray, Port of Tacoma
Judith Lorbeir, City of Tacoma
Gerold Poller, Heart of America Northwest
Thomas Grumbly, Department of Energy
Charles Head, Department of Energy

RESPONSE TO COMMENT COMMENTOR NO. 1118: U.S. REPRESENTATIVE RANDY TATE (CONT'D.)

would make the United States vulnerable, fairly or unfairly, to accusations that we are not living up to our obligations under the Treaty on the Non-Proliferation of Nuclear Weapons to assist nonnuclear weapons states with peaceful applications of nuclear energy and could lead to a resurgence in the use of HEU in civil programs.

Overseas Reprocessing: For overseas reprocessing, as discussed in Sections 1.1, 2.3, and 4.4.2 of the EIS, the answer is that United States policy goals could possibly be achieved, for at least a portion of the foreign research reactor spent nuclear fuel, under the right conditions. As discussed in Section 1.1, Dounreay does not currently have the capability to reprocess the new high density LEU fuel that the United States developed to replace the original HEU fuel. In addition, in the past, Dounreay has allowed their customers to specify the form in which uranium separated during reprocessing would be returned. Most of the uranium from spent nuclear fuel containing HEU was returned as HEU. So far, the operators of Dounreay are insisting that they will continue this practice in the future. As a result, reprocessing at Dounreay, as it has been conducted in the past, could only be used as a means of spent nuclear fuel management by reactors that are using HEU for fuel. This would serve to perpetuate the use of HEU in civil programs, in direct opposition to United States nuclear weapons nonproliferation policy goals. However, if some means can be developed for revising the practices for reprocessing at Dounreay, in a manner that will achieve United States nuclear weapons nonproliferation policy objectives (such as are discussed in Section 2.3 of the EIS), then this approach might be acceptable. DOE and the Department of State are actively working with counterparts in the United Kingdom in an attempt to make this a feasible option.

Response to Comment No. 1118-3

In general, any developed nation either has the technical capability to store the foreign research reactor spent nuclear fuel, if that is what they choose to do with it, or could obtain any required technical expertise from commercial engineering firms. The United Kingdom and France, in particular, have scientific capability and expertise in spent nuclear fuel management at least equal to that of the United States. Their capability in spent nuclear fuel reprocessing as a commercial activity exceeds that of the United States. However, as discussed above, there are significant issues that make it in the best interest of the United States to avoid overseas storage of foreign research reactor spent nuclear fuel. Similarly, overseas reprocessing would only be in the best interest of the United States if the past reprocessing practices were changed (Sections 1.1, 2.3, 4.4.1, and 4.4.2 of the EIS).

Response to Comment No. 1118-4

A comparison of the costs of reprocessing overseas to chemical separation in the United States would depend on several assumptions about the operational status of the Savannah River Site. If the Savannah River Site is chemically separating other materials during the

Commentor No. 1118:
U.S. Representative Randy Tate (Cont'd.)

Response to Comment
Commentor No. 1118:
U.S. Representative Randy Tate (Cont'd.)

period 1998 through 2002 (as is possible under the Interim Management of Nuclear Materials EIS), then chemical separation in the United States is less costly than reprocessing overseas or any other technical approach. If several years of independent chemical separation are added, then costs for the U.S. option could equal or exceed the overseas option depending upon the way fixed and variable costs are allocated to the foreign research reactor spent nuclear fuel program. For chemical separation through about 2005, costs are similar to those overseas.

The costs of storing the material in countries with major commercial nuclear power installations, e.g., France, United Kingdom, would be equal to or less than that of the United States (including all shipping and disposal costs). The costs of storing the material in countries without major commercial nuclear power installations or with no effective plans for commercial power reactor spent nuclear fuel disposal would be higher than those in the United States. For countries with limited industrial capability and relatively low national security, costs would be speculative and risks would be high. Overall, excluding the half-dozen or so commercial nuclear powers, distributed storage and disposal at a level of safety and security commensurate with that of the United States would be more expensive than aggregated storage in a single country.

SECTION 2.2
STATE GOVERNMENT

COMMENTOR NO. 1: SOUTH CAROLINA STATE PORTS AUTHORITY

south carolina state ports authority
Post Office Box 817, Charleston, South Carolina 29402 Telephone 803/723-8651

May 8, 1995

W. Don Welch
EXECUTIVE DIRECTOR

Mr. Charles Head
U.S. Department of Energy
Office of Environmental Management (EM-37).
1000 Independence Avenue, SW
Washington, DC 20585

Dear Mr. Head:

Reference: The Handling of Spent Nuclear Fuel

As I believe your office is aware, the South Carolina State Ports Authority does not support the use of the SPA facilities at Charleston or any facility at other commercial ports for the movement of spent nuclear fuel. The return of spent nuclear fuel to the United States is in the national interest and to meet that government goal, the SPA continues to recommend the use of Federal military installations for the receipt, handling, and sequential shipment of such cargo. 1-1

The State Ports system is recognized internationally as a very efficient port and the spent nuclear fuel could in the SPA's opinion be safely handled at Charleston, however the SPA's firm opposition to the movement of this cargo is based on: 1-2

- significant local citizen, political, and environmental opposition;
- the likelihood of severely restrictive safety requirements being placed on the fuel-handling operation, which would significantly interfere with normal commercial operations;
- the inability of the commercial sector to protect itself against business losses due to closed channels, operational shut-downs, evacuations, or whatever procedures may be ordered by the U.S. Coast Guard.

The SPA will not voluntarily open its facilities at Charleston to the receipt of spent nuclear fuel as defined in the U.S. Department of Energy program. In fact, unless ordered to do so by the federal government, the SPA will restrict any steamship line from landing any such cargo at SPA property in Charleston harbor. 1-3

RESPONSE TO COMMENT
COMMENTOR NO. 1: SOUTH CAROLINA STATE PORTS AUTHORITY

Response to Comment No. 1-1

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without the additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all of the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted.

The security provisions are summarized in the new Appendix H that has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify the details of the transportation process, including security provisions in port and during transit.

Response to Comment No. 1-2

The South Carolina State Ports Authority's opinion that spent nuclear fuel could be safely handled at the Port of Charleston, SC is noted. The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Charleston, or to any of the ports analyzed in the EIS, is low.

DOE considers that the use of any of the ports indicated by the port selection process, including Charleston, would not impact normal commercial operations. This is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions. As such, there should be not adverse commercial or economic reaction to the use of the port. Historically, there were no adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

Response to Comment No. 1-3

DOE considers that the analysis presented in Sections 4.2.2 and 4.5 of the EIS indicates that foreign research reactor spent nuclear fuel would pose little risk to the port or to anyone in or around the port. Therefore, DOE regrets the position taken by the State Ports Authority and considers that it is unnecessarily restrictive.

COMMENTOR NO. 1: SOUTH CAROLINA STATE PORTS AUTHORITY (CONT'D.)

Mr. Charles Head
Page two
May 8, 1995

There are many military installations available for this cargo and the SPA respectfully suggests that they be utilized. *1-1 (Cont'd.)*

Sincerely,

W. Don Welch

W. Don Welch

WDW/lr

RESPONSE TO COMMENT
COMMENTOR NO. 1: SOUTH CAROLINA STATE PORTS AUTHORITY (CONT'D.)

COMMENTOR NO. 69: JACKSONVILLE PORT AUTHORITY

AIRPORTS
- Jacksonville International
- Craig
- Herlong

JAXPORT

JACKSONVILLE PORT AUTHORITY
Post Office Box 3005
2831 Talleyrand Avenue
Jacksonville, Florida 32206-0005

SEAPORTS
- Blount Island Terminal
- Talleyrand Terminal

May 19, 1995

Mr. Charles Head
Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Re: Jacksonville Port Authority Comments on Foreign Research Reactor Spent Nuclear Fuel Draft EIS DOE/EIS-0218D

Dear Mr. Head:

The City of Jacksonville and the Jacksonville Port Authority have reviewed the Draft Environmental Impact Statement (EIS) for acceptance of foreign research reactor spent fuel. We have also attended both the environmental workshop forum held in Washington on February 10, 1994 and the public meeting called in Jacksonville on March 29, 1994.

While we understand the relationship of retrieving U. S. origin highly enriched uranium to the U. S. policy on nonproliferation, we must insist that several factors be first considered. These facts will take Jacksonville out of consideration for a port of entry:

1. The Nuclear Fuel Acceptance Program is a national security and national defense issue; and, therefore, all transportation movements of spent nuclear fuel to the Southeastern U. S. during this program should move through the Military Ocean Terminal at Sunny Point, North Carolina. *69-1*

2. Since the Savannah River Site near Aiken, South Carolina or the Oak Ridge, Tennessee Site are the potential Southeastern U. S. destinations of this cargo, there are at least three (3) maritime ports capable of handling container type cargo that would be considerably closer to these destinations, thereby reducing the overland exposure to any incidents.. *69-2*

3. The draft of your Environmental Assessment issued in November, 1993, did not list Jacksonville, Florida as a port for consideration. We were not involved in the original decision process to add Jacksonville to the list for consideration. *69-3*

Facilitating International Trade and Travel for Florida's First Coast

RESPONSE TO COMMENT
COMMENTOR NO. 69: JACKSONVILLE PORT AUTHORITY

Response to Comment No. 69-1

The commentor's preference for the use of MOTSU is noted. The selection process used to evaluate candidate ports is described in Appendix D of the EIS. As indicated by the analysis in Sections 4.2.2 and 4.5 of the EIS, risk associated with acceptance of spent nuclear fuel from foreign research reactors at military or commercial ports would be low.

Response to Comment No. 69-2

The distance from the port to the management site is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations include port population, route population, port experience with handling containers, and access to the ocean. Appendix D, Section D.1.9 of the EIS presents details of the port selection process.

Response to Comment No. 69-3

The Environmental Assessment was developed to support emergency relief for certain foreign research reactors that had special need to resolve spent nuclear fuel disposition issues in the near term, therefore the port selection process was restricted. The EIS on the other hand, is considering a longer-term policy so it must consider a wider range of options, including an expanded process of selecting ports of entry. The selection process used for ports for the Environmental Assessment was independent to that used for the EIS. Although Jacksonville was not considered under the EA, when some 161 commercial and military ports were included for consideration for the policy of accepting foreign research reactor spent nuclear fuel for the longer term, Jacksonville, as a major East Coast port, was included. All ports were subjected to the same selection criterion, which are described in Appendix D, Section D.1.9 of the EIS.

COMMENTOR NO. 69: JACKSONVILLE PORT AUTHORITY (CONT'D.)

Mr. Charles Head
Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
May 19, 1995
Page 2

4. The port of Jacksonville has never handled this type of highly radioactive hazardous material in the forty (40) years this type of cargo has been entering the United States. We see no reason to start at this critical point. It would seem prudent that those ports which have the experience and knowledge of handling spent nuclear fuel over the forty (40) year history should be the only ones considered for this port of entry situation. 69-4

We therefore respectfully request that the Port of Jacksonville be withdrawn from the list of ports being considered in your deliberations

Thank you for your understanding in this matter.

Sincerely,

C. Mendoza

C. Cliff Mendoza
Managing Director

CCM/BMP/kje

RESPONSE TO COMMENT
COMMENTOR NO. 69: JACKSONVILLE PORT AUTHORITY (CONT'D.)

Response to Comment No. 69-4

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Jacksonville is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Jacksonville, or to any of the ports analyzed in the EIS, is low.

As the port selection process section (Appendix D, Section D.1 of the EIS) explains in detail, Jacksonville and the other nine ports all meet the criterion to safely handle the foreign research reactor spent nuclear fuel. The experience criterion used in the port selection process (Criterion 1; Appendix D, Section D.1.9.1 of the EIS) evaluates the port's experience in handling containerized cargo, not in dealing with radioactive material. Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the casks used to transport it would be low, so no special handling is required; experience with handling containers is sufficient. The Port of Jacksonville has significant experience handling containers, so it met the experience selection criteria.

STATEMENT OF THE OREGON DEPARTMENT OF ENERGY

on Acceptance of Foreign Reactor Spent Nuclear Fuel

May 25, 1995

I am Michael Grainey. I am the Assistant Director for the Oregon Department of Energy. The State of Oregon has had a longstanding interest in assuring that the shipment of radioactive materials through Oregon occurs safely.

We consider both Hanford and the Idaho National Engineering Laboratories as unacceptable for storage of any shipments of foreign spent fuel. Therefore, it makes no sense to bring the shipments through the Port of Portland. Other U.S. Department of Energy sites should be selected, depending on whether USDOE will simply store the fuel or reprocess it. In our opinion, neither the Hanford site nor the Idaho site should be used for storage or reprocessing this fuel. 114-1

The U.S. Department of Energy has included Hanford and the Idaho site as possible locations for storing some or all of the foreign research reactor spent fuel. This storage period is expected to last at least 40 years. Given the massive problems that exist already at Hanford, the State of Oregon opposes any proposal to bring large amounts of spent fuel to Hanford for long-term storage.

The Hanford Site has suffered an enormous toll of environmental contamination from nearly fifty years of plutonium production. Oregon has consistently urged the U.S. Department of Energy to devote all its efforts at Hanford to the monumental task of environmental restoration of the site. Bringing in more spent fuel to Hanford would only serve to complicate clean-up issues and further delay restoration of the site.

Recently, a new Hanford cleanup agreement was negotiated between the State of Washington, the U.S. Department of Energy and the Environmental Protection Agency. That document does not take into account the receipt of additional spent fuel for long-term storage. 114-2

The U.S. Department of Energy's own draft Environmental Impact Statement on foreign spent fuel considers Hanford an unacceptable site. That statement provides the following: -- and I quote -- "The age, condition, available capacity of these facilities, and the Tri-Party Agreement milestones generally prevent the use of the existing facilities for storage of foreign reactor spent fuel. .... The Hanford Site has concluded that there are no existing facilities available and ready for accepting foreign research reactor spent nuclear fuel." (Page F-53).

Indeed, there are major environmental problems associated with the current storage of spent nuclear fuel at Hanford. Eleven hundred and fifty metric tons of spent fuel is now stored in a leaking basin at the K-E reactor. This has resulted in tritium contamination

Response to Comment No. 114-1

The Oregon Department of Energy's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Portland is noted. Based on the criteria used for identifying the ports evaluated (Section 2.6.3.1 of the EIS), the port identification is not affected by the choice of a management site.

Response to Comment No. 114-2

In accordance with the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement Record of Decision released on May 30, 1995, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site. A Consent Order, embodying the litigation settlement between the State of Idaho, the Navy, and DOE was issued on October 17, 1995.

COMMENTOR NO. 114: OREGON DEPARTMENT OF ENERGY (CONT'D.)

of the groundwater and of the Columbia River. This problem won't be resolved until after the turn of the century. To bring more spent fuel in -- when there is still much to be done to safely store the fuel at Hanford now -- would be folly.

114-2 (Cont'd.)

While we are not as familiar with the problems at the Idaho site, we have major concerns about use of that site as well. Because of serious concerns by the State of Idaho about the storage and handling of spent fuel at the Idaho site, the U.S. Department of Energy has been under a court order that severely restricts the number of shipments allowed there. Idaho was successful in its court action because of USDOE's woeful record on waste handling and storage; that record raises serious questions about the suitability of INEL to accept more spent fuel for long-term storage.

Moreover, even if the federal court order at the Idaho site is eventually removed, we have concerns about the use of the Idaho site. Spent fuel sent to Idaho would likely be "reprocessed" in aged facilities. These facilities should be decommissioned, not restarted. Reprocessing creates more waste which would complicate the task of managing wastes at the Idaho site and cleaning it up. If the fuel is to be reprocessed, and we have concerns about reprocessing any fuel, other USDOE sites are better suited than Idaho.

114-3

In opposing shipment of foreign spent fuel through the Port of Portland, let me make clear that we believe that spent nuclear fuel can be transported safely and public confidence can be maintained as long as the federal government works cooperatively with state, Tribal, and local agencies. Emergency responders must receive adequate funding, training and equipment. Dock workers must be trained in the safe and proper handling of the spent fuel casks. State officials must receive advance notice of shipments. Independent inspections must occur at all critical points in the shipment. And, the routing and timing of shipments must avoid adverse weather and road conditions.

114-4

There have been dozens of shipments of spent fuel through the Port of Portland over the past 20 years. Our experience with Port Management and the Longshoremen has been exceptional. We have no concerns about whether the Port is professional enough to safely handle these shipments. The issue is, why ship through Portland at all? No shipments should go to Hanford or to Idaho and therefore no shipments should come through Portland.

114-1 (Cont'd.)

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RESPONSE TO COMMENT
COMMENTOR NO. 114: OREGON DEPARTMENT OF ENERGY (CONT'D.)

Response to Comment No. 114-3

The commentor's opposition to chemical separation at the Idaho National Engineering Laboratory is noted. The Record of Decision for its Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs EIS was issued on May 30, 1995. Chemical separation at Idaho National Engineering Laboratory was not included in this Record of Decision, so additional site-specific NEPA documentation would be required to restart the chemical separation facilities at this site.

Response to Comment No. 114-4

DOE will continue to work with State and local officials to ensure that emergency response capabilities are adequate and that the communications channels between the DOE and State and local governments remain open.

As discussed in Section 2.7 of the EIS, the primary responsibility for emergency response to an incident would reside with State, Tribal, and local authorities. DOE would provide coordination and technical assistance, and training to the State, Tribal, and local emergency response personnel. In addition, DOE has Radiological Assistance Program teams that operate from eight strategically located DOE offices around the country. Upon State, Tribal, or local request, these teams can provide technical expertise and assistance to monitor and assess radiological hazards. The teams are activated on an as-needed basis and generally can be ready to deploy from their home station within four hours of notification.

Appendix H has been added to the final EIS in response to public comments, to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that describes the overall management of and requirements for transportation. Details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port, transit to the management site(s), and plans in the case of severe weather or adverse road conditions,

would be contained in individual transportation plans for each shipment. DOE is required to inform the Governor of each State and any Tribal chair, or their designee, along a transportation route at least seven days in advance of the shipment of hazardous cargos, including radioactive materials.

Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the transportation casks would be low. No special handling or loading/unloading procedures would be required for the foreign research reactor spent nuclear fuel when it is contained in standard shipping containers; experience with handling containers is sufficient. Therefore, no special training of dock workers would be required.

The foreign research reactor spent nuclear fuel containers would be inspected numerous times during transport. First, the transportation cask and the container that carries the cask would be inspected for integrity at the foreign research reactor site. Next, the container would be inspected prior to loading it on the ship in the foreign port. During the time that the container would be onboard the ship, it would be inspected daily to ensure the container's integrity and to verify that the container was properly secured to the ship (Appendix C, Section C.4.1 of the EIS). Then the container would be inspected in the U.S. port of entry prior to off loading for overland transport (Appendix D, Section D.4.4 of the EIS) to the management site(s). This inspection schedule exceeds the regulatory requirements and has been proven sufficiently thorough over 30 years of previous shipments.

COMMENTOR NO. 159: STATE OF FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS

STATE OF FLORIDA
DEPARTMENT OF COMMUNITY AFFAIRS

2740 CENTERVIEW DRIVE • TALLAHASSEE, FLORIDA 32399-2100

LAWTON CHILES
Governor

LINDA LOOMIS SHELLEY
Secretary

June 2, 1995

Mr. Charles Head
U.S. Department of Energy
Office of Environmental Management (EM-37)
1000 Independence Avenue Southwest
Washington, DC 20585-0001

RE: Nuclear Waste Disposal Siting - Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel - Draft Environmental Impact Statement - Florida
SAI: FL9504170247C

Dear Mr. Head:

The Florida State Clearinghouse is awaiting additional comments from our reviewing agencies. Therefore, we are requesting an additional fifteen (15) days for completion of the consistency review in accordance with 15 CFR 930.41(b). 159-1

We will make every effort to conclude the review and forward the consistency determination to you on or before June 16, 1995.

Very truly yours,

Linda Loomis Shelley
Secretary

LLS/mgg

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RESPONSE TO COMMENT COMMENTOR NO. 159: STATE OF FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS

Response to Comment No. 159-1

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 days total) to be sufficient for public comment.

COMMENTOR NO. 240: WASHINGTON STATE REPRESENTATIVE TOM CAMPBELL

STATE REPRESENTATIVE
2nd DISTRICT
TOM CAMPBELL

State of Washington House of Representatives

FINANCIAL INSTITUTIONS AND INSURANCE
HEALTH CARE
LAW AND JUSTICE

June 14, 1995

Charles Head
Office of Spent Nuclear Fuel Management
U.S. Department of Energy
1000 Independence Avenue
Washington, DC 20585

Dear Mr. Head:

It has been brought to my attention that The United States Department of Energy is proposing to ship Nuclear Spent fuel through the Port of Tacoma, Washington.

As a State Representative of the 2nd District in Pierce County, I would strongly object to this material being transported through our port. The exposure of this potentially hazardous material to our people could cause substantial harm should any accidents occur with the handling process. I am simply not comfortable with the possible risks and believe that further consideration should be done to select a smaller port in a lesser populated area. In addition, the people in our county have not been fully informed. 240-1

I have been invited to attend a public hearing on Spent Nuclear Fuel on June 19, 1995. I intend to be available to the constituents in Pierce County and will be happy to represent them with concerns about this issue. Please keep me informed of further intentions by the U.S. Department of Energy to use the Port of Tacoma as one of their 10 ports for shipment of nuclear fuel.

Sincerely,

TOM CAMPBELL
STATE REPRESENTATIVE
2nd District

cc: Patrick O'Malley
President, Port Commission
Port of Tacoma

LEGISLATIVE OFFICE: 332 JOHN L. O'BRIEN BUILDING, PO BOX 40600, OLYMPIA, WA 98504-0600 • (360) 786-7824
HOTLINE DURING SESSION: 1-800-562-6000 • TDD: 1-800-635-9993
RESIDENCE: PO BOX 445, SUNAWAY, WA 98387 • (206) 847-1818
PRINTED ON RECYCLED PAPER

RESPONSE TO COMMENT
COMMENTOR NO. 240: WASHINGTON STATE REPRESENTATIVE TOM CAMPBELL

Response to Comment No. 240-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. All population within a fifty mile radius of Tacoma was considered when analyzing the impact of both incident-free transport and the range of hypothetical port accidents. The risks were found to be low. The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS).

The use of a remote port might slightly reduce the already low consequences of an accident, however there are other considerations that also must be made when making port selection. Appendix D, Section D.1.9 of the EIS presents a complete discussion of the port selection process.

In regard to informing the public, the draft EIS was mailed to more than 1,500 people and an official DOE announcement of the meeting location and purpose was advertised in local newspapers. Public service announcements were also provided to local radio stations and to cable-access television. The meeting announcement was included in the Federal Register concerning the EIS. In addition, 1-800 numbers were provided for preregistration and for requesting copies of the draft EIS.

COMMENTOR NO. 248: WASHINGTON STATE SENATOR DEAN SUTHERLAND

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Dean Sutherland Phone: 360-690-7262
Title and Organization: Washington State Senator
Address: 23503 NE 108th St
City: Vancouver State WA Zip 98682

*** COMMENTS ***

I have worked on nuclear safety related issues for years. What is being considered by USDOE is simply wrong. I trust public input has value in this process and isn't just proforma. The transport of these -- the world's worst waste --- requires sincere public review, scientific study, and a very thoughtful decision. I am available for full discussions and involvement if you desire

Respectfully submitted
Dean Sutherland
State Senator
I chair the Energy Cmte.

248-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

Washington State Senate
Senator Dean Sutherland
17th Legislative District

Olympia Office
422 John A. Cherberg Bldg.
P.O. Box 40417
Olympia, WA 98504-0417
(360) 786-7632
Legislative Hotline: 1-800-562-6000
FAX: (360) 786-7959

District Office
23503 108th Ave E
Vancouver, WA 98682-9717
(360) 690-7262
FAX: (360) 896-6442
Internet: senator.17@leg.wa.gov

RESPONSE TO COMMENT
COMMENTOR NO. 248: WASHINGTON STATE SENATOR DEAN SUTHERLAND

Response to Comment No. 248-1

The commentor's opposition to the transport of spent nuclear fuel from foreign research reactors is noted. Health and safety effects of management in the United States (Management Alternative 1 or 3) are discussed in Sections 4.2 and 4.5 of the EIS. Public comments and participation are important factors in the development of this EIS prepared under both the NEPA and DOE environmental Regulations and are considered in selecting the preferred alternative (Section 2.1 of the EIS).

COMMENTOR NO. 265: CALIFORNIA ENERGY COMMISSION

CALIFORNIA ENERGY COMMISSION
CHARLES R. IMBRECHT
Chairman

June 19, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

Dear Mr. Head:

We have reviewed the U.S. Department of Energy's (DOE) recently released environmental assessment and impact statement regarding their policy on foreign research reactor spent nuclear fuel[1]. Our enclosed comments focus on the transportation impacts of these proposed waste management policies (Enclosure 1).

The State of California has long voiced its concerns regarding the transportation implications of DOE's policy to accept and manage spent nuclear fuel from foreign research reactors. In 1986, Governor Deukmejian expressed concern that DOE planned to use the Port of Long Beach for shipments of spent fuel from Taiwan to the Savannah River Site in South Carolina (Enclosure 2). California's Attorney General's Office challenged DOE's failure to prepare an environmental assessment of the potential impacts from these shipments. These and other challenges led to DOE's preparation of an Environmental Assessment that concluded that shipping this fuel via the East Coast, rather than the West Coast, decreased overall transportation risk.

In our comments on DOE's Environmental Assessment (1991) and DOE's Notice of Intent (1993) regarding DOE's foreign reactor spent nuclear fuel policy, we called for a safety analysis of alternative ports and overland routes. We also objected to the possibility of DOE's not taking title to the foreign research reactor spent nuclear fuel before it reached the DOE waste management sites. This presumably would leave such decisions as cask, carrier and shipper selection to foreign countries who may base such decisions solely on least cost considerations, rather than on safety.

[1]The Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Fuel; and Environmental Assessment of Uranium-Enrichment Acceptance of Foreign Research Reactor Spent Nuclear Fuel.

1516 Ninth Street, Sacramento, California 95814-5512
(916) 654-5000
FAX: (916) 654-4420

RESPONSE TO COMMENT
COMMENTOR NO. 265: CALIFORNIA ENERGY COMMISSION

COMMENTOR NO. 265: CALIFORNIA ENERGY COMMISSION (CONT'D.)

Charles Head
June 19, 1995
Page 2

After reviewing DOE's environmental assessment and impact statement on foreign research reactor spent nuclear fuel, we conclude the following:

1. DOE's proposed foreign reactor spent nuclear fuel shipments to waste management sites in the East, e.g., the Savannah River Site in South Carolina (SRS), should be made via the East Coast, not the West Coast. Spent fuel should be shipped directly to an off-loading point located near the point of destination (DOE Waste Management Site). Analyses by DOE have shown that spent fuel shipments to SRS via the West Coast pose a greater risk to public safety than shipping via the East Coast. To help ensure the safe and uneventful shipment of spent nuclear fuel to waste management sites, shipping cost considerations should not be allowed to override efforts to minimize public risks.

2. DOE's criteria for selecting ports of entry for foreign research reactor spent fuel shipments would appear to disqualify from consideration both the Port of Oakland and the Naval Weapons Station in Concord, California. High population densities, extremely heavy traffic congestion, high seismic risk and co-location with weapons shipments would appear to disqualify these ports.

3. If feasible, DOE should take title to the foreign research reactor spent fuel shipments prior to shipment departure to provide greater assurance that the casks, shippers, carriers, routes and appropriate procedures for accident avoidance and emergency response procedures (key variables for determining shipment safety) are used.

4. DOE should work with corridor states affected by these shipments to develop rail and truck transport plans and procedures prior to the proposed foreign reactor spent fuel shipments. A transportation program, similar to that used for cesium shipments and that planned for transuranic waste shipments to the Waste Isolation Pilot Plant in New Mexico, should be developed by DOE and corridor states. Shipments should be inspected using the most recent inspection standards, e.g., Commercial Vehicle Safety Alliance (CVSA) enhanced inspection standards developed for spent fuel shipments and transuranic waste shipments.

5. Only cask designs that meet current federal transport safety requirements for transporting spent fuel should be used, i.e., the cask designs should be able to meet current spent fuel cask licensing requirements.

6. DOE should work with states to select rail and truck routes that minimize public risk and potential public impacts in the event of a transport accident.

RESPONSE TO COMMENT COMMENTOR NO. 265: CALIFORNIA ENERGY COMMISSION (CONT'D.)

COMMENTOR NO. 265:
CALIFORNIA ENERGY COMMISSION (CONT'D.)

These recommendations and conclusions are discussed in greater detail in the enclosed comments. We appreciate the opportunity to review these documents and hope to work with the Department of Energy in developing transport plans for these shipments.

Sincerely,

CHARLES R. IMBRECHT
Chairman

Enclosures: 2

RESPONSE TO COMMENT
COMMENTOR NO. 265:
CALIFORNIA ENERGY COMMISSION (CONT'D.)

COMMENTOR NO. 265: CALIFORNIA ENERGY COMMISSION (CONT'D.)

Enclosure 1

Comments by the
STATE OF CALIFORNIA
on the

U.S. DEPARTMENT OF ENERGY AND U.S. DEPARTMENT OF DEFENSE
DRAFT ENVIRONMENTAL IMPACT STATEMENT
ON A PROPOSED NUCLEAR WEAPONS NONPROLIFERATION POLICY
CONCERNING FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL

INTRODUCTION

The Draft Environmental Impact Statement (DEIS) is the result of a long legal struggle between states and DOE regarding DOE's policy to manage spent nuclear fuel from foreign research reactors. Over the past decade, the State of California has expressed concerns to the Department of Energy (DOE) regarding DOE's plans to transport spent nuclear fuel as part of the foreign research reactor spent nuclear fuel policy. These concerns were communicated in letters to DOE, legal challenges, as well as our comments on environmental assessments regarding this policy. In particular, the State objected to DOE's plans to use California ports for receiving foreign research reactor spent fuel destined for the Savannah River Site in South Carolina. In 1986, Governor Deukmejian wrote DOE to express concern regarding DOE's plans to use the Port of Long Beach to receive spent nuclear fuel from Taiwan for transport to the Savannah River Site in South Carolina.

California's Attorney General joined the Port of Oakland and the State of Washington in a legal challenge regarding DOE's failure to prepare an environmental assessment of the potential impacts from these shipments. Following DOE's preparation of an Environmental Assessment, DOE concluded that shipping this fuel via the East Coast, rather than the West Coast, decreased overall transport risk. As a result, the Taiwanese spent fuel was shipped in 1988 via Portsmouth, Virginia.

In 1991, DOE released a Finding of No Significant Impact (NOI) and Environmental Assessment on the proposed policy. The State of California provided comments on these documents as well as comments, provided in 1993, on DOE's Notice of Intent (NOI) to prepare an EIS.

Key issues raised by California in these proceedings have included:

(1) Concern over DOE's selection of the Port of Long Beach and the Port of Oakland for off-loading spent fuel from overseas; Governor Deukmejian stated that "a more direct route would further enhance the safety and security of these shipments."

RESPONSE TO COMMENT COMMENTOR NO. 265: CALIFORNIA ENERGY COMMISSION (CONT'D.)

COMMENTOR NO. 265:
CALIFORNIA ENERGY COMMISSION (CONT'D.)

(2) The need for a full public disclosure, as required by law, of the potential environmental impacts and risks from these planned shipments.

(3) The need for a comparative evaluation of the risks associated with alternative marine ports of entry and overland routes, including any special hazards that may be unique to these harbors or routes. Land routes from ports being considered for use in California traverse some of the most densely populated urban regions of the U.S.

In addition, portions of these routes have extremely high traffic congestion, which may increase public exposure and greatly hamper emergency response activities should they be necessary in the event of an accident. Time-of-day restrictions on shipments through these areas may be required to minimize public risk. The Port of Oakland is one of the Pacific Coast's chief industrial areas and the principal distribution center for northern California and much of the U.S.

(4) The need for an evaluation of alternatives that would permit this waste to be shipped directly to an off-loading point located more closely to where the fuel would be managed (DOE Waste Management Site).

(5) The need for an explanation of how it will be determined that adequate safety procedures are in place and transport requirements are met during shipment. In earlier documents, DOE assumed no responsibility for the shipments until they arrive at the Savannah River Site in South Carolina. Countries seeking the least cost means of returning the fuel to the U.S. could sacrifice safety in order to lower shipping costs. Decisions regarding the selection of ports, routes, and packaging for these shipments were to be left to the shipper hired by the foreign country returning the fuel.

(6) The need to directly involve corridor states and tribes in the planning and preparation for these shipments.

SPECIFIC COMMENTS ON THE DEIS

DOE's proposed policy involves the return of spent nuclear fuel from about 104 research reactors located in 41 foreign countries over a 13-year period. A typical cask of foreign research reactor fuel would contain about 900,000 curies. The DEIS estimates that about 186 cask shipments would be received at western ports of entry and about 651 cask shipments received at eastern points of entry (535 from ports and 116 from Canada). About 70 percent of the foreign research reactor fuel contains highly enriched uranium that could be diverted into the production of nuclear weapons, if it were removed from the spent fuel.

RESPONSE TO COMMENT
COMMENTOR NO. 265:
CALIFORNIA ENERGY COMMISSION (CONT'D.)

COMMENTOR NO. 265: CALIFORNIA ENERGY COMMISSION (CONT'D.)

1. Routing of Shipments

Spent fuel shipments intended for the Savannah River Site (SRS) in South Carolina should be shipped via the East Coast, not the West Coast. Analyses for the DEIS show that, for both truck and rail shipments, shipments to SRS via the Naval Weapons Station (NWS) in Concord, California affect the highest population densities when compared to the other ports under consideration in the DEIS. Although DOE has stated that economic factors support shipping some of the spent fuel via the West Coast to SRS, rather than via the Panama Canal to the SRS, least cost considerations should not override public safety. 265-1

Contrary to presumptions of the DEIS, rail routing should not be left solely to the discretion of the railroads. Routes shown in California traverse some of the most densely populated and heavily congested areas of the U.S. These routes would begin in, and continue for hundreds of miles in, Seismic Zones 3 and 4, the highest seismic risk zones. DOE should work with states and rail companies to select truck and rail routes that minimize public risk.

2. Need for State/Federal Cooperative Planning for These Shipments

DOE should work with corridor states affected by these spent fuel shipments in developing transport plans and procedures (including accident prevention and emergency response procedures) prior to shipment. Such plans could be based on the successful nuclear waste transport safety programs, thereby shortening the time needed for developing these plans. For example, a transportation safety program, similar to that used for cesium shipments and that planned for shipments to the Waste Isolation Pilot Plant, could be developed through cooperation between the federal government and shipment corridor states. 265-2

In addition, the federal government needs to develop a program to provide shipment corridor states with the necessary technical assistance and training to prepare for the large number of spent nuclear fuel shipments. DOE and other federal agencies such as the U.S. Department of Transportation and the Federal Rail Administration, should assist, cooperate with, and fund, as appropriate, activities of corridor states to ensure the safe transport of spent fuel and assure the emergency preparedness for potential transport incidents. The State of California will work with DOE in developing this transport plan. 265-3

3. Selection of Ports of Entry

In 1994, DOE designated the Port of Oakland in California as a port of entry for "Urgent-Relief" foreign research reactor spent fuel. In addition, the DEIS designated the Naval Weapons Station at Concord, California as one of three western ports for shipments of foreign research reactor fuel to the U.S. However, DOE's own criteria for selecting these ports of entry would appear to disqualify the Naval Weapons Station and the Port of Oakland. Characteristics important to radiological risk from a transport accident, such as total shipment distance between shipment origin and destination and the population distribution along routes, would make NWS and the Port of Oakland less suitable ports of entry for these shipments. 265-4

RESPONSE TO COMMENT COMMENTOR NO. 265: CALIFORNIA ENERGY COMMISSION (CONT'D.)

Response to Comment No. 265-1

DOE agrees with the commentor that cost considerations should not override public safety. The analysis in the EIS demonstrates that the risk associated with using Concord NWS, or either of the other two West Coast ports, to receive foreign research reactor spent nuclear fuel bound for the Savannah River Site, is low. If foreign research reactor spent nuclear fuel is accepted into the United States, the decision as to which port to use for each shipment would include consideration of the population along the land route to the designated management site(s).

While rail route selection is not covered by specific U.S. Department of Transportation or NRC regulations, the routes must be approved in advance by the NRC (10 CFR Part 73.37 (b)(7)). DOE is required to inform the Governor of each State and any Tribal chair, or their designee, along a transportation route at least seven days in advance of a shipment of hazardous cargo (10 CFR Part 73.37 (f)), including radioactive materials. If foreign research reactor spent nuclear fuel is accepted into the United States, and if Concord NWS is utilized, DOE will work with the State of California to help minimize public risk.

Response to Comment No. 265-2

The commentor's suggestion that DOE work with corridor states affected by spent nuclear fuel shipments to develop transport plans and procedures is noted. A Transportation Plan would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comment..

Response to Comment No. 265-3

The commentor's suggestion that the federal government needs to develop a program to provide shipment corridor states with necessary assistance and training to prepare for a large number of spent nuclear fuel shipments is noted. As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H of the EIS contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State,

COMMENTOR NO. 265: CALIFORNIA ENERGY COMMISSION (CONT'D.)

DOE's criteria require that terminals used for foreign research reactor spent fuel shipments should be physically separated from densely populated city centers (by several kilometers) to help ensure that the general public would be unlikely to be exposed to significant radiation doses from accidents within the port (cask drops, fires, or truck or rail accidents) and that the transport of spent nuclear fuel through large, densely populated, congested areas around the port would not be required. Shipments from Concord travel through some of the highest density populations of the alternative ports under consideration by DOE.

Another of DOE's criteria for port selection is the "absence of conflicting port activities". The NWS handles munitions, and, presumably nuclear weapons have been stored there (p. D-60). In addition, NWS is located on the edge of a very high seismic zone (with potential ground accelerations as high as 0.45 g, p. D-62.) Therefore, the NWS and the Port of Oakland do not appear to meet DOE's own criteria in evaluating alternate ports of entry.

265-4 (Cont'd.)

4. Adequacy of Inspections and Enforcement

The safety of these shipments depends upon the integrity of the packaging, experience and qualifications of the carrier and shippers, and whether the package and transport vehicles meet applicable transport safety regulations. Assurance must be provided through independent safety inspections to verify compliance with federal and international transport safety requirements. The responsibility for enforcing these regulations should be clearly identified and funding provided, as needed, to compensate States for additional costs incurred as the result of these inspections. Shipments should be inspected using the most recent standards, e.g., the Commercial Vehicle Safety Alliance (CVSA) enhanced inspection standards developed for spent fuel and transuranic waste shipments, developed by DOE and corridor states.

DOE's environmental assessments point to the excellent safety record for Type B package shipments. However, this safety record may not reflect transport safety practices in all 41 of the foreign countries from which the spent fuel will originate. Each of these countries would be expected to have varying degrees of ability and inclination to meet transport safety requirements. Therefore, independent shipment safety inspections should be performed prior to shipment departure, including inspection of fuel loading procedures as well as cask maintenance and quality assurance programs.

265-5

5. Adequacy of Emergency Response Preparedness

DOE should work with states along the proposed shipment corridors for these shipments to establish and implement an appropriate emergency response training program for potential transport accidents. Currently, only limited training is available to first responders for spent fuel accidents.

265-6

RESPONSE TO COMMENT COMMENTOR NO. 265: CALIFORNIA ENERGY COMMISSION (CONT'D.)

Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Response to Comment No. 265-4

The Port of Oakland was never considered nor designated as a port of entry for urgent-relief spent nuclear fuel. Concord NWS was one of ten ports that was determined in this EIS to be acceptable to receive the foreign research reactor spent nuclear fuel, if the material is to be accepted into the United States. Population of the port, surrounding areas to a radius of ten miles, and the population along the transportation routes are considered in the port selection criteria. The population around Concord and on the routes to the management sites was low enough to qualify Concord NWS as an acceptable port. The population criteria for port selection (Criterion 5) is discussed in more detail in Appendix D, Section D.1.9.5 of the EIS.

DOE understands that Concord NWS's primary mission is to support the military through handling munitions and that no handling of the foreign research reactor spent nuclear fuel could occur concurrently with handling explosives. These facts have been incorporated into the EIS.

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the transportation cask.

Response to Comment No. 265-5

Prior to use of a specific spent nuclear fuel transportation cask, the shipper would have to comply with the specifications, limitations, and maintenance requirements of the cask as required by the cask's certificate of compliance. In addition, a DOE representative would be present at the foreign research reactor site prior to the loading of the spent nuclear fuel in the cask. Further, a Transportation Plan detailing inspection procedures for the loading of the spent nuclear fuel at the foreign research reactor site would be provided by DOE prior to policy implementation. General provisions of the Transportation Plan are provided in Appendix H of the EIS.

Response to Comment No. 265-6

The commentor's suggestion on minimizing the risk for ground transportation of foreign research reactor spent nuclear fuel is noted. The coordination would be specified in the

COMMENTOR NO. 265: CALIFORNIA ENERGY COMMISSION (CONT'D.)

The difficulties of responding to a large-scale hazardous materials rail incident were recognized during the large hazardous materials spill which occurred in Siskiyou County, California in July 1991. The EIS should explain how the adequacy of rail carrier emergency response plans for spent fuel accidents or sabotage/terrorist incidents will be evaluated. In addition, DOE needs to describe how state and federal resources will be coordinated for responding to rail accidents and how onsite technical assistance will be provided to remote areas where no local hazardous response teams exist.

265-6 (Cont'd.)

6. Location for DOE's Taking Title to Foreign Reactor Spent Nuclear Fuel

Three scenarios are considered in the DEIS for when DOE would take title to the foreign reactor spent fuel: (1) before shipment begins; (2) at the Ports of Entry (at the limit of U.S. territorial waters or continental U.S. borders); or (3) at DOE Management Sites. DOE has proposed taking title to the fuel at the limit of U.S. territorial waters, or continental U.S. borders for shipments from Canada.

The location of taking title to the fuel is relevant to the safety of these shipments. Under scenarios 2 and 3, DOE presumably would be leaving such decisions to the foreign country and its contractors returning the spent fuel. Many foreign countries may use least cost, rather than safety considerations, in selecting the shipper, package, carrier, and routes to return the fuel. Since the safety of these shipments depends largely upon the integrity of the packaging, DOE or U.S. Department of Transportation inspections should be made as the spent fuel is being prepared for shipment to verify that the casks and their contents meet U.S. transport safety requirements.

265-7

Taking title to the fuel at the limit of U.S. territorial waters or continental U.S. does not appear to provide sufficient U.S. oversight to ensure that the spent fuel was properly packaged and prepared for shipment. Stringent safety inspections should occur at the point of origin of the shipment. Without this common-sense safeguard, it may be possible that one or more shipments could arrive at a U.S. port of entry in a conditions unsafe or unsuitable for transport by truck or rail to a DOE waste management site. Therefore, we recommend that DOE, if feasible, take title to the shipment before the shipment begins to ensure that the shipment and its contents meet international and national transport safety requirements.

In addition, to clarify any uncertainty regarding liability coverage in the event of a major transport accident, DOE should publish in the Federal Register, for public review and comment, DOE's determination that accidents involving foreign reactor spent nuclear fuel shipments would be covered under the Price-Anderson Act.

265-8

RESPONSE TO COMMENT COMMENTOR NO. 265: CALIFORNIA ENERGY COMMISSION (CONT'D.)

Transportation Plan which would be prepared for any spent nuclear fuel shipment that would be carried out. The general provisions of the Transportation Plan are included in Appendix H of the EIS.

Appendix D, Section D.5.9 has been added in the EIS to address terrorism and sabotage. This section concludes that, while certain terrorist and sabotage attempts cannot be precluded, theft would be. DOE considers that the foreign research reactor spent nuclear fuel is accepted into the United States. The security measures employed would be required to meet or exceed all the security requirements in the Code of Federal Regulations (10 CFR Part 73). DOE supports these regulations as being adequate to protect the foreign research reactor spent nuclear fuel.

Response to Comment No. 265-7

The commentor's support for taking title to the foreign research reactor spent nuclear fuel at the point of origin of the shipments instead of the territorial waters or continental U.S borders (Section 2.2.1.4 of the EIS) is noted. Regardless of which location were selected for taking title, DOE would, through contractual agreements, ensure that the appropriate inspections take place at the point of origin to verify that the casks and their contents meet U.S transport safety requirements.

Response to Comment No. 265-8

The Price-Anderson Act's indemnification requirements pertaining to DOE contract activities must be complied with whenever DOE enters into a contract with a person who will carry out activities under that contract that involve the risk of public liability. The specific language of the indemnification agreement that would be included in the contract is contained in 48 CFR Part 952.250-70. In order for indemnification to take place, there must first be a nuclear incident as defined by the regulations. DOE will not publish in the Federal Register a determination that Price-Anderson indemnification provisions would cover accidents involving spent nuclear fuel because the law itself (Price-Anderson Act) makes it clear exactly when, and under what circumstances, the indemnification provisions apply and DOE must comply with the law under such circumstances.

COMMENTOR NO. 265: CALIFORNIA ENERGY COMMISSION (CONT'D.)

7. Shipping Casks

The DEIS states that Type B packaging will be used for shipping foreign research reactor spent nuclear fuel and naval reactor spent fuel. In the past, DOE has used Type B packaging that meets 1967 Nuclear Regulatory Commission requirements for shipping transuranic wastes. These older package designs could not be licensed under current transport package licensing requirements, although they can still be used for shipping transuranic waste. (Current licensing requirements for transporting plutonium are more stringent.)

265-9

The DEIS also states that the casks proposed for ground transport are not currently certified for shipping foreign research reactor spent fuel. How will the casks used by foreign countries be certified? Will they have full-scale testing? The casks used for the proposed spent fuel shipments should be required to meet current federal transport requirements for transporting spent fuel.

RESPONSE TO COMMENT
COMMENTOR NO. 265: CALIFORNIA ENERGY COMMISSION (CONT'D.)

Response to Comment No. 265-9

Spent nuclear fuel is required to be transported in "Type B" transportation casks that are certified for transporting radioactive materials. These transportation casks are subject to stringent design, fabrication, and operating requirements imposed by the competent authority for the country of origin (the NRC, in the United States) to withstand very severe accidents without releasing their contents. Regardless of where a transportation cask is designed, fabricated, or certified for use, if used internationally it must meet certain minimum performance requirements and regulations established by the international Atomic Energy Agency. The selection of a specific model of "Type B" transportation cask to be used depends on the particular spent nuclear fuel to be shipped.

COMMENTOR NO. 266: OREGON DEPARTMENT OF ENERGY

Oregon

DEPARTMENT OF ENERGY

June 16, 1995

U.S. Department of Energy
Office of Environmental Management (EM-37)
Attn: Mr. Charles Head
1000 Independence Avenue, S.W.
Washington D.C. 20585-0001

Dear Mr. Head:

Thank you for this opportunity to offer the state of Oregon's comments on the draft Environmental Impact Statement (EIS) on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. Our comments focus on the following four areas: potential U.S. storage sites, reprocessing, transport issues, and emergency preparedness.

The issue of whether or not to ship foreign spent fuel back to the United States is beyond our scope for comment. We do not have enough information to determine whether adequate security can be established at each of the foreign sites to safeguard the spent fuel. Nor do we have detailed information on the treaty agreements that were made with these countries.

POTENTIAL U.S. STORAGE SITES

We support the U.S. Department of Energy's (USDOE) position (as outlined in the Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Waste Management Programs Final EIS and the subsequent Record of Decision) not to use the Hanford Site as a storage site for foreign spent fuel. As we stated during hearings in Portland in December 1993 and May 1995, we oppose storage of foreign research spent nuclear fuel at the Hanford Site. Hanford does not have facilities available for storage. Further, we are concerned that bringing additional waste into the site would seriously detract from the vital clean up work currently underway. 266-1

The draft EIS lists several options in which foreign fuel is stored temporarily (for about 10 years) at one or more USDOE facilities, then moved to another USDOE facility. We oppose this approach. Although we believe spent nuclear fuel can be transported safely, we also believe it is not good public policy to move high level nuclear waste from one interim storage facility to another. There is some risk, although small, 266-2

John A. Kitzhaber
Governor

625 Marion Street NE
Salem, OR 97310
(503) 378-4040
FAX (503) 373-7806
Toll-Free 1-800-221-8035

RESPONSE TO COMMENT
COMMENTOR NO. 266: OREGON DEPARTMENT OF ENERGY

Response to Comment No. 266-1

The commentor's support for the statement in the Record of Decision for the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement that no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site, is noted.

Response to Comment No. 266-2

As discussed in Section 2.6.5 of the EIS, the management of foreign research reactor spent nuclear fuel at an interim site would have become a necessity if the decision to manage the rest of DOE's spent nuclear fuel involved the exclusive use of a site lacking existing facilities to accept the fuel at the start of the policy. These sites were the Hanford Site, the Oak Ridge Reservation, and the Nevada Test Site. Since the Record of Decision discussed in response to comment 266-1 above did not select these sites for future management of spent nuclear fuel, the commentor's concern is no longer an issue, as both the Savannah River Site and the Idaho National Engineering Laboratory have existing facilities capable of accepting the fuel on the effective starting date of the policy.

COMMENTOR NO. 266:
OREGON DEPARTMENT OF ENERGY (CONT'D.)

State of Oregon Comments on a
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involved with the transport of spent nuclear fuel. Shuttling it from one site to another unnecessarily increases the risk. 266-2 (Cont'd.)

If shipments do come to the United States, USDOE proposes storage at the Savannah River Site and the Idaho National Engineering Laboratory (INEL). Both sites do have available storage capacity and experience in handling foreign spent fuel. However, we believe INEL has serious problems which preclude its use as a site to store additional foreign research reactor spent nuclear fuel. Because of serious concerns by the state of Idaho about the storage and handling of spent fuel at the Idaho Site, USDOE is under a court order that severely restricts transporting additional waste to INEL. Idaho was successful in its court action because USDOE's past record of waste handling and storage at INEL is less than exemplary. 266-3

REPROCESSING

We oppose the reprocessing of foreign research reactor spent fuel. Reprocessing does little to reduce the volume of high level waste. It creates new waste streams. It adds to the amount of weapons grade material that is available. We oppose reprocessing whether the spent fuel remains in Europe or is returned to the United States. 266-4

TRANSPORT ISSUES

USDOE should reassess, based on its own selection criteria, the continued study of the Port of Portland as a receiving point for foreign research reactor spent fuel. One screening criteria used by USDOE to select potential ports of entry was favorable transit from the open ocean to the selected terminal. The draft EIS states that "DOE concluded that ports meeting the intent of this criterion would have relatively short trips to port from large deep bodies of water that were either oceans, seas, or notable extensions thereof....and which present no special navigational hazards to ships." Yet, the Port of Portland is more than twice as far from large deep bodies of water than any of the other ports still under consideration. Further, the draft EIS states "There are a number of cautions concerning entering and navigating the Columbia and Willamette Rivers. The U.S. Coast Guard warns that entry into the Columbia River can be dangerous because of sudden and unpredictable changes in the currents often accompanied by breakers." The draft EIS goes on to list free floating logs and submerged 266-5

RESPONSE TO COMMENT
COMMENTOR NO. 266:
OREGON DEPARTMENT OF ENERGY (CONT'D.)

Response to Comment No. 266-3

In accordance with the Department of Energy's Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement Record of Decision released on May 30, 1995, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. A Consent Order, embodying the litigation settlement between the State of Idaho, the Navy, and DOE was issued on October 17,1995.

Response to Comment No. 266-4

The commentor's opposition to chemical separation is noted. The advantages and disadvantages of chemical separation are discussed in Section 2.2.2.6 of the EIS.

Response to Comment No. 266-5

The passage from the Pacific Ocean up the Columbia River to Portland meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for the port selection (Appendix D, Section D.1.9 of the EIS). Favorable transit from open ocean is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations include port population, along the route to the management site, port experience with handling containers, and port facilities. Appendix D, Section D.1.9 of the EIS, presents details of the port selection process.

COMMENTOR NO. 266: OREGON DEPARTMENT OF ENERGY (CONT'D.)

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deadheads or sinkers as sources of danger. The draft EIS also cites Coast Guard statistics of 112 ship collisions and 145 (hard) groundings between 1990 and 1993. Given these warnings, it appears that USDOE disregarded its own criteria to keep Portland among the ports under consideration. 266-5 (Cont'd.)

We believe that USDOE should seriously consider exclusive use of military ports for shipments. Military ports are far more suitable to meet the security needs of these shipments. The use of military ports would also eliminate the very real possibility that longshoremen would refuse to unload foreign spent fuel. 266-6

Since USDOE proposes to store spent fuel at Savannah River and INEL based on fuel type, some shipments bound for Savannah River would likely be delivered to West Coast ports and some fuel destined for INEL would likely be delivered to East Coast ports. This would necessitate cross-country shipments by rail or truck. We believe the final EIS should evaluate shipping these materials through the Panama Canal in lieu of cross-country shipments. 266-7

USDOE asked for comments on when the federal government should take title to the fuel. We believe this should occur before shipment, if shipments are to occur. This is the only way to ensure that all components of the transport system comply with U.S. transport safety regulations. 266-8

EMERGENCY PREPAREDNESS

The shipment of foreign research reactor spent fuel to and through the United States raises significant issues about the adequacy of emergency response preparedness. The draft EIS rightfully states that the primary responsibility for emergency response resides with local authorities. The draft EIS also says an emergency management and response infrastructure already exists to support these shipments. To a limited extent, that is true. However, that does not remove USDOE from its responsibility to work with states and Indian tribes along shipping routes to ensure an adequate level of preparedness exists. 266-9

Spent nuclear fuel can be transported safely and public confidence can be maintained as long as the federal government works cooperatively with state, Tribal and local agencies. Emergency responders must receive adequate funding, training and equipment. Dock workers must be trained in the safe and proper handling of spent fuel casks. State officials must

RESPONSE TO COMMENT COMMENTOR NO. 266: OREGON DEPARTMENT OF ENERGY (CONT'D.)

Response to Comment No. 266-6

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. The commentor's preference for the exclusive use of military ports to ship foreign research reactor spent nuclear fuel is noted. DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted. Sections 4.2.2.2 and 4.2.2.3 of the EIS provide the analysis on impacts of incident-free operation and consequences of port accidents, respectively.

The possibility of a longshoremen's refusal to off-load this material was not considered in the ports selection process (Appendix D, Section D.1.9 of the EIS) because such a policy, even if valid, would be impossible to predict.

Response to Comment No. 266-7

In the evaluation of sea routes (Appendix C, Section C.3.2 of the EIS) and the incident-free impacts of the ocean transit of the foreign research reactor spent nuclear fuel (Appendix C, Section C.4.1 of the EIS) the assumption was made that some of the shipments would pass through the Panama Canal. There are no regulations against sending spent nuclear fuel through the Panama Canal.

Response to Comment No. 266-8

The commentor's support for taking title to the foreign research reactor spent nuclear fuel at the point of origin of the shipments instead of the territorial waters or continental U.S borders (Section 2.2.1.4 of the EIS) is noted. Regardless of which location were selected for taking title, DOE would, through contractual agreements, ensure that the appropriate inspections take place at the point of origin to verify that the casks and their contents meet U.S transport safety requirements.

Response to Comment No. 266-9

DOE considers that if foreign research reactor spent nuclear fuel is managed in the United States, there is adequate regulatory and emergency preparedness infrastructure to ensure its safe acceptance and transportation to the designated management site. As discussed in Section 2.7.1 of the EIS, Federal funding to State, Tribal, and local governments is being provided for maintaining emergency response programs. There are three national emergency

COMMENTOR NO. 266: OREGON DEPARTMENT OF ENERGY (CONT'D.)

receive advance notice of shipments. The routing and timing of shipments must avoid adverse weather and road conditions. And, USDOE must carefully select the truck, rail and steamship carriers and operators to handle these shipments. Human error and equipment failures are the main causes of accidents. Should shipments occur, USDOE should select only firms and individuals with demonstrated safety records to haul these materials.

266-9 (Cont'd.)

The draft EIS lists some of the cooperative work USDOE has done with Western corridor states to prepare for cesium capsule shipments and transuranic waste shipments to the WIPP facility. That work is a good start. USDOE needs to build on those efforts and provide sufficient funding to prepare for shipment of foreign research reactor spent fuel, if it is to occur.

SUMMARY OF OREGON COMMENTS

In summary, it is our position that:

- Hanford not be used now or in the future as a storage site for foreign research reactor spent fuel;
- The Idaho National Engineering Laboratory has serious problems which preclude its use as a site to store additional foreign research reactor spent nuclear fuel;
- Foreign research reactor spent fuel should not be shipped to any USDOE site for interim storage with the intent of eventually moving it to another USDOE site for longer-term storage;
- The foreign research reactor spent fuel should not be reprocessed either in the United State or elsewhere;
- USDOE should re-assess, based on its own selection criteria, the continued study of the Port of Portland as a receiving point for foreign research reactor spent fuel;
- USDOE should seriously consider using only military ports for shipments of foreign research reactor spent fuel;
- USDOE should compare the risks of shipping foreign research reactor spent fuel through the Panama Canal instead of making cross-country shipments;
- If shipments are to be made to the United States, USDOE should take title to the fuel before shipment; and,

RESPONSE TO COMMENT COMMENTOR NO. 266: OREGON DEPARTMENT OF ENERGY (CONT'D.)

response plans under which DOE provides technical advice and assistance to the State, Tribal and local agencies involved with a radiological incident. DOE is also required to inform the Governor of each State and any Tribal chair, or their designee, along a transportation route seven days in advance of the shipment of hazardous cargoes, including radioactive materials. It would be the responsibility of the Governor to provide any further notification to State and local officials.

Emergency preparedness, security, and coordination of DOE with local emergency response authorities that would be involved with the acceptance and transportation of foreign research reactor spent nuclear that would be involved with the acceptance and transportation of foreign research reactor spent nuclear fuel will be discussed in detail in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which has been added to the final EIS in response to public comments. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders.

COMMENTOR NO. 266:
OREGON DEPARTMENT OF ENERGY (CONT'D.)

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- If shipments are to be made to the United States, USDOE must work cooperatively with state, Tribal and local officials along shipping routes to ensure an adequate level of emergency preparedness exists.

Sincerely,

John Savage
Acting Director

cc: Kerry Barnett, Director, Oregon Department of Consumer and Business Services
Paula Burgess, Natural Resources Advisor to Governor John Kitzhaber
Steve Marks, Senior Policy Advisor to Governor John Kitzhaber
Oregon Congressional Delegation Staff

[redacted]

RESPONSE TO COMMENT
COMMENTOR NO. 266:
OREGON DEPARTMENT OF ENERGY (CONT'D.)

COMMENTOR NO. 310: WASHINGTON STATE REPRESENTATIVE RUTH FISHER

STATE REPRESENTATIVE
27th DISTRICT
RUTH FISHER

State of Washington
House of Representatives

TRANSPORTATION
RANKING MINORITY
GOVERNMENT OPERATIONS
AGRICULTURE & ECOLOGY
LEGISLATIVE TRANSPORTATION
CHAIR

MY NAME IS RUTH FISHER. I REPRESENT THE 27TH DISTRICT IN THE STATE LEGISLATURE. THE PORT OF TACOMA IS LOCATED WITHIN THE 27TH.

I WAS THE CHAIR OF THE HOUSE TRANSPORTATION COMMITTEE AND BECAME THE RANKING MEMBER AFTER THE LAST GENERAL ELECTION.

I WISH TO SPEAK TO THE ISSUE OF TRANSPORTATION TONIGHT. ADDING TRUCK TRAFFIC TO THE I-5 CORRIDOR NORTH IS PUTTING AN ADDITIONAL LOAD ON THE FOURTH MOST CONGESTED HIGHWAY SYSTEM IN THE UNITED STATES. ---NOT WESTERN WASHINGTON, NOT THE STATE OF WASHINGTON, NOT EVEN THE WEST COAST -- THE FOURTH MOST CONGESTED CORRIDOR IN THE UNITED STATES! 310-1

IF WE ARE ADDRESSING RAIL TRAFFIC, YOU WILL BE ADDING TO ANOTHER CROWDED CORRIDOR. THE STATE OF WASHINGTON HAS INVESTED A GOOD CHUNK OF MONEY IN THE TRACKS GOING NORTH AND SOUTH. WE HAVE BEEN DESIGNATED THE PRIORITY CORRIDOR BY THE UNITED STATE DEPARTMENT OF TRANSPORTATION. WE ARE STRUGGLING WITH COMMUTER RAIL INTERCITY RAIL AND FREIGHT RAIL ON THE BURLINGTON NORTHERN TRACKS. 310-2

WE ARE ALSO STRUGGLING WITH A POLITICAL CLIMATE IN THIS STATE THAT HAS SAID "NO MONEY FOR TRANSPORTATION IMPROVEMENT."

IT'S GOING TO GET A LOT WORSE BEFORE IT GETS BETTER.

IF YOU ARE CONSIDERING AIR TRAFFIC, WE ARE IN THE MIDDLE OF A CONTROVERSY CONCERNING THE THIRD RUNWAY AT THE SEATAC AIRPORT. THAT MAY NOT BE RESOLVED FOR 10 TO 20 YEARS. 310-3

LEGISLATIVE OFFICE: 314 JOHN L. O'BRIEN BUILDING, PO BOX 40953, OLYMPIA, WA 98504-0953 • (360) 786-7930
RESIDENCE: 1922 NORTH PROSPECT, #D, TACOMA, WA 98406 • (206) 752-7926

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RESPONSE TO COMMENT
COMMENTOR NO. 310: WASHINGTON STATE REPRESENTATIVE RUTH FISHER

Response to Comment No. 310-1

The commentor's concern related to adding truck traffic to the I-5 corridor is noted. Even if Management Alternative 1 were adopted and the Port of Tacoma were to be used exclusively (an unlikely assumption), then only an additional 721 ISO containers would be unloaded at Tacoma over a period of 13 years, an average of one container per week. This would represent a very small increase to the existing and future truck or rail traffic burden. This subject is discussed in detail in Section 2.6.4 of the EIS.

Response to Comment No. 310-2

The commentor's concern related to rail traffic congestion is noted. See the response to comment 310-1 above.

Response to Comment No. 310-3

As discussed in Section 2.10 of the EIS, transportation of foreign research reactor spent nuclear fuel by air was considered as an alternative and was dismissed.

Commentor No. 310: Washington State Representative Ruth Fisher (Cont'd.)

YOU CANNOT ADD TO THE TRANSPORTATION SYSTEM WITHOUT SEVERE CONSEQUENCES.

I'M NOT TALKING ABOUT THE DANGER OF COLLISION. I'M TALKING ABOUT THE ADDITIONAL TRAFFIC ON AN OVERLOADED SYSTEM. WE IN THIS STATE MUST CONTINUE PLANNING FOR THE GROWTH WHICH WILL OCCUR IN THE NEXT DECADE. THE TRANSPORTATION SYSTEM IS NOT ADEQUATE NOW.

AS A PUBLIC OFFICIAL WHO IS CONCERNED, I OBJECT.

AS A RESIDENT WHO MUST USE THE SYSTEM, I OBJECT.

AS A LONGTIME REPRESENTATIVE FOCUSED ON TRANSPORTATION PROBLEMS AND SOLUTIONS, I OBJECT.

Response to Comment
Commentor No. 310: Washington State Representative Ruth Fisher (Cont'd.)

COMMENTOR NO. 325: WASHINGTON STATE SENATOR MARILYN RASMUSSEN

Washington State Senate

Olympia Offices
408 Legislative Building
P.O. Box 40482
Olympia WA 98504-0482

Senator Marilyn Rasmussen
2nd Legislative District

Telephones:
(360) 786-7682
Toll Free: 1-800-562-6000

June 19, 1995

CHARLES HEAD, PROGRAM MANAGER
OFFICE OF SPENT NUCLEAR FUEL MGT (EM-37)
US DEPT OF ENERGY
1000 INDEPENDENCE AVE SW
WASHINGTON D C 20585

Dear Mr. Head:

I strongly oppose any shipment of high-level nuclear waste through the Port of Tacoma and urge you to eliminate the port from your list of possible entry sites. 325-1

High-level nuclear waste is extremely radioactive; and a spill, cask rupture, or shipboard fire would have disastrous consequences for our entire region. This deadly fuel would have to be transported through our waters, unloaded by port longshoremen, and then trucked through city streets and highways to its ultimate destination. With more than 721 shipments scheduled to move through the port over 13 years, the public safety and environmental risks are unacceptable. 325-2

Additionally, the draft environmental impact statement prepared by the federal government is incomplete and inaccurate. It is based on outdated information about the port and its terminals and fails to adequately address critical security and cleanup concerns. 325-3

I respectfully urge you to reject the Port of Tacoma site.

Warmest regards,

MARILYN RASMUSSEN
State Senator
Second Legislative District

MR:dlb

Committees: Agriculture & Agricultural Trade & Development, Chair • Education • Transportation • Select Committee on Water Policy

RESPONSE TO COMMENT
COMMENTOR NO. 325: WASHINGTON STATE SENATOR MARILYN RASMUSSEN

Response to Comment No. 325-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 325-2

Human health and safety were primary considerations during the evaluation of environmental effects for the alternatives. Conservative estimates of radiological and nonradiological impacts show that risks to the population and workers are low (Section 4.2 of the EIS). Section 4.10 of the EIS summarizes risks associated with U.S. acceptance of the foreign research reactor spent nuclear fuel and compares these risks with those due to natural background radiation and other common risks. The probability of an accident at sea is discussed in Appendix C, Section C.5.5 of the EIS, while the port accident probabilities are found in Appendix D, Section D.5.3.1.3 of the EIS. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3). With respect to accidents involving a fire, the EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), during which an airborne release of radioactive material results. Appendix D, Section D.5.4 of the EIS presents the results of the analysis. Analyses in the EIS indicate that even in the event of a severe ship fire involving a spent nuclear fuel transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5 of the EIS). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 40 years of spent nuclear fuel ground transport experience, no radiative materials have ever been released from a spent nuclear fuel transportation cask as a result of an accident.

Response to Comment No. 325-3

In regard to the analysis in the EIS being based on outdated and inaccurate information, errors have been found in the draft EIS, including some of the information on the Port of Tacoma and the associated map. Updated information on the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS. All of these errors have been corrected in the final EIS, and the conclusion that the risks associated with accepting foreign research reactor spent nuclear fuel into the United States through Tacoma, or any of the other candidate ports, are low and would result in low impacts is still valid. The population data used in the analyses, which was verified as being correct, were based on the 1990 census.

DOE considers that the foreign research reactor spent nuclear fuel could safely be received without additional security beyond that required by the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these

COMMENTOR NO. 325: WASHINGTON STATE SENATOR MARILYN RASMUSSEN (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 325: WASHINGTON STATE SENATOR MARILYN RASMUSSEN (CONT'D.)

requirements, it would be the responsibility of the shipper to provide the required additional security. DOE supports these regulations as being adequate to protect the foreign research reactor spent nuclear fuel in any port.

Appendix H has been added to the final EIS in response to public comments to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

In the unlikely event of a severe accident, the analysis performed for the EIS indicates that some radioactive material could be released from the cask and distributed into the environment. However, the analysis in Section 4.2.2.3 and Appendix D, Section D.5 of the EIS determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident. Close in to the accident, near the cask would likely require some cleanup, but the overall impact on the water and air quality in the port would be very small.

COMMENTOR NO. 385: WASHINGTON STATE
SENATOR LORRAINE WOJAHN

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Strongly oppose shipments and believe the citizens of the region will be subjected to serious risks. Further believe the draft environmental statement prepared by the federal government is incomplete and inaccurate and based on outdated information about the port and its terminals. Further, it fails to adequately address critical security and cleanup concerns

Name and Address: Lorraine Wojahn, State Senator
2515 South Cedar
Tacoma WA 98405

385-1

RESPONSE TO COMMENT
COMMENTOR NO. 385: WASHINGTON STATE
SENATOR LORRAINE WOJAHN

Response to Comment No. 385-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

In regard to the EIS being based on outdated and inaccurate information, errors have been found in the draft EIS, including some of the information on the Port of Tacoma and the associated map. Updated information on the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS. All of these errors have been corrected in the final EIS, and the conclusion that the risks associated with accepting foreign research reactor spent nuclear fuel into the United States through Tacoma, or any of the other candidate ports, are low and would result in low impacts is still valid. The population data used in the analyses, which was verified as being correct, were based on the 1990 census.

Appendix H has been added to the final EIS in response to public comments to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

No cleanup is expected to be needed. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive contents have ever been released from a spent nuclear fuel transportation cask, nor has a spent nuclear fuel transportation cask ever been punctured, even as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality. In the unlikely event of a severe accident, the analysis performed for the EIS indicates that some radioactive material could be released from the cask and distributed into the environment. However, the analysis also shows that the resultant contamination is so small that no cleanup would be required, other than possibly in the immediate vicinity of the accident.

COMMENTOR NO. 463: STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY PETE WILSON, Governor

DEPARTMENT OF TRANSPORTATION
BOX 23660
OAKLAND, CA 94623-0660
(510) 286-4444
TDD (510) 286-4454

June 14, 1995

04–General
SCH # 95054003

United States Department of Energy
Office of Environmental Management (EM–37)
Attn: Mr. Charles Head
1000 Independence Avenue, S. W.
Washington, D. C. 20585–0001

Re: Draft Environmental Impact Statement: PROPOSED NUCLEAR WEAPONS NONPROLIFERATION POLICY CONCERNING FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL.

Dear Mr. Head:

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for this project. We have examined the above referenced document and forward the following comments:

The casks used to transport the spent nuclear fuel are too heavy to be hauled on the public roads within the weight limits of the California Vehicle Code. To accommodate such shipments, Caltrans Transportation Permit policy provides for the issuance of overweight permits. 483-1

In those instances where the conditions of the transportation permit require the hauler to deviate from the designated hazardous material route for the radioactive material, the hauler must first obtain permission from the California Highway Patrol.

We appreciate the opportunity to work with you on this project. Should you have any questions regarding these comments, please call Timothy Sable of my staff at (510) 286-5555.

Sincerely,

JOE BROWNE
District Director

By: Phillip Badal

PHILLIP BADAL
District Branch Chief
IGR/CEQA

RESPONSE TO COMMENT
COMMENTOR NO. 463: STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

Response to Comment No. 463-1

If any foreign research reactor spent nuclear fuel is accepted into the United States, DOE and its shipping contractor would review and comply with all State and Federal laws and regulations involving ground transport.

DOE estimates that the transportation of foreign research reactor spent nuclear fuel would have about the same impact on the structural integrity of local roadways and bridges as does the commercial transportation of gravel and cement. As shown in Table B-14 in Appendix B of the EIS, marine transport casks for foreign research reactor spent nuclear fuel weigh between 10.9 and 25.5 metric tons. Including the truck, the total weight would be approximately 24 to 38 metric tons. For comparison, commercial ten-wheel sand and gravel trucks usually weigh almost 30 metric tons when fully loaded. Newer sand and gravel trucks which have an additional axle can weigh as much as 34 metric tons.

Commentor No. 483: David M. Beasley, Governor, State of South Carolina

State of South Carolina

Office of the Governor

David M. Beasley
Governor

Post Office Box 11369
Columbia 29211

June 20, 1995

The Honorable Hazel R. O'Leary
Secretary of Energy
United States Department of Energy
Washington, D.C. 20585

Re: Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Secretary O'Leary:

I appreciate the opportunity to comment on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

I urge you to limit the amount of fuel covered by this EIS to that which truly poses a proliferation threat. Since publication of the Notice of Intent, the scope of the EIS has increased sharply. The Draft EIS now includes 41 countries rather than 28, and the amount of fuel has increased by more than fifty percent, from 15,000 elements to 22,700 elements. The inclusion of other foreign research reactors "who have notified DOE and the Department of State that they are interested in participating in the proposed spent nuclear fuel management program" (Draft EIS Volume I at 2-7) indicates a willingness on the part of DOE to offer convenient spent fuel disposition to foreign reactors without regard to whether acceptance by the United States actually furthers nonproliferation goals.

483-1

DOE must give careful consideration, not just lip service, to alternatives to bringing this fuel into the United States. Research reactors in the United States continue to use highly enriched uranium; surely many of our allies can safeguard this material as well. Where possible, DOE should provide technical assistance to reactor operators to assure that highly enriched uranium is not diverted for weapons use. Where spent fuel cannot be stored safely at the reactor site or in the reactor's host country, chemical separation in Europe should be considered. Processing in the United Kingdom is in complete compliance with the Treaty on Nonproliferation of Nuclear Weapons and is consistent with United States nonproliferation goals. The fuel may be blended down to low enriched uranium, thus recycling it into commercially useful material instead of just throwing it away.

Response to Comment Commentor No. 483: David M. Beasley, Governor, State of South Carolina

Response to Comment No. 483-1

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). The inclusion of developed countries and/or U. S. allies in the proposed action is designed to support the United States under the RERTR program. If these stable, developed allies are not included in this program, many of these research reactors will have to shut down or are likely to switch back, or continue to use, HEU fuel. The increase in the amount of spent nuclear fuel from foreign research reactors eligible for the program is discussed in Section 2.2.1.3 of the EIS. The policy considerations and environmental impacts are discussed in Section 4.4 of the EIS.

This EIS provides an evaluation of environmental effects that would result from implementation of three basic policy alternatives and the No Action Alternative (Sections 2.2 through 2.5 of the EIS). Results given in Section 4 of the EIS indicate that implementation of any of the alternatives would have no significant effects on human health or the environment.

The commentor's preference for overseas management of spent nuclear fuel from foreign research reactors is noted. Overseas management of spent nuclear fuel from foreign research reactors, including overseas reprocessing and storage, is described in Section 2.3 of the EIS.

COMMENTOR NO. 483: DAVID M. BEASLEY, GOVERNOR, STATE OF SOUTH CAROLINA (CONT'D.)

Honorable Hazel R. O'Leary
Page Two
June 20, 1995

Additionally, I strongly object to the determination in the Draft EIS that chemical separation is not a preferred alternative for management of this fuel. Chemical separation at the Savannah River Site takes advantage of existing technical expertise at SRS, and offers the opportunity to dilute the highly enriched uranium to low enrichment. In addition, stabilization by processing and vitrification results in a stable waste form that protects against releases to the environment.

Simply storing this waste with no long-term disposal in sight is irresponsible. If "[u]ltimate disposition of DOE's spent nuclear fuel, including foreign research reactor spent nuclear fuel, is a high priority" (Draft EIS Volume I at 2-5), the fuel should be prepared for disposal in the repository. Assuming that aluminum clad fuel will meet waste acceptance criteria for the repository simply assumes away the problem. 483-2

Finally, processing is a cost-competitive option for management of this fuel, particularly given the susceptibility of aluminum clad fuel to corrosion and the technical uncertainties of dry storage. It is likely that the canyons at SRS will be operated for some period of time to process other materials at risk; the foreign research reactor fuel can be combined with these processing campaigns.

The people of South Carolina support the nuclear nonproliferation goals of the United States. I recognize, however, that research reactor operators who would prefer not to make difficult or costly decisions are pressuring the Department of Energy and the State Department to accept this fuel. I urge you to ensure that the proposed policy is carefully tailored to meet the objectives of the United States and that the management alternative chosen is in the United States' best interest. 483-3

Sincerely,

David M. Beasley

cc: Charles R. Head

RESPONSE TO COMMENT
COMMENTOR NO. 483: DAVID M. BEASLEY, GOVERNOR, STATE OF SOUTH CAROLINA (CONT'D.)

Response to Comment No. 483-2

The commentor's support for domestic chemical separation and vitrification are noted. This is Management Alternative 1, Implementation Alternative 6, which is discussed in Sections 2.2.2.6 and 4.3.6 of the EIS. It is also part of Management Alternative 3, which is discussed in Section 2.4 and 4.5 of the EIS.

Response to Comment No. 483-3

DOE and the Department of State agree that any policy that might be implemented should be tailored to meet the objectives of the United States and be in the best interest of the United States.

COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE

North Carolina Department of Crime Control and Public Safety
Division of Emergency Management

James B. Hunt, Jr., Governor — Thurman B. Hampton, Secretary

June 9, 1995

MEMORANDUM

RECEIVED
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N.C. STATE CLEARINGHOUSE

TO: Chris Baggett, North Carolina Clearinghouse

FROM: Billy R. Cameron

SUBJECT: DOE Spent Fuel Shipments

The North Carolina Division of Emergency Management disagrees with the proposed importation of foreign research reactor spent nuclear fuel through either the Port of Wilmington, North Carolina or Military Ocean Terminal, Sunny Point, North Carolina. However, this being said, if these shipments do move through North Carolina, this agency's concerns rest with being able to assure Governor Hunt, the General Assembly, County Officials and members of the general public that, if the two prospective North Carolina sites are selected, the shipments will be made as safely as possible. I also must be able to assure these same people that, should problems arise with the movement of this material through North Carolina, the emergency response agencies of the State and counties are adequately prepared to deal with any situation which might occur. In order to deal with the more likely, less severe accident or incident scenarios we must look at the worst case potentials when developing response plans, supporting procedures and training programs. In looking at worst case scenarios, issues surface which need to be addressed: 485-1

- Will information regarding the shipments be handled within the guidance of the Nuclear Regulatory Commission's Safeguard of Information regulations?

- •During the time immediately prior to the movement of the "Urgent Relief Shipments" the state and county agencies took strong information safeguard precautions. Department of Energy (DOE) officials began releasing shipment related information to the media. While we support the public's right to know what their government is doing, we feel the release of this information on the 485-2

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RESPONSE TO COMMENT
COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE

Response to Comment No. 485-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Ports of Wilmington, NC and Military Ocean Terminal, Sunny Point, NC, is noted. However, analysis in Section 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to these ports, or to any of the ports analyzed in the EIS, is low.

DOE is required to inform the Governor of each State and any Tribal chair, or their designee, along a transportation route at least seven days in advance of the shipment of hazardous cargoes, including radioactive materials. It would be the responsibility of the Governor to provide any further notification to State and local officials.

DOE would continue to work with State and local officials to ensure that emergency response capabilities are adequate and that the communications channels between DOE and State and local governments remain open.

Response to Comment No. 485-2

As discussed in Section 2.6.4.2 of the EIS, the NRC regulations concerning route notification are set forth in 10 CFR Part 73 . The regulation requires DOE to protect the schedules and itineraries of specific shipments, so DOE would not release this information to the news media.

COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE (CONT'D.)

June 9, 1995
Page 2

movement of "weapons grade" spent nuclear fuel has the potential of severely compromising the security of the shipments. This information in the hands of terrorists or extremist groups creates a potential threat and necessitates implementation of security measures.

- If DOE intends to release information on the movement of this material we must insist that a State law enforcement agency provide necessary security and be reimbursed for this service. The North Carolina Highway Patrol has personnel highly trained in law enforcement, security and radiological response. The Highway Patrol is adequately equipped to provide both ground and aerial surveillance as well as radiological monitoring and armed security.

485-2 (Cont'd.)

•DOE in Volume 1 Section 2.7.5 of the Draft Environmental Impact Statement, (EIS) states that "Primary responsibility for emergency response to a foreign research reactor spent nuclear fuel incident would reside with local authorities.... Each corridor State or Tribe would be responsible for augmenting their existing emergency management and response plans and procedures with any foreign research reactor spent fuel specific information they felt were necessary. They would also provide personnel and equipment to take charge of a foreign reactor spent fuel emergency in the unlikely event one should occur." DOE infers, in Volume I Section 2.7.1 of the Draft EIS that, because of existing federal funding programs, State and local governments should be able to manage all-hazards on a day-to-day basis. We agree that States and local governments receiving federal emergency preparedness funds should have emergency management and response programs to manage all-hazards on a day-to-day basis when such hazards have existed and come within the context of the State and local governments "Hazard and Risk Analysis". We submit that, because the movement of this type hazardous cargo is a new hazard and potential risk to many local areas, these local governments should not be presumed to have adequate programs to deal with "weapons grade" spent nuclear fuel accidents or incidents.

485-3

•DOE should be required to develop and implement, in coordination with the Division of Emergency Management, an on-going program to provide technical and financial support to the Division of Emergency Management and to all emergency response agencies within a ten mile radius of the selected port and with ten miles either side of selected transportation routes within North Carolina. This technical and financial support would enable these agencies to develop emergency management plans, training programs and equipment resources to deal with this new hazard and potential risk being introduced by DOE.

If you need further information on this matter please contact Buddy Jackson of my staff at 733-2931.

RESPONSE TO COMMENT
COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE (CONT'D.)

Response to Comment No. 485-3

DOE considers that there is adequate regulatory and emergency preparedness infrastructure to ensure the safe acceptance and transport to designated management sites if the foreign research reactor spent nuclear fuel is managed in the United States. Federal funding to State, Tribal, and local governments for maintaining emergency response programs is discussed in Section 2.7.1 of the EIS. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advice and assistance to the State, Tribal and local agencies involved with a radiological incident. Emergency preparedness, security, and coordination of DOE with local emergency response authorities, are discussed in general in Sections 2.7 and 2.8 of the EIS. Details would be contained in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE (CONT'D.)

State of North Carolina
Department of Environment,
Health and Natural Resources
Legislative & Intergovernmental Affairs

James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
Henry M. Lancaster II, Director

DEHNR

MEMORANDUM

TO: Chrys Baggett

FROM: Bill Flournoy BF.

SUBJECT: Draft EIS, Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (SCH# 95-0772)

DATE: June 1, 1995

The N.C. Department of Environment, Health, and Natural Resources has reviewed the draft EIS for a proposed Nuclear Weapons Nonproliferation Policy concerning foreign research reactor spent nuclear fuel. These and the attached comments from divisions of this department constitute our formal response.

The draft EIS was found to be particularly deficient in its discussion of the low probability but high impact consequences of an accident with release of radiation. For example, the loss of a cask in deep water during transport or shallow water while in port was mentioned, but the release of radiation into these environments was not assessed. The ease of clean-up and the potential effects on the food chain and related marine environment should have been topics of assessment. 485-4

Further, as the list of potential ports-of-entry were screened down there was an opportunity to include more discrete analysis of each port's unique environmental and socioeconomic characteristics. The draft EIS did not take optimum advantage of this opportunity and significant considerations were left unaddressed. Again, an opportunity loss analysis could have been performed on the low probability but high impact consequences of an accident with release of radiation. Such analysis might further distinguish the relative suitability between the final list of potential ports. For example, what Threatened and Endangered Species might be exposed to a release of radiation; what special environments, such as primary or secondary nurseries, shellfish waters, or Outstanding Resource Waters, and what public trust/recreation resources might be contaminated? Likewise, each of these topics has a socioeconomic value to the culture, character, and economy of the area that can be measured to assess both the importance of these sectors to the stability of each area, and the relationship between potential ports-of-entry. 485-5

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RESPONSE TO COMMENT
COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE (CONT'D.)

Response to Comment No. 485-4

The radiological impacts of a foreign research reactor spent nuclear fuel transportation cask sinking in deep ocean waters were estimated in the EIS (Appendix C, Section C.5). In that analysis it was assumed that the transportation cask seals would rupture if the cask were to sink in the deep ocean. If the cask is not recovered, the spent nuclear fuel eventually corrodes and all of the radioactive material eventually reaches the ocean environment. However, the results of this analysis show that both the consequences and the risk of this accident are low (Appendix C, Sections C.5.4 and C.5.5 of the EIS). Very little fishing or other harvesting of the deep ocean occurs due to difficulty of such an operation and to the relatively low populations of life in the deep ocean, so the food chain would be minimally impacted by an accident that resulted in the loss of a cask in the deep ocean.

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). The EIS (Section 4.2.1.3) has been revised to include DOE's intentions in regard to lost casks in U.S. coastal waters and elsewhere. Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

Response to Comment No. 485-5

The EIS does not consider the impacts on the discrete environmental or socioeconomic characteristics of each of the potential ports of entry because both the incident-free and the accident impacts were found to be negligible (Sections 4.2.2.2 and 4.2.2.3 of the EIS).

The severe port accidents discussed in Section 4.2.2.3 of the EIS, are all low-probability accidents involving the release of radioactive material, however the radiation dose consequences are not severe enough to be considered high-consequence accidents. In the unlikely event of a severe accident, the analysis performed for the EIS indicates that some radioactive material could be released from the spent nuclear fuel transportation cask and distributed into the environment. However, the analysis of impacts also shows that the resultant contamination would be so small that no cleanup would be required in any of the ports or surrounding areas. The analysis also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident. Section 4.2.2.3 and Appendix D, Section D.5 of the EIS detail the accident analysis and results.

Threatened and endangered species were considered on an individual port basis as part of the port selection process (Appendix D, Section D.1.9.6, Desirable Port Attributes). The desirable port attributes were used as discriminators for those ports that passed the five criteria used for port selection. Fernandina Beach, FL was removed from the selected candidate ports, in part, because of the presence of manatees.

COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE (CONT'D.)

The operational issue of whether shipments should be made through a single port or several qualified ports was not discussed in the draft EIS or referenced from prior environmental documents. Given the purpose of the Nonproliferation Policy, sensitivity of the material in transit, and need for discretion there is a lot to be said for a multi port strategy. This is an issue that deserves consideration as a critical element of the overall policy and program.

485-5 (Cont'd.)

The draft EIS correctly focussed on the issue of radiation, possible human exposure levels resulting from shipments, and related health effects. On the other hand, it was conspicuously weak in the breadth of documentation given to the affected environment which was viewed from the solid perspective of policy considerations, rather than as a living, functioning, and vulnerable ecosystem. In the process of showing that the proposed policy would have virtually inconsequential levels of impact regardless of which port(s) were utilized, the draft EIS lost the ability to distinguish between alternative ports. This ability can be regained through attention to the unique environmental and socioeconomic differences among the ports under consideration, as well as the opportunity loss implications of a low probability but high impact consequences of an accident with release of radiation. Such sensitivity analysis among ports will provide valuable information to decisionmakers about which port(s) are best suited for the proposed program.

485-6

BF:jr

Attachment

RESPONSE TO COMMENT
COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE (CONT'D.)

DOE considers that there would be no significant adverse impacts on the natural resources or on the air and water quality at any of the ports that might be used to accept the material under the proposed policy of managing foreign research reactor spent nuclear fuel. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

The port selection process and results presented in Appendix D, Sections D.1.8 and D.1.9, of the EIS only indicate ports that would be acceptable for the receipt and handling of foreign research reactor spent nuclear fuel; it does not determine which ports would ultimately be used. While all ports, if they are selected by the selection criteria, would be equally acceptable, the commentor's preference for a multi port strategy will be considered among other factors in determining the port or ports to be used.

Response to Comment No. 485-6

As discussed in Section 4.1.2 of the EIS, the detailed analysis of the potential environmental impacts presented in the Appendices of the EIS did not reveal any factor that would differentiate among alternatives. These factors include socioeconomic and ecology considerations for the ports considered. The emphasis on worker and public exposure to radiation is because of the public interest in that area.

COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE (CONT'D.)

State of North Carolina
Department of Environment,
Health and Natural Resources
Division of Radiation Protection

James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
Dayne H. Brown, Director

MEMORANDUM

DATE: May 30, 1995

TO: Melba McGee
Environmental Review Coordinator

FROM: Johnny Jarrell

SUBJECT: Comments on the Draft Environmental Impact Statement (DOE/EIS-0218D March 1995) on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

My review of the Environmental Impact Statement (EIS) on the Foreign Research Reactor Spent Nuclear Fuel was primarily focused on the entry of shipments (ports) and/or transportation of the fuel through North Carolina on the routes to Savannah River Site (SRS) or other Department of Energy facilities. Most of the fuel would probably be shipped to the SRS. If you have any questions or need additional information please contact me.

Following is a list of the comments and questions I have on the Draft EIS:

1. Will a primary and a backup port be selected on the East coast for all the spent fuel shipments? Or, will several ports be selected to spread shipments to all ports? Will a port be selected that will result in the lowest cost per shipment? Will a port be selected on risk factors only? — 485-7

2. If Military Ocean Terminal at Sunny Point (MOTSU) is selected as a port will commercial vessels be accepted for mixed cargo use? Are there any Department of Defense regulations at MOTSU that would preclude the use of normal commercial cargo vessels from docking without special clearance or arrangements? — 485-8

3. If MOTSU is selected as a port would the number of shipments have an impact on the normal operation as a military port for both normal times and in national security situations (troop and supply buildup for potential military operations)?

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RESPONSE TO COMMENT
COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE (CONT'D.)

Response to Comment No. 485-7

The port selection process and results presented in Appendix D, Sections D.1.8 and D.1.9 of the EIS only indicate ports that are acceptable for the receipt and handling of foreign research reactor spent nuclear fuel; it does not determine which ports would ultimately be used. The decision as to which port(s) would be used in the case that foreign research reactor spent nuclear fuel is accepted into the United States, will be made in the Record of Decision. Many risk factors must be considered in determining the port to be used, including the population in the port and along the route to the management site and other public safety considerations. Only after consideration of applicable risks and public safety concerns may the cost per shipment of foreign research reactor spent nuclear fuel be used as a factor in the final port selection.

Response to Comment No. 485-8

If MOTSU were selected as a port of entry for foreign research reactor spent nuclear fuel, either mixed use or dedicated ships could be used. No mixed use commercial vessels could be brought into a military base.

In addition, as stated in Appendix D, Section D.2.1.5 of the EIS, DOE is not aware of regulatory restrictions on receipt, handling, and transshipment of foreign research reactor spent nuclear fuel at MOTSU. Since the majority of cargoes handled at MOTSU are explosive, the terminal is laid out such that an explosion at one wharf will not seriously impact activities at an adjacent wharf. This would permit containerized spent nuclear fuel to be safely received and transported from the terminal even through there may be conflicting activities within the terminal. However, the unloading of spent nuclear fuel would be scheduled during periods when explosives were not being handled. Since MOTSU receives about 70 vessels per year on average, DOE considers that receipt of spent nuclear fuel at MOTSU would not impact the normal operation of the facility. Obviously, in times of national emergency where scheduled shipments of foreign research reactor spent nuclear fuel might conflict with MOTSU operations, alternate ports of entry would be selected.

COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE (CONT'D.)

4. In Volume 2, Appendix D, Selection and Evaluation of Potential Ports of Entry, page D-79, second paragraph, there is a statement, "Wilmington has handled many import shipments of nuclear fuel consigned to a General Electric nuclear power plant north of Wilmington, and has also handled containerized Class A explosives (Wilson, 1993).". The General Electric plant is not a nuclear power facility but is a manufacturing facility for new nuclear fuel for nuclear power plants. I am not sure what the reference to "has handled many import shipments of nuclear fuel " means. The shipment of new reactor fuel does not have the radiological hazard compared to spent nuclear fuel. 485-9

5. In Volume 2, Appendix E, Evaluation of Human Health Effects of Overland Transportation, page E1-35, Figure E1-6, and page E1-38, Figure E1-10, has MOTSU labeled as being in South Carolina. 485-10

6. In Volume 2, Appendix E, Evaluation of Human Health Effects of Overland Transportation, page E1-62, lists the road system that would be used for the truck routes from Wilmington, NC, to Savannah River. North Carolina should be consulted on the roads selected for both MOTSU and Wilmington ports for the most appropriate routes. 485-11

7. In Volume 2, Appendix D, Selection and Evaluation of Potential Ports of Entry, page D-68, fourth paragraph, there is a statement, "MOTSU is the only port in the contiguous United States which has current experience with foreign research reactor spent nuclear fuel receipt and handling, with two shipments received in October 1994 under the Urgent Relief Environmental Assessment.". This statement implies that MOTSU is the only port that could handle a spent fuel shipment if based on current experience because no other fuel has been shipped since approximately the mid 1980s. I do not believe that this should be a consideration for the handling of spent fuel at other ports. Several other ports have experience with spent fuel shipments and could handle these shipments with very little preparation. 485-12

cc: Steve Benton, Cabinet Management
Buddy Jackson, Emergency Management

RESPONSE TO COMMENT
COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE (CONT'D.)

Response to Comment No. 485-9

Based on the commentor's statement, clarification of this matter has been made in Appendix D, Section D.2.1.10 of the EIS.

Response to Comment No. 485-10

The captions of the two figures cited in this comment have been corrected in the final EIS.

Response to Comment No. 485-11

DOE has not yet selected ports, routes, or transport modes for the foreign research reactor spent nuclear fuel. Truck routes would be selected in accordance with Department of Transportation regulations (49 CFR Part 397.101 (a)(2)). A State routing agency can designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103.

Response to Comment No. 485-12

The experience criterion used in the port selection process evaluates the port's experience in handling containerized cargo, not necessarily for dealing with nuclear or radioactive material (Appendix D, Section D.1.9.1 of the EIS). Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the casks used to transport it would be low, so no special handling would be required; experience with handling containers would be sufficient. The ten ports selected all meet the criteria and hence are considered to be able to safely handle the foreign research reactor spent nuclear fuel.

COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE (CONT'D.)

North Carolina Wildlife Resources Commission

512 N. Salisbury Street, Raleigh, North Carolina 27604-1188, 919-733-3391
Charles R. Fullwood, Executive Director

MEMORANDUM

TO: Mollie McOnt
Office of Legislative & Intergovernmental Affairs

FROM: Franklin T. Mirabito, Manager
Habitat Conservation Program

DATE: May 30, 1995

SUBJECT: Comments on DEIS, SCH# 95-0772 for Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

Staff biologists with the North Carolina Wildlife Resources Commission have reviewed the subject draft environmental impact statement (DEIS) with regard to potential impacts to fish and wildlife resources. Our comments are provided in accordance with provisions of the National Environmental Policy Act (42 U.S.C. 4332(2)(C)) and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et. seq.).

We do not have a staff biologist knowledgeable in the dealing with spent nuclear fuel; therefore, we will have to depend on other review agencies to provide meaningful comments concerning USDOE's conclusions in the DEIS. However, we question if USDOE considered using the value of natural resources (e.g., commercial fisheries, threatened and endangered species, environmentally sensitive areas or outstanding resource areas) as a screening criterion for selecting ports of entry? If not - we request that the opportunity for potential loss of irreplaceable natural resources be included as a screening criterion and that the selected ports of entry be reevaluated. 485-13

Thank you for the opportunity to review and comment on this DEIS. If you need to discuss these comments please call me at (919) 528-9886.

RESPONSE TO COMMENT
COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE (CONT'D.)

Response to Comment No. 485-13

DOE considers that there would be no significant adverse impacts on the natural resources or on the air and water quality at any of the ports that might be used to receive the material under the proposed action of managing foreign research reactor spent nuclear fuel. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive contents have ever been released from a spent nuclear fuel transportation cask, nor has a transportation cask ever been punctured, even as a result of an accident. A paragraph has been added to (Section 4.2.2.2) of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

In the unlikely event of a severe accident, the analysis performed for the EIS indicates that some radioactive material could be released from the cask and distributed into the environment. However, the analysis of impacts also shows that the resultant contamination is so small that no cleanup would be required in any of the ports or surrounding areas. The analysis also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident. Close in to the accident, near the transportation cask would likely require some cleanup, but the overall impact on the water and air quality in the port would be small. Sections 4.2.2.3 and Appendix D, Section D.5 of the EIS detail the accident analysis and results.

COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE (CONT'D.)

State of North Carolina
Department of Environment,
Health and Natural Resources
Division of Environmental Management

James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
A. Preston Howard, Jr., P.E., Director

DEHNR

June 6, 1995

TO: Melba McGee

FROM: Dianne M. Reid

RE: Review of Draft EIS on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

I have reviewed the referenced document and found that they have addressed all the concerns indicated in the April 1994 review of the urgent-relief acceptance of foreign research reactor spent nuclear fuel. The one thing I would note for consideration is the location of Outstanding and High Quality Waters in the lower Cape Fear that could be directly affected should an accident occur. These areas include Masonboro Sound (Outstanding Resource Waters) and Walden Creek (High Quality Waters). These waters have excellent water quality and high resource values. There are also primary nursery areas and shellfishing waters downstream of the two North Carolina ports. If there are other ports which do not support these types of natural resources and excellent water quality areas, they should receive higher priority than the North Carolina ports.

485-14

cc: Monica Swihart
Steve Zoulily
Bill Flournoy, Office of Policy and Development

P.O. Box 29535, Raleigh, North Carolina 27626-0535 Telephone 919-733-3083 FAX 919-733-9919
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RESPONSE TO COMMENT COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE (CONT'D.)

Response to Comment No. 485-14

See the response to Comment 485-13 above.

COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE (CONT'D.)

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
P.O. BOX 25201, RALEIGH, N.C. 27611-5201

JAMES B. HUNT, JR. GOVERNOR

R. SAMUEL HUNT III SECRETARY

June 6, 1995

MEMO TO: Chrys Baggett, State Clearinghouse

FROM: Larry Bass, Assistant to State Highway Administrator

RE: 95-E-0000-0772
Draft EIS, Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

NCDOT's concern with any freight movement on the highway system includes the structural integrity of the roads and bridges over which the movements would occur, along with the safety of the motoring public and nearby residents in the vicinity of the route. The State Port at Wilmington and the Military Ocean Terminal at Sunny Point are discussed as possible ports of entry in the draft EIS. Both would appear to have transportation concerns.

The Wilmington Port does not have direct and easy access to high quality multi-lane highways. Freight movements have to travel city streets for some four miles to reach US Highways 74/76/17 (non-controlled access facilities) and eight miles on city streets to reach Interstate 40. Movements of heavy trucks, and particularly the heavier trucks envisioned in this proposal, could cause structural damage to these city streets as well as increase safety risks in an urban environment. 485-15

The report, on page D-74 of Volume 2, also seems to be misleading with respect to rail service. Norfolk Southern Railway has never served the Wilmington Port, and the intermodal TOFC and COFC facilities were closed down by CSX years ago. 485-16

Similar concerns exist with respect to the Military Ocean Terminal at Sunny Point. The report indicates the Sunny Point Terminal "is serviced by well-maintained roads", but dismisses the fact these are rural two lane roads requiring long connections to multi-lane controlled access highways. We are concerned with the impact that heavy truck movements might have on the structural integrity of these lower-level roadways and bridges. 485-17

RECEIVED
JUN 6 1995
N.C. STATE CLEARINGHOUSE

PHONE (919) 733-7844 FAX (919) 733-9428

RESPONSE TO COMMENT
COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE (CONT'D.)

Response to Comment No. 485-15

See the response to Comment 485-11 above. Furthermore, DOE and its shipping contractor would review and comply with all State laws and regulations involving ground transport.

DOE considers that the transportation of foreign research reactor spent nuclear fuel would have about the same impact on the structural integrity of local roadways and bridges as the commercial transportation of gravel and cement. As discussed in Table B-14 in Appendix B of the EIS, transportation casks for foreign research reactor spent nuclear fuel weigh between 10.9 and 25.5 metric tons. Including the truck (an 18-wheeler), the total weight would be approximately 24 to 38 metric tons. For comparison, commercial ten-wheel sand and gravel trucks usually weigh almost 30 metric tons when fully loaded. Newer sand and gravel trucks which have an additional axle can weigh as much as 34 metric tons.

Response to Comment No. 485-16

With regard to the intermodal TOFC (trailer-on-flat-car) and COFC (container-on-flat-car) facilities mentioned in the draft EIS, DOE thanks the Governor of North Carolina for this information and has updated the EIS to reflect it. Requested information received last year from the North Carolina State Ports Authority for the Port of Wilmington indicated a T.O.F.C./C.O.F.C. Area in the port which was assumed to be operational. Subsequent communication with the Port provided the clarifying information which has been incorporated into the EIS in Appendix D, Section D.2.1.10.

Response to Comment No. 485-17

Truck access to interstates is presented in Appendix D, Section D.2.1.5, but does not address the concerns expressed by the North Carolina Department of Transportation. The discussion in the EIS has been modified to respond to those concerns. Also see the response to Comment 485-15 above.

COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE (CONT'D.)

Chrys Baggett
June 4, 1995
Page 2

It would seem appropriate to consider the ease with which these movements could be made from the port of entry to their final destination. Presumably, movement on an interstate type highway or a higher level rail line would offer the greatest degree of safety, security, and efficiency. Access to southbound Interstate 95, the most likely direction for these shipments, clearly is inconvenient from both Wilmington and Sunny Point. 485-15 (Cont'd.)

ls

cc: Secretary Sam Hunt
Garland Garrett
Larry R. Goode
Chris McAdams

RESPONSE TO COMMENT
COMMENTOR NO. 485: NORTH CAROLINA STATE CLEARINGHOUSE (CONT'D.)

COMMENTOR NO. 498: STATE OF TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DOE OVERSIGHT DIVISION
761 EMORY VALLEY ROAD
OAK RIDGE, TENNESSEE 37830-7072

June 15, 1995

Mr. Charles Head
Office of Environmental Management
US Department of Energy
1000 Independence Avenue SW
Washington DC 20585-0001

Dear Mr. Head

Document NEPA Review -- "Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, DOE/EIS-0218D, Dated March 1995."

The Tennessee Department of Environment and Conservation, DOE Oversight Division has received the above subject document. Review was conducted in accordance with the requirements of the National Environmental Policy Act (NEPA) and implementing regulations of 40 CFR 1500 -1508 and 40 CFR 1021.

We request the attached comments on the above document be given full consideration in the preparation of the Final Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

If you have any questions, please contact Dale Rector at (615) 481-0995 or Steve Nisley at (615) 481-0163.

Sincerely

Earl C. Leming, Director

Enclosure
cc w/Encl Brian Kelly, Governor's Office
Patricia W. Phillips, ORO NEPA Compliance Officer
Amy McCabe-Fitzgerald, LOC
Elgan Usrey, TEMA Nashville
Oak Ridge Environmental Peace Alliance em0253.11

RESPONSE TO COMMENT
COMMENTOR NO. 498: STATE OF TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

COMMENTOR NO. 498: STATE OF TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION (CONT'D.)

Tennessee Department of Environment and Conservation/DOE Oversight Division

Comment on Document DOE/EIS-0211D, "Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel."

General Comments

1. Foreign research reactor spent nuclear fuel will be managed under the same alternative that is selected for management of DOE spent nuclear fuel. Therefore, the spent nuclear fuel Programmatic Environmental Impact Statement alternative selected by the "Record of Decision" should be identified in the Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel Environmental Impact Statement. — *498-1*

2. Summary, Figure S-16, page 48. 10 CFR 1021.311 "DOE National Environmental Policy Act (NEPA) Implementing Procedures," paragraph (d) requires a public scoping meeting including news releases to local media or letters to affected parties. A public scoping meeting for a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel Environmental Impact Statement was not held at Oak Ridge but was require prior to preparation of this document as the Oak Ridge Reservation is a candidate site for storage of the foreign research reactor spent nuclear fuel. Since Stakeholders in the Oak Ridge area were denied the opportunity for scoping input, the Oak Ridge Reservation should receive no further consideration as a storage site for foreign research reactor spent nuclear fuel. — *498-2*

Specific Comments

1. Summary, Section 1.2, last paragraph, page 6. Provide information on how long host countries would have to convert and make arrangements for the disposition of their own LEU Provide information on the length of time for the SNF Management policy. — *498-3*

2. Volume 1, Section 2.6.5.3.2 "Idaho National Engineering Laboratory," second paragraph, page 2-64. The sixth sentence of this paragraph states that ".....the Idaho National Engineering Laboratory could receive.....all of the TRIGA-type (Training, Research, Isotope, General Atomic) foreign research reactor nuclear fuel under the Regionalization by Fuel Type alternative (from the SNF PEIS)....." The reason that all TRIGA SNF (including aluminum clad) will go to INEL under the Regionalization by Fuel Type alternative is because SRS cannot process the uranium-zirconium hydride fuel compound contained in the TRIGA fuel. That reason should be explained in this section. — *498-4*

1

RESPONSE TO COMMENT
COMMENTOR NO. 498: STATE OF TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION (CONT'D.)

Response to Comment No. 498-1

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory.

Response to Comment No. 498-2

Based on the determination of potential management sites as discussed in response to Comment 498-1, no foreign research reactor spent nuclear fuel would be shipped to the Oak Ridge Reservation.

Response to Comment No. 498-3

Policy duration is described in detail in Sections 2.2.1.1 and 2.2.2.2 of the EIS. Detail in the Summary was reduced for conciseness.

Response to Comment No. 498-4

The reasons for segregating spent nuclear fuel by fuel type under the Regionalization By Fuel Type Alternative in the Department of Energy's Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement include more than just chemical separation expertise. Handling, inspection, canning, and storage expertise are also important, so a commitment to chemically separate was not a prerequisite for selecting this programmatic alternative. The selection criteria are discussed on Page 3-3 of Volume 1 of that EIS.

3. Volume 1, Section 3.3.4.1, second paragraph, page 3-96. The statement that the only active sinkhole at the Oak Ridge Reservation is on Copper Ridge adjacent to Melton Hill Dam is incorrect and should be revised as the ORR has numerous active sinkholes.

4. Volume 1, Section 3.3.4.3.2, second paragraph, page 3-99. The current conceptual model indicates the Oak Ridge Reservation as the most geologically complex of all DOE Sites. The groundwater conceptual model at the Oak Ridge Reservation is evolving from that of (Solomon et al., 1992) reference. The use of the terms aquitards and aquifers does not benefit decisions concerning environmental issues therefore the use of these terms should be omitted. 498-5

5. Volume 1, Section 3.3.4.5, page 3-103. Provide additional information on which endangered species are associated with the preferred habitat within the ORR boundaries.

6. Volume 1, Section 3.3.4.6, page 3-103. Provide a clarification of statement that alluvial and colluvial soil types eligible for classification as prime farmland are present on the West Bear Creek Valley site along Grassy Creek tributaries, and the statement that there are no onsite areas that are subject to Native American Treaty rights or that contain any prime or unique farmland.

7. Volume 2, Appendix B, note 2 at bottom of page B-3. TRIGA fuel is clad in "zircoloy" aluminum, or stainless steel. "Zircoloy" should be added to this note.

8. Volume 2, Appendix B, Section B.1.1.1 "Fuel Type", item 3 at top of page B-4. TRIGA fuel is clad in "zircoloy", aluminum, or stainless steel. "Zircoloy" should be added to this item. 498-6

9. Volume 2, Appendix B, Section B.1.3.5 "Rod-Type Design", pages B-14 through B-18. According to this section, TRIGA SNF is clad in aluminum, stainless steel, or zircoloy. Figure B-6 (on page B-17) show a "typical" TRIGA fuel element with stainless steel cadding. It should be noted at the bottom of the figure that TRIGA fuel elements can have aluminum, stainless steel, or zircoloy cladding.

10. Volume 2, Appendix F, Section F.4.4.2.1.8, second paragraph, page F-195. Oak and Hickory forest are "climax" succession species that do not grow as quickly as pine forests, a primary succession species. Provide a ratio of existing oak-hickory forest and pine-hardwood forest along with the proposed revegitation ratio. 498-5 (Cont'd.)

Transportation Comments

1. All probable ground transportation routes should be identified in the Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spend Nuclear Fuel Environmental Impact Statement. 498-7

Response to Comment No. 498-5

For the purpose of being accurate on information presented in the EIS, Sections 3.3.4.1, 3.3.4.3.2, 3.3.4.5, and 3.3.4.6 have been revised. With regard to Appendix F, Section F.4.4.2.1.8, the level of detail desired by the commentor is not required to determine the environmental impacts of the evaluated alternatives.

Response to Comment No. 498-6

The commentor's use of the term zircoloy cladding is incorrect with regard to the TRIGA fuel elements. It may be that the commentor means incoloy cladding when mentioning zircoloy. Appendix B of the EIS has been revised to include the word incoloy when fuel cladding is mentioned.

Response to Comment No. 498-7

There are too many possible ground transport routes to specify them all. DOE has presented representative routes in Appendix E, but these exact routes may not be the ones selected by DOE or approved by the NRC. The results presented in Appendix E and Section 4.2.3 of the EIS indicate that all the ground transport risks would be low along all the representative routes, so other routes would also be expected to have similarly low risks.

DOE agrees with this commentor's intent to minimize the inherent ground transport risks. One way DOE plans to minimize these risks is to minimize the total distance traveled. There may be specific cases, however, when DOE would choose to transport casks across the country.

COMMENTOR NO. 498: STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION (CONT'D.)

2. Volume 1, Section 2.6.4, "Ground Transport Route Options and Route Identification Process", page 2-35 through 2-40. According to this section, foreign research reactor spent nuclear fuel could be delivered to a port on the opposite side of the country from its destination. This would result in excessive ground transportation of the SNF. In order to minimize inherent ground transportation risks, each shipment of foreign research reactor SNF should be delivered to a port near its destination. Accordingly, foreign research reactor SNF destined for Idaho National Engineering Laboratory (INEL) should be shipped to a west coast port. If a shipment contains SNF destined for both INEL and SRR, the ship should deliver SNF to ports at both coasts in order to minimize ground transportation. It should be explained in this section and other applicable sections how this will be accomplished.

498-7 (Cont'd.)

3

RESPONSE TO COMMENT
COMMENTOR NO. 498: STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION (CONT'D.)

COMMENTOR NO. 527: STATE OF FLORIDA
DEPARTMENT OF COMMUNITY AFFAIRS

STATE OF FLORIDA
DEPARTMENT OF COMMUNITY AFFAIRS

2740 CENTERVIEW DRIVE • TALLAHASSEE, FLORIDA 32399-2100

LAWTON CHILES
Governor

LINDA LOOMIS SHELLEY
Secretary

June 16, 1995

Mr. Charles Head
U. S. Department of Energy
Office of Environmental Management (EM-37)
1000 Independence Avenue Southwest
Washington, DC 20585-0001

RE: Nuclear Waste Disposal Siting - Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel - Draft Environmental Impact Statement - Florida
SAI: FL9504170247CE

Dear Mr. Head:

The Florida State Clearinghouse, pursuant to Presidential Executive Order 12372, Governor's Executive Order 93-194, the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended, and the National Environmental Policy Act, 42 U.S.C. §§ 4321, 4331-4335, 4341-4347, as amended, has coordinated a review of the above-referenced project.

The Department of Energy's (DOE) draft Environmental Impact Statement (EIS) proposes adoption and implementation of a policy for management of spent nuclear fuel from foreign research reactors. This proposal is intended to reduce the potential for the proliferation of nuclear weapons by storing and managing spent nuclear fuel containing highly enriched uranium in the United States.

In response to the DOE's request for comment, the state has reviewed the draft EIS containing three management alternatives which identifies ten potential ports of entry for the receipt of the spent nuclear fuel. The City of Jacksonville, Florida is identified as a potential port. While the state supports the government policy on nonproliferation of nuclear weapons, we are concerned about the potential adverse environmental impact of bringing the spent fuel into the Jacksonville area.

527-1

EMERGENCY MANAGEMENT • HOUSING AND COMMUNITY DEVELOPMENT • RESOURCE PLANNING AND MANAGEMENT

RESPONSE TO COMMENT
COMMENTOR NO. 527: STATE OF FLORIDA
DEPARTMENT OF COMMUNITY AFFAIRS

Response to Comment No. 527-1

The analysis in the EIS indicates that there would be no significant adverse impacts on the natural resources or on the air and water quality at any of the ports that might be used to receive the foreign research reactor spent nuclear fuel. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive material has ever been released from a spent nuclear fuel transportation cask, nor has a spent nuclear fuel transportation cask ever been punctured, even as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

In the unlikely event of a severe accident, the analysis performed for the EIS indicates that some radioactive material could be released from the cask and distributed into the environment. However, the analysis in Section 4.2.2.3 and Appendix D, Section D.5 determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident. Close in to the accident, near the transportation cask would likely require some cleanup, but the overall impact on water supplies and air quality, and therefore wildlife, in the port and its approaches would be low.

COMMENTOR NO. 527: STATE OF FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS (CONT'D.)

Mr. Charles Head
June 16, 1995
Page Two

The Department of Environmental Protection (DEP) and the St. John's River Water Management District (SJRWMD) have expressed major concern regarding the potential for damage to the St. John's River and the Timucuan Ecological and Historic Preserve. Jacksonville is physically located on the lower St. John's River. The lower boundaries of the preserve extend from the mouth of the river and include the river within the preserve which terminates at Blount Island. Therefore, a ship docking at Blount Island would have to travel through the Timucuan Preserve.

The river and the preserve have long been the focal point of state efforts to protect the water resources, endangered and threatened species and habitats in the areas. The lower St. John's is one of six project areas for the State's Ecosystem Management Program; is one of the original state Surface Water Improvement and Management project areas; and is being considered for funding through the EPA's National Estuary Program.

The Timucuan Preserve is an immense estuarine system which includes 46,000 acres of salt marsh grasses, waterways and wooded islands. Recently, the Department of the Interior and the National Park Service proposed a cooperative management option to share responsibilities of the preserve among federal, state, local, and private entities. The area provides habitats for many threatened and endangered species, including the West Indian manatee, bald eagle, wood stork, shortnose sturgeon and Atlantic sturgeon. The preserve has also been designated as Class II waters of the state because of the substantial spawning grounds for fish and invertebrates suitable for shellfish harvesting.

Should Jacksonville be selected as the receiving port, the state is particularly concerned about the potential for accidental release of radioactive materials and its detrimental impacts upon the manatees, sea turtles and right whales which inhabit the area. In addition, it must also be emphasized that the residents of the Jacksonville area and the entire state depend almost entirely upon ground water for drinking water supplies, making the protection of our aquifer system of critical importance. *527-1 (Cont'd.)*

To minimize the distance necessary for overland transport, and the possibility of accidents, the DOE is strongly encouraged to select the port in closest proximity to the storage site(s). However, if the DOE selects Jacksonville as the port of entry, the final EIS should contain a discussion of the difficulty of navigating the St. Johns River, and a detailed comparison of the navigational risks posed at each of the candidate ports. In *527-2* *527-3*

RESPONSE TO COMMENT
COMMENTOR NO. 527: STATE OF FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS (CONT'D.)

Response to Comment No. 527-2

The distance from the port to the management site(s) is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations such as port population, route population, port experience with handling containers, and access to the ocean would also be considered in making the final selection of ports of entry. Appendix D, Section D.1.9 of the EIS presents details of the port selection process.

Response to Comment No. 527-3

Regarding navigation of the St. Johns River, see response to comment 527-4 below.

As discussed in the response to comment 527-4 , the spent nuclear fuel transportation casks are unlikely to affect the air or water quality. For this reason, there would be no impact on the water supplies, marine, estuarine, aquatic or uplands areas surrounding Jacksonville.

Mr. Charles Head
June 16, 1995
Page Three

addition, the EIS should also be revised to more thoroughly describe the affected environment and the potential impacts to those areas, including water supplies, and marine, estuarine, aquatic and upland areas surrounding Jacksonville and along potential transportation routes to the storage site.

527-3 (Cont'd.)

The DEP and SJRWMD letters of June 5, 1995, are enclosed for your review. We appreciate the opportunity to review the draft EIS, and look forward to working with you on the issue in the future.

Very truly yours,

for Mary Anne Price

Linda Loomis Shelley
Secretary

LLS/cmk

Enclosures

cc: Virginia Wetherell, Department of Environmental Protection
Carliane Johnson, Department of Environmental Protection
Margaret Spontak, St. John's River Water Management District

RESPONSE TO COMMENT
COMMENTOR NO. 527: STATE OF FLORIDA
DEPARTMENT OF COMMUNITY AFFAIRS (CONT'D.)

COMMENTOR NO. 527: STATE OF FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS (CONT'D.)

Department of
Environmental Protection

Lawton Chiles
Governor

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Virginia B. Wetherell
Secretary

JUN 8 1995

June 5, 1995

RECEIVED
JUN 9 1995
Florida Coastal Management Program

Suzanne Traub-Matlay
State Clearinghouse
Office of Planning and Budgeting
Executive Office of the Governor
The Capitol
Tallahassee, Florida 32399-0001

RE: Department of Energy/Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel
SAI: FL9504170247C

Dear Ms. Traub-Matlay:

The Department has reviewed the referenced draft Environmental Impact Statement (EIS) pertaining to the management alternatives of foreign research reactor spent nuclear fuel to processing facilities in the United States. The document identifies ten potential ports of entry for the receipt of the spent nuclear fuel and Jacksonville, Florida is listed as one candidate port.

The Department reviewed a prior EIS for spent nuclear fuel (SAI FL9402100081C) which evaluated seven different ports, including Jacksonville (see attached letter). We continue to have these same general concerns and offer the following additional comments:

1. The lower boundaries of the Timucuan Ecological and Historic Preserve extend from the mouth of the St. Johns River and includes the river within the preserve which terminates at Blount Island. For a ship to dock at Blount Island it must travel through the preserve.

The Timucuan Ecological and Historic Preserve was established by Public Law 100-249 on February 16, 1988. The Department of the Interior and the National Park Service have recently proposed a cooperative management option to share the responsibilities of the preserve among federal, state, local, and private entities. The Department of Environmental Protection is interested in this cooperative management endeavor and has an ecosystem-wide interest in the protection of the Timucuan Preserve.

The preserve includes 46,000 acres of salt marsh grasses, waterways and wooded islands. It is a vast estuarine system between the Nassau and St. Johns Rivers and the Atlantic Ocean.

527-1 (Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 527: STATE OF FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS (CONT'D.)

COMMENTOR NO. 527: STATE OF FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS (CONT'D.)

JUN 28

Ms. Traub-Metlay
June 2, 1995
Page Two

Blount Island is on the southwest border of the preserve. Much of the salt marsh is among the least disturbed on the southern Atlantic Coast. Many resident, migratory and rare species rely on the important habitats in the preserve. The preserve also provides important spawning grounds for fish and invertebrates and is designated as Class II waters of the State, suitable for shellfish harvesting. Many threatened and endangered species utilize the preserve's resources including: the West Indian manatee, bald eagle, wood stork, shortnose sturgeon and Atlantic sturgeon.

Although the draft EIS states that accidents are rare, this unique and sensitive coastal ecosystem should be adequately protected from any potential releases of chemical contamination.

2. The accidental release of radioactive materials could also adversely affect manatees, sea turtles and right whales. Manatees are regularly present in the Jacksonville area including the surrounding estuaries and the St. Johns River system. Sea turtles utilize the beaches for nesting throughout Florida including the Jacksonville area. Right whales are prevalent in the northeastern region of Florida, particularly during winter months, and they utilize the waters off the eastern coast of the U.S. throughout the year.

3. The draft EIS states that the St. Johns River is difficult to navigate which could increase the possibility of accidents. Strong tidal currents could exacerbate the problem if an accident did occur in which there is a loss of cargo. The EIS should make a detailed comparison of the navigational risks posed at each of the candidate ports.

4. It seems most logical to designate a port as close as possible to the storage site(s) at Savannah River Plant and Oak Ridge National Laboratory to minimize the distance necessary for overland transport. A road or rail accident has the potential to directly affect the citizen population, the upland environment, surface waters and groundwater. It would also be preferrable to designate a port with the most previous experience in handling spent nuclear waste.

5. If overseas transport is to be used, the cargo should be shipped on vessels of the safest design possible to minimize environmental and health risks to the greatest extent possible.

If Jacksonville is selected as the preferred location to receive spent nuclear fuel, the EIS should be revised to more thoroughly describe the affected environment and the potential impacts to those areas. This would include the marine, estuarine,

527-1 (Cont'd.)

527-4

527-5

527-6

RESPONSE TO COMMENT
COMMENTOR NO. 527: STATE OF FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS (CONT'D.)

Response to Comment No. 527-4

The passage from open ocean up the St. Johns River to the terminals operated by the Jacksonville Port Authority meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). As noted in the EIS, both terminals serve a number of major general cargo and container ship lines from around the world. Favorable transit from open ocean is only one of the considerations in evaluating and selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations such as port population, along the route to the management site, port experience with handling containers, and port facilities have also been considered in making the final selection of ports of entry. Appendix D, Section D.1.9 of the EIS presents details of the port selection process.

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered even where tidal currents may be strong. Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

Response to Comment No. 527-5

The risk due to ground transport does increase as the travel distance increases and this effect was taken into account in the traffic risk calculations that are presented in Section 4 and Appendix E of the EIS. In all cases the risks were found to be low.

As discussed in Appendix D, Section D.1 of the EIS, independent maritime safety experts have informed DOE that any modern breakbulk or container terminal can accommodate the safe receipt, handling, and transshipments of foreign research reactor spent nuclear fuel. Thus, previous port experience in handling nuclear materials is not necessary.

Response to Comment No. 527-6

Appendix C, Section C.3.1.2 of the EIS discusses types of ships that could be used, including purpose-built ships designed specifically for the transport of spent nuclear fuel. While the specific risks of using purpose-built ships were not analyzed, Section 4.2.1.3 of the EIS analyzes and compares the impacts of using either commercial or chartered (which includes purpose-built ships) shipping. This section demonstrates that, although there are differences between them, both would have low environmental effects and low risks. The Record of Decision will state the type(s) of ships to be used, if foreign research reactor spent nuclear fuel is to be accepted into the United States.

COMMENTOR NO. 527: STATE OF FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS (CONT'D.)

JUN 2 8

Ms. Traub-Matlay
June 2, 1995
Page Three

aquatic, and upland areas surrounding Jacksonville and along potential transportation routes to the storage site. On consideration of this information and the issues addressed above, the Department can evaluate the consistency of designating Jacksonville with its authorities in the Florida Coastal Management Program.

If I can be of further assistance, please feel free to contact me at (904) 487-2231.

Sincerely,

Carliane D. Johnson
Environmental Specialist
Office of Intergovernmental Programs

/cdj
cc: Jan Brewer
Roxane Dow
Ed Irby
Frank Votra

RESPONSE TO COMMENT COMMENTOR NO. 527: STATE OF FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS (CONT'D.)

Henry Dean, Executive Director
John R. Wehle, Assistant Executive Director
Charles T. Myers III, Deputy Assistant Executive Director

WATER MANAGEMENT DISTRICT

POST OFFICE BOX 1429 PALATKA, FLORIDA 32178-1429
TELEPHONE 904/329-4500 SUNCOM 904/860-4500
TDD 904/329-4450 TDD SUNCOM 860-4450
FAX (EXECUTIVE/LEGAL) 329-4125 (PERMITTING) 329-4315 (ADMINISTRATION/FINANCE) 329-4508

FIELD STATION

515 E. South Street, Orlando, Florida 32801, 407/897-4300, TDD 407/897-5960
7775 Baymeadows Way, Suite 102, Jacksonville, Florida 32256, 904/730-6270, TDD 904/730-7600
PERMITTING: 305 East Drive, Melbourne, Florida 32904, 407/984-4940, TDD 407/725-4347
OPERATIONS: 8133 N. Wickham Road, Melbourne, Florida 32935-8109, 407/254-1762, TDD 407/253-1303

June 5, 1995

JUN 14 1995

Office of Environmental Services

Ms. Suzanne Traub-Metlay
Florida State Clearinghouse
Executive Office of the Governor - OPB
Room 1603, The Capitol
Tallahassee, FL 32399-0001

Re: SAI # FL 9504170247C
Name of Project: Draft Environmental Impact Statement on Foreign Research Spent Nuclear Fuel

Dear Ms. Traub-Metlay:

The staff of the St. Johns River Water Management District has reviewed the document listed above for consistency with Chapter 373, Florida Statutes and offer the following comments.

The proposal outlines various policy alternatives for managing foreign research spent nuclear fuel including alternatives that involve transporting and storing foreign fuel in the U.S. vs Management of the spent nuclear fuel overseas. In general, it would appear the management alternative 2 or 3 would be in our best interest to insure protection of the United States natural and human resources. Just the transporting of such fuels would greatly increase the potential for accidents. 527-7

More specifically, one of the proposed ports is Jacksonville, Florida. Jacksonville is situated on the lower St. John's River, an area that has been prioritized by many state and regional agencies as a significant surface water body. The Lower St. John's River is one of six project areas for the State's Ecosystem Management Program. It is one of the original state Surface Water Improvement and Management (S.W.I.M.) project areas based on environmental and economic importance. Currently, the area is being considered for funding through EPA's National Estuary Program (N.E.P). The District would be glad to furnish more specific information of this priority water body at your request.

Special considerations would have to be taken in transporting of the fuels from the port in Jacksonville to the storage site in Savannah. Because residents in Florida depend almost entirely on ground water for drinking water supplies, the protection of our aquifer system is vitally important. I have enclosed a copy of our most recent aquifer recharge map for your assistance. Only a few areas in the vicinity of the Northeast Interstate I-95 system are in low recharge (0-4 inches per year). 527-8

Patricia T. Harden, CHAIRMAN, SANFORD
William Segal, VICE CHAIRMAN, ORTLAND
Dan Roach, TREASURER, PENNSUCO BEACH
Otis Mason, SECRETARY, ST. AUGUSTINE
Kelly Chiney, JACKSONVILLE
Griffin A. Greene, VERO BEACH
James H. Williams, OCALA
Reid Hughes, DAYTONA BEACH
James T. Swann, OCOEE

Response to Comment No. 527-7

The commentor's preference for Management Alternative 2 or 3 is noted. These are discussed in Sections 2.3, 2.4, 4.4, and 4.5 of the EIS.

Response to Comment No. 527-8

The commentor's concern for the protection of drinking water supplies is noted. The chance of a cask carrying foreign research reactor spent nuclear fuel crashing in an aquifer recharge area in northeast Florida is very low. Even if such an accident did occur, however, the cask would be expected to survive the crash without releasing any of its radioactive contents. (Appendix B, Section B.2 and Section 2.6.2 of the EIS.)

COMMENTOR NO. 527: STATE OF FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS (CONT'D.)

Page 2
SAI# 9504170247C

JUN 28 [redacted]

In addition to ground water protection, the northeast area contains many regionally significant habitat areas which are depicted on the enclosed map. These areas should be considered when establishing transportation routes, etc. A more detailed map with supporting information is available. The Florida Game & Fresh Water Fish Commission can provide you with a detailed study indicating their strategic habitat areas and a listing of endangered species for this region.

527-8 (Cont'd.)

This letter does not constitute or substitute for a permit review. Permit reviews require more specific information.

Please feel free to have the Department of Energy staff contact us for further assistance on this important project at (904) 329-4374.

Sincerely,

Margaret Spontak, Director
Division of Policy and Planning

Enclosure

MS/ac

RESPONSE TO COMMENT
COMMENTOR NO. 527: STATE OF FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS (CONT'D.)

COMMENTOR NO. 541: THE RESOURCES AGENCY OF CALIFORNIA

The Resources Agency

Pete Wilson
Governor

Douglas P. Wheeler
Secretary

of California

California Conservation Corps • Department of Boating & Waterways • Department of Conservation
Department of Fish & Game • Department of Forestry & Fire Protection • Department of Parks & Recreation • Department of Water Resources

June 19, 1995

U. S. Department of Energy
Office of Environmental Management (EM-37)
ATTN: Charles Head
1000 Independence Avenue, S.W.
Washington, DC 20585-0001

Dear Mr. Head:

The State has reviewed the Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, submitted through the Office of Planning and Research.

We coordinated review of this document with the Air Resources, California Integrated Waste Management, and San Francisco Bay Regional Water Quality Control Boards; the Energy Resources, Conservation & Development, Public Utility, and State Lands Commissions; and the Departments of Fish and Game, Health Services, and Transportation.

None of the above-listed reviewers has provided a comment regarding this document. Consequently, the State will have no comments or recommendations to offer. 541-1

Thank you for providing an opportunity to review this project.

Sincerely,

for James T. Burroughs
Deputy Secretary and General Counsel

cc: Office of Planning and Research
1400 Tenth Street
Sacramento, CA 95814
(SCH 95054003)

The Resources Building Sacramento, CA 95814 (916) 653-5656 FAX (916) 653-6102

California Coastal Commission • California Tahoe Conservancy • Colorado River Board of California
Energy Resources, Conservation & Development Commission • San Francisco Bay Conservation & Development Commission
State Coastal Conservancy • State Lands Commission • State Reclamation Board

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RESPONSE TO COMMENT
COMMENTOR NO. 541: THE RESOURCES AGENCY OF CALIFORNIA

Response to Comment No. 541-1

Satisfactory completion of the reviews of the draft EIS by environmental agencies of the State of California is noted. A copy of this final EIS will be provided to the Resources Agency of California, Office of Planning and Research.

COMMENTOR NO. 551: STATE OF IDAHO
OFFICE OF THE ATTORNEY GENERAL

STATE OF IDAHO
OFFICE OF THE ATTORNEY GENERAL
Statehouse, Room 210
P. O. Box 83720
BOISE 83720-0010

ALAN G. LANCE
ATTORNEY GENERAL

Telephone: (208) 334-2400
Fax: (208) 334-2530

Criminal Law Division
Fax: (208) 334-2942

Natural Resources Division
Fax: (208) 334-2690

June 20, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Re: State of Idaho Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

The State of Idaho submits for consideration the following comments on the Department of Energy's Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (Draft FRR EIS).

In general, the portions of the document that deal with the transportation of spent nuclear fuel (SNF) to the Idaho National Engineering Laboratory (INEL) and storage at that site build on the analyses presented in the Programmatic SNF/INEL Environmental Restoration and Waste Management EIS issued by the Department in April 1995. The State of Idaho submitted extensive comments to the Department on the Draft SNF/INEL EIS. However, the Final SNF/INEL EIS did not adequately address Idaho's comments and the matter is now before the court. To that extent, we will not repeat our concerns in this comment letter, except to reiterate that the analysis associated with SNF transportation and storage alternatives is inadequate. *551-1*

In the past, the State of Idaho has also commented on the advisability of accepting SNF from foreign research reactors. These comments focused on the fact that the Department does not have the ability to handle its own wastes. This situation has not improved. Department sites, such as the INEL, have a legacy of environmental problems requiring cleanups which will not be completed for many years. The timing

RESPONSE TO COMMENT
COMMENTOR NO. 551: STATE OF IDAHO
OFFICE OF THE ATTORNEY GENERAL

Response to Comment No. 551-1

As this comment states, DOE has already responded to the State of Idaho's comments on spent nuclear fuel transportation and storage alternatives in the Programmatic SNF and INEL Draft EIS, so DOE will not repeat them here. This comment does not contain any specific references to the foreign research reactor spent nuclear fuel EIS, so DOE cannot respond in specific terms.

and adequacy of the Department's clean-up efforts have been put in further jeopardy by recent Congressional efforts to balance the country's budget.

551-1 (Cont'd.)

In addition, the Department does not have a permanent solution for the storage of SNF. The Department has not made any significant progress toward gaining approval for Yucca Mountain or any other permanent repository for SNF. In fact, given the current political climate, it is unlikely that Yucca Mountain will ever be opened.

The Department should solve its own nuclear waste storage and disposal problems before it gratuitously agrees to accept spent fuel from other countries, particularly those with proven ability to handle and control spent fuel consistent with our nation's nuclear nonproliferation policy. Until the Department has a permanent storage solution for SNF and can resolve the existing environmental problems at the sites proposed for "interim" storage, the Department should not permit additional material to be stored at those sites.

551-2

Sincerely,

Kathleen E. Trever

KATHLEEN E. TREVER
Deputy Attorney General
Natural Resources Division

KET/pb

cc: Bob Ferguson, INEL Oversight Program Administrator
Jeff Schrade, Office of Governor Batt

15171mka

Response to Comment No. 551-2

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS).

COMMENTOR NO. 576: THE TEXAS OFFICE OF STATE-FEDERAL RELATIONS

THE TEXAS OFFICE
OF STATE-FEDERAL RELATIONS

122 C STREET, N.W., SUITE 800
WASHINGTON, D.C. 20001
(202) 638-1022
FAX (202) 628-1941

201 E. 14TH STREET, SUITE 500
AUSTIN, TEXAS 78701
(512) 463-1803
FAX (512) 463-1084

June 13, 1995

Mr. Charles Head (EM-37)
U.S. Dept of Energy/Ofc Spent Nucler Fuel
1000 Independence Avenue, SW
Washington, D.C. 20585

RE: TX-R-95-05-01-0001-50-00
DRAFT EA/PROPOSED NUCLEAR WEAPONS NONPROLIFEATION

Dear Mr. Head:

Your environmental impact statement for the project referenced above has been reviewed. No substantive comments were received. 576-1

We appreciate the opportunity afforded to review this document. Please let me know if we can be of further assistance.

Sincerely,

T. C. Adams, State Single Point of Contact

TCA//yjy

RESPONSE TO COMMENT
COMMENTOR NO. 576: THE TEXAS OFFICE OF STATE-FEDERAL RELATIONS

Response to Comment No. 576-1

The reviewer's satisfactory evaluation of the draft EIS is noted. A copy of the final EIS will be forwarded to the Texas Office of State-Federal Relations.

Commentor No. 688: Washington State Representative Scott Smith

STATE REPRESENTATIVE
2nd DISTRICT
SCOTT SMITH

Washington
House of
Representatives

FINANCIAL INSTITUTIONS & INSURANCE
VICE CHAIRMAN
EDUCATION
LAW & JUSTICE

June 20, 1995

Department of Energy
Attn: Mr. Charles Head
Office of Spent Nuclear
Fuel Management (EM-37)
1000 Independence Avenue
Washington D.C. 20585

Dear Mr. Head:

I want to voice strong opposition to the proposed shipping of nuclear fuel through the Port of Tacoma in Washington State. Not one person in the 2nd Legislative District is in favor of this proposal, and I am in opposition to it personally as well. *688-1*

Thank you for your time and attention to this matter.

Sincerely,

Scott Smith

Representative Scott Smith
2nd Legislative District

SS/tt

cc: Mr. Patrick O'Malley
President of Port Commissioners
Port of Tacoma

LEGISLATIVE OFFICE: 413 JOHN L. O'BRIEN BUILDING, PO BOX 40600, OLYMPIA, WA 98504-0600 • (360) 786-7912
HOTLINE DURING SESSION: 1-800-562-6000 • TDD: 1-800-635-9993

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Response to Comment
Commentor No. 688: Washington State Representative Scott Smith

Response to Comment No. 688-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 689: WASHINGTON STATE REPRESENTATIVE GRANT O. PELESKY

STATE REPRESENTATIVE
25th DISTRICT
GRANT OWEN PELESKY

State of
Washington
House of
Representatives

APPROPRIATIONS
EDUCATION
FINANCIAL INSTITUTIONS & INSURANCE

June 21, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Mgt (EM-37)
U.S. Dept. of Energy
1000 Independence Ave.
Washington, D.C. 20585

Dear Mr. Head,

As you know, ours is a government of, by and for the people. As a Representative of the 25th Legislative District of Washington State, I am compelled to write regarding shipments of nuclear spent fuel through the Port of Tacoma. 689-1

Via resolutions of the Pierce County Council, The Port Commission of Tacoma, and citizen input, it is abundantly clear that said shipments of spent fuel through the port do not have the consent of the governed.

It is my further belief that shipment of spent fuel without the consent of the governed would exemplify federal overreach as defined in the 10th Amendment to the United States Constitution.

As a legislator familiar with sensitive public issues, I am convinced that alternative #2 of the Draft Environmental Impact Statement is the only acceptable solution. Finally, The United Kingdom is willing to accept the material at a cost savings to us. Please feel free to contact me if you would like to discuss this matter further. 689-2

Respectfully,

Grant Pelesky

Rep. Grant O. Pelesky
State Representative
25th District

cc: Patrick O'Malley, President
Mike Fletcher, Commissioner
Mr. Leonard Sanderson, Mayor
Mr. John Komen, Editor, TNT
Mr. George Pica, Editor, Pierce County Herald

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RESPONSE TO COMMENT
COMMENTOR NO. 689: WASHINGTON STATE REPRESENTATIVE GRANT O. PELESKY

Response to Comment No. 689-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 689-2

The commentor's preference for the overseas management alternative is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

COMMENTOR NO. 690: WASHINGTON STATE REPRESENTATIVE DEBBIE REGALA

STATE REPRESENTATIVE
27th DISTRICT
DEBBIE REGALA

State of Washington
House of Representatives

NATURAL RESOURCES
ASSISTANT RANKING MINORITY
CAPITAL BUDGET
AGRICULTURE & ECOLOGY

June 23, 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave SW
Washington, D.C. 20505

Dear Mr. Head;

As a Washington State Representative, representing Tacoma, Fife and the Puyallup Indian Tribe, I am writing to express my strong opposition to the proposal to bring shipments of high level nuclear waste through the Port of Tacoma.

Bringing these shipments to the Port of Tacoma would mean transporting these wastes through Puget Sound; a major population center extending from Everett to Olympia. Puget Sound is also a highly important and fragile eco-system. Several areas in this waterway are so deep that retrieval of any casks lost overboard would be impossible. With 721 shipments planned, an accident is not impossible and one accident would be devastating. A shipboard fire would expose millions of people to potential health risks. 690-1

Transport by rail or truck from the Port of Tacoma to any possible storage sites would also require the shipments to pass though large population areas. It should be noted the most likely highway route contains the 4th most congested highway corridor in the United States. 690-2

Although the Port of Tacoma has highly trained longshoremen, they are not trained in handling spent nuclear fuel. In fact our longshoremen have strongly expressed their refusal to handle such shipments. Neither the Port nor the City of Tacoma have adequate resources to respond in an emergency involving this type of hazardous material. A military port where such worst-case scenario training and resources are available seems a more appropriate port of entry. 690-3 690-4

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RESPONSE TO COMMENT
COMMENTOR NO. 690: WASHINGTON STATE REPRESENTATIVE DEBBIE REGALA

Response to Comment No. 690-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

All of the population in the area of the port, including the population in close proximity of the terminal, was considered when the effects of possible accidents were calculated (Appendix D, Section D.5 of the EIS). These calculations demonstrate that the risk from accidents to all individuals is not significant. However, on the issue of air and water quality as it pertains to the proposed policy of managing foreign research reactor spent nuclear fuel, DOE considers that there would be no significant adverse impacts to any of the ports that might be used to receive the material. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality. In the unlikely event of a severe accident, the analysis performed for the EIS indicates that some radioactive material could be released from the cask and distributed into the environment. However, the analysis also shows that the resultant contamination is so small that no cleanup would be required in any of the ports or surrounding areas. Close to the accident, near the casks would likely require some cleanup, but the overall impact on the water and air quality in the port would be very small. Section 4.2.2.3 and Appendix D, Section D.5 of the EIS detail the accident analysis and results.

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1000 feet). Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

Appendix D, Section D.5.3.1 of the EIS describes several accident scenarios that involve fire. The results of the analysis of these accidents can be found in Appendix D, Section D.5.4. The analysis shows that even in the event of a severe ship fire, neither the consequences nor risks are great (Appendix D, Section D.5.5).

Response to Comment No. 690-2

DOE acknowledges the population density and the congestion on the highway corridor near Tacoma. However, the approach taken in the EIS to risk assessment adequately considers local conditions and accident patterns.

COMMENTOR NO. 690: WASHINGTON STATE REPRESENTATIVE DEBBIE REGALA (CONT'D.)

During the hearing on June 19, it was stated that France, Japan and the United Kingdom were all willing to accept these materials and that reprocessing was possible in Scotland. The United States, however, does not have that capability. I believe alternative 2 provides a more reasonable and less costly solution. 690-5

In reviewing the screening criteria for evaluation of ports, there are serious questions about the Port of Tacoma in at least 5 areas. The citizens of this area have studied the DEIS and have expressed their concern with the adequacy of that document. They have also expressed their strong objection to further consideration of this proposal by the Department of Energy. As their Representative, I echo that objection.

Sincerely,

Debbie Regala

DEBBIE REGALA
State Representative
27th Legislative District

DR:laf

RESPONSE TO COMMENT
COMMENTOR NO. 690: WASHINGTON STATE REPRESENTATIVE DEBBIE REGALA (CONT'D.)

The frequency of accidents on highways has been taken into account in all the ground transport risk estimates in the EIS. As discussed in Section 4.2.3 and Appendix E of the EIS, spent nuclear fuel has been transported along highways, railways, and waterways for over 40 years without release of the radioactive contents from the spent nuclear fuel transportation cask.

The population along all representative truck transport routes was taken into account in the calculations of ground transport risks. In all cases the risk was found to be low. This subject is discussed further in Section 4.2.3 and Appendix E of the EIS.

Response to Comment No. 690-3

Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the casks used to transport it would be low. No special handling or loading/unloading procedures would be required for the foreign research reactor spent nuclear fuel when it is contained in approved standard shipping containers; experience with handling containers is sufficient. Therefore, no special training of longshoremen is required.

There is a maximum allowable radiation dose rate of 200 mrem per hour, however, this limit is on the dose rate at the surface of the transportation cask, which would be inside of the container. The maximum radiation dose rate limit of interest to those that would be near the container, such as longshoremen, is 10 mrem per hour at a distance of 2 meters from the surface of the container (both dose rate limits come from regulation 49 CFR 173). The actual total dose that a longshoreman would get handling a cask would be quite small due to the fact that a handler would not be present at the surface of the container for long and the total time near the cask would be quite short. Appendix D, Section D.4.3.2.1 of the EIS provides the time/distance analysis of cask handling, Appendix D, Section D.4.5 presents the resulting doses and risks, and Appendix F, Section F.5 presents an evaluation of the dose rates from a transportation cask containing research reactor spent nuclear fuel. The maximum allowable exposure for port workers would be 100 mrem per year, the same radiation dose limit established by the NRC to protect individual members of the public (Section 4.2.2.2 of the EIS). As the EIS demonstrates, both the dose and dose rate for the port workers would be low.

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE-sponsored meetings, informal discussions, and informational materials.

Commentor No. 690: Washington State Representative Debbie Regala (Cont'd.)

Response to Comment
Commentor No. 690: Washington State Representative Debbie Regala (Cont'd.)

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Response to Comment No. 690-4

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without the additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all of the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference of the use of military ports is noted.

Response to Comment No. 690-5

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 818: WASHINGTON STATE SENATORS MARC GASPARD AND LORRAINE WOJAHN

Washington State Senate

June 19, 1995

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

Dear Mr. Head:

We strongly oppose any shipment of high-level nuclear waste through the Port of Tacoma and urge you to eliminate the port from your list of possible entry sites.

High-level nuclear waste is extremely radioactive and a spill, cask rupture, or shipboard fire would have disastrous consequences for our entire region. This deadly fuel would have to be transported through our waters, unloaded by port longshoremen, and then trucked through city streets and highways to its final destination. With more than 721 shipments scheduled to move through the Port over 13 years, the public safety and environmental risks are huge and, we believe, unacceptable.

818-1

Additionally, we think the draft environmental impact statement prepared by the federal government is incomplete and inaccurate. It is based on outdated information about the port and its terminals, and fails to adequately address critical security and cleanup concerns.

For these reasons we respectfully urge you to reject the Port of Tacoma site and select a port in a less densely populated area.

Sincerely,

Sen. Marc Gaspard
Senate Majority Leader
25th District

Sen. Lorraine Wojahn
Senate President Pro Tempore
27th District

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RESPONSE TO COMMENT
COMMENTOR NO. 818: WASHINGTON STATE SENATORS MARC GASPARD AND LORRAINE WOJAHN

Response to Comment No. 818-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, Sections 4.2.2 and 4.5 of the EIS demonstrate that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS).

Foreign research reactor spent nuclear fuel in a transportation cask cannot spill because it is solid metallic fuel and is shipped dry. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident.

In regard to the EIS being based on outdated and inaccurate information, errors have been found in the draft EIS, including some of the information on the Port of Tacoma and the associated map. Updated information on the terminals at the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS. All of these errors have been corrected in the final EIS, and the conclusion that the risks associated with accepting foreign research reactor spent nuclear fuel into the United States through Tacoma, or any of the other candidate ports, are low and would result in low impacts is still valid. The population data used in the analyses, which was verified as being correct, were based on the 1990 census.

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

The general security provisions are provided in the new Appendix H that has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit.

COMMENTOR NO. 942: WASHINGTON STATE REPRESENTATIVE VELMA VELORIA

STATE REPRESENTATIVE
11th DISTRICT
VELMA VELORIA

State of
Washington
House of
Representatives

STATE GOVERNMENT
VICE CHAIR
HEALTH CARE
COMMERCE & LABOR

June 27, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
US Department of Energy
1000 Independence Avenue
Washington, DC 20585

Dear Mr. Head:

I am very concerned about the shipment of Nuclear Spent Fuel through the Port of Tacoma.

As a member of the National Environmental Justice Advisory Council, US EPA (NEJAC), I am very much aware of the pollution and health risks involved in moving nuclear materials

I am deeply troubled at the lack of understanding by the Department of Energy of the Port of Tacoma terminals, water depth, population and environment, that Commencement Bay is a superfund site, and other serious concerns as stated in the Port of Tacoma Resolution no. 95-16. I support this resolution and ask that you recognize the problems involved in considering the Port of Tacoma as a shipment site for nuclear spent fuel.

942-1

Thank you for your consideration.

Sincerely,

Velma Veloria
State Representative
11th District

LEGISLATIVE OFFICE: 405 JOHN L. O'BRIEN BUILDING, PO BOX 40622, OLYMPIA, WA 98504-0622 • (206) 786-7882
LEGISLATIVE TOLL-FREE MESSAGE: 1-800-562-6000 • TDD: 1-800-635-9993
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RESPONSE TO COMMENT
COMMENTOR NO. 942: WASHINGTON STATE REPRESENTATIVE VELMA VELORIA

Response to Comment No. 942-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Some outdated and inaccurate information has been found in the draft EIS, including some of the information on the Port of Tacoma and the associated map. Updated information on the terminals at the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS. All of these errors have been corrected in the final EIS, and the conclusion that the risks associated with accepting foreign research reactor spent nuclear fuel into the United States through Tacoma, or any of the other candidate ports, are low and would result in low impacts is still valid. The population data used in the analyses, which was verified as being correct, were based on the 1990 census.

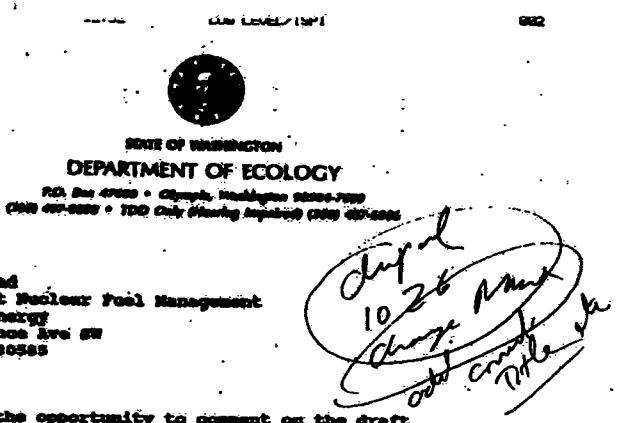
In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Section 4.2.1.3 of the EIS has been modified to include this assurance of recovery in coastal waters. Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

DOE has added a sentence to Appendix D, Section D.2.1.9 of the EIS regarding Commencement Bay being a Superfund site. The analysis of impacts in Section 4 of the EIS demonstrates that there would be no significant adverse impacts on the ports, people, or natural environment from shipments of foreign research reactor spent nuclear fuel and the overall impacts to Commencement Bay would be unchanged by the various management alternatives.

The port selection process that determined that Tacoma was an acceptable port considered the population of the port and surrounding areas (Appendix D, Section D.1.9.5 of the EIS). Additionally, all population within a fifty mile radius of the Port of Tacoma was considered when analyzing the potential impact of a range of hypothetical port accidents. The risks were found to be low (Appendix D, Section D.5 of the EIS).

Human health and safety were primary considerations during the evaluation of environmental effects for the proposed action. Conservative estimates of radiological and non-radiological impacts show that risks to the population and workers are low (Sections 4.2.2 and 4.5 of the EIS). Section 4.10 of the EIS describes risks associated with U.S. acceptance of the spent nuclear fuel and compares these risks with those due to natural background radiation and other common risks.

COMMENTOR NO. 1026: STATE OF WASHINGTON DEPARTMENT OF ECOLOGY



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

July 13, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management
U.S. Dept of Energy
1000 Independence Ave SW
Washington DC 20585

Dear Mr. Head:

Thank you for the opportunity to comment on the draft environmental impact statement (DEIS) for the Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (DOE/EIS-0218D). We reviewed the DEIS and have the following comments for the State of Washington.

Key Principles

Washington State has dealt with the issue of importing foreign nuclear reactor spent fuel since the mid-1980s. Based on public concerns and on the work of an interagency task force, the state has developed a consistent position based on the following key principles:

1. There must be a clear demonstration of the need to return spent fuel to the United States.

2. There must be a basis to select the safest option for transport and storage of the spent fuel.

3. There must be early, open, and honest communication with workers, responsible officials and the public in affected communities.

4. The federal government must support and work cooperatively with the responsible state and local government agencies in developing the regulatory and emergency preparedness measures needed to assure safe and uneventful transport of spent fuel.

1026-1

Appropriateness of DEIS

In July, 1991, Ecology strongly challenged the U.S. Department of Energy's (USDOE) draft environmental assessment covering the same issues, and urged that a full environmental impact statement (EIS) be prepared. Ecology argued that only an EIS would provide

RESPONSE TO COMMENT
COMMENTOR NO. 1026: STATE OF WASHINGTON DEPARTMENT OF ECOLOGY

Response to Comment No. 1026-1

Section 1.2 of the EIS describes the purpose of and need for the proposed action and management alternatives. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

Appendices D through F provide the rationale for selection of candidate ports, transportation routes, and management sites. As discussed in Section 4 of the EIS, environmental effects were evaluated at the candidate ports, along representative transportation routes and at potential management sites. The proposed action and management alternatives were found to result in no significant benefits or risks to human health or the environment.

DOE has attempted to develop this EIS in a completely open manner. In fact, DOE's public interaction related to this draft EIS has been well in excess of the requirements set forth in NEPA and DOE's environmental regulations. Seventeen public hearings were held in the locations determined most likely to be directly affected by the EIS alternatives. In addition, the period of acceptance for written comments was extended from June 20 to July 20, 1995, for a total comment period of 90 days. DOE considers that these actions have provided sufficient opportunity for the public to comment on the draft EIS.

DOE considers that if foreign research reactor spent nuclear fuel is managed in the United States there is adequate regulatory and emergency preparedness infrastructure to ensure its

COMMENTOR NO. 1026: STATE OF WASHINGTON DEPARTMENT OF ECOLOGY (CONT'D.)

sufficient information and adequate opportunity for public comment, and the development of public understanding of such a policy (see attachment). We welcome the publication of the DEIS, and USDOE's efforts to communicate with the public.

Storage and Treatment Options

We have not reviewed in detail those portions of the DEIS dealing with Hanford as a potential storage site for foreign reactor spent nuclear fuel. We expect consideration of Hanford (as well as Oak Ridge National Laboratory and the Nevada Test Site) to be dropped from the final EIS for this proposal. This is based upon the fact that Secretary of Energy Hazel O'Leary adopted a Record of Decision (ROD) on June 1, 1995, based on the Final Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory EIS. It is our understanding that the ROD names the Savannah River Site and Idaho National Engineering Laboratory (INEL) as storage and potential treatment sites for spent nuclear fuel from foreign research reactors. 1026-2

Transport

It is Washington's perspective that the safest option for transporting, storing, and disposing of nuclear materials should be selected. If reasons, such as cost or practicality, cause the selection of a less safe option, that choice should be discussed openly and arrived at with broad public support.

Unfortunately, the stance taken in the DEIS seems to be that the risks of all options are low, and the DEIS fails to provide sufficient information to determine the safest method of transport. We believe that the following topics should be adequately evaluated to provide sufficient, clear and consistent information to assist the public in understanding the decisions to be made:

Selection of potential ports of entry. The process for selecting potential ports of entry appears complex and inconsistent in application (Appendix D), and in some cases decisions appear arbitrary. For instance, the application of Criterion 2, favorable transit from open ocean (pp. D-11 ff) drops two ports with substantially shorter routes from the open sea than Portland, Oregon. The section on favorable transit dismisses accident data as not comprehensive. When accident data exist regarding navigation accidents, as in the case of the Columbia River approach to Portland, the data are dismissed as probably applying to barges rather than ocean-going vessels (p. D-61). Similar data are not disclosed for the use of Lake Charles, Louisiana, but the latter is eliminated based on Coast Guard judgments about increasing traffic (p. D-106). 1026-3

RESPONSE TO COMMENT
COMMENTOR NO. 1026: STATE OF WASHINGTON DEPARTMENT OF ECOLOGY (CONT'D.)

safe acceptance and transportation to the designated management site. As discussed in Section 2.7.1, Federal funding to State, Tribal, and local governments is being provided for maintaining emergency response programs. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advice and assistance to the State, Tribal and local agencies involved with a radiological incident. DOE is also required to inform the Governor of each State and any Tribal chair, or their designee, along a transportation route at least seven days in advance of the shipment of hazardous cargoes, including radioactive materials. It would be the responsibility of the Governor to provide any further notification to State and local officials.

Emergency preparedness, security, and coordination of DOE with local emergency response authorities that would be involved with the acceptance and transportation of foreign research reactor spent nuclear fuel will be discussed in detail in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

Response to Comment No. 1026-2

The subject Record of Decision designates the Savannah River Site and the Idaho National Engineering Laboratory as interim DOE management sites for domestic and foreign research reactor spent nuclear fuel. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 1026-3

The process of selecting ports is complex because all ports are unique in their positive and negative attributes so that selecting acceptable ports involves evaluating trade-offs. DOE decided that five of the most important attributes would be used as selection criteria: container experience, favorable transit from the open ocean, appropriate facilities, access to intermodal land transportation, and relatively low human population in the port and along routes to management site(s) (Appendix D, Section D.1.9 of the EIS). Other attributes were considered, but were not mandatory (Desirable Attributes, Appendix D, Section D.1.9.6). The application of these criteria required judgement and expert opinion to be applied. For example, Criterion 2, favorable transit from the open ocean or large deep body of water, involves not only distance from the open ocean or deep body of water, but relative safety of the passage. For this reason, a port relatively close to the ocean, such as Houston, may be eliminated while a port such as Portland, which is far from the open ocean (actually the preferred Terminal 6 is about 140 km from open ocean and has been corrected in Appendix D, Table D-4), was not. See Appendix D, Section D.1.9.2 for more information. As stated in Appendix D, Section D.1.9.2 of the EIS, reliable accident rate information is difficult to find and so could not be used as a stand-alone criterion. However, where available, accident rate data was considered as part of the favorable transit.

COMMENTOR NO. 1026: STATE OF WASHINGTON DEPARTMENT OF ECOLOGY (CONT'D.)

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Page 3

Criterion 4, ready access to intermodal transportation (pp D-15 ff.) is particularly confusing. That criterion eliminates no ports. However, when one gets to "Desirable Port Attributes" (pp. D-32 ff.)--i.e. not mandatory criteria--ready intermodal access is apparently not a necessity. Ports that have it cannot use it, due to populations along transport routes. Yet, Wilmington, Delaware is dropped from further consideration because it loses intermodal "usefulness" in reaching INEL (where about 20% of shipments will go), and Tacoma, Washington is retained, even though it loses intermodal "usefulness" for the approximately 80% of shipments going to Savannah River (p. D-32 and Table D-6).

1026-3 (Cont'd.)

Selection of shipment modes and routes. The selection of shipment modes and routes--which is interrelated with both port selection and risk analysis--again appears both complex and confusing. It also appears that there are inconsistencies between Appendix D, port selection; and Appendix E for the selection of routes. Route selections made in Appendix E appear to drive the affected population (pp. D-20 through D-31), which, in turn, drives port selection. The connection is, however, not easily traceable.

The attached comment from Lt. Lonnie R. Brackins, of the Washington State Patrol, indicates one aspect of the problem encountered in the DEIS when it comes to mode and route selection. The safer--and lower population exposure--route for highway shipments from the Port of Tacoma is identified in Appendix D (p. D-71). But that route (longer by about 48 miles) was not used for risk analysis purposes or for determining exposed populations. More astonishing is the selection of a rail route from Tacoma to Savannah River (Figure E1-18). The route analyzed appears to be several hundred miles longer than an alternate route, and to traverse major population centers (Seattle and Chicago) that the alternate route avoids. No specific information is given to indicate why this selection was made.

1026-4

A second issue raised by the port selection methodology is this: If a port, such as Tacoma, is found not to be "useful" for rail shipment, due to corridor population, will USDOE only use truck shipments from that port? If so, what is the basis for equating the numbers of people at risk along a route, as truck accident rates are higher than rail accident rates (per Fig. 4-27, p. 4-126)? If the above is not applicable, what is the point of the exercise in which some ports are eliminated because their intermodal "usefulness" is impacted (pp. D-20 to D-34)?

Lack of specific cost information to compare scheduled cargo and chartered ship transport. The DEIS does provide risk analysis based on these two alternatives, but appears to give little

1026-5

RESPONSE TO COMMENT
COMMENTOR NO. 1026: STATE OF WASHINGTON DEPARTMENT OF ECOLOGY (CONT'D.)

Criterion 4, ready intermodal transportation, turned out to be an easily met criteria for most ports which passed the first three screening criteria. However, this simply reflects the fact that good ports generally have access to intermodal facilities. Thus, while the criterion failed to screen out any additional ports, it was one which DOE felt obliged to evaluate due to the United States Merchant Marine Academy Workshop determination that it was important to safety.

The confusion between the mandatory requirement for ready intermodal access and desirable port attribute of usefulness is understandable. DOE defined usefulness in Appendix D, Section D.1.9.6 as a relative term reflecting the potential for receiving spent nuclear fuel from around the world to specific ports (Relative Usefulness by Foreign Research Reactor Fuel Shippers in Table D-6), and the ability of those ports to transship the spent nuclear fuel to DOE storage facilities around the United States via truck and rail routes (Relative Usefulness by Storage Sites in Table D-6). For example, Wilmington, Delaware was removed from further consideration because of the relatively high population along the rail routes to the Idaho National Engineering Laboratory, the Hanford Site, and the Nevada Test Site, and its limited service by conventional carriers.

As shown in Appendix D, Figures D-8 through D-17 of the EIS, some combined port/truck route populations are significantly different than the combined port/rail route populations between the same port and management site(s). For example, Appendix D, Figure D-8 of the EIS indicates that the combined port/truck-route population from Tacoma to the Savannah River Site is clearly below the average for the group of 28 ports evaluated. On the other hand, Appendix D, Figure D-9 shows that the combined port/rail-route population from Tacoma to the Savannah River Site is well above the average for the same group of ports and would not be permitted under the low population criterion. Thus, the usefulness of a port is not based on intermodal usefulness, but on the number of sites which can eventually receive spent nuclear fuel by truck and rail from that port within the restrictions imposed by the low population criterion.

Response to Comment No. 1026-4

As the comment states, the representative route selections in Appendix E do contribute to the affected population, which is a contributing factor to port selection. This process is discussed in Appendix D, Section D.1.9.5 of the EIS. Since the commentor did not mention a specific inconsistency, DOE is unable to respond in specific terms.

The representative truck routes from Tacoma used in the EIS analysis are presented in Figure E1-17 in Appendix E of the EIS. These are representative routes only, which were selected using the HIGHWAY computer code. The representative routes all use I-90, but DOE recognizes the possibility of using I-84 via Portland. A State of Washington routing agency could designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103.

COMMENTOR NO. 1026: STATE OF WASHINGTON DEPARTMENT OF ECOLOGY (CONT'D.)

consideration to chartered shipping. No cost differential is presented, yet the DEIS appears to assume the higher risks of scheduled cargo shipping are low enough to be acceptable, and that cost tips the balance. There is no explicit analysis of the two alternatives to support the choice of commercial shipping.

The DEIS does include analysis that shows lower health impacts and risks from chartered ships than from regularly scheduled commercial ships. Routine (incident-free) results are presented in Table 4-5. Accident results can be derived from Table 4-7, using the "direct" line for shipments into each port. If one also assumes that chartered ships can go to a port closest to the receiving site, potentially affected populations along land transport routes can be minimized.

As Table 4-7 also indicates, there is in-port risk for ports other than those selected as potential ports of entry if break-bulk cargo ships are used. (This elevated risk is more thoroughly discussed in Appendix D, Section D.5.5.)

1026-5 (Cont'd.)

USDOE appears to prefer general cargo liner transport, probably for cost reasons. However, section 4.8, Costs, does not separate ocean and ground transport costs out. There is no indication of the proportion of total program costs allotted to transport, or the relative costs of charter as against general commercial shipping. Therefore, the public has no basis to discuss the tradeoffs between an obviously lower risk option and supposedly higher costs.

Consistent with the principle of selecting the safest practicable option, we strongly urge USDOE to assess fully the charter ship option.

Consideration of economic impacts of spent fuel shipments on ports. Neither the DEIS nor Appendix D deals with economic impacts of proposed alternatives on potential ports of entry. Appendix A, on Environmental Justice, deals only with minority and low-income population distribution. This is a serious deficiency in the DEIS.

Two economic impacts need to be analyzed. First, refusal of union workers to off-load spent fuel casks--or even to work on a ship containing a spent fuel container--could be highly disruptive of port activities and schedules. Yet there is strong indication, not only from comments on the present DEIS, but from comments on previous environmental assessments relating to this program, that such refusals are likely.

1026-6

RESPONSE TO COMMENT
COMMENTOR NO. 1026: STATE OF WASHINGTON DEPARTMENT OF ECOLOGY (CONT'D.)

As discussed in Appendix E, Section E.4.2 and Section 2.6.4.2 of the EIS, all the representative rail routes were selected using the INTERLINE computer code, which uses a shortest-route algorithm that finds the minimum impedance path. Again, since the commentor does not suggest an alternative rail route, DOE cannot perform a specific comparison.

If a port, such as Tacoma, is found not to be useful for rail shipment, then DOE would use only truck shipments from that port. While truck accident rates are generally higher than rail accident rates, risk is a complex function of the severity of these accidents, the incident-free doses to the public and crew, the vehicle emissions, and the affected population. The affected population should not be restricted to those people who might be involved in accidents, but should include everyone at risk to all aspects of the transport.

The usefulness of a port may change in the future, as population distributions shift or port facilities are upgraded. Thus, DOE evaluated all the transport modes from each port to each management site to maintain flexibility for the future and to make the comparisons complete.

Response to Comment No. 1026-5

The risks associated with using either charter or commercial ships were found to be low (Sections 4.2.2.2 and 4.2.2.3 of the EIS), even though those for charter ships were slightly lower. Since the risks were low for both types of vessels, either type of vessel was determined to be acceptable for use. Since risk is essentially the same, cost, as well as many other items, such as the availability of commercial lines that would accept nuclear material, would go into the final decision of what type of vessel to use, if the foreign research reactor spent nuclear fuel is to be accepted into the United States.

Response to Comment No. 1026-6

The possibility of union workers' refusal to off-load spent nuclear fuel was not considered in the port selection process (Appendix D, Section D.1.9 of the EIS) since that factor does not impact on the capability to safely receive containers carrying foreign research reactor spent nuclear fuel. The decision as to which port or ports would be used, in the case that foreign research reactor spent nuclear fuel is accepted into the United States, will be made in the Record of Decision. In either case, the possibility of union workers' refusal to off-load spent nuclear fuel is one of the many factors that must be considered in determining which ports to use.

COMMENTOR NO. 1026: STATE OF WASHINGTON DEPARTMENT OF ECOLOGY (CONT'D.)

Charles Head
July 13, 1995
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Second, both the potential for disruption and the perception of increased risk may affect both shippers' and carriers' decisions about use of ports. There is no acknowledgement of the "stigma," or risk-perception aspect of economic impact.

1026-6 (Cont'd.)

Port operating environment. In Ecology's 1991 comments, we were particularly concerned by the lack of any data or analysis of actual port operations and operating environments. The DEIS now includes some explicit discussion about how cargoes are handled, transferred, stored, inspected, and transported out of ports.

While the consequences calculated for ship collisions and shipboard fires (accidents of severity 4-6, pp. 4-16 to 4-22, and Appendix D, section D.5) may be bounding, we note there is no treatment of dockside accidents that could produce a breach of a transport cask. This appears to be based on the assumption that physical forces involved in port handling could not be so severe; this assumption needs to be thoroughly explored with dock workers and port managers. Assumptions used to estimate incident-free exposures also need to be verified. Ecology strongly urges USDOE not only to take port management and worker comments very seriously, but also to pro-actively elicit port-specific "profound knowledge."

1026-7

Commitments to basic safety measures and procedures for overland transportation. Ecology's 1991 comments on the environmental assessment clearly listed six areas where Washington would expect explicit commitments in order to assure safe transportation of spent fuel in the state.

The DEIS cites a number of past USDOE activities that support providing safe conditions for overland transport of nuclear materials (e.g. Sections 5.5 and 5.6). However, Washington believes that the items enumerated in our 1991 letter need to be listed and considered as mitigation measures. State, local, and tribal authorities share responsibility and accountability to citizens in the regulation, inspection, security, emergency planning and emergency response areas, along with the federal government. There must be specific commitments to mitigate both the risks resulting from overland transport and the added requirements borne by other governments.

1026-8

Should shipments in fact come through the Port of Tacoma and move along the routes designated in Appendix E, it is misleading to assert that USDOE, through other programs, has already put in place the resources, training, and other mechanisms needed to ensure safe transport. These activities have not previously occurred in the Puget Sound Basin, or along the routes designated.

RESPONSE TO COMMENT
COMMENTOR NO. 1026: STATE OF WASHINGTON DEPARTMENT OF ECOLOGY (CONT'D.)

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Under NEPA regulations, the socioeconomic effects evaluated for this EIS do not include those associated with psychological fear of receiving spent nuclear fuel. Historically, there were no adverse economic or cultural impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

Response to Comment No. 1026-7

The commentor's evaluation of why dockside handling accidents were not analyzed in regard to violating the spent nuclear fuel transportation cask is correct. The tests performed to receive NRC certification of transportation casks are more severe than any accidents envisioned on the dockside. Although the NRC drop test is only from 30 feet and dockside heights can easily exceed this amount, the NRC test is still considered more severe because the cask is dropped upon an unyielding surface. The unyielding surface used in NRC tests is a monolithic reinforced concrete base covered with battleship armor. Docks are not of such construction. Likewise the puncture test is demanding, consisting of a one meter (39.4 in) cask drop onto a 15 cm (6 in) solid steel bar mounted on an unyielding surface. Section 5.4.1 of the EIS presents details of the certification.

DOE would measure the radiation dose rates at the surface of every ISO container to ensure that the regulations were met and that the incident-free exposures that were calculated in the EIS were conservative. Further, records would be maintained of ships' crews and dock workers, so that if any individuals began to approach the regulatory limit of 100 mrem per year, they would be excused from further activities associated with the shipment of foreign research reactor spent nuclear fuel.

Response to Comment No. 1026-8

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding enhances a jurisdiction's emergency management and response capabilities. Appendix H of the EIS contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency

COMMENTOR NO. 1026: STATE OF WASHINGTON DEPARTMENT OF ECOLOGY (CONT'D.)

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Public Involvement

As previously mentioned, the DEIS is a major step toward the kind of public involvement this issue requires. The public needs to have the information on which to make up its own mind about tradeoffs, risk management, costs and other key issues. However, USDOE still has some way to go to secure good public involvement. The public hearing that was originally scheduled in Tacoma, as one of the ten potential ports of entry, was moved to SeaTac. There was also no repository library for the DEIS located in Tacoma. Together, this appears to signal a lack of respect for input from the potentially affected public, and the result is increased mistrust and decreased substantive dialogue.

1026-9

Conclusion

Briefly, the items requiring federal support, are:

- Independent inspections at all critical points in the shipment;
- Avoiding unsafe sea and road conditions, as determined by responsible state, port, and other officials;
- Provision for pre-arranged safe parking areas along transport routes;
- "Real-time" shipment tracking, accessible to emergency response personnel;
- Training for emergency responders; and
- Active incorporation of shipment-specific provisions in, and regularly exercising of, emergency response plans.

1026-10

If you have any questions, please call Mr. Mark Wallace with our Nuclear Waste Management Program at (360) 407-7121.

Sincerely,

Keith E. Phillips

Keith E. Phillips
Environmental Review Section

KEP:ri
95-3235

cc: Mark Wallace, Nuc Waste

Attachments

RESPONSE TO COMMENT
COMMENTOR NO. 1026: STATE OF WASHINGTON DEPARTMENT OF ECOLOGY (CONT'D.)

management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Response to Comment No. 1026-9

When DOE first attempted to arrange for a public hearing in Tacoma, a suitable meeting facility could not be located. When a meeting facility was located at SeaTac airport, DOE erroneously concluded that this would be close enough to allow interested participants to attend the meeting. However, after being informed of the dissatisfaction of Tacoma citizens with the SeaTac meeting location, and in the interests of securing good public involvement, DOE held a second public hearing in the city of Tacoma on June 19, 1995. Although the applicable regulations only require DOE to hold one public hearing on a draft EIS, the Tacoma public hearings were among 17 public hearings DOE held on the draft of this EIS.

In addition, as announced in the April 21, 1995 Federal Register notice announcing the availability of the draft EIS, a copy of the draft EIS was available in Tacoma in the Tacoma Public Library, 1102 Tacoma Avenue South, Tacoma, Washington. Additional copies were made available in other locations in the State of Washington, and were available by mail by calling a toll free telephone number specified in the April 21 Federal Register notice.

In addition, the period of acceptance for written comments was extended from June 20 to July 20, 1995, for a total period of 90 days. DOE considers that the public hearings, coupled with the numerous mechanisms used to distribute the draft EIS and accommodate written comments, provided ample opportunity for public involvement.

Response to Comment No. 1026-10

Appendix H of the EIS contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. The issues would include capabilities and training of first emergency responders as well as the other issues raised by the comment.

COMMENTOR NO. 1030: MIKE LOWRY, GOVERNOR STATE OF WASHINGTON

STATE OF WASHINGTON
OFFICE OF THE GOVERNOR
P.O. Box 40002 • Olympia, Washington 98504-0002 • (206) 753-6780

June 23, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Mgmt. (EM37)
US Dept. of Energy
1000 Independence Ave. SW
Washington, D.C. 20585

Dear Mr. Head:

This letter is in response to the Draft EIS on foreign research reactor spent nuclear fuel.

I appreciate the Department of Energy's commitment to do this full-fledged Environmental Impact Statement. This DEIS fulfills this state's consistent position that considerations involving the return of this fuel be open to the public with full disclosure of information about risks, alternatives and impacts. I also support fully the position taken in the closely-related EIS on spent nuclear fuel management. The preferred alternative, which Secretary O'Leary formally adopted in a Record of Decision on June 1, provides for storage of foreign spent fuel at sites other than Hanford. Given Hanford's mission to clean up the wastes left behind after forty years of plutonium production for this nation's security, we believe this is a wise decision.

With regard to this draft EIS on foreign research reactor spent nuclear fuel, the state of Washington believes the primary consideration for port of entry options must be safety, security and expertise in the handling of foreign spent nuclear fuel. Off-loading facilities must contain adequate safety and security arrangements and served by personnel who have expertise in handling this material. Further, an off-loading facility should be separated from and not intermingled with commercial port facilities to ensure security and safety, and also to avoid any disruptions to commercial port activity. By these tests, the state of Washington does not believe the DEIS provides adequate justification for Tacoma serving as the west coast port of entry for this material. *1030-1*

The state of Washington believes that defense facilities capable of handling containerized cargo, in contrast, best meet the tests for safety, security and expertise. Relative to other considerations, the state of Washington believes it is best to select a military facility capable of handling containerized cargo which is closer to the final destination of this material in order to *1030-2*

RESPONSE TO COMMENT
COMMENTOR NO. 1030: MIKE LOWRY, GOVERNOR STATE OF WASHINGTON

Response to Comment No. 1030-1

The State of Washington's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. The use of a remote port might slightly reduce the already low consequences of an accident, however there are other considerations that also must be made when making port selection. See Appendix D, Section D.1.9 for a complete discussion of the port selection process.

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security measures employed at any port would be required to meet or exceed all the security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. DOE supports these regulations as being adequate to protect the foreign research reactor spent nuclear fuel in any commercial port.

Appendix H has been added to the final EIS in response to public comments to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel, This appendix presents the general provisions of the Transportation Plan, which is a document that provides details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the casks used to transport it would be low. No special handling or loading/unloading procedures would be required for the foreign research reactor spent nuclear fuel when it is contained in approved standard shipping containers; experience with handling containers is sufficient. Therefore, no special training of longshoremen is required.

DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' status with respect to their clients. This position is based on the fact that the foreign research reactor spent nuclear fuel would be accepted by the United States in standard shipping containers that would require no special handling or precautions. As such, there should be no adverse commercial or economic reaction to the use of the port. Historically, there were no adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

Response to Comment No. 1030-2

The State of Washington's recommendation for exclusive use of military ports to transport the foreign research reactor spent nuclear fuel is noted.

COMMENTOR NO. 1030: MIKE LOWRY, GOVERNOR STATE OF WASHINGTON (CONT'D.)

Charles Head
June 23, 1995
Page Two

minimize the distance traveled in the United States and minimize overall risk. We also believe there should be greater consideration of the use of charter vessels which go directly to an off-loading facility, as opposed to use of commercial vessels which may make intermediate stops at commercial port facilities. We would prefer to see greater discussion of these points in the EIS. 1030-2 (Cont'd.)

In short, the state of Washington believes shipment to an equipped military off-loading facility nearest the destination of the spent fuel should be the preferred option. This option meets our test for safety, security and expertise, and provides relatively less risk to the public and commercial activities. 1030-3

Also, for the record, I am submitting the Department of Ecology's detailed comments on this DEIS.

Sincerely,

MIKE LOWRY
Governor

Enclosure

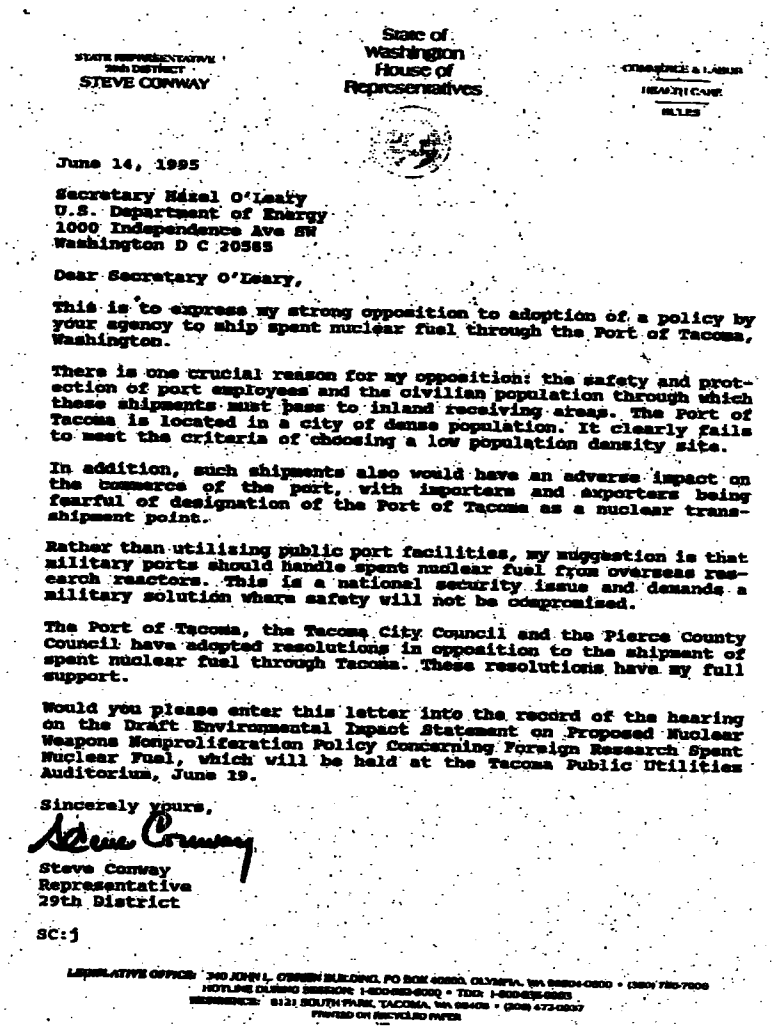
RESPONSE TO COMMENT COMMENTOR NO. 1030: MIKE LOWRY, GOVERNOR STATE OF WASHINGTON (CONT'D.)

Candidate ports were chosen from among commercial and military ports along the eastern seaboard, western seaboard, and the Gulf of Mexico. The selection process is described in Appendix D, Section D.1 of the EIS. No significant human health, safety, or environmental risks were found to exist at any of the candidate commercial or military ports selected (Section 4.2.2 of the EIS). The experience criterion used in the port selection process (Appendix D, Section D.1.9.1) evaluates the port's experience in handling containerized cargo, such as would be the case for any spent nuclear fuel shipments. Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the casks used to transport it are low, so no special handling is required.

Response to Comment No. 1030-3

The commentor's preference for greater consideration of charter vessels, as opposed to commercial vessels, is noted. Based on the analysis of impacts associated with accidents and incident-free operations involving foreign research reactor spent nuclear fuel, the EIS demonstrates that commercial ships represent an acceptable option for the transportation of foreign research reactor spent nuclear fuel (Section 4.2.2.3 of the EIS on consequences of port accidents and Section 4.2.2.2 for impacts of incident-free operation). Whether the shipments come as cargo on a scheduled carrier or on a chartered ship, no special precautions are expected to be required by the Coast Guard or any other authority. As such, there need be no additional requirements to use dedicated ships, nor any adverse consequences to the use of the commercial ships.

COMMENTOR NO. 1068: WASHINGTON STATE REPRESENTATIVE STEVE CONWAY



STATE REPRESENTATIVE
29th DISTRICT
STEVE CONWAY

State of Washington
House of Representatives

COMMERCE & LABOR
HEALTH CARE
RULES

June 14, 1995

Secretary Hazel O'Leary
U.S. Department of Energy
1000 Independence Ave SW
Washington D C 20585

Dear Secretary O'Leary,

This is to express my strong opposition to adoption of a policy by your agency to ship spent nuclear fuel through the Port of Tacoma, Washington.

There is one crucial reason for my opposition: the safety and protection of port employees and the civilian population through which these shipments must pass to inland receiving areas. The Port of Tacoma is located in a city of dense population. It clearly fails to meet the criteria of choosing a low population density site.

In addition, such shipments also would have an adverse impact on the commerce of the port, with importers and exporters being fearful of designation of the Port of Tacoma as a nuclear transshipment point.

Rather than utilising public port facilities, my suggestion is that military ports should handle spent nuclear fuel from overseas research reactors. This is a national security issue and demands a military solution where safety will not be compromised.

The Port of Tacoma, the Tacoma City Council and the Pierce County Council have adopted resolutions in opposition to the shipment of spent nuclear fuel through Tacoma. These resolutions have my full support.

Would you please enter this letter into the record of the hearing on the Draft Environmental Impact Statement on Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Spent Nuclear Fuel, which will be held at the Tacoma Public Utilities Auditorium, June 19.

Sincerely yours,

Steve Conway

Steve Conway
Representative
29th District

SC:j

LEGISLATIVE OFFICE: 240 JOHN L. O'BRIEN BUILDING, PO BOX 40600, OLYMPIA, WA 98504-0600 • (360) 786-7800
HOTLINE DURING SESSION: 1-800-562-6000 • TDD: 1-800-635-9993
RESIDENCE: 8121 SOUTH PARK, TACOMA, WA 98408 • (206) 472-0897
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1068-1

1068-2

1068-3

RESPONSE TO COMMENT
COMMENTOR NO. 1068: WASHINGTON STATE REPRESENTATIVE STEVE CONWAY

Response to Comment No. 1068-1

The commentor's opposition to the use of the Port of Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. However, the analysis in the EIS indicates that the risks associated with an accident are low (Sections 4.2.2.3 and 4.5) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Sections 4.2.2.2 and 4.5), and pose no significant risk to port personnel, the local population, or the environment.

It should also be noted that Section 3151 of Public Law 103-160 (the National Defense Authorization Act for the fiscal year 1994), requires that "the Secretary of Energy shall, if economically feasible and to the maximum extent practicable, provide for the receipt of spent nuclear fuel...at a port of entry in the United States which...had the lowest human population in the area surrounding the port of entry... " Public Law 103-160 was signed on November 30, 1993, which is after completion of the scoping process for this EIS. DOE included consideration of Section 3151 of Public Law 103-160 by including Criterion 5 in the port selection criteria for this EIS (Appendix D, Section D.1.9.5). Application of this criterion resulted in cities such as Seattle being dropped from the list of proposed ports of entry, while Tacoma stayed on the list.

Response to Comment No. 1068-2

DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' status with respect to their clients. This position is based on the fact that the foreign research reactor spent nuclear fuel would be accepted by the United States in standard shipping containers that would require no special handling or precautions. As such, there should be no adverse commercial or economic reaction to the use of the port. Historically, there were no adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received. Under NEPA regulations, the socioeconomic effects evaluated for this EIS do not include those associated with psychological fear of receiving spent nuclear fuel.

Response to Comment No. 1068-3

The commentor's preference of the use of military ports to receive foreign research reactor spent nuclear fuel is noted. Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

Commentor No. 1209: Washington State Representatives Marilyn Mitchell and Tim Hickel

WASHINGTON STATE LEGISLATURE

July 14, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington D.C. 20585

Dear Mr. Head,

We firmly oppose adoption of a policy by your agency to ship spent nuclear fuel through the Port of Tacoma, Washington.

This letter outlines our objections in detail. Please enter it into the record of written comments on the Draft Environmental Impact Statement (DEIS) on foreign research reactor spent nuclear fuel. We applaud the Department of Energy's commitment to the EIS process, and we welcome the opportunity to share not only our views, but those of many citizens in Washington's 30th Legislative District.

I. GENERAL COMMENTS

In our state, people matter more than policy. The safety and well-being of port employees and residents of neighboring communities must guide DOE's decisions in this matter. The port is no place for nuclear waste. It is bordered by Tacoma and Federal Way, two of Washington's six largest cities. When residents from the other neighboring city of Fife and unincorporated Pierce County are factored in, the civilian population surrounding the port exceeds 200,000 – which hardly can be classified as low-density. Please note that the city of Federal Way, the city of Milton, the city of Puyallup, the Pierce County Council and the Port of Tacoma have passed resolutions opposing this action, and the city of Tacoma has expressed grave concerns. The representatives of these communities recognize, as we do, that the risk to residents from an accident during transport of this hazardous material is too great. *1209-1*

Though we are pleased by USDOE's commitment to the public process, we note that it has not been entirely satisfactory. Initially, the agency did not even schedule a public hearing in the Tacoma/Federal Way area. It was inexcusable to exclude citizens who would feel the greatest impact from the proposed action. It implied a lack of concern on the part of USDOE, not to mention a failure to recognize the simple geography and population of the surrounding area. USDOE has since remedied the situation by scheduling a hearing in Tacoma, but we must point out that this took place only after significant public outcry. *1209-2*

Response to Comment
Commentor No. 1209: Washington State Representatives Marilyn Mitchell and Tim Hickel

Response to Comment No. 1209-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

All population within a fifty mile radius of the Port of Tacoma was considered when analyzing the impact of both incident-free transport and the range of hypothetical port accidents. The risks were found to be low. (Section D.5 of Appendix D, of the EIS provides details on accident analysis).

Response to Comment No. 1209-2

DOE has attempted to provide ample opportunity for individuals, organizations, and government representatives to comment and/or attend hearings on the proposed action. In fact, seventeen public hearings were held on the draft EIS in the locations determined most likely to be directly affected by the EIS alternatives, specifically in the ports of entry and at the potential management sites. In addition, as stated by the commentor, at the request of the City of Tacoma, representatives of DOE attended a second hearing in that area to allow interested parties to presents comments on the proposed action.

COMMENTOR NO. 1209: WASHINGTON STATE REPRESENTATIVES MARILYN MITCHELL AND TIM HICKEL (CONT'D.)

WASHINGTON STATE LEGISLATURE

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We agree with DOE's intention to promote nonproliferation of nuclear weapons. We also agree with DOE's policy objective to ultimately eliminate highly-enriched uranium (HEU) from civilian commerce. 1209-3

Because we agree with those objectives, we cannot agree with the proposal to ship spent nuclear fuel through a civilian port. Among alternatives described in the DEIS, we prefer Management Alternative 2, which would facilitate overseas management of foreign research reactor spent nuclear fuel. We add that this alternative should receive strong consideration in well-developed countries that participate in the IAEA Nuclear Safeguards Program, specifically France, the United Kingdom, Japan, Germany, Sweden, Switzerland and Canada. Participation by these countries would greatly reduce the total amount of spent nuclear fuel to be transported. 1209-4

Within the limits of Management Alternative 1, we would prefer to see secure military ports handle foreign spent nuclear fuel. This option would guarantee the security of civilians, and add a layer of protection against potential terrorist attacks. The tragedy of Oklahoma City teaches us that attacks can come from any quarter at any time, even within our own borders. In our opinion, the DEIS does not adequately address this lethal possibility. 1209-5

II. PRINCIPAL CONCERNS

I) Transportation

The DEIS provides conflicting and confusing information about transportation. It is difficult to tell which interstate route (I-90 or I-84) is being considered. This raises several questions.

A) First, our State Patrol informs us that transporting nuclear waste via I-90 and Snoqualmie Pass is unacceptable, given the high likelihood of dangerous road conditions. The I-90 route should be removed from consideration in the DEIS. 1209-6

B) Second, the I-84 route is described as a connection to the city of Portland via I-5. If this route is under consideration, surely a shorter path to it is preferable in terms of risk. It makes no sense to transport the material from the Port of Tacoma and through half of Washington when it could easily be routed through the Port of Portland.

C) Third, the DEIS rather vaguely refers to rail transportation as an option, even though the only conceivable rail route would move through Seattle -- already rejected on the basis of population density. 1209-7

D) Fourth, USDOE Secretary Hazel O'Leary's June 1 adoption of a Record of Decision formally provides for storage of foreign spent fuel at sites other than Hanford. I applaud this decision; Hanford has more than its share of wastes to clean up. Also, possible decisions by the current Congress could include severe cuts at Hanford, which would 1209-8

RESPONSE TO COMMENT
COMMENTOR NO. 1209: WASHINGTON STATE REPRESENTATIVES MARILYN MITCHELL AND TIM HICKEL (CONT'D.)

Response to Comment No. 1209-3

The commentor's support for nonproliferation of nuclear weapons and elimination of HEU from civilian programs is noted. Sections 1.1 and 1.2 of the EIS discuss the nonproliferation of nuclear weapons and reductions in the use of HEU in civilian programs.

Response to Comment No. 1209-4

The commentor's preference for Management Alternative 2 is noted. Sections 2.3 and 4.4 of the EIS discuss the advantages and disadvantages of overseas storage and reprocessing.

Response to Comment No. 1209-5

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments is required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted.

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures can greatly reduce the risk of such actions. Security would be provided for all shipments of foreign research reactor spent nuclear fuel, as required by the Code of Federal Regulations (10 CFR Part 73). The security provisions are summarized in the new Appendix H that has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit.

Response to Comment No. 1209-6

The representative truck routes from Tacoma used in the EIS analysis are presented in Figure E1-17 in Appendix E of the EIS. These are representative routes only. The representative routes all use I-90, but DOE recognizes the possibility of using I-84 via Portland. A State of Washington routing agency could designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103.

COMMENTOR NO. 1209: WASHINGTON STATE REPRESENTATIVES MARILYN MITCHELL AND TIM HICKEL (CONT'D.)

WASHINGTON STATE LEGISLATURE

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endanger the site's ability to handle additional waste. Moreover, the Hanford site is currently unequipped to receive this type of waste for permanent storage. 1209-8 (Cont'd.)

We would add that if an eastern storage site such as Savannah River is selected, there is no need to use any West Coast port as a destination point for spent nuclear fuel. 1209-9

2) Lack of consistent standards in cancer risk assessment

Information regarding the acceptable level of cancer risk is unclear with respect to variable thresholds among federal agencies. Where public health is concerned, it is inappropriate for individual federal agencies to set thresholds which differ. Particularly in matters of this magnitude, the most stringent cancer risk level should apply, whether the standard is set by DOE or another agency.

For example, the federal Clean Air Act of 1990 sets an acceptable cancer risk level of less than 1 in 10,000. Within our own state, carcinogen risk levels for air toxics are defined as 1 in 100,000 to 1 in 1,000,000. DOE appears to set a standard of 1 in 10,000. Given a surrounding population of roughly 200,000 citizens in Tacoma, Federal Way, Fife and unincorporated Pierce County, this means approximately 20 people could contract cancer. Please provide a policy rationale for this risk level. Also, please compare it to the cancer risk levels established by other agencies, including the Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), the Food and Drug Administration (FDA) and the Department of Transportation (DOT). Please explain the differences (if any) between thresholds and provide justification for adhering to lower standards. 1209-10

We share the opinion of California Congressman Henry Waxman that any cancer risk greater than 1 in 1,000,000 is unacceptable. The inclusion within the DEIS of various daily activities that pose a cancer risk is simplistic and deceptive; regardless of the activities that human beings engage in which pose health risks, the government has no business adding to the risks.

3) Duration

The amount of time spent nuclear fuel will reside at the Port demands further analysis. The superficial assumption that Hanford staffers will shoulder the burden of labor fails to account for an obvious lack of experience in maritime environments. While the DEIS includes some information about port operations, I believe more information is needed. For example, the DEIS does not consider the likelihood that port workers will refuse to offload this cargo -- a distinct possibility. Also, the DEIS does not seem to recognize the standard backlog of time at the port before cargo is rotated out. Please include this factor in a reassessment of risk levels. 1209-11

4) Absence of cost/benefit analysis

The DEIS does not consider the impact of transporting spent nuclear fuel on business as a whole within the Port and in surrounding communities. It is undeniable that a stigma 1209-12

RESPONSE TO COMMENT
COMMENTOR NO. 1209: WASHINGTON STATE REPRESENTATIVES MARILYN MITCHELL AND TIM HICKEL (CONT'D.)

Response to Comment No. 1209-7

The representative rail routes from Tacoma used in the analysis are presented in Figure E1-18 in Appendix E of the EIS. These are representative routes only, but three of the five routes do not pass through Seattle.

Rail shipment from Tacoma to the Savannah River Site is not permitted based on the EIS. Rail routes from Tacoma to the Idaho National Engineering Laboratory do not go through Seattle.

Response to Comment No. 1209-8

The commentor's support of the Record of Decision for the Department of Energy's Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement, released on May 30, 1995, is noted. In accordance with this Record of Decision, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 1209-9

Based on the criteria presented in Section 2.6.3.1 of the EIS for identifying the ports to be considered, the choice of a management site does not directly affect the identification of a port of entry. Shipments from the western hemisphere nations could still be accepted at western U.S. ports.

Response to Comment No. 1209-10

DOE has not set a cancer risk standard of 1 in 10,000, as suggested by the commentor. DOE has proposed a set of alternative actions, and calculated the risks that would apply under each portion of each alternative to the potentially affected population groups. The risks are presented in Section 4 of the EIS, and it is up to the public and the government decisionmakers to determine if those risks are acceptable.

For the general public in a port area, there would be no measurable radiation exposure at all unless there was an accident that released some radiological material from the spent nuclear fuel transportation cask. The frequency of such an accident multiplied by the consequences of such an accident yields the risk of that accident. The risk of such an accident to the general public in the Tacoma area is given in Table 4-7 of Section 4 of the EIS, and it is shown to be far less than one LCF. The analysis in the EIS contradicts the commentor's statement, that approximately 20 people could contract cancer presumably from receipt of foreign research reactor spent nuclear fuel at the Port of Tacoma.

The information in Section 4.10 of the EIS on various daily activities that pose risks is valid and the public can use it to put the risks from the proposed action into perspective. DOE considers this information appropriate to share with the public.

COMMENTOR NO. 1209: WASHINGTON STATE REPRESENTATIVES MARILYN MITCHELL AND TIM HICKEL (CONT'D.)

WASHINGTON STATE LEGISLATURE

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follows nuclear waste, and its presence can have a chilling effect on commerce. Moreover, the Port of Tacoma is already a federal Superfund site, where millions of taxpayer dollars are being expended in cleanup efforts. The presence of nuclear waste would add another potential hazard to a site that is already fraught with them, scuttling any attempts to restore the port's reputation and improve its competitiveness in international markets. The DEIS does not acknowledge these factors. Whenever DOE considers a project of this sort, analysis of the costs to surrounding communities should be included. Please provide an analysis of economic impacts on business within the Port, and in the surrounding cities of Tacoma, Federal Way, and Fife.

1209-12 (Cont'd.)

5) Inaccurate appraisal of depth in Puget Sound

The DEIS asserts that in the event of an accident within the waters of Puget Sound, recovery of any spent nuclear fuel containers should be relatively easy, because depth is less than 200 feet. This statement is inaccurate. Within Puget Sound, pockets exist where depth is greater than 200 feet. Please reanalyze the potential impact of a nautical accident within Puget Sound, with particular emphasis on the possibility of spent nuclear fuel containers dropping into areas of greater depth.

1209-13

This concludes our comments. Thank you for your consideration.

Sincerely,

Maryann Mitchell

Timothy T. Hickel

Maryann Mitchell
Tim Hickel
State Representatives
30th District

RESPONSE TO COMMENT
COMMENTOR NO. 1209: WASHINGTON STATE REPRESENTATIVES MARILYN MITCHELL AND TIM HICKEL (CONT'D.)

Response to Comment No. 1209-11

Under normal circumstances, the foreign research reactor spent nuclear fuel would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

The commentor is correct that the EIS does not analyze the possibility of a longshoremen's refusal to off-load this material, but such a factor does not impact the capability to safely receive containers carrying foreign research reactor spent nuclear fuel. However, this possibility is one of the many factors that would be considered in determining which ports to use.

Response to Comment No. 1209-12

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Under NEPA regulations, the socioeconomic effects evaluated for this EIS do not include those associated with psychological fear of receiving spent nuclear fuel. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Tacoma would have no adverse economic impacts on business within the port or the surrounding communities.

Response to Comment No. 1209-13

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Section 4.2.1.3 of the EIS has been modified to include this assurance of recovery in coastal waters. Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

Commentor No. 1220: Georgia Department of Natural Resources

Georgia Department of Natural Resources
4244 International Parkway, Suite 114, Atlanta, Georgia 30354
Lonice C. Barrett, Commissioner
Harold F. Reheis, Director
Environmental Protection Division
(404) 362-2675

Mr. Charles Head, Program Manager
U.S. Department of Energy
Office of Spent Nuclear Fuel Management, EM-37
1000 Independence Avenue, SW
Washington, DC 20585

July 20, 1995

Dear Mr. Head,

Thank you for the opportunity to comment on the Draft Environmental Impact Statement (EIS) on a Proposed Nuclear Nonproliferation Policy Concerning Foreign Research Reactor (FRR) Spent Nuclear Fuel (SNF), DOE/EIS-0218D. Should the proposed action in this draft EIS be implemented, the State of Georgia would be a significant stakeholder in this activity, as the Port of Savannah is one of the ten ports identified in the draft EIS, and also as a corridor state for shipments received at the Port of Jacksonville, Florida. In addition, much of the spent fuel addressed by this action would likely be managed just across the South Carolina border at the Savannah River Site (SRS).

The Environmental Protection Division (EPD) of the Georgia Department of Natural Resources (DNR), by Executive Order, is the lead state agency for response to peacetime incidents involving radioactive materials. Although we have concerns regarding the long-term management of foreign research reactor spent nuclear fuel at Savannah River Site (SRS), our main concerns lie in the area of transportation, and more particularly the emergency preparedness and response capabilities of state and local government agencies along transportation corridors, and as such, I will limit my comments to the Emergency Management and Response section of the draft EIS.

Section 2.7.1 states that "State and local governments are required to have emergency management and response programs", and that these programs "must be capable of managing all hazards ranging from natural disasters to hazardous materials incidents on a day-to-day basis". Contrary to the above assertion, the purpose of the Georgia Emergency Management Act of 1981, as amended (Official Code of Georgia, Annotated, Chapter 38-3) is "to create a state emergency management agency and to *authorize* the creation of local organizations for emergency management in the political subdivisions of the state" [emphasis added]. Despite the efforts of federal and state emergency management officials, not all of Georgia's one-hundred fifty nine (159) counties currently have an emergency management agency. Many counties in Georgia rely heavily on volunteers for vital services such as fire protection and emergency

1220-1

Response to Comment
Commentor No. 1220: Georgia Department of Natural Resources

Response to Comment No. 1220-1

The commentor's concerns about to the nation's emergency management system are noted.

DOE considers that if foreign research reactor spent nuclear fuel is managed in the United States, there is adequate regulatory and emergency preparedness infrastructure to ensure its safe acceptance and transportation to the designated management site. As discussed in Section 2.7.1 of the EIS, Federal funding to State, Tribal, and local governments is being provided for maintaining emergency response programs. There are three national emergency response plans under which DOE provides technical advice and assistance to the State, Tribal and local agencies involved with a radiological incident. DOE is also required to inform the Governor of each State and any Tribal chair, or their designee, along a transportation route at least seven days in advance of the shipment of hazardous cargos, including radioactive materials. It would be the responsibility of the Governor to provide any further notification to State and local officials.

Emergency preparedness, security, and coordination of DOE with local emergency response authorities that would be involved with the acceptance and transportation of foreign research reactor spent nuclear that would be involved with the acceptance and transportation of foreign research reactor spent nuclear fuel will be discussed in detail in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

COMMENTOR NO. 1220: GEORGIA DEPARTMENT OF NATURAL RESOURCES (CONT'D.)

Letter to Mr. Charles Head, DOE
July 20, 1995
Page 2 of 4

management and have limited law enforcement resources. While the ability to manage all hazards, including those posed by a transportation accident involving radioactive materials, on a day-to-day basis is a legitimate goal for the nation's emergency management system, this section seem to indicate to the reader that this goal has been achieved. Experience in Georgia, as well as the rest of the nation, would seem to indicate otherwise.

1220-1 (Cont'd.)

Section 2.7.2 contains a commitment, on behalf of DOE, to "provide support and assistance to State, Tribal and local government agencies responsible for responding to a foreign research reactor spent nuclear fuel incident". We fully expect DOE to honor this commitment, as will be discussed later in these comments.

1220-2

Section 2.7.3 indicates that approximately 160 local responders from North Carolina, South Carolina and Georgia participated in a Radiological Emergency Training for Local Responders (RETLR) course. To our knowledge, no local responders from Georgia participated in this training.

1220-3

Section 2.7.3.1 of the draft EIS discusses Department of Energy (DOE) financial and technical assistance to state and tribal governments, and mistakenly implies that DOE provides funds directly to state and tribal governments to fund operations related to transportation emergency preparedness by stating that these funds "enhance a jurisdiction's emergency management and response capabilities". While DOE indeed may provide direct funding to certain states, DOE funding to southeastern states, including Georgia, is in the form of Cooperative Agreements with the Southern States Energy Board (SSEB). Under these agreements, SSEB performs several critical regional coordination activities, including funding two (2) meetings of the SSEB Advisory Committee on Radioactive Waste Transportation per year, providing travel funds for committee members and staff to attend national meetings related to the transportation of spent nuclear fuel, and publication of the SSEB Spent Fuel and High-Level Radioactive Waste Transportation Handbook. Funds provided by DOE to SSEB, however, do not provide support for crucial state needs such as salaries for state management, planning, training, inspection, public information, communications and emergency response personnel, equipment and supplies, equipment repair and maintenance, office space, utilities, telecommunications charges or other regular operating expenses.

The State of Georgia does receive direct funding from DOE in the form of an Agreement in Principle (AIP) with the Savannah River Site (SRS) for environmental monitoring and emergency preparedness activities. Conditions included in this AIP, however, prohibit the use of AIP funds for transportation activities. In short, while DOE may indeed be providing substantial sums of money to "states and tribes" for transportation related

1220-4

RESPONSE TO COMMENT
COMMENTOR NO. 1220: GEORGIA DEPARTMENT OF NATURAL RESOURCES (CONT'D.)

Response to Comment No. 1220-2

As described in response to Comment 1220-1 above, this support and assistance is currently being supplied, and will continue to be supplied.

Response to Comment No. 1220-3

The commentor is correct in that no local responders from the State of Georgia participated in the Radiological Emergency Training for Local Responders (RETLR) course referred in Section 2.7.3 of the EIS. The participants were from the States of North and South Carolina. The section has been revised to correct the inaccuracy.

Response to Comment No. 1220-4

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdictions emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

The operational items and the transportation emergency response capabilities mentioned in the letter are normal and routine functions any jurisdiction would be expected to maintain.

As discussed in response to comment 1220-1, above, Appendix H to the EIS contains the general provisions for emergency preparedness associated with the transportation of foreign

COMMENTOR NO. 1220: GEORGIA DEPARTMENT OF NATURAL RESOURCES (CONT'D.)

Letter to Mr. Charles Head, DOE
July 20, 1995
Page 3 of 4

activities, as is indicated by Table 2-16, little if any of this funding may be used directly by states, tribes or local government agencies to insure the safe, routine transportation of spent nuclear fuel, or to insure that adequate emergency response capabilities exist along transportation routes through their jurisdictions. In order to fulfill the commitment found in Section 2.7.2 and discussed above, DOE must provide direct funding to states, tribes and local governments for these purposes, or require the foreign research reactor operators, particularly those in developed countries, as a condition of DOE management of their fuel, to provide funds specifically for these purposes. Such funding requirements are consistent with the discussion regarding financial arrangements for "basic implementation" contained in Section 2.2.1.2 and the discussion of alternative financial arrangements in Section 2.2.2.3.

1220-4 (Cont'd.)

Section 2.7.3.2 of the draft EIS describes several DOE radiological training courses which have been made available to states, tribes and local governments, including the Radiological Emergency Response Operations (RERO) course, the RETLR course mentioned above, and the Transportation Emergency Training for Response Assistance (TETRA) series of courses. These courses have been provided through the Office of Environmental Management (EM) as part of the Transportation Emergency Preparedness Program (TEPP), which is discussed in Section 2.7.3.4. TEPP also provides support for both the TRANSAX and WIPPTREX series of exercises, as shown in Table 2-18. At a DOE Transportation External Coordination Working Group (TEC/WG) meeting in Kansas City, Missouri on July 18, 1995, the Director of the Office of Transportation, Emergency Management and Analytical Services (EM-26) advised DOE stakeholders that the House markup of the 1996 Federal budget eliminates funding for the Emergency Management activity. The anticipated impacts of this action include deferral of planned 1996 WIPPTREX and TRANSAX exercises, and the inability to provide the training courses mentioned above and outlined in Section 2.7.3.2 of the draft EIS.

1220-5

The impacts of eliminating EM-26 emergency management funding would appear to be inconsistent with the commitment contained in Section 2.7.2 to provide support and assistance to state, tribal and local governments. We urge DOE to take actions necessary to prevent the erosion of assets required to deliver the training courses and to conduct the exercises detailed above. One option may be to consolidate emergency management resources from various DOE offices into a single, department-wide emergency management program. Given the number of spent nuclear fuel shipments proposed in this action, coupled with DOE's own internal spent nuclear fuel shipments and shipments anticipated by the Office of Civilian Radioactive Waste Management (OCRWM), we feel that the time has come for DOE to establish a National Transportation Emergency Response Training Center, and we feel that the resources at the Nevada Test Site (NTS) provide a solid base upon which to develop this center.

1220-6

RESPONSE TO COMMENT
COMMENTOR NO. 1220: GEORGIA DEPARTMENT OF NATURAL RESOURCES (CONT'D.)

research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. Funding for special needs, if necessary, would be addressed during this interface.

Response to Comment No. 1220-5

DOE historically has provided a variety of support to governmental jurisdictions in fulfillment of its responsibilities under regulatory and National emergency plan responsibilities. However, DOE, like all other Federal agencies is undergoing a comprehensive Congressional, as well as an internal budgetary and operational review and realignment to ensure that all of its resources are used in the most effective manner possible. The end results of this will not be fully known until a final budget is passed.

Response to Comment No. 1220-6

The commentor's suggestions that relate to DOE-wide emergency management program are noted. DOE will continue to fulfill its responsibilities, as well as assist other governmental jurisdictions with the incremental impacts its operations cause above and beyond a jurisdiction's normal operations to the best of its ability within the fiscal constraints and realities imposed by our elected leadership. Funding for emergency preparedness associated with the foreign research reactor spent nuclear fuel acceptance and transportation in the United States, which is the subject of this EIS, is addressed in the response to comment 1220-4, above.

COMMENTOR NO. 1220: GEORGIA DEPARTMENT OF NATURAL RESOURCES (CONT'D.)

Letter to Mr. Charles Head, DOE
July 20, 1995
Page 4 of 4

Section 2.7.5 of the draft EIS states that states and tribes would be responsible for augmenting their existing emergency management plans and response procedures to accommodate requirements specific to the shipments of foreign research reactor spent nuclear fuel, and to provide personnel and equipment to manage an incident should one occur. Absent provision of funds by DOE or the foreign research reactor operators themselves directly to states, tribes and local governments to facilitate these activities, and absent the radiological training assistance provided in the past by DOE and outlined in this draft EIS, many jurisdictions may find it difficult to meet the requirements imposed on them by the activity proposed in this draft EIS.

1220-7

Again, thank you for the opportunity to comment on this draft EIS. I look forward to continuing dialogue in this matter.

Sincerely,

James C. Hardeman, Jr., Manager
Environmental Radiation Program

JCH/jh

RESPONSE TO COMMENT
COMMENTOR NO. 1220: GEORGIA DEPARTMENT OF NATURAL RESOURCES (CONT'D.)

Response to Comment No. 1220-7

DOE would provide assistance to local authorities to ensure that appropriate measures are taken in the unlikely event of an accident. As part of this assistance, DOE's Radiological Assistance Program teams from the eight offices strategically located throughout the country would be used to coordinate and to provide remediation assistance. This type of assistance and coordination would be specified in the Transportation Plan prepared for any foreign research reactor spent nuclear fuel shipment to be carried out.

As discussed in response to comment 1220-1, above, Appendix H to the EIS contains the general provisions for emergency preparedness associated with the transportation of foreign research reactor spent nuclear fuel in the United States.

Commentor No. 1264: Texas State Representative A. Craig Eiland

TEXAS HOUSE OF REPRESENTATIVES

Capitol, Extension #1703
P.O. Box 2910
Austin, Texas 78768-2910
(512) 463-0568
Fax (512) 463-8649

217 Tremont
Galveston, Tx 77550
409-763-1200
1-800-345-2030

CRAIG EILAND

July 21, 1995

VIA FAX: (202)586-8256
Charles Head, Program Manager
Office of Spent Nuclear Fuel Mgmt. (EM-37)
U.S. Department of Energy
1000 Independence Avenue SW
Washington, D.C. 20585

Dear Mr. Head,

I am responding to your request for public comments for the period ending July 20, 1995. I have received and reviewed the letter from various Galveston individuals including Ms. Gini Brown. I join in those comments and have two other items to point out;

1. The Houston Ship Channel is one of the busiest ports in the United States. The entrance to the Houston Ship Channel is the same entrance to the Port of Galveston and is the same entrance to the Port of Texas City. It is a narrow channel and is very crowded. I do not believe that it would be safe or appropriate to transport nuclear waste through such a narrow and busy water way. *1264-1*

2. Texas City is home to one of the largest petro-chemical complexes in the world. This complex is within clear view of the Port of Galveston and is only a couple of miles away. There have been historic explosions of unparalleled magnitude at these plants, additionally highways and byways have been shut down because of chemical spills and releases. This does not even take into account the chemicals and product which are shipped through the Houston Ship Channel as previously mentioned, nor does it include the items that are brought by barge through the intracoastal waterway. The intracoastal waterway also contributes to the congestion around the entry to the Houston Ship Channel and the Port of Galveston. *1264-2*

Please consider the above as well as those items contained in Ms. Brown's correspondence when rejecting Galveston as a port of transport for nuclear waste. *1264-3*

Sincerely yours,

A. Craig Eiland

ACE\ps
legislat\channel.ltr

SANTA FE, LA MARQUE, HITCHCOCK, BAYOU VISTA, TEXAS CITY, GALVESTON
DISTRICT 24

Response to Comment Commentor No. 1264: Texas State Representative A. Craig Eiland

Response to Comment No. 1264-1

The physical constraints of the passage from the Gulf of Mexico to the Port of Galveston were considered as part of the port selection process and were found to meet the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS).

The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (Appendix D, Section D.1.9.2 of the EIS). Appendix D, Section D.5.3.1.3 of the EIS presents a discussion of the determination of the probability of ship accidents used in the EIS.

Response to Comment No. 1264-2

The port selection criterion do not consider the existence of land-based facilities such as refineries because they have no direct impact on the risk associated with the shipment of foreign research reactor spent nuclear fuel. The worst case accident is considered to be the collision of the ship carrying the foreign research reactor spent nuclear fuel with a petroleum tanker. In this accident the transportation cask is damaged in the collision, then subjected to a fire that resulted from the collision (Appendix D, Section D.5 of the EIS). The addition of some mishap at a land-based facility would not add to the severity of this accident, and so was not considered. Section 4.2.2.3 of the EIS discusses the assumptions that went into the port accident analyses and the results of those analyses. As discussed in response to Comment 1264-1, the port selection process does not specifically consider the amount of marine traffic as a criterion.

DOE would like to point out that the foreign research reactor spent nuclear fuel is neither volatile nor unstable. The fuel that the proposed policy deals with is a metal which contains enriched uranium matrixed in, all clad with either aluminum or stainless steel. This type of fuel is very stable. Section 2.6.1 of the EIS presents a detailed description of the foreign research reactor spent nuclear fuel.

Response to Comment No. 1264-3

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Galveston, or to any of the ports analyzed in the EIS, is low. With respect to the comments received by DOE from Ms. Gini Brown, please see the response to comment 1140.

SECTION 2.3
LOCAL GOVERNMENT

Commentor No. 2: Cheryll N. Woods-Flowers, Mayor, Town of Mount Pleasant

TOWN OF MOUNT PLEASANT

TOWN COUNCIL

Robert H. Barton, Jr.
W. Jewel Browder
G. M. Darby, III
Margaret A. Kerr

Cheryll N. Woods-Flowers
Mayor

May 8, 1995

TOWN COUNCIL

Terence M. McManus
E. A. Rodenberg, III
Kruger B. Smith
Thomas P. Tanis

Mr. Charles Head
Office of Environmental Management
Department of Energy
1000 Independence Avenue SW
Washington, DC 20585

Dear Mr. Head:

Thank you for holding this hearing to give citizens of the Town of Mount Pleasant the opportunity to make their views known on this important issue. I would like to take this opportunity to comment on the proposal to bring spent fuel rods through the SC State Ports Authority terminal on the Wando River in the Town of Mount Pleasant; this is the same port referred to in the document as the Port of Charleston.

Several points need to be made:

- Section 3151 of the National Defense Authorization Act directs the Secretary of Energy, "if economically feasible and to the maximum extent practicable," to receive spent nuclear fuel for storage at the SRS at a port of entry that has "the lowest human population in the area surrounding the port of entry, is closest in proximity to SRS, and has the most appropriate facilities for, and experience in, receiving spent nuclear fuel. Section 3151 points directly the fact that the Wando Terminal is indeed not the best choice for receipt of these shipments. It should be noted that the population in the Town is well over 35,000 people with some 4,000 more people in the unincorporated area surrounding the port. I have included, for your review, the most recent socio demographic information for the Town, along with excerpts from the Master Plan for this area, which clearly point out the fact that we are one of the fastest growing municipalities in South Carolina. The Wando Welch Terminal has no experience in the handling of nuclear materials, but previous documents have assumed in error that the Terminal has a Hazardous Material Team to be on hand if needed. This is, in fact, not the case. The closest residential dwellings are within 100 linear feet from the terminal. 2-1 2-2 2-3

P. O. Box 745, 100 Ann Edwards Lane
Mount Pleasant, SC 29465
(803) 884-8517

Response to Comment
Commentor No. 2: Cheryll N. Woods-Flowers, Mayor, Town of Mount Pleasant

Response to Comment No. 2-1

The requirements of Section 3151 of the National Defense Authorization Act for Fiscal Year 1994 were specifically considered in development of the criteria for port selection (Appendix D, Section D.1.6 of the EIS). The application of the criteria that was developed from the Section 3151 requirements, along with the other port selection criteria, are discussed in Appendix D of the EIS.

Appendix D has been revised to specifically note the presence of Mount Pleasant in the immediate vicinity of the Wando Terminal, and the rate of population growth of Mount Pleasant (Attachment 2 to Appendix D). The demographic data pertaining to Mount Pleasant were considered in application of the port selection criteria, but still resulted in the Port of Charleston (that is, the Wando Terminal in Mount Pleasant) being identified as one of the proposed ports of entry.

Response to Comment No. 2-2

Detailed information regarding emergency response requirements and capabilities are found in Section 2.7.4, and Appendix D, Sections D.2.1.1, and D.4.3. The EIS does not indicate the presence of a Hazardous Material Team, but states in Appendix D, Section D.2.1.1 that The South Carolina State Ports Authority Port Police are part of an emergency response team comprised of the local fire departments, Coast Guard, and private hazardous materials response organizations. Such teams are primarily trained for first response duties. The EIS also provides information on the availability of well-trained and equipped national emergency response teams, including DOE's Radiological Assistance Program teams that are available for prompt, reliable assistance to first responders for long-term response and mitigation.

Response to Comment No. 2-3

The entire population in the area of the port, including the population in closest proximity to the terminal, was considered in calculating the effects of possible accidents (Appendix D, Section D.5 of the EIS presents additional details on this issue). Although there may be people who live within 100 feet of the fence around the terminal, due to the large size of the terminal's fenced area, these individuals actually live quite some distance from the wharf area where the spent nuclear fuel transportation casks would be unloaded. The dose rate at 100 feet from a cask containing foreign research reactor spent nuclear fuel is essentially zero (Appendix F, Section F.5 of the EIS). The calculations in the EIS demonstrate that both the dose from incident-free operations (Section 4.2.2.2) and the risk from accidents (Section 4.2.2.3) to all individual would be low, including that to the people in the closest houses.

COMMENTOR NO. 2: CHERYLL N. WOODS-FLOWERS, MAYOR, TOWN OF MOUNT PLEASANT (CONT'D.)

- As was pointed out previously by a number of the Town's planning staff, in 1990, the 185 urban square miles of Charleston County closest to the metropolitan core had a population of approximately 277,500 persons with approximately 17,539 county residents spread over rural sections of the County. The Wando Welch Terminal is in the immediate proximity to Metropolitan Charleston County's twenty square mile heart which includes Peninsular Charleston, sections of North Charleston, and sections of East Cooper. This area of at least 100,000 translates into a density of 5,000 people per square mile. 2-4

During the two hearings held here in the Town of Mount Pleasant last year, many of our citizens lodged their disapproval of this proposal, Congressman Ravenel delivered his letter of disapproval, and I presented a Resolution passed by the Mount Pleasant Town Council (enclosed) in opposition to it as well. I am also aware of several petitions containing thousands of signatures that were mailed during the original comment period. I was told that the Department of Energy does not normally oppose the will of a community in these matters. I believe, as does my Council, that the criteria could not justify a Wando Terminal decision for these shipments and, in fact, we would vehemently dispute any decision made in this regard. 2-5

I am enclosing several pieces of correspondence and several petitions, all of which were presented just over one year ago when a port of entry was being considered for emergency shipments. The Department of Energy made the decision that the Wando Welch Terminal was not the best choice for emergency shipments subsequent to the 1994 public hearings. I would respectfully submit to you that the Wando Terminal would be less appropriate for the proposed 10-15 years of shipments. 2-6

If I or my staff can provide you with further information, do not hesitate to contact me. Please advise me, personally, as soon as any decision has been made.

Sincerely,

Cheryll N. Woods-Flowers
Mayor
TOWN OF MOUNT PLEASANT

/ch
Attachments

cc: Town Council
cc: The Honorable Strom Thurmond
cc: The Honorable Ernest F. Hollings
cc: The Honorable Mark Sanford
cc: Mr. Don Welch, SPA

RESPONSE TO COMMENT
COMMENTOR NO. 2: CHERYLL N. WOODS-FLOWERS, MAYOR, TOWN OF MOUNT PLEASANT (CONT'D.)

Response to Comment No. 2-4

The commentor states that the population of Mount Pleasant and surrounding communities is large and growing rapidly, hence it is not an appropriate port to use to bring in the foreign research reactor spent nuclear fuel. However, as shown in Table D-5 of Appendix D of the EIS, the population within 10 miles (16 km) of Wando Terminal (233,424) is currently the 7th lowest port population in the final group of 28 ports evaluated using the EIS low population criterion. Sections 4.2.2. and 4.5 evaluate the impacts on ports of accepting the foreign research reactor spent nuclear fuel in the United States. The results of these analyses, which take into account population, indicate that the risk associated with this activity at any of the assessed ports, including those ports in the Charleston/ Mount Pleasant area, are low.

In addition, Appendix D, Section D.1.9.5 of the EIS specifically addresses the consideration of port populations in the port selection process. Attachment D2 shows that the projected population growth is expected to be in the range of 35 percent to 80 percent for most of the ports from Wilmington, NC, to Jacksonville, FL. While high, that growth is not expected to result in any of those ports becoming unacceptable under the selection criteria employed in Appendix D of the EIS. The demographic data presented by the commentor were considered in the EIS analyses.

Response to Comment No. 2-5

The commentor's objection, as well as the oppositions of the Town of Mount Pleasant Town Council and Congressman Ravenel to bringing foreign research reactor spent nuclear fuel through the Port of Charleston Wando Terminal, are noted. However, Sections 4.2.2 and 4.5 demonstrate that the risk of bringing spent nuclear fuel to the Port of Charleston, or to any of the ports analyzed in the EIS, is low. In making the decision which ports to use if foreign research reactor spent nuclear fuel is to be accepted into the United States, the desires of the affected communities will be considered as well as the qualifications of the port.

Response to Comment No. 2-6

Although the Wando Terminal was not used for the urgent-relief shipment of foreign research reactor spent nuclear fuel last year, the port selection process described in Appendix D, Section D.1.9 concludes that the use of any of the ports selected, including the Port of Charleston, can safely receive the foreign research reactor spent nuclear fuel. However, the port selection process only indicates ports that are acceptable for the receipt and handling of foreign research reactor spent nuclear fuel, it does not determine which port is best. The decision as to which port or ports would be used if foreign research reactor spent nuclear fuel is accepted into the United States, will be addressed in the Record of Decision.

COMMENTOR NO. 22: HELEN M. ALLEN, MAYOR, CITY OF CONCORD

CITY OF CONCORD
1950 Parkside Drive, MS/01
Concord, California 94519-2578
FAX: (510) 798-0636

OFFICE OF THE MAYOR
Telephone: (510) 671-3158

Concord

CITY COUNCIL
Helen M. Allen, Mayor
Tom Rosas, Vice Mayor
Colleen Coll
Bill McManigal
Michael A. Pastrick

Lynnet Keibl, City Clerk
Thomas Wentling, City Treasurer

Edward R. James, City Manager

May 22, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RE: Draft Environmental Import Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

I want to thank you and your team from the Department of Energy for coming to our community this evening to conduct a public information meeting. The potential shipment of spent nuclear rods through the Concord Naval Weapons Station raises a number of health and safety issues which need to be addressed. The issue of public safety is our paramount concern. Public information meetings such as this can provide an excellent forum for you to explain the project to the community and for you to obtain a response from the community about your proposal.

The City of Concord and the Naval Weapons Station have been good neighbors for over 50 years. The Station has been actively involved with the community. Major amenities enjoyed by City residents as well as Navy personnel, such as Willow Pass Park and the Diablo Creek Golf Course, are due in part to cooperation between the Station and the City. Questions and concerns raised by the City regarding D.O.E.'s proposal to use the Port of Concord should not be construed as questioning the role and mission of the Navel Weapons Station.

The City will not be taking a position regarding the merits of the proposed federal nuclear nonproliferation policy. Our objective is not to formulate a stance on federal foreign policy, but to identify potential impacts to Concord of using the Naval Weapons Station port as a transfer facility from ships to trains and trucks.

The following are concerns and issues that we have identified thus far. After the presentation of information at this meeting is made, we may wish to add to our list:

1. General Issues

   - D.O.E. has stated that the chance of an accident is minimal. If so, why did a D.O.E. spokesperson state that one reason the Port of Oakland was dropped from consideration in favor of the Port of Concord was that the Concord area had a smaller population than the Oakland area? Also, if the chances of an accident are so low, why did Charles Head of D.O.E. state that some operators of commercial ports believe that spent nuclear fuel rods should only be off-loaded at military ports?

22-1

RESPONSE TO COMMENT
COMMENTOR NO. 22:
HELEN M. ALLEN, MAYOR, CITY OF CONCORD

Response to Comment No. 22-1

The calculations of incident-free operations demonstrate that there would be no increase in impacts associated with increases in the population surrounding the potential ports of entry (Section 4.2.2 of the EIS). Even in the event that an accident should occur, the impact analysis results demonstrate that, although there is a linear relationship between the population around the port and the accident consequences expressed in person-dose (Section 4.2.2.3 and Figure 4-1), the highest risk of a latent cancer fatality is 0.000029 for the full range of ports considered. The risk number assumes the acceptance of all of the foreign research reactor spent nuclear fuel into the United States and the use of very high population-density ports such as Elizabeth, New Jersey, which is just across the Hudson River from New York City. These results demonstrate that there are only minor benefits to be obtained from restricting the proposed action to low population-density ports.

Nevertheless, Section 3151 of Public Law 103-160 (the National Defense Authorization Act for the Fiscal Year 1994), requires that the Secretary of Energy shall, "if economically feasible and to the maximum extent practicable, provide for the receipt of spent nuclear fuel at a port of entry in the United States which had the lowest human population in the area surrounding the port of entry..." Public Law 103-160 was signed on November 30, 1993, which is after completion of the scoping process for this EIS, including the scoping meeting in Oakland, California. While the National Defense Authorization Act was written specifically to regulate the receipt and management of foreign research reactor spent nuclear fuel at DOE's Savannah River Site, DOE elected to apply this criterion, among others, in identifying potential ports of entry, to the maximum extent practicable.

DOE included consideration of Section 3151 of Public Law 103-160 by including Criterion 5 in the port selection criteria for this EIS (Appendix D, Section D.1.9.5). Application of this criterion resulted in Oakland being dropped form the list of proposed ports of entry, while Concord stayed on the list.

Mr. Head's comments to the effect that some operators of commercial ports believed that spent nuclear fuel should only be off-loaded at military ports merely reported the nature of some of the comments DOE had received, not DOE's position regarding the need to use military ports.

COMMENTOR NO. 22:
HELEN M. ALLEN, MAYOR, CITY OF CONCORD (CONT'D.)

Charles Head
May 22, 1995
Page 2

- The Bay Area is one of the largest metropolitan regions in the country. Even though the danger of nuclear accident is low, we question bringing the rods through the Golden Gate Bridge to Concord. The Bay Area has over 6 million people.

2. Port of Concord

- The Port of Concord is a very specialized facility built and operated solely for the loading and off-loading of munitions. Does the port have the capacity or the equipment to off-load spent nuclear fuel rods? — 22-2
- Are additional police personnel or military personnel needed to secure the port area and temporary storage areas? What additional role, if any, would be placed on the City, County, and State law enforcement agencies? — 22-3
- The entry to the Naval Weapons Station has been the scene of demonstrations by people opposed to various federal policies. Concord police personnel have been involved in the past in providing support to military personnel during these demonstrations. What resources will D.O.E. provide to deal with large demonstrations? — 22-4

3. Emergency Services

- In case of an accident, D.O.E. has stated that local emergency services agencies would be expected to handle the situation. Has D.O.E. contacted agencies such as those listed below to assess their capability to help in accident situations? — 22-5
  - Contra Costa County Emergency Services
  - County Consolidated Fire District
  - County Sheriff's Department
  - Concord Police Department
  - Mt. Diablo Hospital
  - John Muir Hospital
  - Kaiser Hospitals
  - Ambulance companies
  - Toxic waste companies
- What resources are being provided by D.O.E. to deal with the long-term impacts of an accident to the surrounding area? What would we do if an accident situation resulted in health hazards, contaminated the water supply, closed major roads, and caused localized panic? — 22-6
- Has D.O.E. included in its analysis a review of particular hazards in this area which might increase the risk of accidents, such as earthquake faults? — 22-7

4. Rail/Truck Shipments from Concord to Storage Sites

- Concord is far away from the three western storage sites: Hanford, Washington; Idaho National Engineering Laboratory; and the Nevada Test Site near Las Vegas. These inland storage areas are not easily reached from Concord, routes carry significant amounts of civilian traffic, and mountain routes are often closed due to snow storms.
  - Why was Concord one of the studied ports? — 22-8

RESPONSE TO COMMENT
COMMENTOR NO. 22:
HELEN M. ALLEN, MAYOR, CITY OF CONCORD (CONT'D.)

Response to Comment No. 22-2

Concord NWS has the experience and facilities necessary to handle the containers in which the foreign research reactor spent nuclear fuel would be shipped. Currently the Concord NWS has a floating crane that routinely handles containers. Also, the NWS is scheduled to add two container cranes to increase the container handling capacity of the facility.

Response to Comment No. 22-3

NRC regulations require armed guards on all spent nuclear fuel being transported through cities (10 CFR Part 73). The Transportation Plan that will be developed prior to implementation of the policy will address security requirements. The Security Plan for each shipment will be reviewed by affected State and local governments. The costs for guards and escorts would be paid by the shipper (foreign research reactor operators). The general provisions of the Transportation Plan are presented in Appendix H, which was added to the EIS in response to public comments.

Response to Comment No. 22-4

Dealing with demonstrations is the responsibility of the local and State governments, as well as the military if such demonstrations occur on military bases. However, if the demonstrations were the result of the receipt of foreign research reactor spent nuclear fuel, DOE would work with local, State, or military organizations to deal with the situation.

Response to Comment No. 22-5

Each port considered in the EIS has developed an Area Contingency Plan. This plan outlines response capabilities, procedures and authorities for responding to and recovering from hazardous material incidents. Additionally, DOE would provide assistance to local authorities to ensure that appropriate measures would be taken in the unlikely event of an accident. As part of this assistance, DOE's Radiological Assistance Program teams, from eight offices strategically located throughout the country, would be used to coordinate and to provide remediation assistance. This type of assistance and coordination would be specified in the Transportation Plan that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H of the EIS. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected.

Response to Comment No. 22-6

DOE would provide coordination and technical assistance and training to the State, Tribal, and local emergency response personnel. In addition, DOE has Radiological Assistance Program teams that operate from eight strategically located DOE offices around the

COMMENTOR NO. 22:
HELEN M. ALLEN, MAYOR, CITY OF CONCORD (CONT'D.)

Charles Head
May 22, 1995
Page 3

- Routes pass by and through major cities in the Western states. What would they do in case of accident? 22-9
- Considering the long distance between Concord and the storage areas, would not one anticipate the possibility of more traffic accidents and terrorist activity? 22-10
- In accessing interstate routes to the storage areas would local Concord streets be used to transport rods? 22-11

These issues are important to our community. Hearing your responses will help local residents develop positions regarding D.O.E.'s proposal. I would appreciate responses to our concerns as soon as possible so all concerned parties can intelligently comment on the D-EIS prior to the June 20, 1995 deadline.

Thank you for the opportunity to address these issues with you.

Sincerely yours,

Helen M. Allen
Mayor

JM5720.HAS

cc: City Council
City Manager
Senator Barbara Boxer
Senator Diane Feinstein
Representative Bill Baler
Representative George Miller
Contra Costa County Board of Supervisors

RESPONSE TO COMMENT
COMMENTOR NO. 22:
HELEN M. ALLEN, MAYOR, CITY OF CONCORD (CONT'D.)

country. Upon State, Tribal, or local request, these teams can provide technical expertise and assistance to monitor and assess radiological hazards. The teams are activated on an as-needed basis and generally can be ready to deploy from their home station within four hours of notification. However, as discussed in Section 2.7 of the EIS, the primary responsibility for emergency response to an incident would reside with State, Tribal, and local authorities.

In dealing with the long-term impacts of an accident, each case would have to be dealt with separately, since the exact situation cannot be known ahead of time. According to the analyses in Section 4.2.2.3 of the EIS, no significant impacts are anticipated from any accident associated with the shipment of foreign research reactor spent nuclear fuel.

In addition, the Price-Anderson Act would provide funds to cover costs associated with public liability claims that arise out of a "nuclear incident," as defined by law. In pertinent part, a "nuclear incident" is one that causes, for example, injury, sickness or property damage, resulting from radioactive, toxic, explosive or other hazardous properties of source, special nuclear, or by-product material.

Response to Comment No. 22-7

Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident and thus effect the probability of such accidents; however, the number of earthquake-induced ship and road accidents is small compared to other causes.

Response to Comment No. 22-8

Concord NWS was one of 161 ports (153 commercial and eight military ports) considered. These ports were evaluated against selection criteria, resulting in 10 ports that met all of the criteria. Appendix D, Sections D.1.8 and D.1.9 of the EIS provide a detailed discussion of the process and results.

Response to Comment No. 22-9

See response to comment 22-6 above.

COMMENTOR NO. 22:
HELEN M. ALLEN, MAYOR, CITY OF CONCORD (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 22:
HELEN M. ALLEN, MAYOR, CITY OF CONCORD (CONT'D.)

Response to Comment No. 22-10

Yes, for traffic accidents. The chance of a traffic accident does increase as the travel distance increases and this effect was taken into account in the traffic risk calculations that are presented in Section 4.2.3 and Appendix E of the EIS.

Section D.5.9 has been added to Appendix D of the EIS to address the issue of attack by disgruntled persons or terrorists. Also see the response to Comment 78-2 for a brief description of the requirements for physical protection of spent nuclear fuel shipments.

Response to Comment No. 22-11

DOE has not yet selected ports, routes, or transport modes for the foreign research reactor spent nuclear fuel. If Concord NWS is selected, then DOE would choose the best route to I-680 in accordance with Department of Transportation regulations (49 CFR Part 397.101 (a)(2)). That route could use Route 4, Route 24, and/or Waterfront Road. The State of California routing agency can designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103.

COMMENTOR NO. 63: THOMAS C. TAYLOR, CHAIRMAN, COUNTY COUNCIL OF BEAUFORT COUNTY

COUNTY COUNCIL OF BEAUFORT COUNTY
ADMINISTRATION BUILDING
1000 RIBAUT ROAD
POST OFFICE DRAWER 1228
BEAUFORT, SOUTH CAROLINA 29901-1228
TELEPHONE: (803) 525-7100
FAX: (803) 525-7181

THOMAS C. TAYLOR
CHAIRMAN

ELIZABETH P. GRACE
VICE-CHAIRMAN

COUNCIL MEMBERS

CHARLES R. (BOB) ATKINSON
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LEONARD M. TENNAN

SUZANNE M. RAINEY
CLERK TO COUNCIL

MICHAEL G. BRYANT
COUNTY ADMINISTRATOR

DEPUTY ADMINISTRATORS

MORRIS C. CAMPBELL
THOMAS A. HENDRICKSON, CPA
RANDOLPH L. WOOD, JR.

LAUSON F. HOWELL
COUNTY ATTORNEY

May 5, 1995

U.S. Department of Energy
Office of Environmental Management (EM-37)
Attention: Mr. Charles Head
1009 Independence Avenue, SW
Washington, DC 20585-0001

RE: Draft Environmental Impact Statement on Proposed Nuclear Weapons Non-Proliferation Policy Concerning Foreign Research Reactors Spent Nuclear Fuel

Dear Mr. Head:

I am writing to you as the Chairman of the Beaufort County Council. Our County Council represents the 87,000 citizens of Beaufort County which is located in the lower southeastern quadrant of South Carolina, near Savannah and within 150 miles of the Savannah River Site. Over 20,000 of our citizens in Beaufort County receive their drinking water from the Savannah River. I am writing you to express our Council's serious concern about the Department of Energy's consideration of further expansion of the current program of storage of spent nuclear fuel rods at the Savannah River Site. As I understand it, the Environmental Impact Statement on the proposed Nuclear Weapons Non-Proliferation Policy estimates that further storage of foreign spent nuclear rods may be forthcoming. While we certainly appreciate the overall intent of this policy, that being to stop the spread of nuclear weapons grade material, we have serious concerns on behalf of the citizens of Beaufort County about further storage of spent nuclear fuel rods at the Savannah River Site. 63-1

On behalf of our citizens, we strongly request the Department of Energy's efforts be directed toward cultivating and procuring other sites away from South Carolina for the disposal and/or storage of foreign spent nuclear fuel rods. South Carolina has provided its fair share of storage for nuclear waste in the 63-2

RESPONSE TO COMMENT
COMMENTOR NO. 63: THOMAS C. TAYLOR, CHAIRMAN, COUNTY COUNCIL OF BEAUFORT COUNTY

Response to Comment No. 63-1

The commentor's opposition to the acceptance and management of foreign research reactor spent nuclear fuel in South Carolina is noted. The EIS has analyzed the environmental impacts that could result from management of foreign research reactor spent nuclear fuel at the Savannah River Site in Section 4.2.4. The analysis indicates that the risk to the health and safety of the public within 50 miles from the Savannah River Site would be low.

Response to Comment No. 63-2

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory.

COMMENTOR NO. 63: THOMAS C. TAYLOR, CHAIRMAN, COUNTY COUNCIL OF BEAUFORT COUNTY (CONT'D.)

COUNTY COUNCIL OF BEAUFORT COUNTY

U.S. Department of Energy
May 5, 1995
Page 2

United States. We urge you to now look elsewhere for the protection of future generations of our citizens in this State.

63-2 (Cont'd.)

Cordially

Thomas C. Taylor
Chairman

TCT:smr

cc: Beaufort County Council
Legislative Delegation
County Administrator

RESPONSE TO COMMENT
COMMENTOR NO. 63: THOMAS C. TAYLOR, CHAIRMAN, COUNTY COUNCIL OF BEAUFORT COUNTY (CONT'D.)

COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ

Mr. Charles R. Head
Office of Spent Fuel Management
U.S. D.O.E.
1000 Independence Ave. SW
Washington, DC 20585-0001

May 25, 1995
(Page 1 of 6)

From:
George Delacrus
Bay Point Municipal Advisory Council
3569 Sharon Court
Bay Point CA 94565
(510)458-3373

Dear Mr. Head:

Please accept the following comments on the Draft Environmental Impact Statement, and the Port Selection Process for the Handling of Spent Nuclear Fuels at Concord Naval Weapons Station, California.

Certain criteria for port selection is used by the D.O.E. I will attempt to categorise each item with the representative criteria.

CONTAINER EXPERIENCE

Only moderate experience with containers is documented at CNWS. The facts represent that CNWS, not having the proper containerization equipment, couldn't have the experience necessary for this highly critical commodity. 72-1

PORTS MUST PROVIDE SAFE PASSAGE FROM THE OCEAN

CNWS is situated on a very narrow estuarine body of water. Navigation is difficult and the threat of collision is always present. Funding cuts have reduced the Coast Guard Radar Facility at Treasure Island, further adding to the possibility of ship collision. Passage from the Pacific Ocean would take the ships in question, past numerous petro chemical plants, which could well add to the hazard these ships face. In addition, although SNF casks are tested for resistance to fire, the fairly short term testing the D.O.E. has used does not replicate the usual ship fire, which is of long term duration. 72-2 72-3

APPROPRIATE FACILITIES

The proposed activity at CNWS does involve construction of new port facilities and a change to existing facilities, in contravention to D.O.E.'s port selection criteria. This community believes that the closure of Port Chicago Highway to Bay Point, the closure of Waterfront Road to Martinez and the proposed construction of new port facilities were orchestrated with this D.O.E. proposal in mind, not to speed up CNWS's ordinary munitions handling, although this would be a corollary benefit. D.O.E. must follow it's own criteria for port selection. 72-4

RESPONSE TO COMMENT
COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ

Response to Comment No. 72-1

While Concord NWS's experience with containers may not equal some of the ports that deal with a high volume of container traffic, a majority of the containers that Concord NWS handles contain hazardous materials. DOE considers that Concord NWS's extensive experience dealing with hazardous materials easily balances any concern there might be in regard to their lesser experience with handling containers. In regard to container handling equipment, the existing facilities are adequate. In the longer term Concord NWS is scheduled to add container cranes by 1999. Appendix D, Section D.2.1.6 of the EIS provides further details of the container handling.

Response to Comment No. 72-2

The passage from San Francisco Bay to Concord meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2). Favorable transit from open ocean is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations such as port population, population along the route to the management site, port experience with handling containers, and port facilities have also been considered in making the final selection of ports of entry. Appendix D, Section D.1.9 of the EIS presents details of the port selection process.

Response to Comment No. 72-3

The transportation casks that would be used for the foreign research reactor spent nuclear fuel are certified if their design meets certain tests, including a fire test, and if the individual casks pass periodic inspections (Section 2.6.2 of the EIS). These certification standards were developed for use of the transportation casks on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. The duration of a ship fire is directly related to the amount of combustibles carried on board. The number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicate that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures.

In respect to the impact a ship fire might have on a spent nuclear fuel transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship fire's intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the

COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ (CONT'D.)

Charles R. Head
PAGE 2 OF 6

GOOD ACCESS TO TRUCK AND RAIL TRANSPORT

Although reasonable access is available to rail and truck transport, the containers would have to move through heavily populated areas. 72-5

Oakland was eliminated as a site for this offloading. Containers going east or south would have gone through Oakland, San Jose, other heavily populated areas in the San Joaquin Valley, and the remaining areas of California as well as the eastern and southern parts of the nation. East, they would go through Bay Point, the Northern Counties of California, and the States of Nevada, Oregon, and Idaho.

HUMAN POPULATION IS LOW

Oakland was eliminated because of the high population density; yet, Concord and Bay Point are only some 15 miles from Oakland and are in the center of a population of approximately 6,000,000 people, the same as Oakland. If, as a hypothetical doomsday scenario, someone were to hijack an ISO container loaded with an SNF cask, he would only have to move a short way, with little chance of being noticed, (as there are many ISO containers in the area). He could pump ammonium nitrate and fuel oil into the container, and detonate it; thus, causing many deaths from radiation poisoning, in addition to untold suffering from future cancers. This is not too far fetched a scenario, considering what happened in Oklahoma. As a point in fact, it is well known that intermodal drivers are the lowest paid and have the most poorly maintained equipment. Most should not be allowed to haul these containers due to lack of training and skill. 72-6 72-7 72-8

In addition to the above referenced-criteria, I include the following comments:

Contra Costa County, California, has the highest inventory of toxic materials in the State and the 2nd highest in the Country; thus, adding more danger to an already dangerous situation. 72-9

Concord Naval Weapons Station has failed to participate fully in our Community Warning System. This lack of respect for the surrounding communities shows just how little it really cares. If there was an accident involving SNF, how would the warning get out? CNWS's share of the Community Warning System is $54,000.00. It paid only $8,000--far short of what is needed to insure adequate warning of a catastrophic event. The secrecy surrounding CNWS creates a problem should there be a catastrophic event. We would always wonder if warning would be given in time for our citizens to remove themselves from the vicinity. In the event of such a catastrophe, even with timely warning, the problems of rapid evacuation would be almost insurmountable. 72-10

RESPONSE TO COMMENT
COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ (CONT'D.)

extreme temperatures needed to damage the transportation cask. For these reasons, it would be almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of research reactor spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).

The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt research reactor nuclear fuel. Appendix D, Sections D.5.3 and D.5.4 of the EIS present a detailed discussion of accident probabilities and radioactive material source terms and the results of the analyses, respectively.

In conclusion, although long duration ship fires are possible, and have occurred, they are uncommon events. Analyses in the EIS indicate that even in the event of a severe ship fire involving a transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5 of the EIS).

Response to Comment No. 72-4

DOE understands that the expansion of capabilities at Concord NWS will continue as scheduled regardless of the outcome of the proposed policy on foreign research reactor spent nuclear fuel. Likewise, the closures of Port Chicago Highway and Waterfront Road were independent of the proposed policy. Selection of Concord NWS as one of the ports that might receive foreign research reactor spent nuclear fuel, if the proposed policy is adopted, would be based on the selection criteria set out in Appendix D, Section D.1.9 of the EIS.

Response to Comment No. 72-5

The human populations along the highway and rail routes from Concord NWS to each of the five DOE management sites are listed in Table E-4 in Appendix E of the EIS. The incident-free and accident risks are also tabulated in Appendix E, and are shown to be low.

Response to Comment No. 72-6

Concord NWS was one of ten ports that was indicated to be acceptable to receive the foreign research reactor spent nuclear fuel, if accepted into the United States. Population of the port and surrounding areas is one of the considerations of the port selection criteria, and one of the reasons the port of Oakland was not included in the final list of ports. Section 3151 of Public Law 103-160 (the National Defense Authorization Act for the

COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ (CONT'D.)

Charles R. Head
page 3 of 6

I must take exception to the routes taken by these Spent Nuclear Fuel containers. These routes do not take into consideration accident rate, transit time, population density, or activities in the area. 72-11

The routes these containers must follow would be as follows: Port Chicago Highway near Clyde California, to Highway 4, then east or west. If these containers go west, they would go through what is known as Franklin Canyon to reach Highway 80. This area is well known as a very dangerous stretch of Highway, being at least partly responsible for many deaths and injuries each year. If they go west to Highway 680 and then north, they would have to cross the Benicia Bridge. This bridge has some of the most roller coaster approaches I have ever seen, and I must state that I have 40 years of experience driving 18 wheelers. The winds on the Benicia Bridge have been known to upset even the most solidly built trucks.

If they leave via Waterfront Road, They would have to navigate a Road which is under water when the tide is high. They would then have to go over one of the most dangerous on-ramps I have ever seen, to reach the Benicia Bridge. This route would also take the trucks or rail car's through petro chemical plants--one of which had a very serious fire 2 1/2 years ago, causing the release of large amounts of sulfuric acid (SO2). 72-12

If they are instructed to use Port Chicago Highway in the community of Bay Point, to Highway 4, these containers would then pass dangerously close to homes in the Bay Point community--in some cases within 30 feet. They would then proceed south on Willow Pass Road to Bailey Road taking them onto Highway 4 south. They would then enter the San Joaquin Valley and go either north to Nevada and Idaho, south to the Los Angeles area or to the east. In all of the above-referenced cases, these containers would pass through highly populated areas.

At many times of the year, fog plays an important part in the safety of our highways. This element is rather quick to develop and is not always predictable.

The issue has been raised regarding the quality of the workforce at CNWS. There have been many reports of substance abuse and it has been noted that there is no drug testing on the job at CNWS. It has been reported that employees at CNWS have been seen working under the influence of alcohol and various drugs. 72-13

There have been reports of containers punctured by fork lifts. This appears to be a very common type of "accident", and goes to the talent of the work crews which could be used to handle SNF containers. 72-14

RESPONSE TO COMMENT
COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ (CONT'D.)

Fiscal Year 1994), requires that the Secretary of Energy shall, "if economically feasible and to the maximum extent practicable, provide for the receipt of spent nuclear fuel...at a port of entry in the United States which...had the lowest human population in the area surrounding the port of entry..." Public Law 103-160 was signed on November 30, 1993, which is after completion of the scoping process for this EIS, including the scoping meeting in Oakland, California. While the National Defense Authorization Act was written specifically to regulate the receipt and management of foreign research reactor spent nuclear fuel at DOE's Savannah River Site, DOE elected to apply this criterion, among others, in identifying potential ports of entry, to the maximum extent practicable.

DOE included consideration of Section 3151 of Public Law 103-160 by including Criterion 5 in the port selection criteria for this EIS (Appendix D, Section D.1.9.5). Application of this criterion resulted in Oakland being dropped from this list of proposed ports of entry, while Concord stayed on the list.

Response to Comment No. 72-7

As discussed in Sections 2.7 and 5.4.2 of the EIS, the security measures and the transportation regulations for marine and ground transport would significantly reduce the likelihood that an unauthorized individual would have a chance of getting near the ISO container carrying the spent nuclear fuel transportation cask. In spite of these precautions, if such a doomsday scenario were to occur, the cask would be tossed around by the force of the explosion, however, it would most likely survive the explosion. In response to this and similar comments, Appendix D, Section D.5.9 of the EIS presents an evaluation of the consequences of two scenarios resulting from sabotage and terrorist attack. These scenarios were evaluated to provide guidance on the level of evacuation to be considered by the emergency response team.

Response to Comment No. 72-8

The commentor's position that most intermodal drivers are poorly paid, operate poorly maintained equipment, and are not competent to haul hazardous cargo is noted. DOE does not agree with this opinion. During the past four decades, thousands of shipments of spent nuclear fuel have been transported over truck and rail routes in the United States (Section 4.2.3 of the EIS). Only 21 incidents involving spent nuclear fuel have occurred during that period. To date, no radioactive contents have ever been released from a spent nuclear fuel transportation cask, nor has a spent nuclear fuel cask ever been punctured, even as a result of an accident.

COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ (CONT'D.)

Charles R. Head
page 4 of 6

There are reports of 1,000 lb. bombs being dropped into the waters around CNWS, and it is said that some of the munitions are unrecoverable. If they remain submerged at the piers, they would pose a substantial risk to the safety of ships calling at CNWS. — 72-14 (Cont'd.)

I believe that the port selection process is deficient. Some highly qualified ports were left off the list which could perform the work called for in the EIS--Seal Beach Naval Weapons Station and Point Mugu Naval Station, to name just two. These ports were not on the original list for consideration. Why? — 72-15

Within less than one mile of the offloading site at CNWS, is Contra Costa Water District's Mallard reservoir which provides safe drinking water for as many as 500,000 people. — 72-16

The map on page 3-27, figure 3-24, Volume 1, March 1995 of the Draft EIS, is very deceptive. It does not show the close proximity to a large population of Contra Costa County residents. It does not show the prevailing winds in this area which would, in the normal course blow directly over Bay Point, Pittsburg, Antioch, Brentwood, Oakley and the rest of East Contra Costa County. In the event of a release of radioactivity, the life and well being of everyone in the these communities would be jeopardized — 72-17

Figures 3-23 and 3-26 are incorrect and show some lack of care in the preparation of this document. These tables consider surrounding counties only when Contra Costa is the county which would bear the brunt of any accidental release of radiation from SNF. — 72-18

Having lived in this area all of my life, I must take exception to the calling of Suisun Bay, San Suison Bay. It appears your cartographers are documenting the area from afar, and don't care about the historic significance of our area. — 72-19

What percentage of SNF casks are of the 125-ton variety? These, of course, would demand special handling. The exhibits shown at the Concord Centre Public meeting showed standard 20 and 40 foot ISO containers. The public needs to know which are going to be the predominant type. — 72-20

What will the D.O.E. do to indemnify residents for the drop in property values which will surely follow the bringing of SNF into the Concord Naval Weapons Station. Under California Realty Law, home sellers are required to notify potential buyers of any hazards incumbent upon their property, such as electro magnetic power fields and earthquake faults. Potential radiation exposure will be included in this list. — 72-21

RESPONSE TO COMMENT
COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ (CONT'D.)

Response to Comment No. 72-9

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternative 1 or 3) there would be no storage of this material at Concord NWS, any other port, or anyplace except for DOE management sites. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems, due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible. Spent nuclear fuel from foreign research reactors is radioactive, but is not toxic, flammable, or explosive.

Response to Comment No. 72-10

DOE expects that agreements between Concord NWS and Contra Costa County would be followed in the unlikely event of an accident. The Station has a Disaster Preparedness Plan which includes a Mutual Aid Agreement between the Naval Weapons Station and Contra Costa County. Under the terms of the agreement each party is to immediately notify the other of any emergency which presents an imminent danger. A similar mutual aid agreement also exists between the Station and the County Fire Protection District.

Several accident scenarios including a breach of the cask and fire sufficient to oxidize the contents were analyzed during preparation of the EIS. Results of the accident analysis at the ports are given in Section 4.2.2 of the EIS with supporting detail in Appendix D, Section D.5. of the EIS. No catastrophic effects were found to result from severe accidents involving foreign research reactor spent nuclear fuel.

Response to Comment No. 72-11

The routes in Appendix E of the EIS are representative routes and the actual routes may vary, but all the routes do take into consideration accident rates, transit times, and population densities. Since the commentor did not specify what activities in the area that DOE did not consider, a more specific response cannot be provided.

Response to Comment No. 72-12

DOE has not yet selected transportation routes or transport modes for the foreign research reactor spent nuclear fuel. If the Concord NWS is selected, then DOE would choose the best route to I-680 in accordance with U.S. Department of Transportation regulations (49 CFR Part 397.101 (a)(2)). That route could use Route 4, Route 24, and/or Waterfront Road. These are the local Concord streets that the trucks would probably use. The State of California routing agency can designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103.

COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ (CONT'D.)

Charles R. Head
Page 5 of 6

The E.I.S. does not appear to address the negative economic impact that the receipt of SNF would have on the communities surrounding CNWS. The abject fear of the possible release of lethal amounts of radiation could have a depressing effect on the economic activity in the area. Developers could decide to build elsewhere; businesses could decide to close due to their proximity to CNWS! 72-22

I would like to suggest that D.O.E. adopt Management Alternative Two: A ship could be outfitted to collect SNF casks and process the product aboard ship. Then, perhaps, store the product on the South Sea Islands. 72-23

Many structures at CNWS have not been retrofitted to withstand expected earthquakes in the Richter Scale Range of 7.0 to 8.0. This by itself should eliminate CNWS from consideration as the port to receive SNF. The cost would be very prohibitive. 72-24

Under decisions to be Made Based on this EIS, Page 1-10, Sub-Section 1.4, Volume one, March 1995, CNWS would need such upgrading of existing facilities and extensive new construction to handle containers of SNF. 72-25

There are, at this time, no geologic repositories available to handle the reprocessed SNF. There would have to be extensive new Environmental Impact Statements provided for the new sites that would be needed, and immense amounts of funding would also be needed. This would come at a time when Congress is intent on balancing the budget and reducing spending. 72-26

Under Implementation Alternative 6, 2.2.2.6, Page 2-15, the high level waste is only EXPECTED to be acceptable for geologic disposal. It also appears that the technology has not been perfected to process SNF for Near Term Conventional Separation. New construction would also be necessary at Idaho National Engineering Laboratory to store these SNF's. 72-27

Mr. Head, you stated, "No SNF's would go through the Panama Canal." This would mean that all SNF's from Pacific Rim nations would pass through CNWS if it is chosen. This is, again; not acceptable to the citizens of Contra Costa County, California, due to the strong possibility of release of radioactive material into the atmosphere. 72-28

The DEIS does not show any geologic survey maps of the CNWS area. As earthquakes are so predominant in this area I believe this omission could create severe problems in the future. 72-29

I suggest that all SNF's go to the new wet storage facility at Oak Ridge National Laboratory until geologic disposal sites are ready. 72-30

RESPONSE TO COMMENT
COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ (CONT'D.)

Response to Comment No. 72-13

Concord NWS has a no-tolerance policy on alcohol and drug abuse. Individuals suspected of being under the influence of drugs or alcohol would be removed from their worksite and escorted to the on-site dispensary for a competence-for-duty examination. If found to be under the influence, they would be sent home and action initiated to rehabilitate and/or discipline the individuals, depending on specific circumstances in each case. A drug testing program for Concord NWS has been approved by the Navy and is expected to begin before the end of the calendar year 1995.

Response to Comment No. 72-14

As the result of public concern born from a September 1993 television report, the Contra Costa County Board of Supervisors initiated an investigation of the safety at Concord NWS. Their report on the subject, Safety at the Concord Naval Weapons Station dated November 2, 1993, concluded in part: "There were no incidents involving explosions or radiation exposure"; and that "Many of the reported incidents were not accidents caused by Weapons Station employees but, rather, were discoveries by employees that materials being received had been damaged during loading or transit." In some cases the shipments had not been properly blocked, braced or banded.

In fact, the safety record at Concord NWS is significantly better than that of similar activities in ports in the private sector. According to the Department of Labor statistics, for the category of marine cargo handling, the number of lost workday cases per 100 full-time workers for 1993 was 7.1 nationwide (current data not available), which is typical. The number of lost workday cases per 100 workers at Concord NWS for the first three quarters of fiscal year 1995 was 5.3, which is also typical for Concord.

Specifically addressing forklifts, forklifts would not be expected to be used to unload foreign research reactor spent nuclear fuel containers, however, if a forklift was to puncture a container with foreign research reactor spent nuclear fuel, the cask would not be damaged for two reasons. First, there is a gap between the cask and the container wall of approximately 0.5 meter (1.5 feet) and second, the rugged construction of the cask would not be damaged by a fork lift prong because the casks are designed and built to withstand being dropped one meter (40 inches) onto a 15 cm (6 inch) steel bar without damage (Appendix B, Section B.2.1.3 of the EIS).

In regard to the allegation that ordnance has been dropped into the water and not recovered, an official at Concord NWS has assured DOE that no ordnance has ever been dropped into the water. The official explained that if ordnance were to be dropped into the water, their policy is to recover it without exception. As a confirmation that no ordnance has fallen into the water and not been reported, periodic dredging of the dock area has never detected or recovered an ordnance.

COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ (CONT'D.)

Charles R. Head
Page 6 of 6

I understand the preferred alternative is to send the aluminum based SNF to Savannah River and the Triga based as well as some aluminum based SNF to INEL. This would mean 80% to Savannah River and 20% to INEL. If all Pacific Rim nation shipments go to CNWS rather than Portland or Tacoma, an inordinate number of ships would then go through San Francisco Bay and it's narrow ship channels, greatly increasing the chance of accident. 72-31

Tacoma's newly set public hearing (June 19) would only allow one day for public comment. I suggest you extend the public comment period 60 to 90 days. 72-32

"Type B" casks, although they haven't had an accidental release of radioactivity, present the greatest possibility of terrorist attack--simply due to their relatively small size and their shipment in standard I.S.O. containers. These containers could be captured rather simply and pumped full of ammonium nitrate and fuel oil for detonation. The rather large open space in the container around the cask provides room for, speculatively speaking, 5,000 to 10,000 lbs. of explosive. I don't believe the cask could withstand such an explosion. 72-33

The possibility of a release of substantial amounts of radiation from the sinking of a transport vessel in very deep water is highly likely. Extreme depths would probably rupture the cask, releasing large amounts of SNF into the water and could jeopardize the food chain of many. 72-34

From Section 4.2.3.5, Ground Transportation Mitigation Measures, it is clear Portland or Tacoma should be selected simply on the basis of their proximity to the Idaho National Engineering Laboratory. 72-35

I suggest that only developing nations be subsidized for the removal of reactor fuel. The United States of America has more than paid it's share of developing nuclear power and research for the world. 72-36

Thank you for your consideration and attention.

Sincerely,

George Delacruz

RESPONSE TO COMMENT
COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ (CONT'D.)

Response to Comment No. 72-15

The initial screening of both military and commercial ports removed those ports and bases that did not regularly handle containerized cargo from ocean-going ships in any sufficient quantity. Only 31 commercial ports and three military bases qualified, not including Seal Beach Naval Weapons Station or Point Mugu Naval Station (Appendix D, Section D.1.9.1 of the EIS).

Response to Comment No. 72-16

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 40 years of spent nuclear fuel transports within the United States, no radioactive contents have ever been released from a spent nuclear fuel transportation cask, nor has a spent nuclear fuel transportation cask ever been punctured, even as the result of an accident. Based on this experience, DOE considers that spent nuclear fuel transportation casks passing through the Concord NWS would not release their radioactive contents, and would not affect the quality of the water supply for Contra Costa Water District via Mallard Reservoir or any other path. Analysis of a severe accident involving a ship at Concord NWS (Section 4.2.2.3 of the EIS) indicates that the resultant contamination would be so small that no cleanup would be required, other than possibly in the immediate vicinity of the accident. This means that contamination of Mallard Reservoir would be minimal. To insure that this was the case, if such a severe accident were to occur, all water supplies in the area, as well as food and air, would be tested for contamination.

Response to Comment No. 72-17

The maps in Section 3.2 of the EIS are presented to provide the reader with some detail of the immediate area of the proposed site of receipt to aid in identifying the site being discussed, not to show the general area and major population centers or meteorology. If the scale were to be increased so as to show the general area, the details of the immediate area of the port or base would be lost. The text of Section 3.2 for each port does discuss the population within 10 miles, and the analysis of the impacts of accidents considers the population within 50 miles of the port (Appendix D, Section D.5 of the EIS), so the population of the general area has been considered. Likewise, the local meteorology was taken into account when the impacts of accidents were calculated (Appendix D, Section D.5.3.3 of the EIS). To present a map showing the prevailing wind might wrongly convey that only that wind was considered, when in fact that is not the case.

Section 4.2.2.3 of the EIS discusses the impacts of accidents in ports, and shows that the risks of using any of the proposed ports to receive foreign research reactor spent nuclear fuel would be low.

COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ (CONT'D.)

Response to Comment No. 72-18

In Section 3 of the EIS, Figures 3-23 and 3-26 show the number of low-income households surrounding the Military Ocean Terminal at Sunny Point, North Carolina and the Naval Weapons Station at Concord, California, respectively. The enumeration of households residing within 10 miles (16 km) of candidate ports, and within counties whose boundaries lie at least partially within a 10-mile radius centered at the port, was obtained from data published by the United States Bureau of the Census based on the 1990 Census (Appendix A of the EIS). County data shown in Section 3 and Appendix A for the Military Ocean Terminal at Sunny Point includes Brunswick and New Hanover Counties, while the corresponding data for the Naval Weapons Station at Concord includes Contra Costa and Solano counties. Additional data concerning low-income households surrounding candidate ports is given in Table A-3 of Appendix A. Figures A-11 through A-20 of Appendix A show distributions of low-income households residing near candidate ports.

Response to Comment No. 72-19

This correction has been made in Section 3.2.1.6 and Appendix D, Section D.2.1.6 of the EIS.

Response to Comment No. 72-20

As discussed in Appendix B of the EIS the potential casks identified for marine transport of foreign research reactor spent nuclear fuel weigh approximately 10 to 25 metric tons. The 125-ton variety of casks are rail transportation casks to be potentially used for spent nuclear fuel transportation between management sites. These casks are not used for marine transport. Either size of ISO container might be used, depending on availability at the time of a shipment

Response to Comment No. 72-21

There is no evidence that property values would be diminished at Concord NWS, or any other port for that matter, due to the implementation of the proposed action. Furthermore, the analysis in the EIS examined in detail potential risks related to the proposed action, and determined that they are low. Additionally, as to the concern that California realty law would eventually require home sellers to notify potential buyers of potential radiation exposure, DOE's safe management and operation of the foreign research reactor spent nuclear fuels program would minimize any potential risk.

Response to Comment No. 72-22

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports

COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ (CONT'D.)

identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, such adverse impacts have not been observed during the 30 plus years foreign research reactor fuel was accepted into the United States in the past. Under NEPA regulations, the socioeconomic effects evaluated for this EIS do not include those associated with psychological fear of receiving spent nuclear fuel at Concord NWS.

Response to Comment No. 72-23

The commentor's position on Management Alternative 2 is noted. Management Alternative 2 is discussed in Sections 2.3 and 4.4. of the EIS.

Response to Comment No. 72-24

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the transportation cask.

Response to Comment No. 72-25

DOE understands that the expansion of capabilities at Concord NWS will continue as scheduled regardless of the outcome of the proposed policy on foreign research reactor spent nuclear fuel. The principal upgrade to occur at Concord NWS is the addition of two container cranes. Although these cranes would facilitate the off-loading of the foreign research reactor spent nuclear fuel, if it were to be shipped to Concord NWS, the current container handling equipment is adequate. Therefore, no new facilities are required in order to use Concord NWS. The facility upgrade that is to occur at Concord NWS has no connection with the proposed policy to manage foreign research reactor spent nuclear fuel. The need for construction of new facilities or modification of existing facilities discussed in Section 1.4 is referring to construction or modification of DOE management sites, not ports or bases that might receive the spent nuclear fuel for transshipment to the management sites.

Response to Comment No. 72-26

The impacts of ultimate disposition of foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime,

support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS).

Response to Comment No. 72-27

Under Implementation Alternative 6, vitrified high-level waste generated after chemical separation of spent nuclear fuel is expected to be acceptable for geologic disposal. The criteria for waste acceptance in a geologic repository and the long-term performance of the repository are still under investigation, but vitrified waste is known to be very stable over long periods of time.

The technology for chemical separation of spent nuclear fuel is not under development, but rather has been used for decades and is still being used today in several nations.

If the decision is made to accept foreign research reactor spent nuclear fuel into the United States, and if DOE's decision is to store the foreign research reactor spent nuclear fuel instead of chemically separating it, then new construction for long-term storage would be necessary at any of the five management sites.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs EIS. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory.

Response to Comment No. 72-28

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Concord NWS, or to any port analyzed in the EIS, is low.

There are no regulations against sending spent nuclear fuel through the Panama Canal. Furthermore, Mr. Head does not recall stating that the Panama Canal would not be used. It is possible that, if foreign research reactor spent nuclear fuel is accepted into the United States, some of it may pass through the Panama Canal. Appendix D, Section D.5.3.1 of the EIS discusses the probability of the release of radioactive material from a spent nuclear fuel transportation cask and shows that the probability is low.

COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ (CONT'D.)

Response to Comment No. 72-29

The EIS evaluates the risk associated with marine port activities in Section 4.2.2. The port impacts were evaluated for both incident-free and accident conditions. Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident and thus effect the probability of such accidents, however, the number of earthquake-induced ship and road accidents is small compared to other causes. DOE considers that the inclusion of geologic survey maps of the Concord NWS area is not relevant to the impacts analysis presented in Section 4 of the EIS.

Response to Comment No. 72-30

The commentor's suggestion that all spent nuclear fuel go to a new wet storage facility at the Oak Ridge Reservation is noted.

Response to Comment No. 72-31

DOE did not specify a preferred alternative in the draft EIS. DOE's preferred alternative is specified in this final version of the EIS (Sections 2.9 and 4.7). However, if DOE decides to accept the maximum quantity of foreign research reactor spent nuclear fuel into the United States under the basic implementation of Management Alternative 1 (Section 2.2.1), the number of shipments expected to be received at West Coast ports would be approximately 185 over 13 years, or about one a month. Other possible amounts of foreign research reactor spent nuclear fuel that might be accepted on the West Coast under the hybrid alternative range from 185 to zero.

The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay Appendix D, Section D.1.9.2). (Appendix D, Section D.5.3.1.3 presents a discussion of the determination of the probability of ship accidents used in the EIS.

COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 72: BAY POINT MUNICIPAL ADVISORY COUNCIL MEMBER GEORGE DELACRUZ (CONT'D.)

Response to Comment No. 72-32

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 days total) to be sufficient for public comment.

Response to Comment No. 72-33

The majority of transportation casks used for transport of foreign research reactor spent nuclear fuel are smaller in size than that used for commercial power reactor spent nuclear fuel. This fact alone does not mean that it is easier to handle. As stated in the response to Comment 72-7, the likelihood that an individual could get to the ISO container and have sufficient time to accomplish the scenario that has been hypothesized by the commentor is low. Nevertheless, Appendix D, Section D.5.9 of the EIS evaluates the consequences of an enveloping sabotage scenario.

Response to Comment No. 72-34

The impacts of a foreign research reactor spent nuclear fuel transportation cask sinking in deep ocean waters was estimated in Appendix C, Section C.5 of the EIS. In that analysis it was assumed that the transportation cask seals would rupture if the cask were to sink in the deep ocean. If the cask is not recovered, the spent nuclear fuel corrodes and all of the radioactive material eventually reaches the ocean environment. However, the results of this analysis shows that both the consequences and the risk of this accident are low (Appendix C, Sections C.5.4 and C.5.5). Very little fishing or other harvesting of the deep ocean occurs due to difficulty of such an operation and to the relatively low populations of life in the deep ocean, so the food chain would be little impacted by an accident that resulted in the loss of a cask in the deep ocean.

Response to Comment No. 72-35

The distance from the port to the management site(s) is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations such as port population, route population, port experience with handling containers, and access to the ocean would have to be considered in making the final selection of ports of entry. Appendix D, Section D.1.9 of the EIS presents details of the port selection process.

Response to Comment No. 72-36

The commentor's suggestion that the U.S. only subsidize management of foreign research reactor fuel from developing countries (Section 2.2.2.3 of the EIS) is noted.

COMMENTOR NO. 78: CITY OF FEDERAL WAY

CITY OF FEDERAL WAY

33530 1ST WAY SOUTH

(206) 661-4000
FEDERAL WAY, WA 98003-6210

May 26, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
1000 Independence Avenue SW
Washington, D. C. 20585

Dear Mr. Head:

Thank you for the opportunity to comment on the Draft Environmental Impact Statement (DEIS) on the proposed Nuclear Weapons Proliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

The City of Federal Way is a municipality of 73,500 persons north of and adjacent to the City of Tacoma. Our municipal boundary is only one mile from the Port of Tacoma. Our review of the DEIS leads us to the conclusion that the review is inadequate in several respects:

1. The DEIS fails to adequately addresses security issues at the port and in transit. What measures are provided to adequately secure the spent fuels from a hostile attempt to steal or pirate the casks while in transit on ship, rail or truck? — *78-1 & 78-2*

2. The DEIS fails to adequately identify emergency response in the event of a catastrophic mishap. What agency and resources would respond? What is the plan of action? Who is responsible for training? — *78-3*

3. The DEIS fails to adequately address the socio-economic factors that would be associated with the stigma of being a port for the transport of spent nuclear fuel. What costs would there be associated with lack of future business to the Port of Tacoma and the City of Tacoma by those choosing to do business elsewhere because of this issue? — *78-4*

Without a complete and detailed analysis addressing these issues it would appear that the DEIS is inadequate. You can contact me at (206) 661-4106 if you have any questions.

Sincerely,

Gregory D. Moore

Gregory D. Moore, AICP
Director of Community Development Services

c: Federal Way City Council
United States Representative Randy Tate
United States Senator Patty Murray
United States Senator Slade Gorton
State Representative Ray Schow
State Representative Tim Hickel
State Representative Maryann Mitchell
Patrick O'Malley, President, Port of Tacoma, and Commissioners
Harold G. Moss, Mayor, City of Tacoma, and Council

RESPONSE TO COMMENT
COMMENTOR NO. 78: CITY OF FEDERAL WAY

Response to Comment No. 78-1

To better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel, Appendix H has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

Response to Comment No. 78-2

The requirements for physical protection of spent nuclear fuel shipments are specified in 10 CFR Part 73.37. The principal points are (1) cooperation with local law enforcement agencies, (2) armed escorts, and (3) communications with a communications center that is staffed 24 hours per day. (Section 5.4.2 of the EIS.)

For truck shipments in heavily populated areas, one escort vehicle containing an armed guard would lead the truck and another escort vehicle containing another armed guard would follow the truck. In less populated areas, there would be only one escort vehicle instead of two. For rail shipments, the escort would ride on the train in a location that permits observation of the shipment car while the train is in motion.

Response to Comment No. 78-3

Each port considered in the EIS has developed an Area Contingency Plan. This plan outlines response capabilities, procedures and authorities for responding to and recovering from hazardous material incidents. Additionally, DOE would provide assistance to local authorities to ensure that appropriate measures would be taken in the unlikely event of an accident. As part of this assistance, DOE's Radiological Assistance Program teams, from eight offices strategically located throughout the country, would be used to coordinate and to provide remediation assistance. This type of assistance and coordination would be specified in the Transportation Plan that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H of the EIS. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected.

Response to Comment No. 78-4

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified would not be greater than the risk associated with the handling of other hazardous

cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Under NEPA regulations, the socioeconomic effects evaluated for this EIS do not include those associated with psychological fear of receiving foreign research reactor spent nuclear fuel. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Tacoma would have no adverse economic impacts on business within the port or the surrounding communities.

COMMENTOR NO. 79:
MARTINEZ CITY COUNCIL MEMBER JULIAN FRAZER

City of Martinez
525 Henrietta Street, Martinez, CA 94553-2394 (510) 372-3505
FAX: (510) 372-0257

May 26, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue
Washington, D.C. 20585-0001

Re: Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

I appreciated the opportunity to address questions to you at the May 22 public hearing in Concord. As an elected councilperson and resident of the City of Martinez, I am concerned that the Department of Energy (DOE) has not fully considered critical health and safety issues raised by its proposal to ship foreign spent nuclear fuel through the Concord Naval Weapons Station (Concord NWS).

This letter is my individual position. The City Council will consider adopting a City position on June 5, 1995.

The City of Martinez, like Concord, has been a close neighbor to the Concord NWS for over 50 years. Martinez is a major refinery and chemical production center, and together with Richmond and Benicia, forms part of one of the largest refinery areas in the United States. Millions of tons of petroleum and chemicals pass through these ports every year. The proposed federal action will move spent nuclear fuel directly through the heart of this busy area. We note that the draft environmental impact statement (Draft EIS) does not appear to take the proximity to refineries or refinery ship traffic into consideration in its calculations of risk of accident from the project. The ships bearing spent nuclear fuel will pass under at least six bridges (including the Golden Gate) before reaching Concord NWS. Moreover, the Draft EIS does not appear to acknowledge the close proximity of the Concord Fault to the Concord NWS, or consider the risk of seismic disturbances in the immediate vicinity of shipping activities. 79-1 79-2

The Draft EIS considers the hazards of an accident to be so minimal as to be comparable to routine human activities, as shown in Table 4-60. This assertion appears inconsistent with DOE's explanation for moving the proposed entry port from Oakland to Concord NWS, namely that the area around Concord NWS has a lower population than that surrounding Oakland. In addition, the stated preference for military ports also suggests a higher level of risk than acknowledged in the Draft EIS. 79-3 79-4

CITY COUNCIL [illegible] CITY MANAGER [illegible]

[illegible]

RESPONSE TO COMMENT
COMMENTOR NO. 79:
MARTINEZ CITY COUNCIL MEMBER JULIAN FRAZER

Response to Comment No. 79-1

The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (port selection Criterion 2; Appendix D, Section D.1.9.2 of the EIS). Appendix D, Section D.5.3.1.3 of the EIS presents a discussion of the determination of the probability of ship accidents used in the EIS. The addition of some mishap at a land-based facility would not add to the severity of this accident, and so was not considered. Section 4.2.2.3 discusses the assumptions that went into the port accident analysis and the results of those analyses.

Response to Comment No. 79-2

Appendix D, Section D.2.1.6 of the EIS discusses the seismic activity at Concord NWS. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the transportation cask. Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident and thus effect the probability of such accidents, however, the number of earthquake-induced ship and road accidents is small compared to other causes.

Response to Comment No. 79-3

Concord NWS was one of ten ports that was indicated to be acceptable to receive the foreign research reactor spent nuclear fuel, if accepted into the United States. Population of the port and surrounding areas is one of the considerations of the port selection criteria, and one of the reasons the port of Oakland was not included in the final list of ports. Section 3151 of Public Law 103-160 (the National Defense Authorization Act for the Fiscal Year 1994), requires that the Secretary of Energy shall, "if economically feasible and to the maximum extent practicable, provide for the receipt of spent nuclear fuel...at a port of entry in the United States which...had the lowest human population in the area surrounding the port of entry..." Public Law 103-160 was signed on November 30, 1993, which is after completion of the scoping process for this EIS, including the scoping meeting in Oakland, California. While the National Defense Authorization Act was written

COMMENTOR NO. 79:
MARTINEZ CITY COUNCIL MEMBER JULIAN FRAZER (CONT'D.)

Charles Head
May 26, 1995
Page 2

The Draft EIS does not appear to explain the social or economic impact of a catastrophic accident. I am further concerned that the Draft EIS does not address the hazard to human health that might result from an intentional breach of a radioactive cask. One of the principal reasons given by DOE for return of the spent fuel is to avoid such potential activities (i.e., terrorism) in foreign countries, but recent events show that our country is not exempt from these activities. 79-5 79-6

I have many questions concerning the impacts and costs imposed by the proposed project upon already strained local services that would be required in the event of an accident. In your presentation on May 22, you stated that local agencies would be responsible for responding to an accident once the material leaves Concord NWS. However, we do not know what assistance Concord NWS or DOE would request in the event of a ship-board fire or accident at Concord NWS? What particular police, fire, and emergency services would be required in the event of an accident? What is the fiscal cost to local communities imposed by the project? What additional social services will be required by Concord NWS in order to carry out the proposed activity? Will DOE provide financial and other assistance to the county, Martinez, Concord, and other communities along transportation routes? 79-7

The Draft EIS does not identify the streets and roads in the immediate vicinity of Concord NWS that would be connect with interstate highways. The lack of such information inhibits the ability of local providers of emergency services to plan for potential responses in the event of an accident. I must point out that the most direct route to I-680 is Waterfront Road, which passes through the City limits of Martinez. 79-8

The present deadline for responses to the Draft EIS (June 20) provides insufficient time for local agencies and members of the public to respond to a federal proposal of such local significance. Normally, project proposals that are presented to our City require months of consideration and discussion before a decision is made. I request that DOE extend the comment period for at least 60 additional days (until August 20, 1995), and respond to these concerns in writing at your earliest opportunity. 79-9

Thank you for affording me the opportunity to present these matters to you.

Sincerely,

Julian Frazer
Councilmember

cc: Mayor and City Council, Martinez
Community Development Department, Martinez
Association of Bay Area Governments (ABAG)
Contra Costa County Board Supervisors
Senator Barbara Boxer
Senator Dianne Feinstein
Congressman Bill Baker
Congressman George Miller

RESPONSE TO COMMENT
COMMENTOR NO. 79: MARTINEZ CITY COUNCIL MEMBER JULIAN FRAZER (CONT'D.)

specifically to regulate the receipt and storage of foreign research reactor spent nuclear fuel at DOE's Savannah River Site, DOE elected to apply this criterion, among others, in identifying potential ports of entry, to the maximum extent practicable.

DOE included consideration of Section 3151 of Public Law 103-160 by including Criterion 5 in the port selection criteria for this EIS (Appendix D, Section D.1.9.5). Application of this criterion resulted in Oakland being dropped from the list of proposed ports of entry, while Concord NWS stayed on the list.

Response to Comment No. 79-4

Ten ports that are considered to be able to safely receive foreign research reactor spent nuclear fuel were selected using the port selection criteria discussed in Appendix D, Section D.1.9. of the EIS. Examination of the port selection criteria will show that there is no stated preference for military ports, contrary to the comment. Either military or commercial ports, if they meet the selection criteria, are equally acceptable. Risks associated with accidents in both military and commercial ports are discussed in Appendix D, Section D.5.5.

Response to Comment No. 79-5

Appendix D, Section D.5.3.1 of the EIS describes several accident scenarios, including catastrophic accidents. The results of the analysis of these accidents can be found in Appendix D, Section D.5.4.

Response to Comment No. 79-6

An analysis of an enveloping sabotage scenario, cask explosion, is evaluated in Appendix D, Section D.5.9, of the EIS. The consequences of such scenario indicate that the general property destruction and numerous fatalities and injuries that could result from the explosion would result in far greater harm to the general health of the public in the immediate vicinity of such explosion than caused by the release of radioactive material from the spent nuclear fuel inside the transportation cask.

Response to Comment No. 79-7

DOE considers that there is adequate regulatory and emergency preparedness infrastructure to ensure the safe acceptance and transportation to the designated management site if foreign research reactor spent nuclear fuel is managed in the United States. As discussed in Section 2.7.1 of the EIS, Federal funding to State, Tribal, and local governments is being provided for maintaining emergency response programs. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advice and assistance

COMMENTOR NO. 79: MARTINEZ CITY COUNCIL MEMBER JULIAN FRAZER (CONT'D.)

RESPONSE TO COMMENT COMMENTOR NO. 79: MARTINEZ CITY COUNCIL MEMBER JULIAN FRAZER (CONT'D.)

to the State, Tribal and local agencies involved with a radiological incident. Emergency preparedness, security, and coordination of DOE with local emergency response authorities, and security are discussed in general in Sections 2.7 and 2.8 of the EIS. Details would be contained in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

Response to Comment No. 79-8

DOE has not yet selected ports, routes, or transport modes for the foreign research reactor spent nuclear fuel. If Concord NWS is selected, then DOE would choose the best route to I-680 in accordance with U.S. Department of Transportation regulations (49 CFR Part 397.101 (a)(2)). That route could use Route 4, Route 24, and/or Waterfront Road. The State of California routing agency can designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103.

Response to Comment No. 79-9

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers that the comment period (90 days total) to be sufficient for public comment.

COMMENTOR NO. 91: CITY OF BERKELEY

City of Berkeley

City Clerk Department
Martin Luther King, Jr. Civic Center Building
2180 Milvia Street
Berkeley, California 94704

TEL: (510) 644-6480 FAX: (510) 644-8801

May 30, 1995

Public Comments on the Draft FRR SNF EIS
Attn.: Charles R. Head
Office of Spent Fuel Management (EM-37)
United States Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585-0001

Subject: Proposed Policy of Transporting Spent Fuel Rods of Nuclear Waste from Foreign Research Reactors back to the United States for Permanent Storage

On May 23, 1995, the Berkeley City Council unanimously expressed its opposition to the proposed policy which would permit the return of spent HEU (highly enriched uranium) wastes to various ports in the United States including the Concord Naval Weapons Center via San Francisco Bay.

It is understood that the intent of this policy is to reduce the risk of plutonium contained in these wastes being used to produce nuclear weapons in other countries and that this policy is to serve as an incentive for the substitution of low level uranium by foreign research reactors. Balanced against these considerations, however, should be the concern that the environmental and public health impacts from even brief exposures to the radioactivity in these spent fuel rods are extremely dangerous. The dispersal of even a small quantity of this material into the environment by fire and explosion (as happened at Chernobyl on a massive scale) can have dire economic and health consequences which could last for decades or even centuries. The potential for accident during shipment by sea is serious, and the potential risk, particularly airborne, in case of fire, in transportation of these materials through the San Francisco Bay and the estuary to Concord for even temporary storage is enormous given the population density in the Bay Area. 91-1 91-2 91-3 91-4

These comments are submitted to you for inclusion among the formal comments for the public hearings on this issue.

Sincerely,

Sherry M. Kelly

Sherry M. Kelly
City Clerk

Telecommunication Device for the Deaf (510) 644-6915

RESPONSE TO COMMENT
COMMENTOR NO. 91: CITY OF BERKELEY

Response to Comment No. 91-1

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). The proposed action encourages the continued use of, or conversion to, LEU fuels in foreign research reactors. Plutonium is present in such minute quantities in spent nuclear fuel from research reactors that it is not considered a proliferation threat. The uranium-235 content of HEU spent nuclear fuel is a significant proliferation concern.

Response to Comment No. 91-2

The risks of adverse environmental and human health effects were evaluated and found to be low. The general radiological health effects are quantified in Section 4.1.3 and the risks associated with each alternative are presented throughout the rest of Section 4 of the EIS.

Response to Comment No. 91-3

The health risks due to accidents involving the transportation and other management of the foreign research reactor spent nuclear fuel are discussed in Sections 4.2.3 and 4.2.4 of the EIS. The results of the analyses of the credible accidents involving foreign research reactor spent nuclear fuel demonstrate that the risk associated with implementation of the proposed action is low. Due to differences in the nature of the foreign research reactor spent nuclear fuel from the situation at Chernobyl (e.g., Chernobyl involved an operating power reactor with a graphite moderated core versus the foreign research reactor spent nuclear fuel which is metallic, water moderated, shutdown and shipped dry in relatively small quantities), there are no accidents involving the foreign research reactor spent nuclear fuel that could approach the severity of the Chernobyl accident.

Response to Comment No. 91-4

The probability of an accident at sea is discussed in Appendix C, Section C.5.5 of the EIS, while the port accident probabilities are found in Appendix D, Section D.5.3.1.3. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3). With respect to accidents involving a fire as mentioned by the commentor, the EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), during which an airborne release of radioactive material results. Appendix D, Section D.5.4 of the EIS presents the results of the analysis.

COMMENTOR NO. 94: PIERCE COUNTY COUNCIL

Fax Transmittal Memo

To Charles Head
Co. US Dept of Energy
Location
Fax #
Comments thank you for your consideration.

4 pages 6/6/95
From Pierce County Council
Location 930 Tacoma Ave So #1046
Fax # TACOMA, WA 98402
Telephone # (206) 591-7777
Original Disposition: ☐ Destroy ☐ Return ☐ Call for pickup

FILE NO. 282 PROPOSAL NO. PRS-113

Sponsored by Councilmembers Karen Biskey, Wendell Brown, Ken Madsen, Jan Shabro and Sally W. Walker

Requested by Ken Madsen

RESOLUTION NO. PRS-113

A RESOLUTION OF THE PIERCE COUNTY COUNCIL EXPRESSING STRONG OPPOSITION TO THE ADOPTION OF A POLICY, BEING PROPOSED JOINTLY BY THE UNITED STATES DEPARTMENT OF ENERGY AND UNITED STATES DEPARTMENT OF STATE, TO ACCEPT AND MANAGE SPENT NUCLEAR FUEL FROM FOREIGN RESEARCH REACTORS BY SHIPMENT THROUGH THE PORT OF TACOMA, WASHINGTON.

WHEREAS, the United States Department of Energy and the United States Department of State are jointly proposing to adopt a policy to manage spent nuclear fuel from foreign research reactors; and

WHEREAS, nuclear fuel containing uranium enriched in the United States of America would be covered by this policy; and

WHEREAS, the purpose of this policy is to promote United States nuclear weapons nonproliferation policy objectives, specifically seeking to reduce highly enriched uranium from civilian commerce, and

WHEREAS, the environmental effects and policy considerations of three management alternative approaches for implementation of the proposed policy are assessed; and

WHEREAS, alternative number one would be the acceptance and management of the spent nuclear fuel by the Department of Energy in the United States; and

Page 1 of 4

RESPONSE TO COMMENT
COMMENTOR NO. 94: PIERCE COUNTY COUNCIL

COMMENTOR NO. 94: PIERCE COUNTY COUNCIL (CONT'D.)

RESOLUTION NO. R93-113 continued

WHEREAS, under alternative number one the spent nuclear fuel would be shipped by ocean-going vessels from foreign countries to the United States of America; and

WHEREAS, the Pierce County Council is the legislative body for Pierce County, Washington, and the Port of Tacoma is a part thereof, and

WHEREAS, the Port of Tacoma is considered one of ten ports through which the shipment of spent nuclear fuels would occur, and

WHEREAS, the Draft Environmental Impact Statement (DEIS) was prepared to address the Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel; and

A. the DEIS has used outdated information about the Port of Tacoma, its terminals, its operations, and the surrounding area; 94-1

B. the DEIS did not consider the deep-water depth in the Puget Sound area, which will cause substantial problems in recovery of nuclear fuel shipping containers in case of accident; 94-2

C. the DEIS fully ignored the harm which can be caused to the population and environment of the area in case of an explosion and fire aboard a vessel navigating Puget Sound; 94-3

D. the DEIS did not recognize the status of Commencement Bay as a superfund site, the stigma attached to this designation, and the expansion of this stigma by Alternative Number One; 94-4

E. the DEIS ignored the significant cleanup effort by the Port of Tacoma, the City of Tacoma, the industries in Commencement 94-5

Page 2 of 4

RESPONSE TO COMMENT
COMMENTOR NO. 94: PIERCE COUNTY COUNCIL (CONT'D.)

Response to Comment No. 94-1

Updated information on the terminals at the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS.

Response to Comment No. 94-2

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Section 4.2.1.3 of the EIS has been modified to include this assurance of recovery in coastal waters. Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters. The impacts of a foreign research reactor spent nuclear fuel transportation cask sinking in coastal and deep waters are estimated in the EIS (Appendix C, Section C.5). The results of this analysis show that both the consequences and the risk of these accidents are low (Appendix C, Sections C.5.4 and C.5.5).

Response to Comment No. 94-3

Appendix D, Section D.5.3.1 of the EIS describes several accident scenarios that involve fire during marine transport, including accidents close to land as would be the case in Puget Sound. The results of the analysis of these accidents can be found in Appendix D, Section D.5.4. The analysis shows that even in the event of a severe ship fire, neither the consequences nor risks are great (Appendix D, Section D.5.5). Although the non-radiological effects of such a catastrophic accident would obviously impact the local environment, no additional impacts are predicted due to the presence of foreign research reactor spent nuclear fuel.

Response to Comment No. 94-4

The acceptance of foreign research reactor spent nuclear fuel through the Port of Tacoma would neither affect the activities being conducted in Commencement Bay as a result of being a Superfund Site, nor would it add any additional burden to this designation. The transport of the spent nuclear fuel on the Bay would not add any hazardous material to the Bay or the environment. DOE has added a sentence to Appendix D, Section D.2.1.9 of the EIS recognizing the designation of the Commencement Bay as a Superfund Site. The notion that the spent nuclear fuel shipments, but not other more hazardous material shipments, passing through the Port of Tacoma would create a stigma is an unjustified fear. The analysis of impacts, as documented in Section 4 of the EIS, shows that there would be no significant adverse impacts on the port, people, or natural environment from

COMMENTOR NO. 94: PIERCE COUNTY COUNCIL (CONT'D.)

RESOLUTION NO. R95-113 continued

Bay, and the associated crippling business interruption issues; 94-5 (Cont'd.)

F. the DEIS stated that part of this material would be of interest to unfriendly nations and/or terrorists, and yet did not provide adequate risk and consequence information of a complete, explosive breach of the nuclear fuel by disgruntled persons or terrorists; 94-6

G. the DEIS did not consider the security aspect of these shipments through the Port of Tacoma, the City of Tacoma, Pierce County, and the State of Washington; 94-7

H. the DEIS did not adequately address the life cycle costs or benefits and risks of the proposed alternatives; 94-8

I. the DEIS fully ignored the fairness and equity issues of selecting the smaller ports in lower population areas after implying the risks were virtually inconsequential; and 94-9

WHEREAS, the record for the safe operation and handling of nuclear materials in United States Department of Energy regulated facilities is less than satisfactory, and there are facilities owned and operated by the United States Government capable of receiving and handling this nuclear material, and 94-10

WHEREAS, the United States House Budget Resolution eliminates the United States Department of Energy thereby creating funding uncertainties, and 94-11

WHEREAS, the United States Department of Energy has failed to properly answer a question in a meeting conducted by the Port of 94-12

Page 3 of 4

RESPONSE TO COMMENT
COMMENTOR NO. 94: PIERCE COUNTY COUNCIL (CONT'D.)

shipments of foreign research reactor spent nuclear fuel through any of the ports of entry. Historically, there were no adverse economic or cultural impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

Response to Comment No. 94-5

Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma as noted by the commentor. The analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2 of the EIS). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Based on over 30 years experience shipping spent nuclear fuel, DOE considers that transportation casks passing through the Port of Tacoma, Commencement Bay, or any other port or waterway analyzed in the EIS would not affect air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality. Similarly, DOE considers that based on the experience of ports that have received spent nuclear fuel in the past, there would be no adverse impacts to any businesses or industry in the Commencement Bay/Port of Tacoma area from shipments of foreign research reactor spent nuclear fuel.

Response to Comment No. 94-6

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk. Section D.5.9 has been added to Appendix D of the EIS to address terrorism and sabotage. All shipments of foreign research reactor spent nuclear fuel would be conducted meeting or exceeding all the security requirements in the Code of Federal Regulations (10 CFR Part 73). Appendix H has been added to the final EIS in response to public comments to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

Response to Comment No. 94-7

The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

See also the 1st Paragraph of the response to Comment 94-6, above.

RESOLUTION NO. R95-113 continued

Tacoma, in Tacoma on the 22nd day of May, 1995, pertaining to the effect of radiation in the environment should a shipping cask be damaged during the handling process in the Port, or to respond in writing to that question as promised and; NOW, THEREFORE, 94-12 (Cont'd.)

BE IT RESOLVED by the Council of Pierce County:

Section 1. The Pierce County Council strongly opposes adoption of a policy, being proposed jointly by the United States Department of Energy and United States Department of State, to accept and manage spent nuclear fuel from foreign research reactors by shipment through the Port of Tacoma, Washington. 94-13

Section 2. Copies of this Resolution shall be transmitted to President Clinton, Vice President Gore, the United States Department of Energy, the United States Department of State, the Washington State Congressional delegation, the Washington State Legislature, the Office of the Governor, the Pierce County Executive, the King County Council and Executive, and all Cities and Towns in Pierce County.

PASSED this 6th day of June, 1995.

ATTEST:

Clerk of the Council

PIERCE COUNTY COUNCIL
Pierce County, Washington

Council Chair

Approved As To Form Only:

Deputy Prosecuting Attorney

Page 4 of 4

Response to Comment No. 94-8

Section 4.9 and Appendix F, Section F.7 of the EIS fully address the life cycle costs, risks, and benefits of the proposed action. The use of a net present value approach reflects the life cycle costs. Benefits would be primarily in the form of reduced risks of the proliferation of nuclear weapons to countries who might use them on us or our allies, as well as, income and employment to the management sites and regions conducting the programs and to the nation from reducing the commerce in certain types of nuclear materials. Health and safety risks would be low, as discussed fully Section 4 of the EIS and Appendices C, D, E, and F. Economic risks are described in detail in Appendix F, Section F.7. Particular attention is paid to major cost uncertainties (e.g., waste acceptance criteria, geologic disposal). Economic impacts relating to ports are minor in all respects.

Response to Comment No. 94-9

As demonstrated by the analyses in the EIS, the risk associated with accepting spent nuclear fuel from foreign research reactors through any of the ports analyzed would be low. This result is borne out by the experience gained in over 30 years of shipments of foreign research reactor spent nuclear fuel to the United States. Accordingly, DOE considers that there is no fairness or equity issue to be resolved.

Response to Comment No. 94-10

DOE has safely received and handled foreign research reactor spent nuclear fuel for over 30 years, most of it through commercial ports.

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted. Sections 4.2.2.2 and 4.2.2.3 of the EIS provide the analysis on impacts of incident-free operation and consequences of port accidents, respectively.

Response to Comment No. 94-11

If DOE were abolished in response to action by Congress, the current DOE programs for management of spent nuclear fuel would have to be transferred to some other Federal government agency to protect the health and safety of the public. Since the spent nuclear fuel will not simply go away, these programs cannot simply be abolished.

COMMENTOR NO. 94: PIERCE COUNTY COUNCIL (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 94: PIERCE COUNTY COUNCIL (CONT'D.)

Response to Comment No. 94-12

DOE responded to this question by letter and fax on June 16, 1995. The response gave the estimated radiation dose rate near the spent nuclear fuel under the assumption that there was no transportation cask to provide shielding, as requested by the Port of Tacoma.

CEQ regulations and guidance do not require a worst cause analysis in an EIS. For the purpose of analysis in the EIS, there is no such thing as a worst case scenario, because for any worst case that is postulated, a still more severe accident can be postulated by adding one more drum of gasoline, one more wrecked rail car, one more terrorist, etc. In addition, for each assumption that is made to make a postulated accident more severe, the probability of the accident becomes smaller. The EIS does not contain a worst case scenario, but a broad range of port accident scenarios, including severe accidents, is discussed in Section 4.2.2.3 of the EIS. Appendix D, Section D.5.4.3.2 of the EIS presents the risks of a very high temperature fire that engulfs a cask, which was part of a sensitivity study on release fractions. In addition, Section D.5.9 has been added to Appendix D of the EIS to address the issue of attack by disgruntled persons or terrorists.

Response to Comment No. 94-13

The commentor's opposition to bringing the foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, Section 4.4.2 and 4.5 demonstrate that the risks associated with bringing the spent nuclear fuel through the Port of Tacoma, or any port analyzed in the EIS, is low.

COMMENTOR NO. 113: CITY OF CONCORD

AGENDA ITEM NO. 4.

Concord REPORT TO MAYOR AND COUNCIL

TO THE HONORABLE MAYOR AND COUNCIL:

DATE: June 6, 1995

SUBJECT: **CONSIDERATION OF A RESPONSE TO THE U. S. DEPARTMENT OF ENERGY'S DRAFT ENVIRONMENTAL IMPACT STATEMENT ON A PROPOSED NUCLEAR NONPROLIFERATION POLICY CONCERNING FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL**

Report in Brief

The U. S. Department of Energy has had a Draft Environmental Impact Statement prepared on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. The Port of Concord at the Naval Weapons Station could be used by ships bringing spent fuel rods into the United States. Spent fuel rods would be loaded on trucks and trains and transported to designated temporary storage sites. There are numerous public safety and public welfare issues associated with this project. The City of Concord has until June 20, 1995 to respond to the Department of Energy regarding the adequacy of the EIR and the proposed project.

Background

For a number of years the federal government has provided foreign countries with nuclear fuel for research purposes. After the fuel is used, or spent, it cannot be used for nuclear research activities. However, this spent fuel could be used by foreign countries or terrorist organizations to manufacture nuclear bombs.

The federal government is considering the adoption of a policy which would allow foreign countries to have their spent nuclear fuel shipped to and stored in this country. Storage in this country, according to the Department of Energy, would lessen the possibility of spent nuclear fuel rods falling into the hands of terrorists or irresponsible governments. The Port of Concord at the Concord Naval Weapons Station is one of the port facilities being considered by the Department of Energy as an entry point for fuel rods into the United States.

The Department of Energy has had a draft environmental impact statement (DEIS) prepared on the proposed policy to ship and store spent nuclear fuel rods in the U. S. The Department of Energy conducted a public informational hearing on this proposal at Centre Concord on May 22. About 235 people were in attendance. Mayor Allen and Councilmember McManigal were at the meeting. The Mayor read the attached letter into the record. The letter outlines the City's concerns and raises questions; it does not take a position on the issue.

113-1

RESPONSE TO COMMENT
COMMENTOR NO. 113: CITY OF CONCORD

Response to Comment No. 113-1

The letter referenced in and attached to the Concord City Council Agenda Item No. 4 summary has been received by DOE and is identified as document 22. Responses have been provided to each comment stated in document 22, which is located in the portion of this volume designated for comments received from local governments.

COMMENTOR NO. 113: CITY OF CONCORD (CONT'D.)

Discussion

The City Council has the option whether or not to respond to the EIS. If the Council does decide to respond, staff recommends that comments be limited to potential impacts to life and property in Concord. Staff further recommends that the City Council not take a position on the merits of the federal government's proposed policy to ship fuel rods from foreign countries to the U. S. International foreign policy issues are not matters normally addressed by local governments.

Staff also recommends that the City's response separate the role of the Weapons Station from the Department of Energy proposal. This issue is discussed in the second paragraph of the attached letter from the Mayor to the Department of Energy.

If the Council does decide to respond to the EIS, the Council could express concerns similar to those addressed in the letter from the Mayor to the Department of Energy. Alternatively, the Council could take a position either in support or in opposition to the Department of Energy proposal.

A staff member from the Department of Energy will be present at the June 6 City Council meeting to address relevant issues.

Fiscal Impact

There are no known direct and significant fiscal impacts to the federal proposal.

Public Contact

This item was announced to the public at the Department of Energy public information meeting of May 22. Posting of the Council agenda.

Alternative Courses of Action

1. Submit a letter to the Department of Energy in opposition to the proposed policy due to the concerns mentioned in the attached letter. Stress the inadequacy of the EIS and potential impacts to the community.

2. Take no position but submit a letter to the Department of Energy addressing the City's concerns about the proposed policy.

3. Submit a letter to the Department of Energy supporting the proposed policy.

4. Take no position.

RESPONSE TO COMMENT
COMMENTOR NO. 113: CITY OF CONCORD (CONT'D.)

Recommendation for Action

1. Alternative #1 or #2 above.

Prepared by David Golick
Chief of Planning

Bill Reeds
Director of Community Development

Edward R. James
City Manager

Enclosure: Letter to U. S. Department of Energy from Mayor Helen Allen dated May 22, 1995.

m:\cc\ascrpt.606

COMMENTOR NO. 158:
WILLIAM D. LANDIS, MAYOR, CITY OF PLEASANT HILL

recycled paper

City of Pleasant Hill

June 8, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
United States Department of Energy
1000 Independence Avenue
Washington, D.C. 20585-0001

Re: Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

The City Council of the City of Pleasant Hill strongly opposes the "preferred alternative" in the Environmental Impact Statement (EIS) that proposes the transport of spent nuclear fuel through the Concord Naval Weapons Station. Pleasant Hill is located immediately adjacent to the City of Concord, and any potential adverse impacts of this proposal would affect our City, as well as other surrounding communities. *158-1*

We understand that the proposal identifies Concord as a site for accepting spent nuclear fuel from reactors around the world, and then shipping the hazardous material out by truck or rail to processing sites elsewhere in the country. We object because Concord is part of a densely populated area, and shipments to and from Concord would pass by several oil refineries, chemical plants and oil tankers in the area. Moreover, the area is located on an earthquake fault, which adds to the possible risks. An accident or natural disaster occurring during the transportation of the hazardous materials could be catastrophic for our community. *158-2*

We understand that the EIS does not address where the shipments will go when they leave Concord, which streets will be used, what railroads will be used, what police services might be necessary, what disaster preparedness and emergency response training would be necessary, or other ways that local jurisdictions would be affected. In this regard, we join in the specific comments and concerns directed to you by the June 7, 1995 letter from the City of Martinez City Council, a copy of which is attached. *158-3*

100 Gregory Lane - Pleasant Hill - California 94523-3323 - (510) 671-5270 - FAX 256-8190

RESPONSE TO COMMENT
COMMENTOR NO. 158:
WILLIAM D. LANDIS, MAYOR, CITY OF PLEASANT HILL

Response to Comment No. 158-1

DOE did not specify a preferred alternative in the draft EIS. DOE's preferred alternative is specified in Sections 2.9 and 4.7 of the final EIS. The commentor's opposition to the use of Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 158-2

The port selection process that determined that Concord NWS was an acceptable port considered the population of the port and surrounding areas (Appendix D, Section D.1.9.5 of the EIS). Additionally, all population within a fifty mile radius of Concord NWS was considered when analyzing the potential impact of a range of hypothetical port accidents. The risks were found to be low (Appendix D, Section D.5 of the EIS).

The passage from San Francisco Bay to Concord meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). The port selection criteria do not consider the existence of land-based facilities such as refineries because the addition of some mishap at a land-based facility would not add to the severity of the worst plausible accident, which is considered to be the collision of the ship carrying the foreign research reactor spent nuclear fuel with a petroleum tanker. While local hazards, such as earthquakes, may slightly increase the probability of an accident, they would not increase the consequences of the accident, which were found to be very minor.

Response to Comment No. 158-3

The EIS actually does address all the subjects raised by the commentor. Section 2.2.1.8 discusses the shipments' destinations, Section 2.6.4 discusses truck and rail route selection, and Section 2.7. discusses police services, disaster preparedness, etc.,

In addition, to further address this issue, individual Transportation Plans would be prepared for any shipments actually scheduled for acceptance through the Concord NWS (or any other port of entry). These Transportation Plans would be prepared in consultation with appropriate State and/or local officials to ensure that details of the transportation process are understood, that the individuals or organizations who would perform all required activities are specified and that these individuals and parties know what is expected of them (Section 2.7.5 and Appendix H of the EIS).

COMMENTOR NO. 158: WILLIAM D. LANDIS, MAYOR, CITY OF PLEASANT HILL (CONT'D.)

June 8, 1995 Letter to U.S.Dept. of Energy
Page 2

We further object to the short time which has been made available for public comment. The June 20, 1995 deadline for responses should be extended to allow thorough evaluation and consideration of this proposal which has serious consequences to our community. *158-4*

Very truly yours,

William D. Landis, Mayor
City of Pleasant Hill

Enclosure: June 7, 1995 Letter from City of Martinez City Council

cc: City Council Members, Pleasant Hill
Mayor and City Council, Martinez
Contra Costa County Board of Supervisors
Senator Barbara Boxer
Senator Dianne Feinstein
Congressman Bill Baker
Congressman George Miller

[I:\legal\robbins\DOE.ltr]

RESPONSE TO COMMENT COMMENTOR NO. 158: WILLIAM D. LANDIS, MAYOR, CITY OF PLEASANT HILL (CONT'D.)

Response to Comment No. 158-4

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 days total) to be sufficient for public comment.

COMMENTOR NO. 160: CITY OF MILTON

RESOLUTION NO. 1234

A RESOLUTION OF THE MILTON CITY COUNCIL EXPRESSING STRONG OPPOSITION TO THE UNITED STATES DEPARTMENT OF ENERGY AND UNITED STATES DEPARTMENT OF STATE TO JOINTLY ADOPT A POLICY TO ACCEPT AND MANAGE SPENT NUCLEAR FUEL FROM FOREIGN RESEARCH REACTORS BY SHIPMENT THROUGH THE PORT OF TACOMA, WASHINGTON, AND TO SUPPORT THE PORT OF TACOMA IN THIER REFUSAL TO ACCEPT ANY SHIPMENTS OF SPENT NUCLEAR FUEL THROUGH ANY FACILITIES OF THE PORT OF TACOMA, WASHINGTON.

WHEREAS, the United States Department of Energy and the United State Department of State are jointly proposing to adopt a policy to manage spent nuclear fuel from foreign research reactors, and

WHEREAS, nuclear fuel containing uranium enriched in the United States of America would be covered by this policy, and

WHEREAS, the purpose of this policy is to promote US nuclear weapons nonproliferation policy objectives, specifically seeking to reduce highly enriched uranium from civilian commerce, and

WHEREAS, the environmental effects and policy considerations of three management alternative approaches for implementation of the proposed policy are assessed, and

WHEREAS, alternative number one would be the acceptance and management of the spent nuclear fuel by the Department of Energy in the United States, and

WHEREAS, under alternative number one, the spent nuclear fuel would be shopped by ocean bearing vessels from foreign countries to the United States of America, and

WHEREAS, the Port of Tacoma is considered one of ten ports through which the shipment of spent nuclear fuels would occur, and

WHEREAS, the Draft Environmental Impact Statement (DEIS) was prepared to address the Propposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, and

A. The DEIS has used outdated information about the Port of Tacoma, its terminals and its operations and the surrounding

160-1

RESPONSE TO COMMENT
COMMENTOR NO. 160: CITY OF MILTON

Response to Comment No. 160-1

Updated information on the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS.

area,

B. Did not consider the deep water depth in the Puget Sound Area, which will cause substantial problems in recovery of nuclear fuel shipping containers in case of an accident. 160-2

C. Fully ignored the harm which can be caused to the population and environment of the area in case of an explosion and fire aboard a vessel navigating Puget Sound, 160-3

D. Not recognized the status of Commencement Bay as a superfund site, the stigma attached to this designation and the expansion of this stigma by alternative number one, 160-4

E. Ignored the significant cleanup effort by the Port of Tacoma, the City of Tacoma and the industries in Commencement Bay, and the associated crippling business interruption issues, 160-5

F. States that part of this material would be of interest to unfriendly nations and/or terrorists, and yet did not provide adequate risks and consequences information of a complete, explosive breach of the nuclear fuel by disgruntled persons or terrorists, 160-6

G. Did not consider the security aspect of these shipments through the Port of Tacoma, the City of Tacoma, Pierce County and the State of Washington. 160-7

H. Did not adequately address life cycle costs, benefits and risks of the proposed alternatives. 160-8

I. Fully ignored the fairness and equity issues of selecting the smaller ports in lower population areas after implying the risks were virtually inconsequential, and 160-9

WHEREAS, the record for the safe operation and handling of nuclear materials in US Department of Energy regulated facilities is less than satisfactory, and there are facilities owned and operated by the US Government capable of receiving and handling this nuclear material, and 160-10

WHEREAS, the US House Budget Resolution eliminates the US Department of Energy thereby creating funding uncertainties, and 160-11

WHEREAS, the US Department of Energy is failing to provide adequate procedural due process in that is is not making a record of its hearings thereby foreclosing individuals abilities to challenge the adequacy of the EIS, and 160-12

Response to Comment No. 160-2

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Section 4.2.1.3 of the EIS has been modified to include this assurance of recovery in coastal waters. Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters. The impacts of a foreign research reactor spent nuclear fuel transportation cask sinking in coastal and deep waters are estimated in the EIS (Appendix C, Section C.5). The results of this analysis show that both the consequences and the risk of these accidents are low (Appendix C, Sections C.5.4 and C.5.5).

Response to Comment No. 160-3

Appendix D, Section D.5.3.1 of the EIS describes several accident scenarios that involve fire during the marine transport, including accidents close to land as would be the case in Puget Sound. The results of the analysis of these accidents can be found in Appendix D, Section D.5.4. The analysis shows that even in the event of a severe ship fire, neither the consequences nor risks are great (Appendix D, Section D.5.5). Although the non-radiological effects of such a catastrophic accident would obviously impact the local environment, no additional impacts are predicted due to the presence of foreign research reactor spent nuclear fuel.

Response to Comment No. 160-4

The acceptance of foreign research reactor spent nuclear fuel through the Port of Tacoma would neither affect the activities being conducted in Commencement Bay as a result of being a Superfund Site, nor would it add any additional burden to this designation. The transport of the spent nuclear fuel on the Bay would not add any hazardous material to the Bay or the environment. DOE has added a sentence to Appendix D, Section D.2.1.9 of the EIS recognizing the designation of the Commencement Bay as a Superfund Site. The notion that the spent nuclear fuel shipments, but not other more hazardous material shipments, passing through the Port of Tacoma would create a stigma is an unjustified fear. The analysis of impacts, as documented in Section 4 of the EIS, shows that there would be no significant adverse impacts on the port, people, or natural environment from shipments of foreign research reactor spent nuclear fuel through any of the ports of entry. Historically, there were no adverse economic or cultural impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

COMMENTOR NO. 160: CITY OF MILTON (CONT'D.)

WHEREAS, the US Department of Energy has failed to properly answer a question in a meeting conducted by the Port of Tacoma, in Tacoma on the 22nd of May, 1995 pertaining to the effect of radiation in the environment should a shipping cask be damaged during the handling process in the Port, and

160-13

WHEREAS, the US Department of Energy has not responded in writing as promised to a question relating to the effect of radiation in the environment should a shipping cask be damaged during the handling process in the Port, and

NOW, THEREFORE

The City Council of the City of Milton do resolve as follows:

Section 1. The City Council of the City of Milton, Washington supports the Port of Tacoma's refusal to accept any shipments of spent nuclear fuel through any facilities of the Port of Tacoma, Washington.

Section 2. That copies of this resolution be transmitted to the US Department of Energy, the US Department of State, the Congressional Delegation of Washington State Legislature, the Office of the Governor, Pierce County, King county and all Cities and Towns in Pierce County.

Passed at a regularly scheduled Council meeting of the City of Milton the 8th June 1995 by a vote of six for, zero against.

CITY OF MILTON

Mayor Leonard E. Sanderson

ATTEST:

Deborah M. Crosier, City Clerk-Treasurer

RESPONSE TO COMMENT
COMMENTOR NO. 160: CITY OF MILTON (CONT'D.)

Response to Comment No. 160-5

Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma as noted by the commentor. The analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2 of the EIS). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Based on over 30 years experience with shipping spent fuel, DOE considers that spent nuclear fuel transportation casks passing through the Port of Tacoma, Commencement Bay, or any other port or waterway analyzed in the EIS would not affect air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality. Similarly, DOE considers that based on the experience of ports that have received spent nuclear fuel in the past, there would be no significant adverse impacts to any businesses or industry in the Commencement Bay/Port of Tacoma area from shipments of foreign research reactor spent nuclear fuel.

Response to Comment No. 160-6

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk. Section D.5.9 has been added to Appendix D of the EIS to address terrorism and sabotage. All shipments of foreign research reactor spent nuclear fuel would be conducted meeting or exceeding all the security requirements in the Code of Federal Regulations (10 CFR Part 73). Appendix H has been added to the final EIS in response to public comments, to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

Response to Comment No. 160-7

The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

Response to Comment No. 160-8

Section 4.9 and Appendix F, Section F.7 of the EIS fully address the life cycle costs, risks, and benefits of the proposed action. The use of a net present value approach reflects the life cycle costs. Benefits would be primarily in the form of reduced risks of the proliferation of nuclear weapons to countries who might use them on us or our allies, as well as, income and employment to the management sites and regions conducting the programs and to the nation from reducing the commerce in certain types of nuclear materials. Health and safety risks would be low, as discussed fully Section 4 of the EIS and Appendices C, D, E, and F. Economic risks are described in detail in Appendix F, Section F.7. Particular attention is paid to major cost uncertainties (e.g., waste acceptance criteria, geologic disposal). Economic impacts relating to ports are minor in all respects.

Response to Comment No. 160-9

As demonstrated by the analyses in the EIS, the risk associated with accepting spent nuclear fuel from foreign research reactors through any of the ports analyzed would be low. This result is borne out by the experience gained in over 30 years of shipments of foreign research reactor spent nuclear fuel to the United States. Accordingly, DOE considers that there is no fairness or equity issue to be resolved.

Response to Comment No. 160-10

DOE has safely received and handled foreign research reactor spent nuclear fuel for over 30 years, most of it through commercial ports.

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted. Sections 4.2.2.2 and 4.2.2.3 of the EIS provide the analysis on impacts of incident-free operation and consequences of port accidents, respectively.

Response to Comment No. 160-11

If DOE were abolished in response to action by Congress, the current DOE programs for management of spent nuclear fuel would have to be transferred to some other Federal government agency to protect the health and safety of the public. Since the spent nuclear fuel will not simply go away, these programs cannot simply be abolished.

COMMENTOR NO. 160: CITY OF MILTON (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 160: CITY OF MILTON (CONT'D.)

Response to Comment No. 160-12

DOE did request that comments be submitted in writing, however, all oral comments presented at each hearing were summarized and have been addressed along with the written comments in Volume 3 of the final EIS. All comments, written and oral, are part of the public record.

Response to Comment No. 160-13

DOE responded to this question by letter and fax on June 16, 1995. The response gave the estimated radiation dose rate near the spent nuclear fuel under the assumption that there was no transportation cask to provide shielding, as requested by the Port of Tacoma.

CEQ regulations and guidance do not require a worst case analysis in an EIS. For the purpose of analysis in the EIS, there is no such thing as a worst case scenario, because for any worst case that is postulated, a still more severe accident can be postulated by adding one more drum of gasoline, one more wrecked rail car, one more terrorist, etc. In addition, for each assumption that is made to make a postulated accident more severe, the probability of the accident becomes smaller. The EIS does not contain a worst case scenario, but a broad range of port accident scenarios, including severe accidents, is discussed in Section 4.2.2.3 of the EIS. Appendix D, Section D.5.4.3.2 of the EIS presents the risks of a very high temperature fire that engulfs a cask, which was part of a sensitivity study on release fractions.

COMMENTOR NO. 195: CITY OF FEDERAL WAY

CITY OF FEDERAL WAY
33530 1ST WAY SOUTH

(206) 661-4000
FEDERAL WAY, WA 98003-6210

June 9, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
1000 Independence Avenue SW
Washington, D. C. 20585

Dear Mr. Head:

The City of Federal Way is a municipality of 73,500 persons north of and adjacent to the City of Tacoma. Our municipal boundary is only one mile from the Port of Tacoma. In a comment letter on the Draft Environmental Impact Statement (DEIS) dated May 26, 1995, I stated the growing concerns of the City of Federal Way over the proposed transportation of spent nuclear fuel through the Port of Tacoma and the inadequacy of the DEIS.

Since then, the Federal Way City Council has passed Resolution 95-205 which strongly opposes the shipment of spent nuclear materials through the Port of Tacoma. The Council also believes that the DEIS is incomplete in its findings regarding security, catastrophic mishap and economic impact on the entire area around the Port, including the City of Federal Way.

You can contact me at (206) 661-4106 if you have any questions.

Sincerely,

Greg Moore

Gregory D. Moore, AICP
Director of Community Development Services

attachment
c: United States Representative Randy Tate
United States Senator Patty Murray
United States Senator Slade Gorton
State Representative Ray Schow
State Representative Tim Hickel
State Representative Maryann Mitchell
Patrick O'Malley, President, Port of Tacoma, and Commissioners
Harold G. Moss, Mayor, City of Tacoma, and Council
Mic Dinsmore, Executive Director, Port of Seattle, and Commissioners

RESPONSE TO COMMENT
COMMENTOR NO. 195: CITY OF FEDERAL WAY

COMMENTOR NO. 195: CITY OF FEDERAL WAY (CONT'D.)

RESOLUTION NO. 95-205

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF FEDERAL WAY, WASHINGTON, OPPOSING THE SHIPMENT OF SPENT NUCLEAR MATERIALS THROUGH THE PORT OF TACOMA

WHEREAS, the Port of Tacoma is one of ten possible ports of entry listed in a Department of Energy March 1995 draft Environmental Impact Statement to receive spent nuclear fuel shipments and that such shipments would be trucked to nuclear fuel sites around the country; and

WHEREAS, the draft Environmental Impact Statement is inadequate in several respects, including that it fails to adequately address security issues at the port and in transit, it fails to adequately identify emergency response in the event of a catastrophic mishap and it fails to adequately address the socio-economic impacts associated with the stigma of being within the proximity of a port of entry of spent nuclear wastes, 195-1 195-2 195-3 195-4

WHEREAS, the City of Federal Way is a major municipality of 73,500 persons located only one mile from the Port of Tacoma; and

WHEREAS, the stigma and inherent risk of having the Port of Tacoma as a port of entry for the shipment of spent nuclear materials would throw a pall over the entire area around the port, including Federal Way; NOW, THEREFORE,

Res.# 95-205 Page# 1

RESPONSE TO COMMENT
COMMENTOR NO. 195: CITY OF FEDERAL WAY (CONT'D.)

Response to Comment No. 195-1

The security provided for the foreign research reactor spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk of such actions. The security provisions are discussed in Section 2.8 of the EIS and are summarized in the Appendix H that has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit.

Response to Comment No. 195-2

Security in transit is discussed in Sections 2.7.5 and 5.4.2 of the EIS.

Response to Comment No. 195-3

Several accident scenarios including a breach of the cask and fire sufficient to oxidize the contents were analyzed during preparation of this EIS. Results of the accident analysis at the ports are given in Section 4.2.2 of the EIS with supporting detail in Appendix D, Section D.5 of the EIS. No catastrophic effects were found to result from severe accidents involving foreign research reactor spent nuclear fuel. Emergency response and management are discussed in Section 2.7 of the EIS.

Response to Comment No. 195-4

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified would not be greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Under NEPA regulations, the socioeconomic effects evaluated for this EIS do not include those associated with psychological fear of receiving

THE CITY COUNCIL OF THE CITY OF FEDERAL WAY HEREBY RESOLVES AS FOLLOWS:

Section 1. Statement of Opposition. The Federal Way City Council strongly opposes the shipment of spent nuclear materials through the Port of Tacoma and encourages the Department of Energy to choose a more suitable site to receive these shipments.

195-5

Section 2. Severability. If any section, sentence, clause or phrase of this resolution should be held to be invalid or unconstitutional by a court of competent jurisdiction, such invalidity or unconstitutionality shall not affect the validity or constitutionality of any other section, sentance, clause or phrase of this resolution.

Section 3. Ratification. Any act consistent with the authority and prior to the effective date of the resolution is hereby ratified and affirmed.

Section 4. Effective Date. This resolution shall be effective immediately upon passage by the Federal Way City Council.

RESOLVED BY THE CITY COUNCIL OF THE CITY OF FEDERAL WAY, WASHINGTON, this 6th day of June, 1995.

CITY OF FEDERAL WAY

MAYOR, MARY E. GATES

ATTEST:

CITY CLERK, N. CHRISTINE GREEN, CMC

Res.#95-205, Page# 2

foreign research reactor spent nuclear fuel. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Tacoma would have no adverse economic impacts on business within the port or the surrounding communities.

Response to Comment No. 195-5

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 210: THE PORT OF LONG BEACH

The Port of Long Beach

"America's most Modern Port"

P.O. BOX 570 · LONG BEACH, CA 90801-0570 · TELEPHONE (310) 437-0041 · FAX (310) 437-3231 · TELEX 65-6462 PORTOFBEACH LGB

June 8, 1995

Mr. Charles Head, Program Manager
Office of Spent Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

SUBJECT: Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (DOE/EIS-0218D)

Dear Mr. Head:

We have reviewed the Draft EIS on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (DOE/EIS-0218D). We are in agreement with the document's position that the Port of Long Beach should not be considered as a port of entry due to the Port's location in a high-population-density area consisting of the Long Beach/Los Angeles and Orange County Metropolitan Areas.

Additionally, the Port of Long Beach was the busiest container port in the nation last year moving 2,573,827 twenty-foot equivalent units (T.E.U.'s). Forty percent of this cargo is either coming from or destined for areas east of the Rocky Mountains. Disruptions to cargo movement through the port facility would have lasting impacts on goods movement throughout the nation. Lastly, the Port of Long Beach is located in the same vicinity as the Port of Los Angeles and similar discussions regarding sensitive environmental habitats should be addressed for both ports.

210-1

If you have any questions regarding our comments or the general operations within the Port of Long Beach, please contact Mr. Ron Everett, Planner, at (310) 590-4158.

Sincerely,

Geraldine Knatz

Geraldine Knatz, Ph.D.
Director of Planning

RLE:s

cc: G. Pelgemaker, City of Long Beach

PRESIDENT'S "E" AND "E-STAR" AWARDS FOR EXCELLENCE IN EXPORT

RESPONSE TO COMMENT
COMMENTOR NO. 210: THE PORT OF LONG BEACH

Response to Comment No. 210-1

The commentor's agreement with the EIS in regard to Long Beach not being one of the selected ports is noted.

COMMENTOR NO. 236: PORT OF GALVESTON

PORT of GALVESTON

123 Rosenberg
P.O. Box 328
Galveston, Texas 77553

Galveston (409) 766-6103
Houston (713) 266-2484
Fax (409) 766-6171

June 9, 1995

Ernest Connor
General Manager

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Dear Mr. Head:

The Port of Galveston is still in the process of assimilating the data required to formulate our response to the EIS on the potential transhipment of spent nuclear fuel thorough Galveston. 236-1

It is anticipated that our reply will reach your office on or about June 27, 1995 and therefore we request that it be made a part of the public comment record on this important issue and further to be used in reaching your decision.

Sincerely,

Ernest Connor
General Manager

EC:JE

RESPONSE TO COMMENT
COMMENTOR NO. 236: PORT OF GALVESTON

Response to Comment No. 236-1

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 day total) to be sufficient for public comment.

COMMENTOR NO. 262: HAMPTON ROADS/PLANNING DISTRICT COMMISSION

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

Rec'd. by Dept. of Environmental Quality

DR. ALAN P. KRASNOFF, CHAIRMAN • W. JOE NEWMAN, VICE CHAIRMAN • V. WAYNE DIXON, TREASURER
ARTHUR L. COLLINS, EXECUTIVE DIRECTOR/SECRETARY

CHESAPEAKE
Dr. Alan P. Krasnoff, City Councilman
W. Joe Newman, City Councilman
James W. Bain, City Manager

FRANKLIN
Robert C. Harrell, City Councilman
John J. Judkins, City Manager

GLOUCESTER COUNTY
Benjamin F. Burrell, Jr., County Supervisor
William H. Whitley, County Administrator

HAMPTON
James L. Eason, Mayor
Robert J. O'Neill, Jr., City Manager
Joseph H. Spencer, II, City Councilman

ISLE OF WIGHT COUNTY
W. Douglas Caskey, County Administrator
O.A. Sperry, Chairman

JAMES CITY COUNTY
Robert A. Magoon, Jr., County Supervisor
David B. Norman, County Administrator

NEWPORT NEWS
Charles C. Allen, City Councilman
Jan B. Frank, City Councilman
Edgar E. Maloney, City Manager

NORFOLK
Mason C. Andrews, M.D., City Councilman
Herbert M. Collins, Sr., City Councilman
Paul D. Fraim, Mayor
James G. Oliver, Jr., City Manager
G. Carey Phillips, City Councilman

POQUOSON
L. Darrell Boshon, Mayor
Robert M. Murphy, City Manager

PORTSMOUTH
Johnny M. Clemons, City Councilman
V. Wayne Dixon, City Manager
P. Ward Robbins, Jr., City Councilman

SOUTHAMPTON COUNTY
Rowland L. Taylor, County Administrator
O. Harold Tarlton, County Supervisor

SUFFOLK
Myles F. Standish, City Manager
Marion B. Rogers, City Councilwoman

VIRGINIA BEACH
John A. Inscoe, City Councilman
Robert K. Fraim, City Councilman
W. W. Harrison, Jr., City Councilman
Louis R. Jones, City Councilman
Meyera E. Oberndorf, Mayor
Nancy B. Parker, City Councilwoman
James K. Spore, City Manager

WILLIAMSBURG
Jackson C. Tuttle, II, City Manager
James Zeiler, City Councilman

YORK COUNTY
Paul W. Garman, Chairman
David M. Mark, County Administrator

June 5, 1995

Mr. Michael Murphy
Department of Environmental Quality
629 E. Main Street
Richmond, Virginia 23219

Re: Nonproliferation Policy EIS
(ENV:NUKE)

Dear Mr. Murphy:

Pursuant to the April 11, 1995 request from the Department of Environmental Quality, the staff of the Hampton Roads Planning District Commission has reviewed the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. The HRPDC and its member local governments have previously reviewed and commented on the Environmental documents for a variety of related projects.

Based on its review of this document as well as of the earlier related projects, the staff of the HRPDC has the following comments:

1. It is recognized that the Port of Hampton Roads has been utilized as the port of entry for Spent Nuclear Fuel associated with a number of projects in the past. Although past shipments have occurred without incident, the HRPDC continues to believe that use of ports located in areas of lower population density would be preferable. *262-1*

2. If the Port of Hampton Roads is selected as the port of entry for this material, the Department of Energy should notify the affected localities in the port area and subsequent transportation route in advance of the shipments so that adequate safety precautions may be taken. In all cases, the localities should be notified directly in advance of any notification to the news media. *262-2*

HEADQUARTERS • THE REGIONAL BUILDING • 723 WOODLAKE DRIVE • CHESAPEAKE, VIRGINIA 23320 • (804) 420-2690
PENINSULA OFFICE • HARBOUR CENTRE, 9 EATON STREET • SUITE 232 • HAMPTON, VIRGINIA 23669 • (804) 728-2667

RESPONSE TO COMMENT COMMENTOR NO. 262: HAMPTON ROADS/PLANNING DISTRICT COMMISSION

Response to Comment No. 262-1

The commentor's preference for ports with low population density is noted. This is one of the criteria for selecting ports, as discussed in Section 2.6.3.1 and Appendix D of the EIS.

Response to Comment No. 262-2

DOE is required under 10 CFR Part 73 to inform the Governor of each State and any Tribal chair, or their designee, along a transportation route seven days in advance of the shipment of hazardous cargos, including radioactive materials. It would be the responsibility of the Governor to provide any further notification to State and local officials.

COMMENTOR NO. 262:
HAMPTON ROADS/PLANNING DISTRICT COMMISSION (CONT'D.)

Mr. Michael Murphy 2 June 6, 1995

3. If the Port of Hampton Roads is selected as the port of entry, all highway transportation of the material through the metropolitan area should be restricted to interstate facilities. Movement of this material should be restricted to off-peak hours. 262-3

We appreciate the opportunity to participate in the review of this project. If you have questions or need further information, please do not hesitate to call.

Sincerely,

Arthur L. Collins
Executive Director/Secretary

JMC:th

cc: Mr. Paul Miller, NN
Mr. Lee Rosenberg, NO
Ms. Marlise Hawkins, PO

RESPONSE TO COMMENT
COMMENTOR NO. 262:
HAMPTON ROADS/PLANNING DISTRICT COMMISSION (CONT'D.)

Response to Comment No. 262-3

The commentor's preference for the use of Interstate highways and off-peak hours is noted. Route selection would follow Department of Transportation regulations. DOE's policy on the truck's departure time is for the trucks to leave the port as soon as they are ready. This would minimize the time the radioactive material is in the port. These subjects are discussed in detail in Section 2.6.4.2 and Appendix E of the EIS.

COMMENTOR NO. 274: PORT OF TACOMA

PORT of TACOMA U.S.A.

June 12, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 20585

Dear Mr. Head:

Re: 1) Questions Pertaining to the DEIS on a "Proposed Nuclear Weapons Non-proliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel"

2) Request for One Week Delay (June 27) in Getting Final Comments to DOE

The Commissioners of the Port of Tacoma have requested and have been promised written answers to a question raised at the Port-DOE Fact-Finding and Public Comment Meeting held May 22, 1995 (6:00 PM at Tacoma Community College). We restate the question below for DOE and formally request that this question be answered in writing before the final Public Comment Meeting on the DEIS in Tacoma on June 19. In addition, we have identified nine other questions as a result of our review and reflection on the documents and the May 22 meeting. We would appreciate answers to these questions as well prior to the June 19 meeting in Tacoma.

Question Raised, Not Answered, and Promised in Writing by DOE at May 22 Tacoma Fact-Finding and Public Comment Meeting:

"What is the estimated effect of released radiation on humans and the environment should a shipping cask and the spent fuel rods contained therein be severely breached* in the vicinity of the Port of Tacoma?"

* Discussion at the meeting covered a range of "breaching" mechanisms including shipboard, storage or transportation fires in the vicinity of the harbor, dock or Tacoma transportation routes that substantially exceeded the design limits of the shipping casks; explosions resulting from hazardous cargo transported to/from the Port or handled at the Port, and acts of terrorism or revenge by terrorists or disgruntled persons, respectively.

274-1

Notwithstanding all of the assumptions, data, and calculations that DOE and/or its contractors used in determining the maximum credible accident, the Port Commissioners and the public want to know what the environmental and human health and safety impacts will be from an accident that does severely, even explosively, breach the cask and spent nuclear fuel while at the Port of Tacoma or in the general vicinity of Tacoma proper. For estimating purposes, the following can be used to estimate the impacts: the worst of 1a) a fire substantially in excess of cask design limits, or 1b) an explosion on the order of the Oklahoma bomb, 2) next to a standard shipment of spent fuel in the worst of one of the following three locations: 3a) in

P.O. Box 1837 • Tacoma, Washington 98401-1837 • Telephone: (206) 383-5841
Commissioners: Stephen R. Anderson • Jack A. Fabulich • Mike Fletcher • Patrick O'Malley • Jerry M. Thorpe
Executive Director: John J. Terpstra

RESPONSE TO COMMENT
COMMENTOR NO. 274: PORT OF TACOMA

Response to Comment No. 274-1

DOE responded to this question by letter and fax on June 16, 1995. The response gave the estimated radiation dose rate near the spent nuclear fuel under the assumption that there was no cask to provide shielding, as requested by the Port of Tacoma.

CEQ regulations and guidance do not require a worst case analysis of accidents in an EIS. For the purpose of analysis in this EIS, there is no such thing as a worst case scenario, because for any worst case that is postulated, a still more severe accident can be postulated by adding one more drum of gasoline, one more wrecked rail car, one more terrorist, etc. In addition, for each assumption that is made to make a postulated accident more severe, the probability of the accident becomes smaller. The EIS does not contain a worst case scenario, but a broad range of port accident scenarios, including severe accidents, is discussed in Section 4.2.2.3 of the EIS. Appendix D, Section D.5.4.3.2 presents the risks of a very high temperature fire that engulfs a cask, which was part of a sensitivity study on release fractions. In addition, Section D.5.9 has been added to Appendix D of the EIS to address the issue of attack by disgruntled persons or terrorists.

COMMENTOR NO. 274: PORT OF TACOMA (CONT'D.)

PORT OF TACOMA

Mr. Charles Head
June 12, 1995
Page 2

the harbor, 3b) at the Port's loading/unloading/storage dock, or 3c) early in the transportation route nearest the most populated part of greater Tacoma.

If DOE or its contractors have any generalized data or other estimates that could be used to provide an estimate of the environmental and human health and safety impacts resulting from a severe breach of such spent nuclear fuel in any populated area like Tacoma, these estimates would suffice. In this instance, however, we would like a qualitative statement by DOE as to whether or not its generalized estimate results from assumptions that are more or less severe than the above three criteria.

274-1 (Cont'd.)

In any event, we were promised an answer to our question, in writing, and we expect to have such answer before the June 19 public comment meeting.

Due to the lack of this promised answer and the need for our citizens to have several days to reflect on the June 19 meeting before they provide DOE with their definitive comments, we hereby request a one week extension until midnight, June 27, 1995 for the final deadline for public comments. We understand time is of the essence in this EIS process, but we feel that a decision as important as this requires a reasonable comment time by an informed citizenry.

274-2

Very truly yours,

PATRICK O'MALLEY
President
Port Commission

w/attachment -- Nine additional questions

cc: Port of Tacoma Commissioners
Mayor, City of Tacoma
Washington State Congressional Delegation
Mr. Patrick J. Wells, DOE-HQ (EM-37)
Mr. Edward T. Fei, DOE-HQ (NN-42)

RESPONSE TO COMMENT
COMMENTOR NO. 274: PORT OF TACOMA (CONT'D.)

Response to Comment No. 274-2

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 days total) to be sufficient for public comment.

COMMENTOR NO. 274: PORT OF TACOMA (CONT'D.)

Nine Other Questions Pertaining to the Draft Environmental Impact Statement

1. *There is inadequate information in the Draft EIS to judge the non-proliferation benefits of the proposed action. Please furnish information that allows us to determine if the U.S., together with formal agreements with its pro-nonproliferation partners and allies, has a sound, comprehensive, funded, world-wide HEU nonproliferation policy that warrants the costs you estimate in the DEIS. Specific questions that would be helpful to assess this include, but are not limited to, the following:*

   a. *How many countries possess enrichment capabilities to produce HEU including those with known programs to do so in the future? What HEU total production capacity is/will be available in MTHM/year at whatever reference enrichment you would like to select?* — 274-3

   b. *Of the countries identified in 1.a, how many have already agreed with and are implementing the proposed U.S. policy to eliminate commerce in HEU for research reactor purposes? What fraction of the world-wide HEU capacity does this represent?* — 274-4

   c. *Of the remaining, if any, how many does the U.S. expect to adopt the U.S. policy at a later date? What fraction of the world-wide HEU capacity does this represent?* — 274-5

   d. *Of the remaining, if any, how many does the U.S. expect to not adopt the U.S. policy? What fraction of the world-wide HEU capacity does this represent?* — 274-6

   e. *Over the same 10 year period proposed for the Draft EIS, please provide a summary HEU mass balance, irrespective of the country of origin of the HEU, that i) will be eliminated by existing agreements today, ii) is expected to be eliminated by future agreements, and iii) is not expected to be eliminated because of technical conversion difficulties or lack of interest in participating in the HEU conversion program.* — 274-7

   f. *Of the countries identified in 1.a, what restrictions, if any, are placed on the purchase and/or use of HEU for purposes other than bona fide research reactor purposes?* — 274-8

2. *Of the 41 countries identified in the Draft EIS as potentially coming under the influence of this proposed policy, please identify which ones:*

   a. *Are already members in good standing in the IAEA Nuclear Nonproliferation and Safeguards program?* — 274-9

RESPONSE TO COMMENT
COMMENTOR NO. 274: PORT OF TACOMA (CONT'D.)

Response to Comment No. 274-3

Argentina, France, Germany, Japan, Netherlands, Pakistan, South Africa, and United Kingdom possess enrichment capability. Brazil has proposed building an enrichment facility. China, Russia, and the United States also have enrichment capability, so the total number of countries is twelve. (World Nuclear Industry Handbook, 1995).

Enrichment capacity is measured in Separative Work Units per year (SWU/yr), not in MTHM/yr. Any enrichment plant could theoretically produce HEU, but the conversion from SWU/yr to MTHM/yr would depend on the amount of uranium feedstock the starting enrichment level, as well as the final enrichment level. Due to the number of the unknowns it is not possible to perform the calculation. Also, it is outside the scope of this EIS.

Response to Comment No. 274-4

Of the twelve countries listed above, ten, including the United States, are covered under the proposed action and have participated in the RERTR Program in some fashion. Not all of the research reactors in those countries, however, have converted or are able to convert to LEU.

The fraction of worldwide enrichment capacity is not relevant because, if the research reactor operators demand fresh supplies of HEU fuel, then several nations have the enrichment capacity necessary to supply it. As stated above and in Section 1.1 of the EIS, Russia or China are potential suppliers of HEU.

Response to Comment No. 274-5

The United States is pursuing discussions with Russia and China, the remaining countries, to encourage them to follow the United States lead and adopt an RERTR-type program which would encourage their client states to convert to LEU fuels. The RERTR program has enjoyed wide support from the international community (Section 1.1 of the EIS).

Response to Comment No. 274-6

There are no remaining countries. All countries listed in 274-3 above are participants in the RERTR Program with the exception of Russia and China.

Response to Comment No. 274-7

There are no existing agreements that would force research reactor operators to stop using HEU fuel. Future agreements that might occur as a result of this EIS would remove up to approximately 4.6 MTHM of HEU from international commerce. If Russia agrees to follow the U.S. lead and start its own RERTR Program, then all the reactors that were supplied by the former U.S.S.R. would also be converted to LEU fuel.

b. *Are known or believed to already have nuclear weapons capability?* — 274-10

c. *Are known to have nuclear reactors operating in their country?* — 274-11

d. *Are known to have spent fuel storage capability?* — 274-12

e. *Are known to have spent fuel disposal programs functioning?* — 274-13

f. *Are known to have or expected to have during the life (10 years) of this Draft EIS an i) enrichment capability or ii) spent fuel reprocessing capability?* — 274-14

3. *At the Fact-finding and Public Meeting in Tacoma on May 22, one of the DOE participants responded "small impact" regarding a question about the nonproliferation impact of this proposed action relative to the total nonproliferation problem. Why? Just how significant of a nonproliferation step is this proposed policy on a world-wide basis?* — 274-15

4. *Notwithstanding the current low prices for uranium which tend to reduce the cost incentives for reprocessing, doesn't the substantial world-wide commerce in plutonium and uranium from commercial spent fuel processing substantially negate or diminish the importance of this proposed U.S. policy?*

Your comments in the DEIS were especially weak in addressing this issue. Please provide documentation of more substance to demonstrate the U.S. should incur the costs and potential risks implicit in implementing this proposed policy, especially the way you propose. For example, you appear to be treating nuclear weapons countries, commercial nuclear reactor countries, lesser developed countries, etc., all the same, i.e. in Alternative 1, the U.S. becomes the custodian of everyone's spent research reactor (U.S. origin) fuel irrespective of each countries' own storage and eventual disposal capabilities. — 274-16

5. *Since over 70% of the spent fuel under the proposed policy resides in seven countries having major commercial nuclear reactor programs, all having major spent fuel storage capability, three having spent fuel reprocessing capability, and all participating in the IAEA Nuclear Safeguards program, why not eliminate Germany, Sweden, Switzerland, France, Canada, Japan and the United Kingdom from consideration in Alternative #1, consider them as allies for implementing Alternatives #2 and #3 and focus more on the remaining 30% of the problem?*

In section S.2.9 of the Summary, you dismiss accepting foreign research reactor spent nuclear fuel from selected countries, e.g., those posing an actual nuclear weapons nonproliferation risk. You however did not consider a more rational basis (see question #5) for selecting certain countries for foreign storage and disposal. If necessary, financial incentives could be provided these seven commercial nuclear reactor countries to help complete their HEU to LEU research reactor conversions and to help — 274-17

Tables B-3 through B-5 in Appendix B, Section B.1.1.3 of the EIS present all the research reactors involved in this EIS and their conversion status. There are three research reactors (one in Belgium and two in France) that cannot be converted from HEU to LEU fuel with current technology. The technology necessary to convert these three research reactors is expected to be available by the end of the 10-year period, however, so none of the existing research reactors would need to continue on the HEU fuel cycle for technical reasons.

This EIS cannot speculate about the amount of HEU that might not be eliminated due to lack of interest.

Response to Comment No. 274-8

The Energy Policy Act of 1992 placed strict limitations on the export of HEU by the United States (Section 1.1 of the EIS). Since passage of this act, no new export licences for HEU have been issued by the United States.

Response to Comment No. 274-9

All 41 countries except Israel and Pakistan are parties to the Treaty on the Nonproliferation of Nuclear Weapons and participate in the safeguards program.

Response to Comment No. 274-10

Under the Treaty on the Non-Proliferation of Nuclear Weapons (the NPT), nuclear weapons states and nonnuclear weapons states are treated differently. In the NPT, the following five countries are recognized as nuclear weapons states: Russia, China, the United Kingdom, France and the United States. The United Kingdom and France would be covered by any new foreign research reactor spent nuclear fuel policy. Information available from the U.S. Government regarding which other countries, if any, are believed to have a nuclear weapons capability is classified. In any case, the names of any such countries are not pertinent to the decisions to be made after completion of this EIS since removal of spent nuclear fuel from such countries would still support overall U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapon-grade) uranium in civil programs worldwide (Section 1.2 of the EIS).

Response to Comment No. 274-11

Of the 41 countries involved in the proposed action, over 20 have operating power reactors. Several of these have announced plans to end operation of these facilities and not to construct any more nuclear power plants. Power reactors and research reactors are distinctly different, however, in that all power reactors run on either low enriched or natural uranium. This material cannot be used to construct nuclear weapons.

COMMENTOR NO. 274: PORT OF TACOMA (CONT'D.)

solve the storage and/or reprocessing problem of the remaining 34 countries. This would greatly lessen the environmental impact on the U.S. while achieving the nonproliferation objectives.

Note: less than 5% of all of the spent fuel covered in this proposed policy comes from the higher risk "developing countries".

274-17 (Cont'd.)

6. ***What makes the DOE believe that this policy and costs are only for the proposed 10 year period? Aren't both the time estimates (10 years) and cost estimates grossly understated based on historical evidence in the U.S. for similar programs? Please explain the specific steps that the U.S. will take to ensure that this program only last 10 years plus the 3 years of cooling for the fuel discharged from the various research reactors in the 8th through 10th years. Where bilateral or tri-party agreements are required to implement this 10 year termination, please furnish evidence that the other parties will agree to such a termination. What are the anticipated foreign costs to the U.S. after termination of this policy assuming that Alternative 1 was adopted?***

274-18

274-19

There is substantial historical evidence to suggest that the cost and time estimates are grossly understated for the proposed policy, especially for Alternative #1 (see comments dealing with question #6 below). The U.S. in particular is a model for large cost and time over-runs dealing with its spent nuclear fuel storage and disposal programs.

7. ***Why isn't Alternative #2 (Facilitate Overseas Management of the Spent Nuclear Fuel) DOE's preferred alternative for this Draft EIS?***

On page 2-24 of Volume 1, next to the last paragraph, DOE makes an excellent case for using existing commercial spent fuel reprocessors to implement the proposed nuclear nonproliferation policy.

Managing research reactor fuel inputs and outputs is a long term proposition that is best left to normal market pressures for routine control. There are no geologic disposal sites on the horizon for the foreseeable future. Consequently, if the U.S. were to take this fuel back into the U.S. for storage, treatment and disposal, we would only drive up the U.S. taxpayer's costs while subsidizing the research reactor operators.

274-20

Foreign reprocessors want this fuels business and are willing to modify plants to provide the necessary reprocessing services that are needed. Transitioning the 41 research reactor countries into the practical realities of storage, treatment and disposal costs would help facilitate sincere moves to become self sufficient.

Unfortunately, some of these same foreign research reactor operators that we are proposing to subsidize are competing with the U.S.'s medical radioisotopes industry – all but driving it bankrupt.

8. ***Do the time and cost estimates to implement Alternative #1 include a prudent set of lawsuits and court cases objecting to the acceptance of***

274-21

RESPONSE TO COMMENT
COMMENTOR NO. 274: PORT OF TACOMA (CONT'D.)

Response to Comment No. 274-12

All reactors have spent nuclear fuel storage pools onsite, but these are only appropriate for short-term storage of limited amounts of spent nuclear fuel. Finland, France, Germany, Japan, Sweden, and the United Kingdom have larger scale interim storage facilities in operation (World Nuclear Industry Handbook, 1995).

Response to Comment No. 274-13

Belgium, Canada, Finland, France, Germany, Japan, Sweden, Switzerland, and the United Kingdom have spent nuclear fuel and/or high-level waste disposal programs. No country has a spent nuclear fuel geologic repository site in operation yet.

Response to Comment No. 274-14

i) Argentina, France, Germany, Japan, Netherlands, Pakistan, South Africa, and United Kingdom have enrichment capability. Brazil has proposed building a facility. (World Nuclear Industry Handbook, 1995).

ii) France, Italy, Japan, and United Kingdom have spent nuclear fuel reprocessing capability. Brazil has a facility under construction. (World Nuclear Industry Handbook, 1995).

Response to Comment No. 274-15

The United States and the foreign research reactors have a combined inventory of approximately two thousand tons of HEU. About four hundred to five hundred tons of this uranium is scheduled for blending down to LEU in order to reduce the risk of nuclear weapons proliferation. As discussed in Section 2.2.1.3 of the EIS, the inventory of HEU in foreign research reactors is nearly five tons - an amount sufficient to make about two hundred bombs comparable in size to those dropped on Hiroshima and Nagasaki near the end of the Second World War. While the total amount of HEU subject to the proposed action is relatively small in comparison to the total inventory, it is nevertheless a significant amount in terms of the risk of diversion to a weapons program. Efforts by the United States to reduce the availability of plutonium are complementary to efforts to reduce the availability of HEU. Differences in policies and approaches for reduction of plutonium and HEU arise from the different physical properties and applications for these materials.

Response to Comment No. 274-16

Chemical separation value is not based on the market price of the recovered uranium but on the conversion of the spent nuclear fuel to a more stable waste form. If all the uranium and separative work in the spent nuclear fuel were recovered via chemical separation, the

foreign spent fuel, and its subsequent transportation, treatment, and storage in the U.S. especially when the U.S. has not demonstrated the ability to manage its own defense and commercial spent fuel wastes in a timely or cost effective manner?

Why would the U.S. seriously consider any alternative of increasing its spent nuclear fuel problems at a time in the U.S. when managing the cleanup of the defense nuclear wastes is in a turmoil (see "Train Wreck Along the River of Money - An Evaluation of the Hanford Cleanup" March 1995 by Steve Blush and Tom Hallman under contract to the U.S. Senate Committee on Energy and Natural Resources)?

274-21 (Cont'd.)

Why would the U.S. seriously consider any alternative of increasing its spent nuclear fuel problems at a time in the U.S. when the cost of disposing of highly radioactive wastes, e.g., storage, treatment and disposal of the U.S.'s commercial spent nuclear fuel, is at least $10 billion overrun and 10 years late, without substantial increases in funding, compared to the initial estimates (see GAO's report to Congress "Nuclear Waste - Comprehensive Review of the Disposal Program is Needed" September 1994 GAO/RCED-94-299)?

In a floor statement submitted to the Senate Record on May 26, 1995, Senator Frank Murkowski, Chair of the Senate Committee on Energy and National Resources, reported that:

- 30,000 tons of spent nuclear fuel is being temporarily stored at power plants at 75 sites.
- In less than three years, 23 reactors will run out of space in their spent fuel storage pools,
- By 2010, a total 78 reactors will have run out of space
- We've already spent 12 years and $4.2 billion to find a permanent high-level repository and conduct site characterization at Yucca Mountain

9. *What independent, third party entities performed/will perform the risk assessments, cost/benefit and nonproliferation assessments for DOE and its Contractors?*

274-22

Congress, the GAO, and others have been calling for independent, third party, peer reviewed risk assessments performed in accordance with a standardized methodology. The same is true for cost/benefit analyses. Traditional, long term contractors to DOE do not qualify as an "independent, third party". How does DOE propose to establish the necessary mutual trust and credibility with the public unless it helps to facilitate such third party reviews?

undiscounted value would be roughly $60 million. Even if the price of uranium and the cost of separative work were to double, the relative costs of a chemical separation option and a storage option would not change enough to affect the policy decision one way or the other. The substantial commerce in commercial spent nuclear fuel is not in HEU; it is in LEU, which is not suitable for weapons. Separated plutonium (which is suitable for weapons) is not a substantial commercial product. Plutonium is either retained at the reprocessing facility (e.g., Dounreay) or, in a very few cases, shipped to the country of origin for use in breeder reactor or mixed oxide fuels. In these latter cases, such as the one from France to Japan earlier in 1995, the shipments are guarded. As a practical matter, the commercial shipment of material suitable for weapons is limited and controlled. Diversion of commercial spent fuel for the purpose of separation by a country or group without advanced commercial or military nuclear technology is unrealistic because the material is too radioactive to handle and too difficult to separate.

Response to Comment No. 274-17

The commentor is suggesting an alternative under which foreign research reactor spent nuclear fuel from seven commercial nuclear reactor countries (Germany, Sweden,...etc) would be excluded from the policy, would manage their own spent nuclear reactor fuel with or without U.S. incentives, and the United States would include only the remaining developing countries under the policy.

DOE considers that, in terms of environmental impacts, this alternative is one of many hybrid alternatives covered under Management Alternative 3, as discussed in Section 2.4 of the EIS. In terms of policy considerations, however, the suggested exclusion of certain countries from the proposed action introduces implications detrimental to the U.S. nuclear weapons nonproliferation policy. The United States has played in the past , and continues to play, a leadership role within the world community in matters of nuclear weapons nonproliferation. In this role, it initiated programs such as the Reduced Enrichment for Research and Test Reactors (RERTR) program and encouraged other nations to support it. Some of the nations which have supported RERTR, such as Britain, France, Japan, Sweden and others, may not currently present the nuclear weapons proliferation risk as others. The reasons for considering these nations under this policy are presented in Section 1.3 of the EIS.

Response to Comment No. 274-18

As discussed in Section 2.2.1.1 the policy duration for the basic implementation of Management Alternative 1 is proposed to be 10 years. Section 4.9 discusses the cost associated with all management alternatives, including the basic implementation of Management Alternative 1. Other policy periods, shorter and longer, have also been evaluated (Section 2.2.2.2 of the EIS). The cost analysis is based on best available information and engineering judgement. It includes appropriate contingencies to account

COMMENTOR NO. 274: PORT OF TACOMA (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 274: PORT OF TACOMA (CONT'D.)

for the uncertainty associated with a program of this duration and size. No bilateral or tri-party agreements are required for the policy implementation. The policy duration for each eligible foreign research reactor operator would be dictated by DOE. The number of elements eligible under the policy are those that would be discharged from the reactor by the end of the policy period. It should be noted that the number of elements considered in the EIS to be discharged by the end of the policy period (Tables 2-1 and 2-2) has been estimated conservatively.

Response to Comment No. 274-19

There would be no anticipated foreign costs to the United States after termination of the policy, assuming Management Alternative 1 is implemented.

Response to Comment No. 274-20

The advantages and disadvantages of Management Alternative 2 are discussed in Sections 2.3 and 4.4 of the EIS. The overseas reprocessors have refused to take responsibility for ultimate disposal of the reprocessed wastes, so either the 41 countries with research reactors or the United States would have to provide disposal. In addition, in the past the reprocessors have returned separated HEU as HEU. This would not be consistent with U.S. nuclear weapons nonproliferation policy.

As discussed in Section 4.3.1.3 of the EIS, nearly all of the medical radioisotopes used in the U.S. come from the NRU reactor in Canada. The United States does not have any reactor that is competing in this business area.

Response to Comment No. 274-21

The minimum program cost estimates do not include either direct or indirect costs for lawsuits or court cases. The costs for shipping do include administrative costs far in excess of those for conventional commercial shipments. The final EIS includes a risk factor for logistics and program management that recognizes the cost impacts on the program from lawsuits.

The ability of the United States to manage its own defense and commercial nuclear waste is an important issue in the development of contingencies and uncertainties, especially the costs associated with long-term disposal. Although legal costs, per se, are not included, the cost risks reported for such options as meeting strict waste acceptance criteria include the costs associated with delays, public opposition, and similar factors. The basis for these cost estimates is the U.S. experience in these fields — an experience that includes delays, public opposition, etc.

The United States is seriously considering the proposed action because it would greatly reduce the civilian commerce in highly dangerous materials. The amount of spent nuclear fuel included in this program is less than 1 percent of the total mass of heavy metal that DOE currently manages. Any approach that addresses the defense and commercial waste disposal problem also addresses the foreign research reactor spent nuclear fuel disposal problem for a small incremental cost, probably on the order of 1-2 percent. The foreign research reactor spent nuclear fuel program cannot address issues such as the status of the high-level waste repository. It can, and does, address the cost risks associated with delays in the repository, stringent waste acceptance criteria, etc.

Response to Comment No. 274-22

Independent, third party peer reviews of risk assessments and cost/benefit analyses are not required under NEPA or DOE's environmental regulation. However, the public is able to comment, throughout the NEPA process, on the analyses presented in the EIS, including the risk assessment component(s) of NEPA documentation pertaining to the proposed action.

COMMENTOR NO. 304:
CITY OF TACOMA, ENVIRONMENTAL COMMISSION

City of Tacoma
Environmental Commission

June 19, 1995

Office of Spent Fuel Management (EM-37)
Office of Environmental Management
United States Department of Energy
1000 Independence Avenue SW
Washington, DC 20585

Dear Sirs:

The Tacoma Environmental Commission has reviewed the United States Department of Energy's proposed policy to manage spent fuel from foreign research reactors and the accompanying environmental analysis. The Commission raises the following environmental concerns which have not been adequately addressed:

(1) Information about the Port of Tacoma, its terminals, its operations, and the surrounding area contained in the environmental analysis is outdated and does not accurately reflect existing conditions; — 304-1
(2) The deep water depth of Puget Sound will cause substantial problems in the recovery of nuclear fuel shipping containers in case of an accident; — 304-2
(3) An explosion and fire aboard a vessel navigating Puget Sound would pose considerable harm to the surrounding population and environment; — 304-3
(4) Commencement Bay is currently designated a federal Superfund site and considerable cleanup effort has already been undertaken by the Port of Tacoma the City of Tacoma, and the industries of Commencement Bay to address contamination issues; — 304-4
(5) The Port of Tacoma is in close proximity to residential neighborhoods surrounding Commencement Bay; — 304-5
(6) Operational procedures regarding handling of these shipments are inadequate; — 304-6
(7) Permanent disposal of this spent nuclear fuel has not been determined; and — 304-7
(8) The security aspect of these shipments through the Port of Tacoma, the City of Tacoma, Pierce County, and State of Washington has not been addressed. — 304-8

The citizens of Tacoma have determined to live in a clean environment and have undertaken to restore to the City the highest standards of clean air, clean water and clean land. High-level radioactive waste presents a threat of the most catastrophic injury to Tacoma residents and environmental pollution and degradation. The potential release of radiation from high-level radioactive waste presents unacceptable risks to the citizens of Tacoma. — 304-9

747 Market Street, Room 900 ▮ Tacoma, Washington 98402-3793 ▮ (206) 591-5310

RESPONSE TO COMMENT
COMMENTOR NO. 304:
CITY OF TACOMA, ENVIRONMENTAL COMMISSION

Response to Comment No. 304-1

Updated information on the terminals at the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS.

Response to Comment No. 304-2

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Section 4.2.1.3 of the EIS has been modified to include this assurance of recovery in coastal waters. Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters. The impacts of a foreign research reactor spent nuclear fuel transportation cask sinking in coastal and deep waters are estimated in the EIS (Appendix C, Section C.5). The results of this analysis show that both the consequences and the risk of these accidents are low (Appendix C, Sections C.5.4 and C.5.5).

Response to Comment No. 304-3

Appendix D, Section D.5.3.1 of the EIS describes several accident scenarios that involve fire during the marine transport, including accidents close to land as would be the case in Puget Sound. The results of the analysis of these accidents can be found in Appendix D, Section D.5.4. The analysis shows that even in the event of a severe ship fire, neither the consequences nor risks are great (Appendix D, Section D.5.5). Although the non-radiological effects of such a catastrophic accident would obviously impact the local environment, no additional impacts are predicted due to the presence of foreign research reactor spent nuclear fuel.

Response to Comment No. 304-4

Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma as noted by the commentor. The analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2 of the EIS). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Based on over 30 years experience shipping spent nuclear fuel, DOE considers that spent nuclear fuel transportation casks passing through the Port of Tacoma, Commencement Bay, or any other port or waterway would not release their radioactive contents, and thus would not affect air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

COMMENTOR NO. 304:
CITY OF TACOMA, ENVIRONMENTAL COMMISSION (CONT'D.)

Based upon the information provided by the Department of Energy, the Environmental Commission recognizes the importance of managing spent fuel from foreign research reactors. We believe the appropriate option is to utilize the capability and expertise of the United States Navy at Concord, California, and therefore, recommend Concord as the port of entry for such materials. Furthermore, the City of Tacoma's Environmental Commission does not believe that the Hanford, Washington site is appropriate for disposal of additional spent fuel. The Nevada test site appears to be far preferable based upon its environmental conditions and geological setting, as well as its proximity to Concord, California. 304-10 304-11 304-12 304-13

Therefore, the Tacoma Environmental Commission strongly opposes the introduction, storage, or transshipment of high-level radioactive waste through Tacoma's Port, rail lines, or highways. We further urge the Department of Energy to remove Tacoma as a possible United States entry site for these shipments. 304-14

Respectfully submitted,

Albert Eggers, Ph.D., Co-Chair

Rens Verburg, Ph.D., Co-Chair

For the Members of the Environmental Commission

Dick Bartells
Bill Baarsma, Ph.D.
Om Bhatia
Tu Ho
Carol MacKinnon, J.D.
Dan Meyer
Anita Preston
Frederick Wolf

AE:RV:ms

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RESPONSE TO COMMENT
COMMENTOR NO. 304:
CITY OF TACOMA, ENVIRONMENTAL COMMISSION (CONT'D.)

Response to Comment No. 304-5

The population residing near candidate ports and along transportation routes were an important factor that was considered in port selection and in the evaluation of environmental effects of the proposed action (Section 4, Appendix D, and Appendix E of the EIS).

Response to Comment No. 304-6

Foreign research reactor spent nuclear fuel has been accepted at ports in the United States without incident for over 30 years (Sections 1.1 and 1.2 of the EIS). If a policy to accept foreign research reactor spent nuclear fuel is adopted, this spent nuclear fuel would be shipped in standard shipping containers which are routinely handled at all of the candidate ports (Section 2.6.3.2 of the EIS).

Response to Comment No. 304-7

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS).

Response to Comment No. 304-8

The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk of such actions. The security provisions are summarized in the new Appendix H that has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit.

COMMENTOR NO. 304:
CITY OF TACOMA, ENVIRONMENTAL COMMISSION (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 304:
CITY OF TACOMA, ENVIRONMENTAL COMMISSION (CONT'D.)

Response to Comment No. 304-9

The commentor's opinion that the risks are unacceptable is noted. DOE considers the risk estimates presented in Section 4 to be accurate.

Response to Comment No. 304-10

The Environmental Commission's recognition of the importance of the proposed action is noted. The proposed policy is an important part of the overall United States campaign to promote worldwide nonproliferation of nuclear weapons.

Response to Comment No. 304-11

The commentor's preference for Concord NWS as a port of entry for foreign research reactor spent nuclear fuel is noted. Results of the environmental analyses given in Section 4 of the EIS indicate that there is no environmental basis for preference among the candidate ports. If any foreign research reactor spent nuclear fuel is to be accepted into the United States, the selection of the actual port(s) of entry to be used will be in the Record of Decision, subsequent to completion of this final EIS.

Response to Comment No. 304-12

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 304-13

The commentor's preference for the Nevada Test Site as the site for managing foreign research reactor spent nuclear fuel in the United States is noted. As discussed in the response to Comment 304-11, based on the Record of Decision issued for the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement, the Nevada Test Site would not be used as a management site.

COMMENTOR NO. 304:
CITY OF TACOMA, ENVIRONMENTAL COMMISSION (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 304:
CITY OF TACOMA, ENVIRONMENTAL COMMISSION (CONT'D.)

Response to Comment No. 304-14

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Commentor No. 305:
Seattle City Council Member Jane Noland

Seattle City Council

JIM STREET
Council President
Chair
Planning & Regional Affairs
Committee
684-8808

MARTHA CHOE
Chair
Transportation & Economic
Development Committee
684-8802

CHERYL CHOW
Chair
Health, Human Services,
Education & Libraries
Committee
684-8804

SUE DONALDSON
Chair
Parks, Public Grounds
& Recreation Committee
684-8806

JAN DRAGO
Chair
Business & Labor
Committee
684-8801

SHERRY HARRIS
Chair
Housing, Community
Development & Urban
Environment Committee
684-8800

JANE NOLAND
Chair
Utilities & Environmental
Management Committee
684-8803

MARGARET PAGELER
Chair
Public Safety Committee
684-8807

TOM WEEKS
Chair
Finance, Budget,
Management &
Personnel Committee
684-8805

June 14, 1995

Hazel O'Leary
Secretary of Energy
Department of Energy
Washington D.C. 20585

Dear Ms. O'Leary:

The City of Seattle remains adamantly opposed to any proposal to bring shipments of High-Level Nuclear Waste through the Puget Sound area by water or land transportation. Such proposals have been floated by the Department of Energy on various occasions over the last several years and, in response, the Seattle City Council has passed a series of resolutions in opposition (latest resolution is attached). We continue to believe that it is unnecessary and inappropriate to expose large population centers to the risks that will necessarily accompany the transportation of nuclear materials.

305-1

We stand with Tacoma in opposition to the transport of nuclear waste through the Port of Tacoma. Such a proposal would not only endanger the lives of Tacoma residents but all residents along the proposed route which includes the City of Seattle and its environs. Keeping Tacoma on the list of proposed routes because it is not a population center does not make sense. It is a population center which stretches from Tacoma to Seattle to Everett. Furthermore, nuclear waste shipments to Tacoma would be shipped north on rail or truck through the heart of Seattle.

305-2

We were informed by Gerald Pollet, Heart of America Northwest, that public testimony at the DOE hearing on May 24 was not made part of the official record. Participants at the hearing were told there was "no record". All written comments and statements made at the hearing and any future hearings must be made part of an official public record.

305-3

It is Seattle's position that no shipments of high level nuclear waste, from any source to any destination requiring transport through the State of Washington, shall be moved through the Seattle metropolitan area (which includes Tacoma and Everett) by land or water transportation without complete site-specific EIS's for each port and

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Response to Comment
Commentor No. 305:
Seattle City Council Member Jane Noland

Response to Comment No. 305-1

The commentor's opposition to the use of the Ports of Seattle and Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. The Port of Seattle is not among the ten candidate ports listed in Section 2.2.1.6 of the EIS. Based on the port selection process described in Appendix D of the EIS, however, the Port of Tacoma is a candidate port which could receive foreign research reactor spent nuclear fuel under Management Alternative 1 or 3. As discussed in Section 4 of the EIS, the analyses determined that there would be no significant environmental benefits or risks at candidate ports of entry, due to the receipt of this spent nuclear fuel. Populations residing near candidate ports and along transportation routes were important factors in the evaluation of environmental effects of the proposed action (Appendices D and E of the EIS).

Response to Comment No. 305-2

DOE did request that comments be submitted in writing, however, all oral comments presented at each hearing were summarized and have been addressed along with the written comments in Volume 3 of the final EIS. All comments, written and oral, are part of the public record.

Response to Comment No. 305-3

During preparation of this EIS, environmental effects of the proposed action were evaluated for each candidate port, transportation route, and interim management site. (Sections 4.2.2, 4.2.3, and 4.2.4) No significant environmental benefits or adverse impacts were found to result from implementation of the proposed action. There is no need to develop separate environmental documents for each candidate port and transportation route because the potential environmental effects have already been evaluated and presented in this document.

COMMENTOR NO. 305:
SEATTLE CITY COUNCIL MEMBER JANE NOLAND (CONT'D.)

each transportation corridor involved, which conclusively establish that shipments will not pose risks to the health or safety of residents. Until we are satisfied with the EIS process and the results, the City of Seattle will continue, by all legal means available, to oppose such a plan.

305-3 (Cont'd.)

Sincerely,

Jane Noland
Seattle City Council

cc: Washington State Congressional Delegation
Nick Schultz, Port of Tacoma
Gerry Pollet, Heart of America NW

RESPONSE TO COMMENT
COMMENTOR NO. 305:
SEATTLE CITY COUNCIL MEMBER JANE NOLAND (CONT'D.)

COMMENTOR NO. 319: TACOMA-PIERCE COUNTY VISITOR AND CONVENTION BUREAU

Public Testimony - from Nancy Watkins, Executive Director of the Tacoma-Pierce County Visitor and Convention Bureau

Provided to the United States Department of Energy at the Public Hearing on Monday, June 19, 1995

GOOD EVENING

MY NAME IS NANCY WATKINS, AND I AM HERE TONIGHT ON BEHALF OF THE TACOMA-PIERCE COUNTY VISITOR AND CONVENTION BUREAU, AN ORGANIZATION THAT REPRESENTS PIERCE COUNTY'S TOURISM INDUSTRY AND ITS INTERESTS.

WE ARE IN THE IMAGE BUILDING BUSINESS. THE VISITOR AND CONVENTION BUREAU PROMOTES OUR COMMUNITIES TO TOURISTS, TOUR COMPANIES, MEETING PLANNERS AND THEIR CONVENTION DELEGATES, AND TRAVEL WRITERS. WE NOT ONLY PROMOTE OUR AREA'S ATTRACTIONS, FACILITIES AND VISITOR SERVICES, WE PROMOTE PIERCE COUNTY AS A SAFE, FRIENDLY AND ATTRACTIVE PLACE TO VISIT.

TACOMA-PIERCE COUNTY

906 BROADWAY, PO BOX 1754, TACOMA, WA 98401
206-627-2836 FAX 206 627 8783

RESPONSE TO COMMENT
COMMENTOR NO. 319: TACOMA-PIERCE COUNTY VISITOR AND CONVENTION BUREAU

COMMENTOR NO. 319: TACOMA-PIERCE COUNTY VISITOR AND CONVENTION BUREAU (CONT'D.)

Public Testimony from Nancy Watkins
June 19, 1995
page 2

TRANSPORTING SPENT NUCLEAR WASTE THROUGH THE PORT OF TACOMA WILL HARM PIERCE COUNTY'S PUBLIC IMAGE. IT WILL DESTROY THE VISITORS' IMAGE OF A SAFE DESTINATION AND IT WILL DESTROY THE RECOGNITION THAT PIERCE COUNTY HAS WON FROM TRAVEL WRITERS AND THEIR READERS IN THIS PAST YEAR.

IF SPENT NUCLEAR FUEL IS TRANSPORTED THROUGH THE PORT OF TACOMA, TRAVEL WRITERS WILL HAVE A NEW STORY. INSTEAD OF WRITING ABOUT TACOMA'S NEW HISTORY MUSEUM, AND THE FUTURE DEVELOPMENT OF GLASS AND MARITIME MUSEUMS, THE STORY WILL BE A WARNING TO VISITORS. INSTEAD OF PRAISING OUR WATERFRONT DEVELOPMENT EFFORTS, OUR CUSTOMERS WILL READ ABOUT THE DANGERS OF RADIATION TACOMA RESIDENTS MUST PREPARE FOR IN THE EVENT OF A NUCLEAR ACCIDENT ON OUR WATERFRONT.

THE VISITOR INDUSTRY IS A $365 MILLION DOLLAR INDUSTRY IN PIERCE COUNTY. IT DIRECTLY EMPLOYS 5,350 PEOPLE. PIERCE COUNTY'S VISITOR INDUSTRY HAS A BRIGHT FUTURE AND WE DO NOT WANT IT DESTROYED WITH A NEGATIVE BLOW SUCH AS THIS.

THE DEPARTMENT OF ENERGY SHOULD DROP THE PORT OF TACOMA FROM ITS LIST OF PUBLIC PORTS CONSIDERED AS ENTRY POINTS FOR THE WORLD'S SPENT NUCLEAR FUEL. 319-1

RESPONSE TO COMMENT
COMMENTOR NO. 319: TACOMA-PIERCE COUNTY VISITOR AND CONVENTION BUREAU (CONT'D.)

Response to Comment No. 319-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

In evaluating and selecting acceptable ports of entry, DOE has developed evaluation criteria. DOE considers that the port selection criteria successfully identify ports that can safely handle foreign research reactor spent nuclear fuel. DOE further considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Sections 4.2.2.3 and 4.5 of the EIS) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel casks are also low (Sections 4.2.2.2 and 4.5 of the EIS).

COMMENTOR NO. 319: TACOMA-PIERCE COUNTY VISITOR AND CONVENTION BUREAU (CONT'D.)

Public Testimony from Nancy Watkins
June 19, 1995
page 3

IF IT IS UNSAFE TO TRANSPORT THE SPENT NUCLEAR FUEL THROUGH LARGER POPULATION CENTERS, SUCH AS SEATTLE, THEN IT IS UNSAFE FOR TACOMA AND ITS NEIGHBORING COMMUNITIES. WE ARE NO MORE WILLING TO COPE WITH THE DEVASTATION OF A NUCLEAR ACCIDENT THAN ANY OTHER COMMUNITY.

319-1 (Cont'd.)

I URGE THE DEPT. OF ENERGY TO RE THINK ITS USE OF THE PORT OF TACOMA AND ALL OTHER PUBLIC PORT FACILITIES AND ENCOURAGE THE DEPARTMENT TO USE A MILITARY PORT OR TO WORK WITH OTHER NATIONS TO SAFELY STORE THEIR OWN NUCLEAR WASTE WITHIN THEIR OWN COUNTRY.

319-2

RESPONSE TO COMMENT
COMMENTOR NO. 319: TACOMA-PIERCE COUNTY VISITOR AND CONVENTION BUREAU (CONT'D.)

Response to Comment No. 319-2

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted. Sections 4.2.2.2 and 4.2.2.3 of the EIS provide the analysis on impacts of incident-free operation and consequences of port accidents, respectively.

The commentor's preference for the overseas storage alternative is noted. This is evaluated as Management Alternative 2, Subalternative 1a, which is discussed in Section 4.4.1 of the EIS.

12/08/93
JW:ssj

RESOLUTION 28848

A RESOLUTION stating the City's position that high level nuclear wastes should not be moved through Seattle or the Puget Sound area by water or land transportation.

WHEREAS, in response to a proposal from the Federal Department of Energy in 1986 to ship high-level nuclear waste from Asia through Puget Sound and Seattle to inland destinations, the Mayor and all Councilmembers signed letters to the Secretary of Energy requesting a site-specific EIS before undertaking such shipments; and

WHEREAS, in 1990 the City Council again, this time by resolution, opposed a Department of Energy proposal to ship high-level radioactive wastes from the Hanford Nuclear Reservation to West Germany through the City and Port of Seattle; and

WHEREAS, this proposal was also withdrawn; and

WHEREAS, in 1991, the Department of Energy made another policy proposal for a ten-year program to transport from 100-352 cask-shipments of high-level nuclear waste from research reactors in foreign countries to DOE facilities in South Carolina and Idaho through Puget Sound ports without a complete EIS and again, the Council, through Resolution 28433, opposed such shipment; and

WHEREAS, the Department of Energy on October 21, 1993 began a public comment period on the scope of an EIS for a proposed policy which would permit acceptance through the Port of Seattle of spent nuclear fuel containing enriched uranium of U.S. origin from foreign research reactors; and this EIS will evaluate the impact of such shipments on marine ports of entry, overland transportation routes and storage at its Hanford or the Idaho National Engineering Laboratory (INEL) site, until a means for permanent disposition is available; and

WHEREAS, the DOE press release of October 21, 1993 appears to suggest that it wishes to return up to 700 spent fuel elements from foreign research reactor while the EIS on the acceptance policy is being prepared; and

WHEREAS, the City Council, the Port of Seattle, and the Longshoremen's Union in Seattle continue to oppose these nuclear shipments through Seattle without adequate safeguards, procedures and risk assessments in place, in advance of any such shipments; NOW, THEREFORE,

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SEATTLE, THE MAYOR CONCURRING, THAT

337-1

Response to Comment No. 337-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Seattle or the Puget Sound area is noted. The Port of Seattle is not among the candidate ports listed in Section 2.2.1.6 of the EIS. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk of bringing spent nuclear fuel through the Puget Sound area and the Port of Tacoma is low.

COMMENTOR NO. 337: SEATTLE CITY COUNCIL (CONT'D.)

RESOLUTION

I. It is the City's position that no shipments of high level nuclear waste, from any source and to any destination requiring transport through the State of Washington, shall be moved through Seattle by land or water transportation without complete site-specific EIS's for each port and each transportation corridor involved, which conclusively establish that shipments will not pose risk to the health or safety of Seattle's residents.

II. It is the City's position that the EIS which is being prepared for the proposed policy should be as thorough and detailed as possible, addressing all potential risks to human health and the environment. The EIS should explore a range of alternatives including leaving the nuclear waste in situ until a strategy for disposal is resolved upon; having DOE take title to the material at the point of its generation, rather than when it arrives at the storage facility; using less-populated locations than the Port of Seattle for transfer from ship to land transport; and using a less congested and dangerous transportation corridor than through Seattle and over the Cascades. It should fully evaluate accidents or events which might result in breakage or leaking from the transport casks, as well as the resulting risks of harm from such leaks and the existance and availability of appropriate emergency equipment and facilities.

III. It is further the City of Seattle's position that if it is not completely satisfied with the EIS, and Seattle is chosen as a Port of Entry, the City will continue, by all means available, to oppose such a plan.

RESPONSE TO COMMENT
COMMENTOR NO. 337: SEATTLE CITY COUNCIL (CONT'D.)

Page 3
RESOLUTION

IV. This resolution shall be transmitted by the City Clerk to the Secretary of the U.S. Department of Energy and the Congressional delegation from the State of Washington.

ADOPTED by the City Council of the City of Seattle the 6th day of December, 1993, and signed by me in open session in authentication of its adoption this 6th day of December, 1993.

Gary P. Benson Jr.
President of the City Council

Filed by me this 9th day of December, 1993.

BY:
Margaret Carter
Deputy Clerk

THE MAYOR CONCURRING:

Norman B. Rice 12/8/93
Norman B. Rice, Mayor

COMMENTOR NO. 439:
TAYLOR DAVIS, MAYOR, CITY OF PITTSBURG

Civic Center • P.O. Box 1518 • Pittsburg, California 94565

OFFICE OF THE MAYOR

June 20, 1995

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585-0001

RE: DRAFT ENVIRONMENTAL IMPACT STATEMENT ON A PROPOSED NUCLEAR WEAPONS NONPROLIFERATION POLICY CONCERNING FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL

Dear Mr. Head:

The attached resolution opposing the designation of the Concord Naval Weapons Station (CNWS) as a potential Port of Entry for the subject project was passed 4-0 by the Pittsburg City Council at its meeting on June 19, 1995. In addition to the considerations identified in the resolution, the City of Pittsburg has the following comments and questions related to the Draft EIS on the proposed project.

The City appreciates the Department of Energy's effort to reduce the amount of spent nuclear fuel available globally for illicit use and as a potential environmental contaminant, and understands the foreign policy implications of the proposed project. While the City does not routinely involve itself in matters of federal foreign policy, we do have a responsibility to protect the health and safety of our community. It is within this context that the City is compelled to comment on what we perceive to be a vague and wholly inadequate analysis of the possible local environmental impacts associated with the proposed project as it affects the CNWS and the surrounding environment. These comments and questions should not be construed as an opposition to the proposed policy, but rather our strong opposition to the consideration of the CNWS as a proposed Port of Entry

We were surprised to learn about the proposed project through published news reports in the local newspaper, and would have preferred to receive some sort of advanced notification from the Department of Energy. As a local jurisdiction located within 10-miles of the CNWS, we believe that it would have been entirely appropriate to provide Pittsburg and other affected public agencies with an Administrative Draft of the subject document for advance review

439-1

California Healthy Cities Project
National Center for Public Productivity Exemplary Award - 1993

City of New Horizons

RESPONSE TO COMMENT
COMMENTOR NO. 439:
TAYLOR DAVIS, MAYOR, CITY OF PITTSBURG

Response to Comment No. 439-1

DOE acted in full compliance with NEPA by publishing in the Federal Register an Advance Notice of Proposed Rulemaking (ANPR), which announced DOE's intention to conduct scoping meetings related to the proposed policy of managing foreign research reactor spent nuclear fuel. The ANPR constitutes DOE notice, under NEPA, that a major federal action is being proposed. Further notice of the proposed policy came with the publication in the Federal Register (60 FR 19899, April 21, 1995) of the availability of the draft EIS and the notification of the public hearings on the draft EIS. In addition, advertisements of the public hearings were placed in local papers prior to their occurrence.

COMMENTOR NO. 439:
TAYLOR DAVIS, MAYOR, CITY OF PITTSBURG (CONT'D.)

Mr. Charles Head; EIS Letter
June 20, 1995
Page Two

and comment. Had this occurred, there may have been time to identify and correct the errors (i.e., San Suison Bay [sic], draft EIS, page 3-26) and technical omissions that are inherent in the Draft EIS. 439-1 (Cont'd.)

When coupled with the magnitude of the proposed project, the review period that the public and local agencies were given to comment on the Draft EIS appears insufficient. This issue is compounded by the revelation that the CNWS was an apparent "last minute" substitution for the Port of Oakland as a proposed Port of Entry. In addition, considerable local and regional attention has been focused on this project, as indicated in part by the approximately 235 citizens that attended the DOE's public information meeting hearing held in the City of Concord on May 22, 1995. In light of these factors, we ask that the DOE extend the comment period for the Draft EIS and consider holding at least one additional public meeting within the area. 439-2

While we understand that the Department perceives the timeline for completion of the EIS to be relatively short, time constraints should not be a justification for flawed and incomplete environmental review. If the project's time constraints do not allow for an extended comment period, or an adequate response to the issues raised by Pittsburg, other jurisdictions, and the public, we would appreciate DOE considering the preparation of a subsequent EIS detailing the potential impacts specific to the Concord region and greater Bay Area should the CNWS be selected as an ultimate Port of Entry.

Although we believe that, to date, the environmental review process for this project has been flawed – at least on the regional level – we are nevertheless in receipt of the Draft EIS and appreciate the opportunity to offer the following comments and questions.

I. Selection of CNWS As A Potential Port of Entry

1) During the May 22, 1995, public hearing held in Concord, DOE staff stated that every port in the country was evaluated as a potential Port of Entry for the proposed project using established criteria, and that this process resulted in the selection of the 10 ports identified in the subject document. Unfortunately, this analysis is absent in the Draft EIS. Please include a complete copy of this evaluation as an appendix to the Final EIS for the proposed project in order to clarify the ultimate selection of the CNWS as a potential Port of Entry. 439-3

In addition to providing a copy of the evaluation, please separately detail the reasons why the Concord site was selected over other military ports located on the West Coast such as those located in the Los Angeles area and in the state of Washington. 439-4

RESPONSE TO COMMENT
COMMENTOR NO. 439:
TAYLOR DAVIS, MAYOR, CITY OF PITTSBURG (CONT'D.)

Response to Comment No. 439-2

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 days total) to be sufficient for public comment. A total of seventeen public hearings, were held on the draft EIS in the locations determined most likely to be directly affected by the EIS alternatives, specifically in the ports of entry and at the potential management sites. In addition to accepting comments from the public during these hearings, written comments were also welcomed, and encouraged. DOE considers that these actions have provided ample opportunity for the public to comment on the draft EIS.

Response to Comment No. 439-3

Concord was one of 161 ports (153 commercial and eight military ports) considered. These ports were evaluated against selection criteria, resulting in 10 ports that met all of the criteria. Appendix D, Sections D.1.8 and D.1.9 present a detailed discussion of the process and results.

Response to Comment No. 439-4

As recommended by the Military Traffic Management Command, a total of eight military ports were evaluated as candidates given their experience with dry containerized cargoes. From the eight military ports and 153 candidate commercial ports, Concord NWS was one of ten ports that has been determined to be acceptable to receive the foreign research reactor spent nuclear fuel, if the material is to be accepted by the United States. In addition to Concord NWS, other West Coast military ports, located in Oakland, CA and Port Hueneme, CA, were considered but found to be unacceptable. The Port Hueneme facility was determined to have inappropriate experience with transshipping containerized dry cargoes (Appendix D, Section D.1.9.1 of the EIS), while the Oakland facility did not meet the criterion for low population (Section D.1.9.5). Appendix D, Sections D.1.8 and D.1.9 present a detailed discussion of the process and results.

COMMENTOR NO. 439:
TAYLOR DAVIS, MAYOR, CITY OF PITTSBURG (CONT'D.)

Mr. Charles Head; EIS Letter
June 20, 1995
Page Three

2) During the May 22, 1995, public meeting in Concord, DOE staff revealed that the proposed storage sites for the spent nuclear fuel had been the subject of a previous EIS (SNF & INEL Programmatic EIS). Did this EIS analyze the potential Ports of Entry and possible transportation routes that would be used to transport the spent fuel to these storage sites? If not, why? And if so, why were the jurisdictions surrounding the possible Ports of Entry and potential transportation routes not provided with a draft copy of this previous EIS? *439-5*

3) DOE staff has consistently stressed that the project poses no threat to the public health and safety, yet the City has repeatedly heard that the CNWS supplanted the Port of Oakland as a potential Port of Entry due to the region's relatively lower population density. Please address this issue, and in doing so, please specify the reasons for the apparent late selection of the CNWS as a possible Port of Entry. Likewise, please clarify the apparent contradiction between DOE statements that the CNWS was selected (over Oakland) because of lower population density and DOE statements that the CNWS was selected to satisfy the need for the possible use of a military port on the West Coast. *439-6*

II. Reliance on Local Agency Support

1) In the event of an accident, DOE has indicated that local emergency service agencies would provide the initial response. Yet, the Draft EIS does not indicate whether or not the DOE has contacted the agencies listed below, or assessed their capability to respond to a worse case scenario involving the proposed project. Nor does the Draft EIS identify what sort of advance coordination will occur between these agencies and the DOE, or what training (and funding) will be provided to these agencies if necessary. The Final EIS should address the issues stated above for each of the following agencies: Contra Costa Emergency Services, Contra Costa Consolidated Fire District, County Sheriff's Department, Concord Police Department, Pittsburg Police Department, Antioch Police Department, Martinez Police Department, Mt. Diablo Hospital, John Muir Hospital, Kaiser Hospitals, and local ambulance companies. *439-7*

2) In the past, the CNWS has been the site of numerous, large scale protests and demonstrations. Should the CNWS be selected as an actual Port of Entry, it seems reasonable to expect that similar protests and demonstrations may occur. What resources will DOE be capable of providing in the event of civil unrest? Do procedures for handling potential protests involve local agencies such as police and fire departments? If so, have their capabilities to provide assistance been addressed? What sort of advanced coordination will occur between the DOE and these agencies? *439-8*

RESPONSE TO COMMENT
COMMENTOR NO. 439:
TAYLOR DAVIS, MAYOR, CITY OF PITTSBURG (CONT'D.)

Response to Comment No. 439-5

The programmatic document addresses interim management for the overall spent nuclear fuel inventory including domestic and foreign research reactor spent nuclear fuel. As a programmatic document, it does not include port evaluation or port selection for the acceptance of spent nuclear fuel from foreign research reactors since no decisions relating to potential ports of entry were to be made pursuant to the programmatic document. Port evaluation and selection for foreign research reactor spent nuclear fuel is discussed in detail in Appendix D of this EIS.

Response to Comment No. 439-6

DOE's analyses indicate that the risks associated with receipt of foreign research reactor spent nuclear fuel, even through the most heavily populated ports in the United States, would be low (Section 4.2.2.3 of the EIS). Nevertheless, in the National Defense Authorization Act for the Fiscal Year 1994, Congress indicated that low port population should be a criterion for use in port selection, where economically feasible (Appendix D, Section D.1.6 of the EIS). Please note that even the National Defense Authorization Act for Fiscal Year 1994 did not make low port population an absolute requirement. Oakland was discussed as a possible port of entry during the scoping process for this EIS. However, as a result of the National Defense Authorization Act for Fiscal Year 1994 requirement, which was established after the scoping process for this EIS had been completed, DOE included population density as one of the factors to be considered in selecting ports of entry. This change in the port selection criteria after completion of scoping resulted in Oakland being screened out.

Concord NWS was identified for consideration at the same time as all the other potential ports of entry discussed in the draft EIS, as a result of the detailed evaluation of available ports that was accomplished for the EIS and documented in Appendix D. This port evaluation process resulted in the addition of three other potential ports of entry that had also not been identified at the time scoping was conducted, namely Galveston, TX; Jacksonville, FL; and Wilmington, NC.

All of the criteria that resulted in selection of Concord NWS as a potential port of entry are specified in Appendix D. The location of this port on the West Coast is certainly a desirable characteristic, but is not specified in the criteria and was not a factor in its selection.

Response to Comment No. 439-7

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used

COMMENTOR NO. 439:
TAYLOR DAVIS, MAYOR, CITY OF PITTSBURG (CONT'D.)

Mr. Charles Head; EIS Letter
June 20, 1995
Page Four

III. Accident Potential

1) The possibility of a worst case scenario accident occurring is downplayed in the Draft EIS. However, this analysis seems to be based on DOE's previous experience in transporting spent nuclear fuel casks, which we understand has occurred less than 400 times during the past 40 years. Does the DOE's rather limited experience in cask transportation provide sufficient statistical data to support the risk analysis contained in the Draft EIS? — 439-9

2) The EIS does not address the potential consequences of shipboard fires or other heat/explosion-based incidents. In light of the number of petroleum and chemical industries concentrated in the region, this omission causes considerable concern and should be addressed in the Final EIS. — 439-10

3) The Draft EIS does not identify known earthquake faults that are located in the Concord-area, nor does the risk assessment analyze potential impacts associated with seismic activity on these faults. — 439-11

4) The EIS needs to address potential impacts to the area's waterways, including: the San Francisco Bay, the Sacramento-San Joaquin River Delta, the Contra Costa Water District, the Contra Costa Canal, and the Mokelumne Aqueduct. — 439-12

5) In the event of an accident, including a worst case scenario event, what resources will the federal government provide local jurisdictions and residents to compensate for both short and long-term impacts, including but not limited to those involving health, property, and economic vitality? — 439-13

6) In the event of a major incident, what public notification mechanisms and emergency warning systems will be used to alert the public of the potential danger? Is any sort of public education and information campaign planned to educate the public as to what safety precautions should be undertaken in the event of a worse case scenario incident?

IV. Transportation Routes

1) Please include copies of all pertinent Department of Transportation regulations pertaining to the transport of cask-sized loads (ranging from 25 to 125 tons) over roads, highways, and railroads. In addition, please discuss how the proposed project will comply with these regulations. — 439-14

RESPONSE TO COMMENT
COMMENTOR NO. 439:
TAYLOR DAVIS, MAYOR, CITY OF PITTSBURG (CONT'D.)

in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Response to Comment No. 439-8

Dealing with demonstrations is the responsibility of the local and State governments, as well as the military if such demonstrations occur on military bases. However, if the demonstrations were the result of the receipt of foreign research reactor spent nuclear fuel, DOE would support local, State, or military organizations in dealing with demonstrations.

See also the 2nd paragraph to the response to Comment 439-7, above.

Response to Comment No. 439-9

The analyses that were performed to evaluate the impact of various accidents divided all plausible accidents into six categories (Appendix D, Section D.5.3.1.1 of the EIS). The most severe accident category, release category 6, assumes that the ship carrying the foreign research reactor spent nuclear fuel transportation cask is in a collision with a tanker and that a fire occurs that engulfs the damaged transportation cask. The consequences of accidents, including category six accidents (the worst case scenario), are discussed in Appendix D, Section D.5.4.2.2. The probability associated with these accidents were developed by using statistical data on collisions obtained from Lloyd's Maritime Information Services, Inc. and are not dependent on previous experience shipping transportation casks containing spent nuclear fuel.

Response to Comment No. 439-10

Sections 4.2.1 and 4.2.2 of the EIS provide an evaluation of consequences and risks of on-board ship fires. Supporting details are given in Appendix D. If a policy to accept foreign research reactor spent nuclear fuel is adopted, spent nuclear fuel elements would

COMMENTOR NO. 439: TAYLOR DAVIS, MAYOR, CITY OF PITTSBURG (CONT'D.)

Mr. Charles Head; EIS Letter
June 20, 1995
Page Five

2) While the Draft EIS does identify major highways and railroads that may be used in the transport of spent nuclear fuel, potential local roads and arterials that could be used to transport the casks are not identified. In order to properly analyze the impacts to these local transportation routes, each possible route needs to identified, and analyzed with regard to weight capacities and possible traffic impacts. This analysis should include a discussion of local bridge capacities and possible effects on local infrastructure systems, as well as proposed mitigations measures.

439-15

3) The Draft EIS does not analyze potential traffic impacts along major arterials and highway systems. It seems likely that the transport of even one, 125-ton cask over one of the region's highways will create major traffic congestion. How will such impacts be mitigated? Will casks only be transported during non-peak hours? If so, please reconcile such a mitigation measure with DOE statements that casks would remain at the CNWS no longer than four-hours after they arrive. If casks are stored in excess of four hours at the CNWS, this would appear to a be a significant change in the project description which may necessitate recirculation of the Draft EIS.

V. Environmental Justice Analysis

1) The conclusion of the Environmental Justice Analysis contained in Appendix A of the Draft EIS appears to rely on the assumption that the DOE does not expect a major incident to occur, rather than being based on the potential impacts associated with a worse case scenario event. Please revise the Environmental Justice Analysis to reflect the proposed project's potential to disproportionatly affect minority and low income populations (including the City of Pittsburg) in the event of a worse case scenario event pursuant to Executive Order 12898.

439-16

2) Appendix A of the Draft EIS appears to severely underestimate the population within ten (10) miles of the project's proposed Ports of Entry by failing to analyze a full ten (10) mile radius from the sites for both its general and minority population calculations. For example, the 10-mile radius that is supposedly measured in Figure A-6 (Distribution of the Minority Population Residing within 16 km of the Port of NWS Concord, California) does not correspond to the accompanying scale. A correction of this underestimation of impact would cause the City of Pittsburg and other Contra Costa communities to be included in the sphere of special consideration for the project.

439-17

RESPONSE TO COMMENT COMMENTOR NO. 439: TAYLOR DAVIS, MAYOR, CITY OF PITTSBURG (CONT'D.)

be shipped in transportation casks which are resistant to destruction by collision and fire (Section 2.6.2 of the EIS). In the unlikely event that a cask is breached by collision and/or fire, the radiological consequences would be low and the associated risks would also be low (Section 4 of the EIS).

Response to Comment No. 439-11

Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident and thus effect the probability of such accidents, however, the number of earthquake-induced ship and road accidents is small compared to other causes.

Response to Comment No. 439-12

The analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports, bays, or waterways that the foreign research reactor spent nuclear fuel might pass through or near. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. As stated in Section 2.6.2 of the EIS, to date no spent nuclear fuel transportation cask has ever released any of its contents (radioactive material), even in actual accidents. Spent nuclear fuel transportation casks passing through Concord NWS, or any other port or waterway, cannot leak because the metal fuel is transported dry, thus it would not affect water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and emphasize the no-impact nature of these shipments on water quality.

Response to Comment No. 439-13

See response to comment 439-7 above.

Response to Comment No. 439-14

The casks that would be used to transport foreign research reactor spent nuclear fuel in the Concord area would weigh up to 25.5 metric tons (28.1 tons). (See next response.) The U.S. Department of Transportation regulations are published in 10 CFR Part 73. DOE and its shipping contractor would review and comply with all Federal and State laws and regulations involving ground transport. How to comply with these laws and regulations is an implementation detail and thus outside the scope of this EIS.

COMMENTOR NO. 439:
TAYLOR DAVIS, MAYOR, CITY OF PITTSBURG (CONT'D.)

VI. Other

1) The Draft EIS does not discuss what disposal methods will be employed to handle residual waste (i.e., gloves, coveralls, strapping, etc., which may be contaminated with trace radiation) that may be generated from handling the cargo in question. What assurances will be provided that such waste products are not disposed of at local landfills such as Keller Canyon Landfill which is prohibited from receiving radioactive wastes, and is located on the border of Pittsburg (a minority community)? Will all incidental waste be transported with the casks to the proposed storage sites?

439-18

This concludes our comments on the Draft EIS on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. However, the City reserves the right to submit additional comments should the public comment period be extended as requested above.

Thank you once again for the opportunity to comment on the draft document. We appreciate your consideration and will look forward to reviewing responses to the comments and questions raised here in the Final EIS. If you desire clarification of any of the issues that we have raised, please contact the City Manager's Office at (510) 439-4850.

Sincerely,

Taylor Davis
Mayor

cc: City Council
Michael Woods, Interim-City Manager/City Attorney

RESPONSE TO COMMENT
COMMENTOR NO. 439:
TAYLOR DAVIS, MAYOR, CITY OF PITTSBURG (CONT'D.)

Response to Comment No. 439-15

For possible local routes near Concord NWS, see the response to Comment 22-11. For restrictions on weight capacities, see the response to Comment 485-15. For possible traffic impacts, see the response to Comment 455-4. See the response to Comment 22-9 for DOE's role in emergency response and management activities. DOE expects that no radiological material would be released from the spent nuclear fuel transportation cask during a truck accident, so no mitigation measures would be necessary.

As shown in Table B-14 in Appendix B, Section B.2.2.1 of the EIS, the heaviest marine transport cask that would be involved in the proposed action weighs only 25.5 metric tons. There are spent nuclear fuel transportation casks that weigh more, but these would be used only for rail transport from one management site to another management site. These heavy casks would not be used near the Concord NWS.

The trucks would not be restricted to driving only during off-peak hours. DOE's policy is for the trucks to leave port as soon as they are ready to go in order to minimize the time in port.

Response to Comment No. 439-16

Conclusions regarding environmental justice given in Appendix A and Section 4.2 of the EIS are based on analyses of radiological and non-radiological effects of the proposed action as described in Section 4 and Appendices B through F of the EIS. These analyses include normal operations and severe accidents (See Tables 4-6 and 4-7 of the EIS). It is not feasible to define a worst case scenario because for every accident scenario, one can always imagine a scenario that is worse. Severe accidents analyzed in this EIS include breach of the cask and immersion of the contents in an intense fire. As shown in Section 4.2.2 of the EIS, acceptance of foreign research reactor spent nuclear fuel would result in no significant benefits or risks to the population, including minority and low-income populations, residing in the area surrounding Concord NWS. As a result, there are no disproportionately high and adverse effects resulting from the proposed action.

Response to Comment No. 439-17

Population data shown in Appendix A for Concord NWS were obtained using a circle of 10 miles (16 km) radius centered at the port. These population data are correct. The scale shown at the bottom of Figure A-6 (and the other figures in Appendix A) of the draft EIS was incorrect and has been corrected in final EIS. As discussed in Appendix A, demographic data for the analysis was obtained from 1990 census data published by the United States Bureau of the Census. In presenting the 1990 census data, the Census Bureau divided the City of Pittsburg into fifty-seven block groups (a block group usually contains from 250 to 550 housing units). Forty-nine of these block groups lie completely

COMMENTOR No. 439:
TAYLOR DAVIS, MAYOR, CITY OF PITTSBURG (CONT'D.)

BEFORE THE CITY COUNCIL OF THE CITY OF PITTSBURG

In The Matter Of: Resolution No. 95- 8188

Opposing the Designation of the Concord Naval Weapons Station as a Potential Port of Entry for Spent Nuclear Fuel as Described in the United States Department of Energy Environmental Impact Statement DOE/EIS-0218D

WHEREAS, the United States Department of Energy ("DOE") has proposed that the Concord Naval Weapons Station ("CNWS") be designated as a Potential Port of Entry for spent nuclear fuel as detailed in the DOE's Environmental Impact Statement ("EIS") #0218D; and

WHEREAS, this proposal calls for approximately twelve (12) arrivals a year of spent nuclear fuel from approximately forty (40) world nations for a projected thirteen (13) year period; and

WHEREAS, the City of Pittsburg understands the benefit of the Department of Energy's effort to reduce the amount of spent nuclear fuel which is available for illicit use and as an environmental contaminant; and

WHEREAS, given the City's understanding of the benefits of the project it must take a position opposing CNWS as a Potential Port of Entry due to the following considerations:

1. Approximately 6.5 million people live in the nine (9) county Bay Area and over 500,000 persons leave within a ten (10) mile radius of the Concord Naval Weapons Station.

2. The Project's EIS severely underestimated the population within ten (10) miles of all of the project's proposed Ports of Entry by analyzing a five (5) mile rather than a ten (10) mile radius from the sites for both its general and minority population calculations. A correction of this underestimation of impact would cause the City of Pittsburg, and other Contra Costa communities to be included in the sphere of special consideration for the project; and

439-19

Page One of Two

RESPONSE TO COMMENT
COMMENTOR No. 439:
TAYLOR DAVIS, MAYOR, CITY OF PITTSBURG (CONT'D.)

within 10 miles (16 km) of the port, and two of these block groups lie partly within a 10 - mile radius centered at the port. As discussed in Appendix A, populations within each block group are assumed in the analysis to be uniformly distributed throughout the geographical area of the block group. Data for Concord NWS shown in the figures and tables of Appendix A includes eighty-eight percent of the population of the City of Pittsburg according to the 1990 census data.

Response to Comment No. 439-18

No contamination of clothing or equipment from trace radiation would occur during handling of containerized foreign research reactor spent nuclear fuel in port. Appendix D, Section D.4.5 of the EIS discusses worker radiation doses resulting from off-loading a spent nuclear fuel transportation cask from a vessel; no radioactive particles are generated in this process which could cause worker contamination. Therefore, no waste disposal methods or waste storage sites would be necessary.

Response to Comment No. 439-19

See the response to Comment 439-17, above.

COMMENTOR NO. 439:
TAYLOR DAVIS, MAYOR, CITY OF PITTSBURG (CONT'D.)

3. The probability of a transportation accident involving spent nuclear fuel in the Bay Area is significantly increased by the water and ground based transportation of significant amounts of refinery and chemical industry products in the region. 439-20

4. The EIS does not adequately identify and analyze emergency response preparedness, environmental justice issues, and economic impacts related to the proposed project. 439-21

5. There has been an inadequate period of time for the communities affected by the proposal to use CNWS as a Potential Port of Entry to review potential impacts.

6. The Cities of Concord and Martinez, and the County of Contra Costa have formally taken positions opposing the designation of CNWS as a Potential Port of Entry for the Spent Fuel project.

NOW THEREFORE, BE IT RESOLVED, that the Pittsburg City Council opposes the selection of the Concord Naval Weapons Station as a Potential Port of Entry of spent nuclear fuel due to the proximity of major population centers and the potential for a transportation accident which could impact the City of Pittsburg and other local communities. This resolution requests that the proposal review for this project be extended and directs City staff to prepare comments on DOE/EIS-0218D which detail the City's concerns. 439-22

PASSED AND ADOPTED, by the City Council of the City of Pittsburg, at a regular meeting duly held thereof, on the 19th day of June, 1995 by the following vote:

AYES:

NAYS:

ABSENT:

ABSTAINED:

_____
Taylor Davis, Mayor

ATTEST:

_____
Lillian J. Pride, City Clerk

RESPONSE TO COMMENT
COMMENTOR NO. 439:
TAYLOR DAVIS, MAYOR, CITY OF PITTSBURG (CONT'D.)

Response to Comment No. 439-20

The methodology for determining the probability of a transportation accident in port is discussed in Appendix D and Section 4.2.2.3 of the EIS and the probability was found to be low. The probability of a ground transport accident is discussed in Appendix E and Section 4.2.3.3 of the EIS and it was also found to be low.

Response to Comment No. 439-21

Section 2.7 of the EIS describes in general, the emergency preparedness issues associated with the transportation of foreign research reactor spent nuclear fuel through the proposed ports and along the ground transportation routes. Details of the process would be included in the Transportation Plan that would be prepared for any individual spent nuclear fuel shipment and coordinated with State and local officials. Environmental justice issues are included in Appendix A of the EIS. The cost associated with the proposed policy, under all management alternatives, is detailed in Section 4.9.

See also the 2nd paragraph to the response to Comment 439-7, above.

Response to Comment No. 439-22

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low. Not only is the risk low, but the analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 2nd Appendix D, Section D.5 of the EIS). Regarding the commentor's concern about the population of the area, the port selection process that determined that Concord NWS was an acceptable port considered the population of the port and surrounding areas. Appendix D, Section D.1.9.5 of the EIS presents an explanation of the population criterion.

COMMENTOR NO. 440:
GREATER CONCORD CHAMBER OF COMMERCE

The Chamber
Greater Concord Chamber of Commerce
Contra Costa's Leading Business Association

Fax: 202-586-5256
June 16, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

Dear Mr. Head:

RE: Draft EIS for Transfer Facility for Foreign Research Reactor Spent Nuclear Fuel Rods

The Greater Concord Chamber of Commerce opposes the use of the Concord Naval Weapons Station port as a transfer facility for foreign research reactor spent nuclear fuel rods.

The Chamber sides with concerns and issues raised by the City of Concord, other cities within Contra Costa County and the Contra Costa Board of Supervisors. We agree that there are too many unanswered questions, i.e., particular hazards in this area which might increase risk of accidents, such as earthquake faults; the port's capacity or equipment to off-load spent nuclear fuel rods; additional public personnel or military personnel needed to secure the port area and temporary storage area; additional role placed on City, County and State law enforcement agencies; and what to do if an accident resulted in health hazards, contaminated water supply, closed major roads and caused localized panic.

440-1

Because the three western storage sites (Hanford, Washington, Idaho National Engineering Laboratory and the Nevada Test Site near Las Vegas) are far away and not easily reached from Concord due to significant amounts of traffic and road closures due to snow storms, the Chamber feels assurances of error and fail-safe procedures are not possible.

While the Chamber recognizes the Concord Naval Weapons Station as a good neighbor and long-standing and contributing member of the Chamber of Commerce and the greater Concord community, the Naval Weapons Station port is situated in a well-populated and very seismically active area, not an appropriate site through which nuclear waste should be shipped.

We trust the D.O.E. will hear the testified reasoning offered here and not move forward with a federal government plan to ship nuclear waste through the Concord Naval Weapons Station.

Sincerely,

Larry Azevedo
President

cc: City of Concord, Board of Supervisors, Senators Diane Feinstein and Barbara Boxer, Congressmen George Miller and Bill Baker, Secretary of the Navy, Captain Roger B. Lanning

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RESPONSE TO COMMENT
COMMENTOR NO. 440:
GREATER CONCORD CHAMBER OF COMMERCE

Response to Comment No. 440-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to Concord NWS, or to any of the ports analyzed in the EIS, is low.

With respect to the commentor's question regarding increased risk of accidents due to local hazards such as earthquakes, see the response to Comment 22-7 for a discussion of this topic.

The commentor questions Concord NWS's capacity or equipment to off-load spent nuclear fuel, see the response to Comment 22-2 for a discussion of this topic.

The security provided for the spent nuclear fuel shipments is required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. The security provisions are summarized in the new Appendix H that has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit.

In response to emergencies involving foreign research reactor spent nuclear fuel, see the response to Comment 22-6 for a discussion of this topic.

In response to the commentor's concern over shipment from Concord to the management site(s), the EIS evaluates the access to intermodal transportation and distance from the port to the management site in selecting ports of entry for the foreign research reactor spent nuclear fuel. Appendix D, Section D.1.9 presents details of the port selection process. The EIS accident risk assessment uses route-specific information to assess the consequences of accidents during overland transportation. Appendix E, Section E.5.2 discusses the accident assessment methodology for overland transportation. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.3.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel transportation casks are also low (Section 4.2.3.2).

COMMENTOR NO. 455: CITY OF ANTIOCH

ANTIOCH CA 94509
CITY HALL THIRD AND H PO 130

(510) 779-7035

June 16, 1995

United States Department of Energy
Office of Environmental Management
Attn: Mr. Charles Head
1000 Independence Avenue, S.W.
Washington, DC 20585-0001

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS) ON A PROPOSED NUCLEAR WEAPONS NONPROLIFERATION POLICY CONCERNING FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL (DOE/EIS-0218d)

Dear Mr. Head:

Thank you for forwarding a copy of the above document for our review. While the need to properly manage the spent nuclear fuel elements received from foreign reactors is appreciated, we are concerned that the Draft EIS does not truly analyze the potential impacts of nuclear waste transport through the San Francisco Bay Area. It is also apparent that NWS Concord is not the optimal port-of-entry for these materials due to evidence cited in the Draft EIS. The following are our comments on this document:

1. Pages D-11 to D-13 of Volume 2 - One of the criterion for port selection is a favorable ship transit route from the open ocean to the dock. Although the route to NWS Concord is listed as "favorable" in Table D-4, the last paragraph on Page D-11 states that "[l]ess desirable were ports that could only be reached by traversing long, narrow and/or winding or crowded ship channels...[such as] the combined long transit from San Francisco Bay through two small bays connected by the narrow Strait of Carquinez, and a narrow ship channel on the San Joaquin River to Stockton, CA."

   Although a trip to NWS Concord would not include the latter passage via the "narrow ship channel" to Stockton, it would nonetheless be a circuitous one and not fit the cited definition of "favorable". Furthermore, the San Francisco Bay Area is a heavily populated metropolitan area and the shipment of spent nuclear fuel elements through such a region is

455-1

RESPONSE TO COMMENT
COMMENTOR NO. 455: CITY OF ANTIOCH

Response to Comment No. 455-1

The physical constraints of the passage from San Francisco Bay to Concord NWS were considered as part of the port selection process. The passage does meet the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2). As discussed in Appendix D, Section D.1.9 of the EIS, other considerations such as port population, population along the route to the management site, port experience with handling containers, and port facilities have also been considered in making the final selection of ports of entry. Regarding the commentor's concern about the population of the San Francisco Bay area, the port selection process that determined that Concord NWS was an acceptable port considered the population of the port and surrounding areas. Appendix D, Section D.1.9.5 of the EIS provides an explanation of the population criterion.

COMMENTOR NO. 455: CITY OF ANTIOCH (CONT'D.)

questionable. The inclusion of NWS Concord as a potential port-of-entry therefore is inappropriate.

2. Page D-34 of Volume 2 - Table D-6 lists NWS Concord as a site which has no relative usefulness to SRS or to foreign research reactor spent nuclear fuel shippers. Why then is it still under consideration as a potential port of entry? 455-2

3. Pages D-36 and D-38 of Volume 2 - NWS Concord is listed as having serious environmental concerns (i.e. the presence of wetlands and Tule Elk near the port). It is also within an area of high seismic activity. These critical concerns do not receive adequate analysis in the Draft EIS. 455-3

4. The overall consequences of truck or rail transport accidents on local communities are not adequately analyzed in the Draft EIS. No mention is made of the impacts that such an event would have on area traffic conditions, local public safety resources, or the communities' physical and social environments. We are greatly concerned that in this present time of limited financial resources, such an event would overly stress our ability to provide an emergency response and to otherwise recover from a transport accident. 455-4

In closing, we maintain that the Draft EIS does not completely assess the impacts of the proposal on local communities that would be affected by the proposal. Furthermore, we maintain that NWS Concord would not be a viable port-of-entry for the project and should be removed from the list of candidate ports.

I thank you for your attention and if you should like to discuss this matter further, please feel free to contact me at (510) 779-7035.

Sincerely,

Victor Carniglia
Deputy Director

VC/rb

cc: City Councilmembers
City Planning Commissioners
David Rowlands, City Manager
William Galstan, City Attorney
Senator Barbara Boxer
Senator Dianne Feinstein
Representative Bill Baker

RESPONSE TO COMMENT
COMMENTOR NO. 455: CITY OF ANTIOCH (CONT'D.)

Response to Comment No. 455-2

As a part of the port selection process, the EIS examines desirable port attributes as one of the criteria used in selecting ports acceptable for the receipt and handling of foreign research reactor spent nuclear fuel. The port selection process is described in detail in Appendix D, Section D.1.9 with desirable port attributes discussed in Section D.1.9.6. Included among the desirable port attributes, DOE examined the likely usefulness of ports for shipment of foreign research reactor spent nuclear fuel to any of the five DOE management sites and the usefulness of ports for conventional shippers of foreign research reactor spent nuclear fuel. While Concord NWS was one of ten ports that has been determined to be acceptable to receive and handle foreign research reactor spent nuclear fuel, Concord NWS is not considered useful for transshipment to DOE's Savannah River Site near Aiken, SC because of the distance. Similarly, the Concord NWS is not considered useful for shipment by conventional shippers because of the military status and security requirements of the port. If foreign research reactor spent nuclear fuel is accepted into the United States, the Concord NWS would remain an acceptable port of entry for a variety of shipment options to the Idaho National Engineering Laboratory. The decision as to which port to use for each shipment would include consideration of the land route to the designated DOE management site and whether shipment were being made by conventional shipper.

Response to Comment No. 455-3

As a part of the port selection process, the EIS examines desirable port attributes as one of the criteria used in selecting ports acceptable for the receipt and handling of foreign research reactor spent nuclear fuel. The port selection process is described in detail in Appendix D, Section D.1.9 with desirable port attributes discussed in Section D.1.9.6 of the EIS. Included among the desirable port attributes, DOE examined the environmental concerns near the ports and the environmental concerns from severe natural phenomena, such as earthquakes.

Although ports are not generally environmentally sensitive areas within the context of NEPA, the EIS identifies the presence of wetlands and Tule Elk near Concord NWS as an environmental concern. If foreign research reactor spent nuclear fuel is accepted into the United States, environmental concerns may be considered in the decision as to which port to use for each shipment of foreign research reactor spent nuclear fuel. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk to humans as well as wildlife associated with bringing spent nuclear fuel to Concord NWS, or to any of the ports analyzed in the EIS, is low.

The risk of releasing radioactive material from a spent nuclear fuel transportation cask as the result of a seismic event is low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the transportation cask. Further, the analyses of impacts associated with accidents involving foreign research reactor spent nuclear fuel presented in Section 4.2.2.3 demonstrates that the use of any of the selected ports would not pose any significant risk to the port personnel or the population near the ports.

Response to Comment No. 455-4

The addition of up to 186 truck shipments to the routes near Concord spread out over a period of 13 years would have an insignificant impact on the traffic congestion or the traffic accident rate because tens of thousands of truck shipments will travel the same roads during those 13 years. As discussed in Appendix E and Section 4.2.3.3 of the EIS, the potential for fatal traffic accidents caused by the proposed action would be very low.

See the response to Comment 22-9 for DOE's role in emergency response and management activities, which would include assistance to local public safety authorities. Based on over 40 years of experience, DOE expects that no radioactive material would be released from the spent nuclear fuel transportation cask during a truck accident, so there would be no radiological damage to the community's physical and social environment.

COMMENTOR NO. 456:
BEN TARVER, MAYOR, CITY OF PLEASANTON

CITY OF PLEASANTON

OFFICE OF THE MAYOR
BEN C. TARVER

June 12, 1995

Charles Head
Program Manager
Office of Spent Nuclear Fuel Management
U.S. Department of Energy
1000 Independence Avenue
Washington D.C. 20585-0001

Re: Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head,

The City of Pleasanton requests that the Department of Energy extend the public notice and comment period on the Department's Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel for not less than 90 additional days, to September 20, 1995. This extension is necessary to permit our Planning Department, Staff, and City Council a full opportunity to evaluate the impacts associated with DOE's proposal to ship spent nuclear fuel from foreign reactors through the Concord Naval Weapons Station and along the California highways and rails to various sites across the United States. We further request that DOE conduct one or more additional hearings to provide affected communities the opportunity to provide input on the proposed action. *456-1*

Since any community along a major highway route leading from the Bay Area is potentially affected by the proposed action, we believe that DOE should provide more extensive notice and opportunity to comment through hearings and written comments. Although two major interstate highways (580 & 680) intersect in Pleasanton, we did not receive any formal notice of the EIS.

The shipment of spent nuclear fuel rods presents health and safety concerns to local communities, and potentially imposes additional costs to emergency planning and services departments. For this reason, we request that DOE establish a representative working group to assist potentially affected cities, counties, and local agencies involved in emergency services in evaluating and anticipating the proposed federal action. *456-2*

123 MAIN STREET • P.O. BOX 520 • PLEASANTON, CA 94566-0802 • (510) 484-8001 • FAX (510) 484-8236

RESPONSE TO COMMENT
COMMENTOR NO. 456:
BEN TARVER, MAYOR, CITY OF PLEASANTON

Response to Comment No. 456-1

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 days total) to be sufficient for public comments. It would not be feasible, nor is it required by NEPA, to conduct public hearings in every community along potential transportation routes for the foreign research reactor spent nuclear fuel. As such, seventeen public hearings were held on the draft EIS in the locations determined most likely to be directly affected by the EIS alternatives, specifically in the ports of entry and at the potential management sites. In addition to accepting comments from the public during these hearings, written comments were also welcomed, and encouraged. DOE considers that these actions have provided ample opportunity for the public to comment on the draft EIS.

Response to Comment No. 456-2

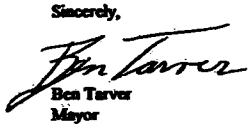
As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Commentor No. 456:
Ben Tarver, Mayor, City of Pleasanton (Cont'd.)

Thank you for your consideration.

Sincerely,



Ben Tarver
Mayor

cc: Senators Feinstein and Boxer
Representative Bill Baker
City Council
City of Concord
City of Martinez

Response to Comment
Commentor No. 456:
Ben Tarver, Mayor, City of Pleasanton (Cont'd.)

COMMENTOR NO. 459: THE CHAMBER OF EASTERN PIERCE COUNTY

The Chamber of Eastern Pierce County
322 - 2nd St. S.W. • P.O. Box 1298 • Puyallup, WA 98371 • (206) 845-6755 • FAX (206) 848-6164
1-800-634-2334

June 13, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Mngmt.
US Department of Energy
1000 Independence Ave., SW
Washington, DC 20585

Dear Mr. Head:

The Chamber of Eastern Pierce County opposes the importation of spent nuclear fuel through the Port of Tacoma, as not in the best interest of the region or this community. Social, safety and economic impacts must be weighed by the U.S. Department of Energy. 459-1

The following liabilities are of concern to any operation at the Port of Tacoma. The ILWU Local #23 has declared they will not handle this cargo. As these shipments will come by regular commercial carrier, other cargo will be affected. Potentially, cargos of adjacent berthed ships might be impacted, thereby hampering the movement of commercial cargos.

Almost all civilian commerce of nuclear materials is anonymous, which greatly increases its security. However, the result of this environmental impact statement's conclusion will identify the trans-shipment point for nuclear materials, thereby compromising security and may attract the attention of terrorist groups. 459-2

There are no provisions or funding for safety planning or training or exercises for local respondents or adjacent worksites or populations. 459-3

People's unreasoning fears associated with nuclear energy is expected to produce a stigma for whichever port's community is announced as the trans-shipment point. Pierce County has had it's share of unreasoned fears.

The Chamber of Eastern Pierce County would like to see the Port of Tacoma removed from the Department of Energy's list of potential sites for shipments of spent nuclear fuel.

Sincerely,

Gerry Moody

Gerry Moody, President
The Chamber of Eastern Pierce County

CC State and Federal Representatives
Port of Tacoma Commissioners

RESPONSE TO COMMENT COMMENTOR NO. 459: THE CHAMBER OF EASTERN PIERCE COUNTY

Response to Comment No. 459-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted.

Candidate ports were chosen from among commercial and military ports along the eastern seaboard, western seaboard, and the Gulf of Mexico. The selection process is described in Appendix D, Section D.1 of the EIS. No significant human health, safety, or environmental risks were found to exist at any of the candidate commercial or military ports selected (Section 4.2.2 of the EIS). Spent nuclear fuel from foreign research reactors is shipped in standard containers, and does not require special handling techniques (Section 2.6.3.2.2 of the EIS). The security provided for the spent nuclear fuel shipments is required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

The possibility of a longshoremen strike was not considered in the ports selection process (Appendix D, Section D.1.9 of the EIS) since that factor does not impact on the capability to safely receive containers carrying foreign research reactor spent nuclear fuel. The decision as to which port or ports would be used, in the case that foreign research reactor spent nuclear fuel is accepted by the United States, will be made in the Record of Decision. In either case, the possibility of strikes is one of the many factors that must be considered in determining which ports to use.

Response to Comment No. 459-2

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk of such actions. Security would be provided for all shipments of foreign research reactor spent nuclear fuel, as required by the Code of Federal Regulations (10 CFR Part 73). The security provisions are summarized in the new Appendix H that has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit.

Response to Comment No. 459-3

DOE considers that there is adequate regulatory and emergency preparedness infrastructure to ensure the safe acceptance and transport to designated management sites if the foreign research reactor spent nuclear fuel is managed in the United States. Federal funding to State, Tribal, and local governments for maintaining emergency response programs is

Commentor No. 459:
The Chamber of Eastern Pierce County (Cont'd.)

Response to Comment
Commentor No. 459:
The Chamber of Eastern Pierce County (Cont'd.)

discussed in Section 2.7.1. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advise and assistance to the State, Tribal and local agencies involved with a radiological incident. Emergency preparedness, security, and coordination of DOE with local emergency response authorities, and security are discussed in general in Sections 2.7 and 2.8 of the EIS. Details would be contained in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H of the EIS.

COMMENTOR No. 472:
GLORIA O.WEBB, MAYOR, CITY OF PORTSMOUTH

City of Portsmouth, Virginia

Office of the Mayor

P. O. Box 828

Established 1752 Portsmouth, Virginia 23705-0828 (804)-393-8745

June 16, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Mr. Head:

Thank you for the opportunity to again comment on the Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. The Draft Environmental Impact Statement issued in March of this year answers many of the questions raised in my letter to John J. Jicha, Jr. of November 23, 1993.

Specifically, Management Alternative 1 proposes that D.O.E. take title to this material when the fuel enters U.S. territorial waters. Other options listed include much later time frames. We support the earliest time possible, but in no case should D.O.E. not have title when the material enters our ports. Additionally, Alternative 1 references the Savannah River Site or INEL as the only available sites with storage capacity for the 10 years of this plan. Given the current court injunction, Idaho would appear to be unavailable. It remains of concern to us what would happen if material were taken into our ports and the only available storage site, Savannah River were also made unavailable. 472-1 472-2

The Draft E.I.S. provides more information on the safety and transportation standards to be followed. If Hampton Roads is included as a port of entry we wish to be given advance notice of any shipments. 472-3

The listing of potential ports has been modified from the original six referenced in the November, 1993 Fact Sheet. Five possible ports of entry have been added and two localities have been deleted from the list. The deletions of 472-4

RESPONSE TO COMMENT
COMMENTOR No. 472:
GLORIA O.WEBB, MAYOR, CITY OF PORTSMOUTH

Response to Comment No. 472-1

The commentor's support for taking title of the foreign research reactor spent nuclear fuel as early on its route as possible and not later than its entry into U.S. territorial waters is noted. The options associated with taking title are described in Sections 2.2.1 and 2.2.2.4 of the EIS.

Response to Comment No. 472-2

It is expected that the availability of the site(s) where the foreign research reactor spent nuclear fuel would be managed would be cleared prior to the unloading of the spent nuclear fuel in any of the proposed ports. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

Response to Comment No. 472-3

DOE is required to inform the Governor of each State and any Tribal chair,or their designee, along a transportation route at least seven days in advance of the shipment of hazardous cargos, including radioactive materials. It would be the responsibility of the Governor to provide any further notification to State and local officials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Response to Comment No. 472-4

Appendix D, Section D.1.9 of the EIS provides details on the evaluation criteria used to identify candidate ports for potential receipt of foreign research reactor spent nuclear

COMMENTOR NO. 472:
GLORIA O.WEBB, MAYOR, CITY OF PORTSMOUTH (CONT'D.)

Mr. Charles Head
June 16, 1995
page 2

Seattle, Washington and Oakland, California may be reflective of D.O.E.'s desire to avoid large population centers. We contend that this criteria should also preclude further consideration of Hampton Roads as a port of entry.

472-4 (Cont'd.)

Hampton Roads is a community of over one million people. We believe D.O.E. should give strong consideration to the use of ports located in areas of lower population density. We appreciate D.O.E. adding such ports to the Draft E.I.S. and request that in the final E.I.S. this matter be given even more emphasis.

Thank you again for the opportunity to comment on this Draft Environmental Impact Statement.

Sincerely,

Gloria O. Webb
Mayor

GOW:tmr

cc: V. Wayne Orton, City Manager
Members of Council
Marilee A. Hawkins

RESPONSE TO COMMENT
COMMENTOR NO. 472:
GLORIA O.WEBB, MAYOR, CITY OF PORTSMOUTH (CONT'D.)

fuel. One of the criteria is population of the port and along the route to the management sites, and is described in detail in Appendix D, Section D.1.9.5 of the EIS. After applying all of the evaluation criteria, the Port of Hampton Roads was identified as a potential port of entry, but the Port of Oakland and the Port of Seattle were excluded.

The port selection process and results presented in Appendix D, Sections D.1.8 and D.1.9 of the EIS, only indicate ports that are acceptable for the receipt and handling of foreign research reactor spent nuclear fuel, not which port(s) is best.

COMMENTOR NO. 474:
PETER MURRAY, MAYOR, CITY OF PINOLE

Pinole California

2131 Pear Street Pinole, CA 94564 (510) 724-9000

June 15, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue
Washington, D.C. 20585-0001

RE: DRAFT ENVIRONMENTAL IMPACT STATEMENT ON A PROPOSED NUCLEAR WEAPONS NONPROLIFERATION POLICY CONCERNING FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL

Dear Mr. Head:

As Mayor of the City of Pinole, I formally request that the United States Department of Energy (DOE) extend the period for public notice and comment for not less than ninety (90) additional days to September 20, 1995. This extension is necessary to permit our Planning Department, staff and Council a full opportunity to evaluate the impacts associated with DOE's proposal to ship spent nuclear fuel from foreign reactors through the Concord Naval Weapons Station (NWS) and along California highways and rails to various sites across the United States. Ordinarily, actions of this magnitude require months of planning study before any local agency or government is prepared to make a decision to approve or disapprove such a proposal. 474-1

I further request that DOE conduct one or more additional hearings to provide affected communities the opportunity to provide input on the proposed action. Since any community along a major highway route leading from the Bay Area is potentially affected by the proposed action, I believe that more extensive notice and opportunity to comment through hearings and written comments should be provided by DOE.

The shipment of spent nuclear fuel rods presents health and safety concerns to local communities, and potentially imposes additional costs to emergency planning and services departments. For this reason, I request that DOE establish a representative working group 474-2

-1-

RESPONSE TO COMMENT
COMMENTOR NO. 474:
PETER MURRAY, MAYOR, CITY OF PINOLE

Response to Comment No. 474-1

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 days total) to be sufficient for public comments. It would not be feasible, nor is it required by NEPA, to conduct public hearings in every community along potential transportation routes for the foreign research reactor spent nuclear fuel. As such, seventeen public hearings were held on the draft EIS in the locations determined most likely to be directly affected by the EIS alternatives, specifically in the ports of entry and at the potential management sites. In addition to accepting comments from the public during these hearings, written comments were also welcomed, and encouraged. DOE considers that these actions provided ample opportunity for the public to comment on the draft EIS.

Response to Comment No. 474-2

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Commentor No. 474:
Peter Murray, Mayor, City of Pinole (Cont'd.)

CHARLES HEAD
June 15, 1995

to assist potentially affected cities, counties, and local agencies involved in emergency services in evaluating and anticipating the proposed federal action.

I look forward to your prompt response to the foregoing matters.

Sincerely,

Peter Murray
Mayor of Pinole

PM:se

-2-

Response to Comment
Commentor No. 474:
Peter Murray, Mayor, City of Pinole (Cont'd.)

COMMENTOR NO. 494:
BETH BARTKE, MAYOR, CITY OF HERCULES

CITY OF HERCULES
111 CIVIC DRIVE, HERCULES, CA 94547
PHONE: 510 • 799 • 8200

June 6, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue
Washington, D.C. 20585-0001

RE: ***Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel***

Dear Mr. Head:

On behalf of the City of Hercules, we formally request that the United States Department of Energy (DOE) extend the period for public notice and comment for not less than ninety (90) additional days to September 20, 1995. This extension is necessary to permit our Planning Department, Staff and Council a full opportunity to evaluate the impacts associated with DOE's proposal to ship spent nuclear fuel from foreign reactors through the Concord Naval Weapons Station (NWS) and along California highways and rails to various sites across the United States. Ordinarily, actions of this magnitude require months of planning study before any local agency or government is prepared to make a decision to approve or disapprove such a proposal. *494-1*

We further request that DOE conduct one or more additional hearings to provide affected communities the opportunity to provide input on the proposed action. Since any community along a major highway route leading from the Bay Area is potentially affected by the proposed action, we believe that more extensive notice and opportunity to comment through hearings and written comments should be provided by DOE.

The shipment of spent nuclear fuel rods presents health and safety concerns to local communities, and potentially imposes additional costs to emergency planning and services departments. For this reason, we request that DOE establish a representative working group to assist potentially affected cities, counties, and local agencies involved in emergency services in evaluating and anticipating the proposed federal action. *494-2*

We look forward to your prompt response to the foregoing matters.

Sincerely,

Beth Bartke

BETH BARTKE
Mayor

BB:bmb
head.ltr

cc: Hercules City Council

RESPONSE TO COMMENT
COMMENTOR NO. 494:
BETH BARTKE, MAYOR, CITY OF HERCULES

Response to Comment No. 494-1

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 days total) to be sufficient for public comments. It would not be feasible, nor is it required by NEPA, to conduct public hearings in every community along potential transportation routes for the foreign research reactor spent nuclear fuel. As such, seventeen public hearings were held on the draft EIS in the locations determined most likely to be directly affected by the EIS alternatives, specifically in the ports of entry and at the potential management sites. In addition to accepting comments from the public during these hearings, written comments were also welcomed, and encouraged. DOE considers that these actions provided ample opportunity for the public to comment on the draft EIS.

Response to Comment No. 494-2

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

COMMENTOR NO. 495:
NORMAN LA FORCE, MAYOR, CITY OF EL CERRITO

OFFICE OF THE MAYOR
(510) 215-4300

June 14, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue
Washington D.C. 20585-0001

Re: Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

As Mayor of El Cerrito, I formally request that the United States Department of Energy (DOE) extend the period for public notice and comment for the above referenced project for not less than ninety (90) additional days to September 20, 1995. This extension is necessary to permit our planning department, staff and council a full opportunity to evaluate the impacts associated with DOE's proposal to ship spent nuclear fuel from foreign reactors through the Concord Naval Weapons Station (NWS) and along California highways and rail lines to various sites across the United States. Ordinarily, actions of this magnitude require months of planing study before any local agency or government is prepared to make a decision to approve or disapprove such a proposal. 495-1

We further request that DOE conduct one or more additional hearings to provide affected communities the opportunity to provide input on the proposed action. Since any community along a major highway route leading from the Bay Area is potentially affected by the proposed action, we believe that more extensive notice and opportunity to comment through hearings and written comments should be provided by DOE.

The shipment of spent nuclear fuel rods presents health and safety concerns to local communities and potentially imposes additional costs to emergency planning and public safety services departments. For this reason, we request that DOE establish a representative working group to assist potentially affected cities, counties, and local agencies involved in emergency services in evaluating and anticipating the proposed federal action. 495-2

CITY HALL 10890 San Pablo Avenue El Cerrito, California 94530 Fax (415) 233-5401
PRINTED ON RECYCLED PAPER

RESPONSE TO COMMENT
COMMENTOR NO. 495:
NORMAN LA FORCE, MAYOR, CITY OF EL CERRITO

Response to Comment No. 495-1

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 days total) to be sufficient for public comments. It would not be feasible, nor is it required by NEPA, to conduct public hearings in every community along potential transportation routes for the foreign research reactor spent nuclear fuel. As such, seventeen public hearings were held on the draft EIS in the locations determined most likely to be directly affected by the EIS alternatives, specifically in the ports of entry and at the potential management sites. In addition to accepting comments from the public during these hearings, written comments were also welcomed, and encouraged. DOE considers that these actions provided ample opportunity for the public to comment on the draft EIS.

Response to Comment No. 495-2

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

COMMENTOR NO. 495:
NORMAN LA FORCE, MAYOR, CITY OF EL CERRITO (CONT'D.)

Charles Head, Program Manager
June 14, 1995
Page Two

Among the concerns and reasons for requesting the extension of the study and comment period are such concerns as detailed by the City of Concord in their letter of May 22 to you, and the City of Martinez in their letters of June 6 to you and to Hazel O'Leary, Director of your Department, (copies of all three enclosed). Rather than repeat these concerns, I wish, by reference, to indicate that we join in their concerns and comments and offer them as reasons why the study period should be extended until September 20, 1995.

We look forward to your prompt response to the foregoing matters.

Sincerely,

Norman La Force,
Mayor

NLF:lg

cc: City Council
City Manager

RESPONSE TO COMMENT
COMMENTOR NO. 495:
NORMAN LA FORCE, MAYOR, CITY OF EL CERRITO (CONT'D.)

COMMENTOR NO. 496:
CITY OF MARTINEZ - CITY COUNCIL

City of Martinez

525 Henrietta Street, Martinez, CA 94553-2394 (510) 372-3505
FAX: (510) 372-0257

June 6, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue
Washington, D.C. 20585-0001

Re: Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

We appreciate this opportunity to comment on the Draft EIS on the Policy On Return of Spent Nuclear Fuel. The proposed project involves federal actions and analysis which are not subject to our local decision making, but may have an impact on our community. We have attempted to address the local impacts of the proposed action and in particular that element of the preferred alternative that proposes the transport of spent nuclear fuel through the Concord Naval Weapons Station (NWS). Based on our review of the documents we have the following comments and questions:

1. The Draft EIS does not evaluate if local agencies can assume the increased burden of providing emergency response. What additional local services will be required as a consequence of the increased activity to the Concord NWS? What provisions have been made for coordination and assistance to local emergency response services for the proposed action? What economic assistance is DOE prepared to extend to assure these services are available? *496-1*

2. Will local governments and other emergency service agencies be notified of ship, rail, and truck shipments in advance? Have these agencies been notified of this and have they been provided an opportunity to comment? *496-2*

3. What secondary actions are being contemplated as a consequence of this project, i.e., road closures, etc.? *496-3*

4. Please clarify the accident analysis in the Draft EIS. In addressing local risks, did the Draft EIS consider local traffic and traffic surveys, rail and ship patterns? Did the Draft EIS review documentation of local ship accidents?

CITY COUNCIL: Michael M. Metcalf, Mayor; Harriet Hunt; Timothy J. Bailey; Julie M. Hoover; Dorothy J. Wickham — CITY MANAGER: James Abel

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RESPONSE TO COMMENT
COMMENTOR NO. 496:
CITY OF MARTINEZ - CITY COUNCIL

Response to Comment No. 496-1

DOE considers that there is adequate regulatory and emergency preparedness infrastructure to ensure the safe acceptance and transport to designated management sites if the foreign research reactor spent nuclear fuel is managed in the United States. Federal funding to State, Tribal, and local governments for maintaining emergency response programs is discussed in Section 2.7.1. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advise and assistance to the State, Tribal and local agencies involved with a radiological incident. Emergency preparedness, security, and coordination of DOE with local emergency response authorities, and security are discussed in general in Sections 2.7 and 2.8 of the EIS. Details would be contained in the Transportation Plan, to be prepared prior to the implementation of the policy. The general provisions of the Transportation Plan are included in Appendix H of the EIS.

Response to Comment No. 496-2

No secondary actions, such as road closures, would be required for the safe and uneventful transportation of foreign research reactor spent nuclear fuel.

Response to Comment No. 496-3

In response to the commentor's concern over local risks associated with the shipment from Concord NWS to the management site(s), the commentor should note that the EIS evaluates the access to intermodal transportation and distance from the port to the management site in selecting ports of entry for the foreign research reactor spent nuclear fuel. Appendix D, Section D.1.9 of the EIS presents details of the port selection process. The EIS accident risk assessment uses route-specific information to assess the consequences of accidents during overland transportation. Appendix E, Section E.5.2 of the EIS discusses the accident assessment methodology for overland transportation. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.3.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel casks are also low (Section 4.2.3.2).

The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated

COMMENTOR NO. 496:
CITY OF MARTINEZ - CITY COUNCIL (CONT'D.)

Charles Head
June 6, 1995
Page 2

5. Are there alternative risk analyses which have been conducted regarding the shipment of nuclear materials such as spent nuclear fuel? Were these considered in preparing the Draft EIS? **496-3 (Cont'd.)**

6. We are concerned that the preparation of a document covering such a large area does not address local concerns and impacts including the impacts on local street and roads, for example, routes proposed to be used may include Waterfront Road in Martinez, since it is the most direct route from the Concord NWS to the 680 Freeway. In addition, the Contra Costa Canal, which is the main water supply for much of Contra Costa County, passes through the Naval Weapons Station. How will accidents and other local impacts such as this be addressed? **496-4**

The present deadline for responses to the Draft EIS (June 20) provides insufficient time for local agencies and members of the public to respond to a federal proposal of such local significance. Normally, project proposals that are presented to our City require months of consideration and discussion before a decision is made. I request that DOE extend the comment period for at least 60 additional days (until August 20, 1995), and respond to these concerns in writing at your earliest opportunity. **496-5**

Without further analysis of safety issues specific to the immediate Bay Area communities, and a fuller opportunity to comment on the issues, the City must oppose the proposed project because of safety concerns of our residents due to the transport of hazardous materials on our freeways, rail lines and on ships throughout the City and adjacent to the City. The proposal doesn't adequately address, at this time, the potential for accidents and emergency services, nor does it propose to provide assistance to our local agencies in case of emergencies.

Sincerely,

Michael M. Menesini
Mayor

Harriett Burt
Vice Mayor

Timothy J. Farley
Councilmember

Julian M. Frazer
Councilmember

Barbara J. Woodburn
Councilmember

cc: Mayor and City Council, Martinez
Community Development Department, Martinez
Association of Bay Area Governments (ABAG)
Contra Costa County Board Supervisors
Senator Barbara Boxer
Senator Dianne Feinstein
Congressman Bill Baker
Congressman George Miller

RESPONSE TO COMMENT
COMMENTOR NO. 496:
CITY OF MARTINEZ - CITY COUNCIL (CONT'D.)

with navigational hazards and distances from the port to the open ocean or a large bay (Appendix D, Section D.1.9.2 of the EIS). Appendix D, Section D.5.3.1.3 of the EIS presents a discussion of the determination of the probability of ship accidents used in the EIS.

Numerous other risk analyses were used in the preparation of the EIS, some of then involving the shipment of spent nuclear fuel. See the list of references at the end of Volume 1 of the EIS.

Response to Comment No. 496-4

DOE has not yet selected ports of entry, ground transportation routes, or transport modes for the foreign research reactor spent nuclear fuel. If the Concord NWS is selected, then DOE would choose the best route to I-680 in accordance with Department of Transportation regulations (49 CFR Part 397.101 (a)(2)). That route could use Route 4, Route 24, and/ or Waterfront Road. The State of California routing agency can designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103.

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 40 years of spent fuel shipments, no radioactive contents have ever been released from a transportation cask, nor has a spent nuclear fuel transportation cask ever been punctured, even as the result of an accident. Based on this experience, DOE does not expect that spent nuclear fuel transportation casks passing through the Concord NWS would release radioactive materials or affect the quality of the water supply for Contra Costa Water District via Mallard reservoir or any other path. Analysis of a severe accident involving a ship at Concord NWS (Section 4.2.2.3 of the EIS) indicates that the resultant contamination would be so small that no cleanup would be required, other than possibly in the immediate vicinity of an accident. This means that contamination of Mallard Reservoir would be minimal. To insure this was the case, if such a severe accident were to occur, all water supplies in the area, as well as food and air, would be tested for contamination.

Response to Comment No. 496-5

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 days total) to be sufficient for public comment.

COMMENTOR NO. 500:
HELEN M. ALLEN, MAYOR, CITY OF CONCORD

CITY OF CONCORD
1950 Parkside Drive, MS/01
Concord, California 94519-2578
FAX: (510) 798-0836

OFFICE OF THE MAYOR
Telephone: (510) 671-3150

Concord

CITY COUNCIL
Helen M. Allen, Mayor
Lou Ross, Vice Mayor
Colleen Gill
Bill McMasigal
Michael A. Pastrick

Lynnet Reibl, City Clerk
Thomas Wentling, City Treasurer

Edward R. James, City Manager

June 15, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585-0001

Re: Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

The Port of Concord, located in the Concord Naval Weapons Station, is one of ten seaports being considered by the Department of Energy to receive spent nuclear fuel from foreign research reactors. The City of Concord is in a unique position relative to this proposal by your Department. The Port of Concord is within the sphere of influence of the City of Concord and is part of the Concord planning area. The administrative center of the Weapons Station and the inland storage area are within the City limits of the City of Concord. The proposal to use the Port of Concord could have major impacts on our City of about 115,000 people as well as the entire region.

The proposed policy regarding spent nuclear fuel shipments is a major concern to our residents. About 235 people attended the public information hearing held by the Department of Energy at Centre Concord on May 22, 1995. The Concord City Council held a hearing on the proposal on June 6, 1995. Speakers were asked to limit their comments to three minutes. Nevertheless, the hearing lasted for about four hours.

At the conclusion of the June 6, 1995 hearing, the City Council unanimously voted to send this letter to the Department of Energy in opposition to the proposed use of the Port of Concord for shipment of spent nuclear fuel rods and to find that the draft Environmental Impact Statement is inadequate and incomplete. The proposal raises potential community health and safety issues which are our paramount concerns. 500-1

Please note that the City of Concord did not take a position regarding the merits of the proposed federal nuclear nonproliferation policy. Our objective was not to formulate a stance on a proposed federal foreign policy. Our expertise is on local issues—the impacts of proposed land uses on our community. Thus, this letter will focus on the identification of impacts to Concord of using the Port of Concord as a transfer facility for fuel rods.

RESPONSE TO COMMENT
COMMENTOR NO. 500:
HELEN M. ALLEN, MAYOR, CITY OF CONCORD

Response to Comment No. 500-1

The draft and final versions of this EIS provide an evaluation of the environmental effects which would occur under implementation for all reasonable management alternatives. Section 2 of the EIS describes the proposed action and management alternatives, and results of the environmental evaluation are given in Section 4 of the EIS. Appendices of the EIS provide detailed supporting data and information for the evaluation. Human health and safety were primary concerns included in the environmental evaluation. As discussed in Sections 4.2.2 and 4.5 of the EIS, the risk associated with bringing spent nuclear fuel to Concord NWS, or any port analyzed in the EIS, is low.

Environmental impacts of a proposed action are one factor in an agency's decision process. Since management of spent nuclear fuel from foreign research reactors would have no significant environmental effects, decisions regarding management of spent nuclear fuel from foreign research reactors would be based on non-environmental considerations.

COMMENTOR NO. 500: HELEN M. ALLEN, MAYOR, CITY OF CONCORD (CONT'D.)

Mr. Charles Head
June 15, 1995
Page 2

This letter should not be construed as questioning the role and mission of the Concord Naval Weapons Station. The City of Concord and the Naval Weapons Station have been good neighbors for over fifty years. The Station and Station personnel are part of our community and have been actively involved with the community.

As stated above, it is the opinion of the Concord City Council that the Draft EIS is flawed. Although the document is lengthy, it contains little information regarding each proposed port of entry. Information regarding the Port of Concord and the Weapons Station is very general. The EIS does not contain enough information to assess possible impacts. For example, there is no discussion of port operations, the impact on the Navy, local streets to be used to haul the fuel rods, and impacts on emergency service personnel and facilities. We believe that the EIS is inadequate and incomplete.

Our concerns regarding the impacts to Concord of he proposed federal policy are listed below.

1. Accident Potential

- The Department of Energy has stated that the chance of an accident is minimal. We question this statement and are very concerned because a D.O.E. spokesperson stated that one reason the Port of Oakland was dropped from consideration in favor of the Port of Concord was that Concord had a smaller population than the Oakland area. **500-2**

- At our teleconference meeting on May 3, 1995, you stated that some operators and customers of commercial ports believe that spent fuel rods should only be off-loaded at military ports. Also, you stated that the Port of Concord was preferred over the Port of Oakland because Concord was a secure military base. These statements are inconsistent with other statements you made that the threat of accidents and terrorism was minimal.

- The San Francisco Bay Area is one of the largest metropolitan regions in the country. Even though the danger of nuclear accident may be low, we question bringing the rods through the Golden Gate to Concord. The Bay Area has over six million people. **500-3**

- In case of an accident, D.O.E. has stated that local emergency services agencies would be expected to handle the situation. The emergency services agencies that we contacted do not believe they are trained and equipped to deal with radiation accidents. Has D.O.E. contacted agencies such as those listed below to assess their capabilities to help in accident situations? **500-4**

Contra Costa County Emergency Services
Contra Costa County Consolidated Fire District
County Sheriff's Department
Concord Police Department
Mt. Diablo Hospital
John Muir Hospital
Kaiser Hospitals
Ambulance companies
Toxic waste companies

RESPONSE TO COMMENT
COMMENTOR NO. 500: HELEN M. ALLEN, MAYOR, CITY OF CONCORD (CONT'D.)

Response to Comment No. 500-2

Concord NWS was one of ten ports that has been determined to be acceptable to receive the foreign research reactor spent nuclear fuel, if the material is to be accepted into the United States. Population of the port and surrounding areas is one of the considerations of the port selection criteria, and one of the reasons the Port of Oakland was not included in the final list of ports. The population criterion for port selection (Criterion 5) is discussed in more detail in Appendix D, Section D.1.9.5 of the EIS. Other considerations such as port experience with handling containers, access to the open ocean, and port facilities have also been considered in making the final selection of ports of entry. Appendix D, Section D.1.9 of the EIS presents details of the port selection process. (Also see the response to Comment 439-5.)

The chances of an accident releasing radioactive material from foreign research reactor spent nuclear fuel are indeed low. Appendix D, Section D.5.3.1 of the EIS presents a detailed discussion of the probability of marine accidents.

Mr. Head's comments to the effect that some operators of commercial ports believed that spent nuclear fuel should only be off-loaded at military ports merely reported the nature of some of the comments DOE had received, not DOE's position regarding the need to use military ports.

Response to Comment No. 500-3

The consequences and risk associated with an accident in San Francisco Bay were calculated (Section 4.2.2.3 of the EIS) and found to be low, in spite of the large population of the Bay Area, indicating that it would be safe to use Concord NWS as a receipt port for the foreign research reactor spent nuclear fuel.

Response to Comment No. 500-4

As discussed in Section 2.7.4, each port considered in the EIS has developed an Area Contingency Plan under the Oil Spill Prevention Act of 1990. This plan outlines response capabilities, procedures and authorities for responding to and recovering from hazardous material incidents. As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

COMMENTOR NO. 500: HELEN M. ALLEN, MAYOR, CITY OF CONCORD (CONT'D.)

Mr. Charles Head
June 15, 1995
Page 3

- What resources are being provided by D.O.E. to deal with the long-term impacts of an accident to the surrounding area? What would we do if an accident situation resulted in health hazards, contaminated the water supply, closed major roads, or caused localized panic?

500-4 (Cont'd.)

- The D.O.E. risk assessment does not include hazards particular to this area such as earthquakes and tsunamis.
- The EIS should assess the potential impacts of the project on the Contra Costa Water District, the Contra Costa Canal, and the Mokelumne Aqueduct.

500-5

2. Port of Concord Facilities

- The Port of Concord is a very specialized facility built and operated solely for the loading and off-loading of munitions. Would the D.O.E. proposal affect military operations? Does the port have the capacity and equipment to off-load spent nuclear fuel rods?

500-6

3. Security Impacts

- We are very concerned about potential impacts on our Police Department. Are additional police personnel needed to secure the port area and temporary on-base storage areas? What additional role would be placed on City, County, and State law enforcement agencies? Would implementation of this project constitute another unfunded federal mandate on local government?
- The entry to the Concord Naval Weapons Station has been the scene of demonstrations by people opposed to various federal policies. Concord police personnel have been involved in the past in providing support to military personnel during these demonstrations. What resources will D.O.E. provide to deal with large demonstrations?

500-7

- It has been stated by D.O.E. officials that spent nuclear fuel rods are not attractive to terrorist organizations because of the high amount of technical expertise as well as money needed to extract materials to make nuclear bombs. However, it has come to our attention that fuel rods could be added to conventional bombs to create a radioactive bomb scene. This potential use of nuclear fuel rods is very disturbing and should be discussed in the EIS.

4. Transportation Routes

- Concord is far away from all of the storage sites including the three western storage sites in Washington, Idaho and Nevada. These inland storage areas are not easily reached from Concord, routes carry significant amounts of civilian traffic, and mountain routes are often closed due to frequent snow storms.

500-8

RESPONSE TO COMMENT
COMMENTOR NO. 500: HELEN M. ALLEN, MAYOR, CITY OF CONCORD (CONT'D.)

Appendix H, which was added to the EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Response to Comment No. 500-5

The EIS considered severe natural phenomena (i.e., seiches, earthquakes, volcanism, etc.) as part of the port selection process (Appendix D, Section D.1.9.6). The probability of severe natural phenomena impacting foreign research reactor spent nuclear fuel shipments is vanishingly small since there is an extremely short period of risk (typically less than 24 hours).

Any ship that would be used to transport foreign research reactor spent nuclear fuel would be equipped with long range communication equipment and remain in contact with weather and ocean condition advisory services. Even if the ship were to experience a collision or sink as the result of a severe storm or other cause (i.e., tsunamis), the analysis in the EIS indicates that the risk to people nearby is low. Appendix D, Section D.5 of the EIS presents details on the calculation of consequences and risk associated with accidents in port and their approaches.

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of experience shipping spent nuclear fuel, no radioactive contents have ever been released from a transportation cask even as the result of an accident (Section 2.6.2 of the EIS). Based on this experience, DOE considers that transportation casks passing through the Concord NWS would not release it contents, and would thus not affect the quality of the water supply for Contra Costa Water District via Mallard Reservoir or any other path. Analysis of a severe accident involving a ship at Concord NWS (Section 4.2.2.3 of the EIS) indicates that the resultant contamination is so small that no cleanup would be required other than possibly in the immediate vicinity of the accident. In the event of any such severe accident, DOE would provide the capability and resources for testing of food, air, and water to ensure that no radioactive contamination occurs.

Response to Comment No. 500-6

DOE understands that Concord NWS's primary mission is to support the military through handling munitions and that no handling of the foreign research reactor spent nuclear fuel could occur concurrently with handling explosives. These facts have been incorporated

COMMENTOR NO. 500: HELEN M. ALLEN, MAYOR, CITY OF CONCORD (CONT'D.)

Mr. Charles Head
June 15, 1995
Page 4

- Local residents and property owners wanted to know traffic routes fuel rod trucks would take from the Weapons Station to the highway system. At the May 22 public information meeting, a D.O.E. transportation engineer refused to respond to this issue.
- Will fuel rod trucks have armed escorts? Will local emergency service providers be told about planned shipments?
- We believe D.O.E. should only ship spent fuel rods during early morning hours because of safety and security issues. We see no assessment of this issue in the draft EIS.
- The draft EIS should assess the capability of existing railroad structures to transport fuel rods.
- Routes pass by and through major cities in the Western states. What would they do in case of accident? Have they even been informed about this proposal?
- Considering the long distance between Concord and the storage areas, would not one anticipate the possibility of more traffic accidents and terrorist activity?
- It is not sufficient to state in your EIS that mitigation measures are not needed because the Department of Transportation has not adopted standards or requirements. The EIS should assess impacts and develop appropriate mitigation measures.

500-8 (Cont'd.)

Thank you for the opportunity to comment on your draft EIS. If you would like further information regarding our position and our concerns, please contact David Golick, Chief of Planning, at (510) 671-3166.

Sincerely yours,

Helen M. Allen

Helen M. Allen
Mayor

AO6899.HAS

cc: City Council
City Manager
Governor Pete Wilson
Senator Barbara Boxer
Senator Dianne Feinstein
Representative Bill Baker
Representative George Miller
State Senator Daniel Boatwright
Assemblyman Robert Campbell
Assemblyman Richard Rainey
Contra Costa County Board of Supervisors
Martinez City Council
Antioch City Council
Pittsburg City Council
Pleasanton City Council
Berkeley City Council
Walnut Creek City Council
San Francisco Mayor and Board of Supervisors
Contra Costa Water District
Association of Bay Area Governments
Contra Costa Times
Concord Transcript

RESPONSE TO COMMENT
COMMENTOR NO. 500: HELEN M. ALLEN, MAYOR, CITY OF CONCORD (CONT'D.)

into Appendix D, Section D.2.1.6 of the EIS. The Concord NWS has the experience and facilities necessary to handle the containers in which the foreign research reactor spent nuclear fuel would be shipped. Currently the Concord NWS has a floating crane that routinely handles containers. Also, Concord NWS is scheduled to add two container cranes to increase the container handling capacity of the facility.

Response to Comment No. 500-7

DOE considers that the impact of the receipt of foreign research reactor spent nuclear fuel on local police departments should be low. The requirements for physical protection of spent nuclear fuel shipments are specified in 10 CFR Part 73.37. The principal points are (1) cooperation with local law enforcement agencies, (2) armed escorts, and (3) communications with a communications center that is staffed 24 hours per day. (Section 5.4.2 of the EIS.)

For truck shipments in heavily populated areas, one escort vehicle containing an armed guard would lead the truck and another escort vehicle containing another armed guard would follow the truck. In less populated areas, there would be only one escort vehicle instead of two. For rail shipments, the escort would ride on the train in a location that permits observation of the shipment car while the train is in motion. (Section 2.7.5 and Appendix H of the EIS.)

In addition, to further address this issue, individual Transportation Plans would be prepared for any shipments actually scheduled for acceptance through the Concord NWS (or any other port of entry). These Transportation Plans would be prepared in consultation with appropriate State and/or local officials to ensure that details of the transportation process are understood, that the individuals or organizations who would perform all required activities are specified and that these individuals and parties know what would be expected of them (Section 2.7.5 and Appendix H of the EIS).

Dealing with demonstrations is the responsibility of the local and State governments, as well as the military if such demonstrations occur on military bases. However, if the demonstrations were the result of the receipt of foreign research reactor spent nuclear fuel, DOE would work with local, State, or military organizations in dealing with demonstrations.

Section D.5.9 has been added to Appendix D of the EIS to address the issue of potential terrorist incidents.

Commentor No. 500: Helen M. Allen, Mayor, City of Concord (Cont'd.)

Response to Comment
Commentor No. 500: Helen M. Allen, Mayor, City of Concord (Cont'd.)

Response to Comment No. 500-8

The distance between Concord and the management sites was taken into account in the ground transport risk calculations in Appendix E and Section 4.2.3 in the EIS. Terrorist activity may not necessarily increase with greater travel distance; this activity is impossible to calculate with confidence.

For routes the trucks might take, see the response to Comment 22-11. The hours for trucking the foreign research reactor spent nuclear fuel shipments would be determined by its arrival time in port. DOE's policy is for the trucks to leave port as soon as they are ready to go in order to minimize the time in port.

As listed in Table B-14 of Appendix B, a fully loaded spent nuclear fuel transportation cask could weigh up to 25.5 metric tons and the existing railroad structures are strong enough to carry this load.

For the subjects of physical protection and advance notification, see the responses to Comments 78-2 and 135-2, respectively.

The EIS does not state that mitigation measures are not needed due to the absence of standards or requirements. In fact, appropriate mitigation measures are presented in Sections 4.2.1.5, 4.2.2.5, 4.2.3.5, and 4.2.4.4.

Commentor No. 506:
William D. Landis, Mayor, City of Pleasant Hill

recycled paper

City of Pleasant Hill

June 8, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
United States Department of Energy
1000 Independence Avenue
Washington, D.C. 20585-0001

Re: Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

The City Council of the City of Pleasant Hill strongly opposes the "preferred alternative" in the Environmental Impact Statement (EIS) that proposes the transport of spent nuclear fuel through the Concord Naval Weapons Station. Pleasant Hill is located immediately adjacent to the City of Concord, and any potential adverse impacts of this proposal would affect our City, as well as other surrounding communities.

We understand that the proposal identifies Concord as a site for accepting spent nuclear fuel from reactors around the world, and then shipping the hazardous material out by truck or rail to processing sites elsewhere in the country. We object because Concord is part of a densely populated area, and shipments to and from Concord would pass by several oil refineries, chemical plants and oil tankers in the area. Moreover, the area is located on an earthquake fault, which adds to the possible risks. An accident or natural disaster occurring during the transportation of the hazardous materials could be catastrophic for our community. *506-1*

We understand that the EIS does not address where the shipments will go when they leave Concord, which streets will be used, what railroads will be used, what police services might be necessary, what disaster preparedness and emergency response training would be necessary, or other ways that local jurisdictions would be affected. In this regard, we join in the specific comments and concerns directed to you by the June 7, 1995 letter from the City of Martinez City Council, a copy of which is attached. *506-2*

100 Gregory Lane - Pleasant Hill - California 94523-3323 - (510) 671-5270 - FAX 256-8190

Response to Comment
Commentor No. 506:
William D. Landis, Mayor, City of Pleasant Hill

Response to Comment No. 506-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

In regard to Concord being a highly populated area, the population of the areas surrounding Concord NWS to a radius of ten miles, and the population along the transportation routes is one of the considerations of the port selection criteria. The population around Concord and on the routes to the management site(s) was low enough to qualify Concord NWS as an acceptable port. The population criteria for port selection (Criterion 5) is discussed in more detail in Appendix D, Section D.1.9.5 of the EIS.

The topic of heavy marine traffic and potentially hazardous land facilities near the waterway are discussed in the response to Comment 79-1.

The topic of impacts of seismic events is discussed in the response to Comment 452-1.

Response to Comment No. 506-2

As discussed in Section 2.2.1.8, five potential management sites were identified for management of the foreign research reactor spent nuclear fuel. These are: the Savannah River Site, the Idaho National Engineering Laboratory, the Hanford Site, the Oak Ridge Reservation, and the Nevada Test Site. See the response to Comment 266-3 for more information on management site selection.

For the streets that might be used, see the response to Comment 22-11. Representative rail routes from Concord to the five potential management sites are shown in Figure E1-12 in Appendix E of the EIS.

The police services and emergency response training that might be necessary are discussed in Section 2.7 of the EIS.

COMMENTOR NO. 506: WILLIAM D. LANDIS, MAYOR, CITY OF PLEASANT HILL (CONT'D.)

June 8, 1995 Letter to U.S.Dept. of Energy
Page 2

We further object to the short time which has been made available for public comment. The June 20, 1995 deadline for responses should be extended to allow thorough evaluation and consideration of this proposal which has serious consequences to our community. 506-3

Very truly yours,

William D. Landis, Mayor
City of Pleasant Hill

Enclosure: June 7, 1995 Letter from City of Martinez City Council

cc: City Council Members, Pleasant Hill
Mayor and City Council, Martinez
Contra Costa County Board of Supervisors
Senator Barbara Boxer
Senator Dianne Feinstein
Congressman Bill Baker
Congressman George Miller

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RESPONSE TO COMMENT
COMMENTOR NO. 506: WILLIAM D. LANDIS, MAYOR, CITY OF PLEASANT HILL (CONT'D.)

Response to Comment No. 506-3

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 days total) to be sufficient for public comment.

COMMENTOR NO. 514: CONTRA COSTA COUNTY

Community Development Department
County Administration Building
651 Pine Street
4th Floor, North Wing
Martinez, California 94553-0095

Phone:
(510) 646-2096

Contra Costa County

Harvey E. Bragdon
Director of Community Development

June 19, 1995

Secretary Hazel R. O'Leary
Secretary of Energy
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

SUBJECT: USE OF THE CONCORD NAVAL WEAPONS STATION AS A PROPOSED PORT OF ENTRY FOR FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL

Dear Madam Secretary:

The Contra Costa County, California, Board of Supervisors, on June 6, 1995, unanimously voted to strongly oppose the use of the Concord Naval Weapons Station (located in Contra Costa County) as a port of entry for foreign research reactor spent nuclear fuel. The Concord Naval Weapons Station is one of three West Coast ports which are currently under review as ports of entry in the U.S. Department of Energy's Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

The Contra Costa County Board of Supervisors' opposition to the use of the Concord Naval Weapons Station for the intake and trans-shipment of spent nuclear fuel is based on concerns for the cumulative impacts of the proposed program on Contra Costa County and the Bay Area which are already affected by military installations, nuclear research facilities, petroleum refineries, and chemical industries. The Board's position of opposition also reflects concerns over the handling of accidents and security.

514-1

The Contra Costa County Board of Supervisors also has concluded that the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel is inadequate for evaluating the potential impacts of the use of the Concord Naval Weapons Station on the County and the Bay Area. The Board, in this respect, adopted the attached Board Order in which County staff reported deficiencies in spent nuclear fuel logistics and transportation corridor analyses. It further noted the absence of comparative impact analyses for the candidate West Coast ports.

RESPONSE TO COMMENT
COMMENTOR NO. 514: CONTRA COSTA COUNTY

Response to Comment No. 514-1

The Contra Costa County Board of Supervisors' opposition to the use of Concord NWS for the shipment of foreign research reactor spent nuclear fuel is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with accepting the spent nuclear fuel would present no significant health, safety, or environmental risk to Concord or any of the candidate commercial or military ports selected. Spent nuclear fuel from foreign research reactors is shipped in standard containers, and does not require special handling techniques (Section 2.6.3.2.2 of the EIS).

The security provided for the spent nuclear fuel shipments is required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. The security provisions are summarized in the new Appendix H that has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit.

Responses to the detailed comments included in the staff report to the Contra Costa County Board of Supervisors can be found in response to Comments 514-2 through 514-5. In regard to the comment that there are no comparative impact analyses for candidate West Coast ports, Section 4.2.2 of the EIS provides just such comparative analyses. The impacts calculated were low for all ten candidate ports.

Secretary Hazel R. O'Leary
June 19, 1995
- Page 2 -

Finally, the Board of Supervisors designated the County Health Officer, William B. Walker, M.D., as County's staff contact on the matter of the proposed use of the Concord Naval Weapons Station as a port of entry for spent nuclear reactor fuel. Dr. Walker's address is Contra Costa County, Health Services Department, 20 Allen Street, Martinez, CA 94553, and his telephone number is (510) 370-5010.

Sincerely,

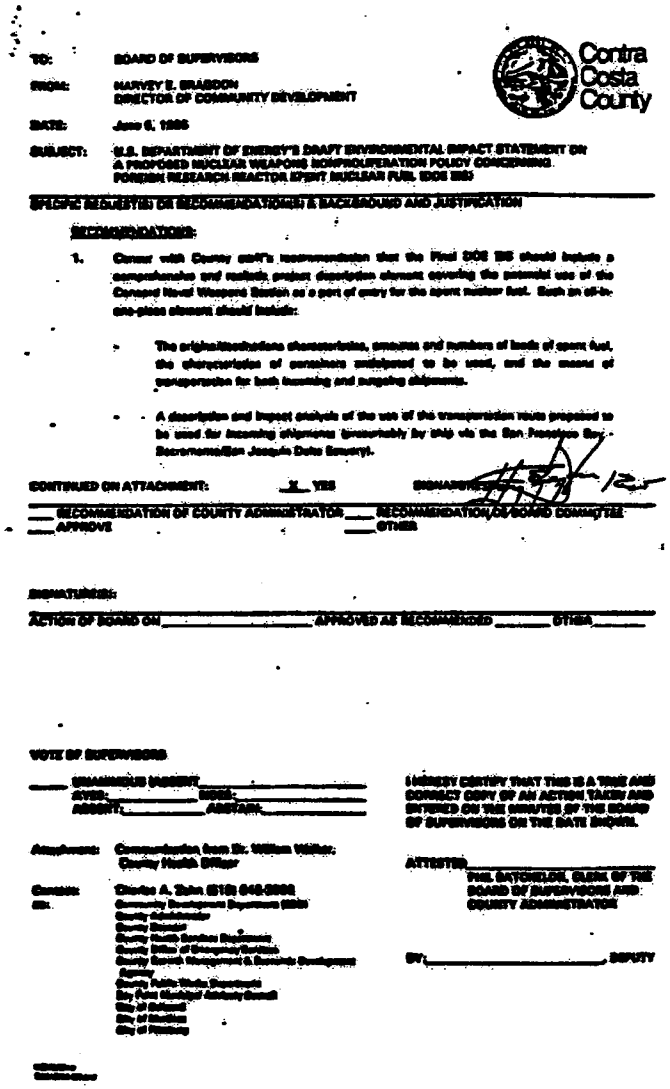
Charles A. Zahn
Assistant Director

Attachment: Board Order 6/6/95

c.c.: Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-39)
U.S. Department of Energy

CAZ:rw
[illegible]

COMMENTOR NO. 514: CONTRA COSTA COUNTY (CONT'D.)



TO: BOARD OF SUPERVISORS

FROM: HARVEY E. BRADDON
DIRECTOR OF COMMUNITY DEVELOPMENT

DATE: June 6, 1995

SUBJECT: U.S. DEPARTMENT OF ENERGY'S DRAFT ENVIRONMENTAL IMPACT STATEMENT ON A PROPOSED NUCLEAR WEAPONS NONPROLIFERATION POLICY CONCERNING FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL (DOE EIS)

SPECIFIC REQUEST(S) OR RECOMMENDATION(S) & BACKGROUND AND JUSTIFICATION

RECOMMENDATION:

1. Concur with County staff's recommendation that the Final DOE EIS should include a comprehensive and realistic project description element covering the potential use of the Concord Naval Weapons Station as a port of entry for the spent nuclear fuel. Such an all-in-one-place element should include:

   - The origin/destinations characteristics, amounts and numbers of loads of spent fuel, the characteristics of containers anticipated to be used, and the means of transportation for both incoming and outgoing shipments.

   - A description and impact analysis of the use of the transportation route proposed to be used for incoming shipments (presumably by ship via the San Francisco Bay - Sacramento/San Joaquin Delta Estuary).

CONTINUED ON ATTACHMENT: X YES

SIGNATURE(S):

___ RECOMMENDATION OF COUNTY ADMINISTRATOR ___ RECOMMENDATION OF BOARD COMMITTEE
___ APPROVE ___ OTHER

SIGNATURE(S):

ACTION OF BOARD ON _____ APPROVED AS RECOMMENDED _____ OTHER _____

VOTE OF SUPERVISORS

___ UNANIMOUS (ABSENT _____)
AYES: _____ NOES: _____
ABSENT: _____ ABSTAIN: _____

I HEREBY CERTIFY THAT THIS IS A TRUE AND CORRECT COPY OF AN ACTION TAKEN AND ENTERED ON THE MINUTES OF THE BOARD OF SUPERVISORS ON THE DATE SHOWN.

Attachments: Communication from Dr. William Walker, County Health Officer

ATTESTED _____
PHIL BATCHELOR, CLERK OF THE BOARD OF SUPERVISORS AND COUNTY ADMINISTRATOR

Contact: Charles A. Zahn (510) 646-2888

cc: [illegible]

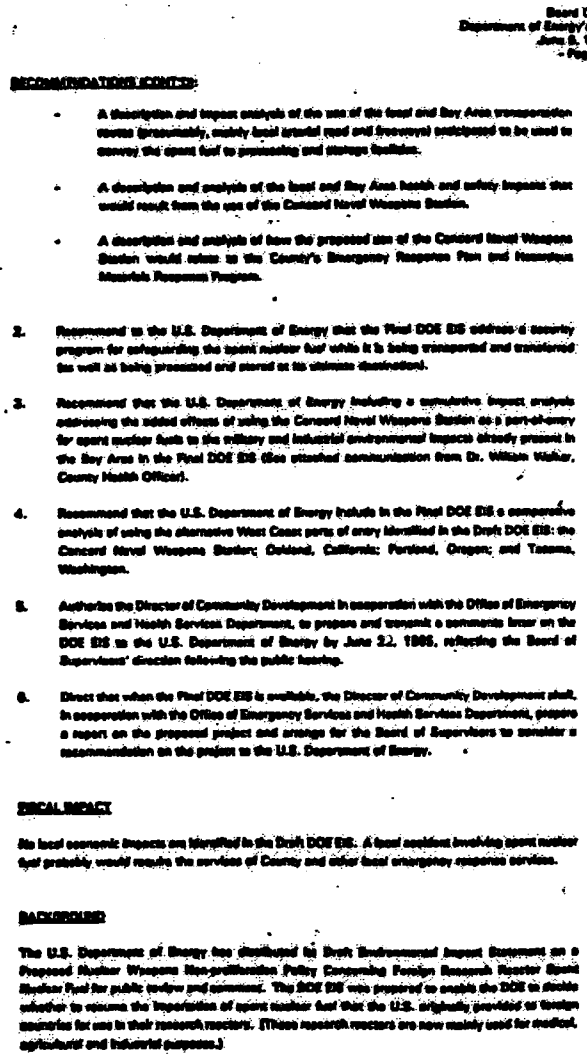
BY: _____, DEPUTY

514-2

RESPONSE TO COMMENT
COMMENTOR NO. 514: CONTRA COSTA COUNTY (CONT'D.)

Response to Comment No. 514-2

If foreign research reactor spent nuclear fuel is accepted into the United States, the detailed shipping arrangements would then be initiated. Since the shipping program could extend over 13 years, some of the details would not be available in the near term. A Transportation Plan would be developed prior to the first shipment to provide specific details. Appendix H to the EIS provides the general provisions of the Transportation Plan. The EIS cannot include the detailed information requested because it is not yet available. Much of the information requested is in the EIS, such as origins of the spent nuclear fuel, amounts and numbers of spent nuclear fuel shipments (Section 2.2.1.3), characteristics of the shipping containers (Appendix B, Section B.2), the means of transportation (Sections 2.6.3 and 2.6.4), and the health and safety impacts of shipping the spent nuclear fuel (Section 4.2 for marine and Section 4.3 for land). Appendix D, Section D.2.1.6 discusses transportation routes and access at Concord NWS. The conclusion of all these analyses is that the impacts of using Concord NWS, or any other of the candidate ports, are low.



Board Order
Department of Energy's EIS
June 6, 1995
- Page 2 -

RECOMMENDATIONS (CONT'D):

- A description and impact analysis of the use of the local and Bay Area transportation routes (presumably, mainly local arterial road and freeway) anticipated to be used to convey the spent fuel to processing and storage facilities.
- A description and analysis of the local and Bay Area health and safety impacts that would result from the use of the Concord Naval Weapons Station.
- A description and analysis of how the proposed use of the Concord Naval Weapons Station would relate to the County's Emergency Response Plan and Hazardous Materials Response Program.

514-2 (Cont'd.)

514-3

2. Recommend to the U.S. Department of Energy that the Final DOE EIS address a security program for safeguarding the spent nuclear fuel while it is being transported and transferred as well as being processed and stored at its ultimate destination(s).

3. Recommend that the U.S. Department of Energy including a cumulative impact analysis addressing the added effects of using the Concord Naval Weapons Station as a port-of-entry for spent nuclear fuels to the military and industrial environmental impacts already present in the Bay Area in the Final DOE EIS (See attached communication from Dr. William Walker, County Health Officer).

514-4

4. Recommend that the U.S. Department of Energy include in the Final DOE EIS a comparative analysis of using the alternative West Coast ports of entry identified in the Draft DOE EIS: the Concord Naval Weapons Station; Oakland, California; Portland, Oregon; and Tacoma, Washington.

514-5

5. Authorize the Director of Community Development in cooperation with the Office of Emergency Services and Health Services Department, to prepare and transmit a comments letter on the DOE EIS to the U.S. Department of Energy by June 22, 1995, reflecting the Board of Supervisors' direction following the public hearing.

6. Direct that when the Final DOE EIS is available, the Director of Community Development shall, in cooperation with the Office of Emergency Services and Health Services Department, prepare a report on the proposed project and arrange for the Board of Supervisors to consider a recommendation on the project to the U.S. Department of Energy.

FISCAL IMPACT

No local economic impacts are identified in the Draft DOE EIS. A local accident involving spent nuclear fuel probably would require the services of County and other local emergency response services.

BACKGROUND

The U.S. Department of Energy has distributed its Draft Environmental Impact Statement on a Proposed Nuclear Weapons Non-proliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel for public review and comment. The DOE EIS was prepared to enable the DOE to decide whether to assume the importation of spent nuclear fuel that the U.S. originally provided to foreign countries for use in their research reactors. (These research reactors are now mainly used for medical, agricultural and industrial purposes.)

Response to Comment No. 514-3

Foreign research reactor spent nuclear fuel shipments are subject to the same types of potential hazards as those of other ships carrying nonradiological hazardous materials.

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H of the EIS contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Response to Comment No. 514-4

Candidate ports were chosen from among commercial and military ports along the eastern seaboard, western seaboard, and the Gulf of Mexico. The selection process is described in Appendix D, Section D.1 of the EIS. No significant health, safety, or environmental risks were found to exist at any of the candidate commercial or military ports selected (Section 4.2.2 of the EIS) which would warrant a cumulative impact analysis in the EIS addressing the effect of receiving spent nuclear fuel on existing commercial and military environments at the various ports, including the Concord NWS. Spent nuclear fuel from foreign research reactors is shipped in standard containers, and does not require special handling techniques (Section 2.6.3.2.2 of the EIS). The security provided for the spent nuclear fuel shipments is required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

Response to Comment No. 514-5

Section 4.2.2.3 of the EIS provides the results of analyses on the impacts of port activities at all of the candidate ports. These impacts are presented in text and in table form for comparison purposes. The impacts are low at all of the candidate ports.

COMMENTOR NO. 517: PORT OF OAKLAND

PORT OF OAKLAND

June 19, 1995

Attention: Mr. Charles Head
U.S. Department of Energy
Office of Environmental Management (EM-37)
1000 Independance Ave., S.W.
Washington, DC 20585-0001

Subject: Comments on Draft EIS, Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

The Port of Oakland acknowledges that the Department of Energy considered our objections and is no longer proposing Oakland as a Port of Entry for the receipt of foreign research reactor spent nuclear fuel. Reference is made to the March 1995 Summary report, Item S.2.2.1.6, Port(s) of Entry, page 13, "Draft EIS, Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel."

517-1

This letter is to reemphasize that the Port of Oakland will continue to object to any future policy change(s) by the Department of Energy which propose that the Port of Oakland be an entry and/ or transfer point for spent nuclear waste.

The Port of Oakland position is supported by the Port's past objections to the Department's proposal to consider Oakland as a port of entry/ transfer for spent nuclear fuel. Refer to the Port letter of 9/29/94 to Thomas Wichmann, Idaho Operations Office of DOE. Refer to Port letter, 3/2/94, to Ms. Brenda Fleming, U.S. DOE, EM-37, Washington, D.C., regarding Federal Register Reference, Vol. 3.8, No.202, 20/21/93, page 54336.

The Port of Oakland ranks within the top 5 containerized ports in the nation. The Port is a public agency responsible for the operation and maintenance of Oakland harbor facilities. These Port facilities, which accommodate over 90 % of containerized cargo in the San Francisco Bay Area, include four major marine terminal areas covering almost 640 acres. The Port is also responsible for providing efficient and uninterrupted cargo.

530 Water Street ■ Jack London's Waterfront ■ P.O. Box 2064 ■ Oakland, California 94604-2064
Telephone (510) 272-1100 ■ Fax (510) 272-1172 ■ TDD (510) 763-5703 ■ Cable address, PORTOFOAK, Oakland

RESPONSE TO COMMENT
COMMENTOR NO. 517: PORT OF OAKLAND

Response to Comment No. 517-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Oakland is noted. As described in Appendix D of the EIS, the Port of Oakland did not meet all of the screening criteria for identification of candidate ports of entry. Thus, it is not considered a candidate port of entry for receipt of foreign research reactor spent nuclear fuel.

COMMENTOR NO. 517: PORT OF OAKLAND (CONT'D.)

throughput services from the harbor to the adjacent transportation network, via truck or rail.

In Resolution No. 29577, 6/3/86, the Board of Port Commissioners declared that spent fuel rods be banned from moving by ocean going vessel to the Port of Oakland and overland through the City of Oakland by motor carrier. Pursuant to that resolution, the ban was incorporated into the Port of Oakland Tariff No 2-A.

By Motion of the Port of Oakland also acted To Appear As Amicus Curiae in U.S. District Court and the June 12, 1986 Affidavit of Robert W. Crandall In Support Of Motion of Port of Oakland To Appear As Amicus Curiae in a suit brought by the Northwest Inland Waters Coalition against the U.S. Department of Energy in 1986.

The Port of Oakland requests that DOE put our organization on the mailing list for notice of any public hearings and for transmittal of SNF and INEL EIS documents on the Spent Nuclear Fuel Management program. We also request to be placed on the mailing list for notification of the Foreign Research Reactor SNF EIS which will evaluate ocean going shipments and port activities.

I may be reached at 510-272-1175.

Sincerely,

James McGrath
Manager, Environmental Department

RESPONSE TO COMMENT
COMMENTOR NO. 517: PORT OF OAKLAND (CONT'D.)

COMMENTOR NO. 518: EUREKA COUNTY, YUCCA MOUNTAIN INFORMATION OFFICE

Eureka County
Yucca Mountain Information Office
P.O. Box 714
Eureka, Nevada 89316
Phone (702) 237-5407 FAX (702) 237-5169

June 19, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue SW
Washington, D.C. 20585

Dear Mr. Head,

RE: Draft EIS On Proposed Nuclear Weapons Non-proliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

The purpose of this letter is to provide the Department of Energy (DOE) with the comments of Eureka County, Nevada regarding the above referenced Draft Environmental Impact Statement (DEIS).

Eureka County is an "affected unit of local government" under Section 116 of the Nuclear Waste Policy Act as amended. We are concerned about the DOE's Yucca Mountain project. Our role is to provide oversight of the DOE project in order to protect the health and safety of residents of our county.

For the record, we are aware that the Programmatic Spent Nuclear Fuel and INEL EIS (Programmatic SNF and INEL EIS) Record of Decision (ROD) has determined that the Nevada Test Site will not be a site for storage of interim spent fuel. Therefore, it is our understanding that the Nevada Test Site will not be used for storage of the Foreign RRF, despite its discussion in the DEIS.

We have prepared comments on the foreign RRF DEIS because, despite the DEIS ROD, the least costly option would be Phase I storage at the Idaho National Engineering Laboratory (INEL) and Phase II storage at the Nevada Test Site.

The DEIS also makes clear that the ultimate disposition of this waste, under the NWPA of 1982 as amended, is geologic disposal in a repository.

RESPONSE TO COMMENT
COMMENTOR NO. 518: EUREKA COUNTY, YUCCA MOUNTAIN INFORMATION OFFICE

COMMENTOR NO. 518: EUREKA COUNTY, YUCCA MOUNTAIN INFORMATION OFFICE (CONT'D.)

We have the following comments by section on the Draft EIS Summary:

S.2.8 Emergency Management.

Our studies of emergency management in rural areas indicate that despite the existence of plans and programs, local governments are not adequately prepared to cope with emergency management and response for radioactive materials. The DEIS does not adequately address the true demands on local governments. The DEIS should detail the kinds of impacts and needs for local governments and local response agencies including training, equipment, staffing, and liability.

In our experience related to the Nuclear Waste Policy Act, Section 180(c) requires DOE to establish a technical assistance program to prepare states and local governments for emergency response involving spent nuclear fuel and high-level radioactive waste. However, DOE is just beginning to determine how it will structure the program even though shipments could occur as soon as 1998. The existence of 180(c) is evidence that communities are not adequately prepared. The absence of a DOE 180(c) program indicates that DOE is not prepared either. The DEIS should discuss 180(c) and its applicability to the research reactor spent fuel. 518-1

It would be useful to address the potential frequency and quantity of the transportation of RRF. The DEIS should address cumulative transportation impacts of accepting and moving foreign fuel.

S.4 Policy Considerations and Environmental Impacts.

Some of the sites and ports under consideration in this document were initially established in areas of disproportionate minority, low-income, and politically disadvantaged populations. 518-2

The EIS should offer an analysis of the cumulative radiological and other health related impacts to these populations.

RESPONSE TO COMMENT COMMENTOR NO. 518: EUREKA COUNTY, YUCCA MOUNTAIN INFORMATION OFFICE (CONT'D.)

Response to Comment No. 518-1

Rural areas, like urban ones, maintain the basic components of emergency management response, i.e. emergency management, fire, law enforcement, and emergency medical services personnel. It is recognized that rural areas depend more heavily on volunteer resources than urban areas and, while this creates an availability issue during normal business hours (i.e. Monday-Friday, 8:00am-5:00pm), rural jurisdictions generally would be able to meet their responsibilities for public safety involving the wide range of hazardous material shipments that traverse their jurisdictions daily.

Section 180(c) of the Nuclear Waste Policy Act pertains to shipments of commercial reactor spent nuclear fuel and is not directly applicable to this EIS. However, DOE has been concerned with, and involved in, the public safety and emergency response issues their shipments raise. To this end, under Section 180(c) of the Nuclear Waste Policy Act and other initiatives, DOE in concert with many other Federal agencies, is researching the training requirements and identifying a training program to address the incremental needs that DOE shipments would place on a jurisdiction above those for which they are already required to prepare.

Response to Comment No. 518-2

Radiological and nonradiological health effects of the proposed action were evaluated and found to pose no significant risks to the populations surrounding candidate ports, along transportation routes, and surrounding management sites (Sections 4.2.2, 4.2.3, and 4.2.4 of the EIS). Conclusions given in the EIS are based upon analyses described in Appendices A through F and Section 4.2 of the EIS. Risks to the general population, including minority and low-income members of the population, were found to be very low, regardless of previous exposures (See Appendix A).

COMMENTOR NO. 518: EUREKA COUNTY, YUCCA MOUNTAIN INFORMATION OFFICE (CONT'D.)

S.4.4.3 Ground Transport Impacts.

The summary states, "The EIS calculations for incident-free and accident conditions demonstrate that for the general population the impacts are very small. Minority or low-income populations living near these routes would not be subjected to any greater impacts. Therefore, these populations would not receive disproportionately high or adverse impacts." Does this conclusion take into account populations which may have already received a disproportionately high exposure to radiation from fallout from above and underground nuclear weapons testing? This should be addressed in the EIS.

518-2 (Cont'd.)

S.4.4.3.1 Impacts of Incident-Free (Routine) Ground Transportation.

Would the truck drivers work for DOE or for a trucking company? The description supposes a level of control by DOE in choosing and screening drivers. Is this realistic? How would it be handled?

Also, in choosing drivers, there is no discussion of the driver's previous radiation doses. Is any consideration given to the driver's cumulative dose rather than just annual?

518-3

S.4.4.3.2 Impacts of Accidents during Ground Transport.

The Summary states that the development of a transportation plan, incorporating state and local emergency response plans, "would increase emergency responder effectiveness and reduce the potential consequences of an...accident." A plan is not going to increase effectiveness. Adequate training, equipment, and personnel might.

S.4.4.4.1 Potential Health and Safety Impacts from Incident-free Management Site Activities.

In this section there is no discussion of the cumulative impact of exposures to workers, including reviewing their past work exposures. Is an annual exposure all we need to address in order to protect the long-term health of radiation workers?

518-4

RESPONSE TO COMMENT
COMMENTOR NO. 518: EUREKA COUNTY, YUCCA MOUNTAIN INFORMATION OFFICE (CONT'D.)

Response to Comment No. 518-3

The drivers would work for a trucking company under contract to DOE or the foreign research reactor operators. It is realistic for the contract with the trucking company to assign some control over choosing and screening drivers. How the driver screening would be included in the contract is an implementation detail that is outside the scope of this EIS.

No. Each driver's radiation dose is limited to 100 mrem per year without consideration of previous years' radiation doses.

DOE considers that a Transportation Plan would be the basis for identification of required personnel and equipment, as well as determining whether training is required. Proper preparation under the plan would help the responders arrive on the scene faster, thus increasing their effectiveness. The subject of emergency management and response is discussed in more detail in Section 2.7 of the EIS.

Response to Comment No. 518-4

Yes. Annual limits are the only limits on worker exposures. The regulatory limit for onsite radiation workers is 5,000 mrem per year, but DOE would use administrative controls to keep each individual's dose much lower each year.

COMMENTOR NO. 518: EUREKA COUNTY, YUCCA MOUNTAIN INFORMATION OFFICE (CONT'D.)

S.4.4.4.3 Other Potential Environmental Impacts From Management Site Activities.

Air Quality. The summary states that only dust would be a problem during construction. For the Nevada Test Site, the DEIS should address potential airborne radioactive particulate including plutonium from the nuclear rocket testing program in area 25.

518-5

S.4.4.4.4 Cumulative Impacts at the Management Site.

The purpose of the analysis of cumulative impacts is to provide decision makers with the big picture and an opportunity to analyze "the straw that could break the camel's back." Therefore, it is not useful to compare these impacts with other larger ones and conclude that the cumulative impact is minimal. Instead, this analysis should address the potential impacts of this program on the proposed sites and in combination with other activities proposed for the same sites.

For example, at the Nevada Test Site, the cumulative impacts analysis should consider the radiological, and socioeconomic, and other impacts of all NTS activities. These include: one million cubic feet per year of low level waste; storage site for TRU waste; the possibility of being the site for Greater than Class C Waste; the proposed Yucca Mountain repository; and defense spent fuel, to name a few. The cumulative impacts analysis in relation to NTS is inadequate.

518-6

S.4.9 Impacts of Ultimate Disposition.

This section should clarify whether a separate EIS will be done on the ultimate disposal of the material or whether the proposed repository EIS proposed will be adopted or substituted.

518-7

RESPONSE TO COMMENT COMMENTOR NO. 518: EUREKA COUNTY, YUCCA MOUNTAIN INFORMATION OFFICE (CONT'D.)

Response to Comment No. 518-5

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Nevada Test Site.

Response to Comment No. 518-6

See response to comment 518-5, above.

Response to Comment No. 518-7

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. A detailed, quantitative discussion of these impacts would have to be the subject of future NEPA documentation.

COMMENTOR NO. 518: EUREKA COUNTY, YUCCA MOUNTAIN INFORMATION OFFICE (CONT'D.)

Mr. Charles Head Page 5 June 19, 1995

The final paragraph of this section states, "After emplacement in a geologic repository, however, DOE expects there would be no more impacts to workers, the public, or the environment because the radioactive material would be effectively isolated." DOE's current thinking is that the repository would remain open for 100 years for monitoring before final closure. Thus there would be a very long period after emplacement and before closure when there could be impacts. Everyone expects there will be impacts to the public and the environment after emplacement, it is just a question of when and how severe.

518-7 (Cont'd.)

To conclude, the DEIS does not adequately address emergency management and response. The activity proposed in this DEIS must be looked at in the context of the DOE Waste Management System, and there should be a thorough cumulative impact analysis for each site.

The transportation analysis is inadequate and it too should take into account the cumulative impacts of Yucca Mountain transportation, DOE complex transportation, Navy Spent Fuel transportation and WIPP shipments among others.

We appreciate the opportunity to comment on the Draft EIS. Please keep us informed of the decisions surrounding these topics.

Sincerely,

Sandra L. Green

Sandra L. Green
Project Coordinator

AC:l/eds
cc: Leonard Fiorenzi
Abigail Johnson
Steve Campbell, PIC
Representatives of AULGs
State of Nevada, Joe Strolin, John Walker

RESPONSE TO COMMENT
COMMENTOR NO. 518: EUREKA COUNTY, YUCCA MOUNTAIN INFORMATION OFFICE (CONT'D.)

COMMENTOR NO. 530: W. CARL STEGMAN, MAYOR, CITY OF FIFE

The City of Fife

5213 PACIFIC HIGHWAY EAST, FIFE, WASHINGTON 98424

Mayor
W. CARL STEGMAN

(206) 922-CITY

Director of Administration
SHIRLEE A. MOTT

Council
GEORGE CRIM
NANCY de BOOY
WALT FRETZ
JACK STEFANO
MARIAN WETSCH

June 19, 1995

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
US Department of Energy
1000 Independence Ave.
Washington, DC 20585

RE: DOE's Foreign Reactor Spent Fuel Policy

Dear Mr. Head:

The City of Fife has passed the attached Resolution objecting to the joint policy of the DOE and Department of State to transport spent nuclear fuel from foreign research reactors by shipment through the City of Tacoma, Port of Tacoma and City of Fife. We object to Alternative 1 and feel that a much better solution would be Transition Now With Alternative 2.

530-1

Our City, our business and our surrounding population and businesses feel strongly that the risks involved in shipment through our area -- or anywhere in the United States -- represents an unacceptable burden and risk upon our citizens. Therefore, we strongly oppose Option 1 and support Alternative 2 as prepared by Port staff and Dr. Ray K. Robinson, consultant.

Sincerely yours,

W. CARL STEGMAN
Mayor

WCS/bmw
cc: Fife City Councilmembers
Mayor Harold Moss, City of Tacoma
Patrick O'Malley, President of
Port Commission, Port of Tacoma
Mott/File

RESPONSE TO COMMENT COMMENTOR NO. 530: W. CARL STEGMAN, MAYOR, CITY OF FIFE

Response to Comment No. 530-1

The commentor's opposition to Management Alternative 1 and support for Management Alternative 2 are noted. These are discussed in Sections 2.2, 2.3, 4.2, and 4.4 of the EIS.

COMMENTOR NO. 530: W. CARL STEGMAN, MAYOR, CITY OF FIFE (CONT'D.)

ORIGINAL

RESOLUTION NO. 518

CITY OF FIFE, WASHINGTON

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF FIFE, PIERCE COUNTY, WASHINGTON OBJECTING TO THE JOINT POLICY OF THE UNITED STATES DEPARTMENT OF ENERGY AND UNITED STATES DEPARTMENT OF STATE TO TRANSPORT SPENT NUCLEAR FUEL FROM FOREIGN RESEARCH REACTORS BY SHIPMENT THROUGH THE CITY OF FIFE, WASHINGTON

WHEREAS, the United States Department of Energy and the United Department of State are jointly proposing to adopt a policy to manage spent nuclear fuel from foreign research reactors; and

WHEREAS, nuclear fuel containing uranium enriched in the United States of America would be covered by this policy; and

WHEREAS, the purpose of this policy is to promote US nuclear weapons nonproliferation policy objectives, specifically seeking to reduce highly enriched uranium from civilian commerce; and

WHEREAS, the number one alternative of the study that assessed the environmental effects and policy considerations of three management alternative approaches for implementation of the proposed policy involves spent nuclear fuel being shipped by ocean going vessels from foreign countries to the United States of America; and

WHEREAS, the Port of Tacoma is considered one of ten ports through which the shipment of spent nuclear fuels would occur; and

WHEREAS, the shipment of the spent nuclear fuels through the Port of Tacoma to other locations within the United States will result in shipping the fuels through the City of Fife; and 530-2

WHEREAS, the US House Budget Resolution eliminates the US Department of Energy thereby creating funding uncertainties; and 530-3

WHEREAS, the US Department of Energy is failing to provide adequate procedural due process in that it is not making a record of its hearings thereby foreclosing individuals abilities to challenge the adequacy of the EIS; and 530-4

WHEREAS, the US Department of Energy has not answered properly the question of what effect the radiation would have on the environment should a shipping cask be damaged during the handling process in the Port of Tacoma or City of Fife; now therefore 530-1 (Cont'd)

BE IT RESOLVED THAT the City Council of the City of Fife

RESPONSE TO COMMENT COMMENTOR NO. 530: W. CARL STEGMAN, MAYOR, CITY OF FIFE (CONT'D.)

Response to Comment No. 530-2

If DOE were abolished in response to action by Congress, the current DOE programs for management of spent nuclear fuel would have to be transferred to some other Federal government agency to protect the health and safety of the public. Since the spent nuclear fuel will not simply go away, these programs cannot simply be abolished.

Response to Comment No. 530-3

DOE did request that comments be submitted in writing, however, all oral comments presented at each hearing were summarized and have been addressed along with the written comments in Volume 3 of the EIS. All comments, written and oral, are part of the public record.

Response to Comment No. 530-4

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 40 years of spent nuclear fuel ground transport in the United States, no radioactive contents have ever been released from a transportation cask, nor has a spent nuclear fuel transportation cask ever been punctured, even as the result of an accident.

The tests performed to receive Nuclear Regulatory Commission certification of transportation casks are more severe than any accidents envisioned on the dockside. Although the NRC drop test is only from 30 feet and dockside heights can easily exceed this amount, the NRC test is still considered more severe because the cask is dropped upon an unyielding surface. The unyielding surface used in NRC tests is a monolithic reinforced concrete base covered with battleship armor. Docks are not of such construction. Likewise the puncture test is demanding, consisting of a one meter (39.4 in) cask drop onto a 15 cm (6 in) solid steel bar mounted on an unyielding surface. Section 5.4.1 of the EIS presents details of the certification.

COMMENTOR NO. 530:
W. CARL STEGMAN, MAYOR, CITY OF FIFE (CONT'D.)

strongly opposes the shipment of spent nuclear materials from foreign research reactors through the Port of Tacoma and the City of Fife. 530-1 (Cont'd)

Passed by the City Council on the 13th day of June, 1995 and approved by the Mayor on the 13th day of June, 1995 at a regularly scheduled meeting of the City Council of the City of Fife.

W. Carl Stegman, Mayor

Attest:

Shirlee Mott
City Clerk

RESPONSE TO COMMENT
COMMENTOR NO. 530:
W. CARL STEGMAN, MAYOR, CITY OF FIFE (CONT'D.)

COMMENTOR NO. 556:
ERNEST F. CIARROCCHI, MAYOR, CITY OF BENICIA

THE CITY OF BENICIA CALIFORNIA

CITY HALL • 250 EAST L STREET • BENICIA, CA 94510 • (707)746-4212 • FAX (707) 747-8120

Office of the Mayor
ERNEST F. CIARROCCHI

June 14, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue
Washington, D.C. 20585-0001

RE: DRAFT ENVIRONMENTAL IMPACT STATEMENT ON A PROPOSED NUCLEAR WEAPONS NONPROLIFERATIONS POLICY CONCERNING FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL

Dear Mr. Head:

The City Council of Martinez, California contacted the City of Benicia about the proposal of the Department of Energy to ship nuclear wastes to the Concord Naval Weapons Station for storage. The City of Martinez requested our support in extending the public notice and comment period for not less than ninety (90) additional days to September 20, 1995. This extension would allow the Martinez Planning Department staff and council a full opportunity to evaluate the impacts associated with DOE's proposal to ship spent nuclear fuel from foreign reactors through the Concord Naval Weapons Station and along California highways and rails to various sites across the United States. 556-1

Ordinarily, actions of this magnitude require months of planning study before any local agency or government is prepared to make a decision to approve or disapprove such a project. I believe the following points illustrate areas of particular importance to all cities in the area:

- The area is densely populated and while the risk of widespread contamination due to accidental release may be low, the potential impact effect of such an accident on thousands of residents, not to mention the long term impacts on people, major waterways and downwind agricultural could be enormous. 556-2
- The transportation of this material, as presently proposed, would bring tons of this material through surrounding cities by rail and truck. 556-3

ERNEST F. CIARROCCHI, *Mayor*
Members of the City Council
CAREY CORRALEY *Vice Mayor* • JOHN SILVA • JERRY HAYES • PEPE ARTIAGA

OTTO WM. GIULIANI, *City Manager*
VIRGINIA SOUZA, *City Treasurer*
FRANCES GRUCO, *City Clerk*

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RESPONSE TO COMMENT
COMMENTOR NO. 556:
ERNEST F. CIARROCCHI, MAYOR, CITY OF BENICIA

Response to Comment No. 556-1

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 days total) to be sufficient for public comment.

Response to Comment No. 556-2

Sections 4.2.1 and 4.2.2 of the EIS provide an evaluation of consequences and risks of on-board ship fires. Supporting details are given in Appendix D of the EIS. If a policy to accept foreign research reactor spent nuclear fuel is adopted, spent nuclear fuel elements would be shipped in transportation casks which are resistant to destruction by collision and fire (Section 2.6.2 of the EIS). In the unlikely event that a cask is breached by collision and/or fire, the radiological consequences would be low and the associated risks would be low (Section 4 of the EIS).

Response to Comment No. 556-3

If one port were to receive all 721 casks over the proposed 13-year receipt period, this would result in about one additional truck or rail car per week on average. This amount of increased traffic is unlikely to have any effect.

DOE has not yet selected ports, routes, or transport modes for the foreign research reactor spent nuclear fuel. If the Concord NWS is selected, then DOE would choose the best route to I-680 in accordance with Department of Transportation regulations (49 CFR 397.101 (a)(2)). That route could use Route 4, Route 24, and/or Waterfront Road. The State of California routing agency can designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103.

COMMENTOR NO. 556:
ERNEST F. CIARROCCHI, MAYOR, CITY OF BENICIA (CONT'D.)

- Since this proposal also includes the use of shipping channels for transport, we are concerned about the potential for widespread contamination in the event of a ship fire or other unforeseen occurrence. 556-4

The City of Benicia, therefore, urges you to take a careful look at this proposal and honor the request of the City of Martinez by extending the period for public notice and comment.

Thank you for your time and attention to this important issue.

Sincerely,

Ernest F. Ciarrocchi
Mayor

EFC:tb
/6895

cc: George Miller
Congressman

Bill Baker
Congressman

RESPONSE TO COMMENT
COMMENTOR NO. 556: ERNEST F. CIARROCCHI, MAYOR, CITY OF BENICIA (CONT'D.)

Response to Comment No. 556-4

See response to comment 556-2, above.

COMMENTOR NO. 557: BOB JACOBS, MAYOR, CITY OF OLYMPIA

City of
OLYMPIA

900 Plum Street, P.O. Box 1967, Olympia, WA 98507-1967

June 23, 1995

COUNCIL
Bob Jacobs, Mayor
Mark Foutch, Mayor Pro Tem
Pat Cole
Holly Gadbaw
Jeanette Hawkins
Mary Lux
Margaret McPhee

CITY MANAGER
Richard C. Cushing

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue
Washington, DC 20585

Dear Mr. Head:

I am writing on behalf of the Olympia City Council regarding a U.S. Department of Energy proposal to ship spent nuclear fuel from foreign research reactors through the Port of Tacoma in the Puget Sound.

The City of Olympia is strongly opposed to this action. We believe this action could produce a devastating and disproportionate impact on the residents of the Puget Sound area including Olympia. 557-1

Instead, we support the alternative developed by the Port of Tacoma which prefers that the United States work collaboratively with foreign sources of nuclear fuel for permanent and appropriate geological disposal in those respective countries. We believe both long term and short term storage can be accommodated for these foreign sources of nuclear waste. We strongly urge you to consider the Port of Tacoma's alternative and to cease any plans to ship those fuels through the environmentally sensitive Puget Sound area. 557-2

Sincerely,

Bob Jacobs
Mayor of Olympia

cc: Olympia City Council

6D675

City Council	753-8908	Community Planning & Development	753-8314	Personnel	753-8442
City Manager	753-8447	Fire	753-8365	Police	753-8300
City Attorney	753-8449	Parks/Recreation/Cultural Services	753-8380	Public Works	753-8362
Administrative Services	753-8325				

RESPONSE TO COMMENT
COMMENTOR NO. 557:
BOB JACOBS, MAYOR, CITY OF OLYMPIA

Response to Comment No. 557-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 557-2

The commentor's preference for overseas storage and disposal is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

Commentor No. 569:
Gayle B. Uilkema, Mayor, City of Lafayette

LAFAYETTE

CITY COUNCIL
Gayle B. Uilkema, Mayor
Ivor Samson, Vice Mayor
Judy Gervens
Anne Grodin
Donald L. Tatzin

June 16, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue
Washington, D.C. 20585-0001

Re: Request a copy of the complete Draft Environmental Impact Statement and a 60 day extension to the public comment period.

Dear Mr. Head,

I wish to respond on behalf of the Lafayette City Council to the **summary** of the Draft Environmental Impact Statement (EIS) for the Proposed Policy On Return of Spent Nuclear Fuel. This proposal, as written, may have an impact on our community and residents. I am referring specifically to the preferred alternative which proposes the use of the Concord Navel Weapons Station (NWS) as a port of entry and transportation hub for spent nuclear fuel. As Mayor of Lafayette, the safety of our residents and our environment is of utmost concern to me. To this end, we formally request a 60 day extension to the public comment period and the opportunity to review a **complete** Draft EIS. *569-1*

I would like to take this opportunity to express my deep concern that the Department of Energy **DID NOT NOTIFY US** regarding this proposal. To this date, we have not even received a complete Draft EIS. The standard procedure for large projects processed at the local level is to subject them to a comprehensive review by all impacted jurisdictions in order to identify the impacts of the project on the entire community. We understand that federal policies are not required to conform to local ordinances; however, the Bay Area (and Lafayette specifically) has a unique combination of factors that merit close scrutiny. Failure to adequately analyze these factors could have a detrimental affect on the safety of the residents in the area.

The City of Lafayette has, through its own efforts, acquired some relevant documents, including the summary of the Draft EIS. After a review of these documents we have the following questions and comments:

1. What services may be required from local agencies in the event that the Concord Navel Weapons Station is used as a port of entry for the transportation of nuclear material? Has there been an evaluation of the increased burden to Lafayette's emergency services and personnel? Has the DOE planned for a regional *569-2*

POST OFFICE BOX 1968
3675 MT. DIABLO BLVD., SUITE 210, LAFAYETTE, CA 94549-1968
TELEPHONE: (510) 284-1968 FAX: (510) 284-3169

Response to Comment
Commentor No. 569:
Gayle B. Uilkema, Mayor, City of Lafayette

Response to Comment No. 569-1

The draft EIS did not specify a preferred alternative. However, the final EIS does present a preferred alternative in Sections 2.9 and 4.7. The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 days total) to be sufficient for public comment. As to the commentor's claim that notification was not provided, DOE acted in full compliance with NEPA by publishing in the Federal Register an Advance Notice of Proposed Rulemaking (ANPR), which announced DOE's intention to conduct scoping meetings related to the proposed policy of managing foreign research reactor spent nuclear fuel. The ANPR constitutes DOE notice, under NEPA, that a major federal action is being proposed. Further notice of the proposed policy came with the publication in the Federal Register (60 FR 19899, April 21, 1995) of the availability of the draft EIS and the notification of the public hearings on the draft EIS.

Response to Comment No. 569-2

Foreign research reactor spent nuclear fuel shipments are subject to the same types of potential hazards as those of other ships carrying nonradiological hazardous materials.

DOE considers that there is adequate regulatory and emergency preparedness infrastructure to ensure the safe acceptance and transport to designated management sites if the foreign research reactor spent nuclear fuel is managed in the United States. Federal funding to State, Tribal, and local governments for maintaining emergency response programs is discussed in Section 2.7.1. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advise and assistance to the State, Tribal and local agencies involved with a radiological incident. Emergency preparedness, security, and coordination of DOE with local emergency response authorities, and security are discussed in general in Sections 2.7 and 2.8 of the EIS. Details would be contained in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

COMMENTOR NO. 569: GAYLE B. UILKEMA, MAYOR, CITY OF LAFAYETTE (CONT'D.)

emergency response in the event of an accident? If so, we have not been contacted regarding these issues.

2. Will our emergency services coordinator or local officials be notified when nuclear material is scheduled to be transported to the NWS? Will special accommodations need to be made during the transporting of the material, perhaps putting emergency personnel on alert or blocking off local roads or freeway on and off ramps? Will local jurisdictions be reimbursed for these expenses? *569-2 (Cont'd.)*

3. What contingencies has the DOE formulated to handle an accident that damages one or both of the major transportation arterials. There are several key transportation arterials which in the past have proven to be especially vulnerable to accidents. These include Highway 24 at the Caldacot Tunnel and Highway 680. Were current and future traffic surveys and the potential for life-threatening accidents been considered in the Draft EIS? *569-3*

4. Since the Draft EIS states this policy would last for 13 years, has the impact been evaluated on future developments? These would include: the increased likelihood of accidents caused by increasing traffic volumnes along major transportation arterials, the impact of accidents on future developments and increased population and emergency response costs due to the cost of future development.

5. There is an open reservoir in Lafayette which potentially provides drinking water to much of the region. What contingencies have been formulated to ensure the reservoir will not be contaminated in the event of an accident? If the reservoir is contaminated, how will the DOE ensure an emergency supply of safe drinking water to the region? *569-4*

6. What are the possible economic impacts to a local jurisdiction if an accident involving the nuclear material occurs? Is there a possibility of long term environmental damage? *569-5*

Obviously, it is impossible to respond adequately or responsibly to the proposed nuclear material transfer policy without having the opportunity to review the complete Draft EIS. Due to the risks associated with the transportation of nuclear materials through densely populated areas, it is imperative that a thorough analysis of the safety issues and risks be completed. I am therefore requesting that a complete EIS be sent to the Lafayette City Offices as soon as possible. I also request that a 60 day extension to the public comment period be granted. This is necessary to allow us the to opportunity thoroughly review and comment on the document.

Sincerely,

Gayle B. Uilkema
Mayor

RESPONSE TO COMMENT COMMENTOR NO. 569: GAYLE B. UILKEMA, MAYOR, CITY OF LAFAYETTE (CONT'D.)

Response to Comment No. 569-3

For the local truck routes near Concord, see the response to Comment 22-11. DOE has not conducted any traffic surveys or formulated any contingencies for an accident that might damage a major transportation arterial. The addition of up to 186 truck shipments to these routes spread out over a period of 13 years would have a low impact on the traffic congestion or the traffic accident rate because tens of thousands of truck shipments will travel the same roads during those 13 years. As discussed in Appendix E and Section 4.2.3.3 of the EIS, the potential for traffic accidents would be low.

The increased likelihood of accidents is included in the ground transport risk calculations presented in Section 4.2.3.3 of the EIS.

Response to Comment No. 569-4

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 40 years of spent nuclear fuel grand transport in the United States, no radioactive contents have ever been released from a spent nuclear fuel transportation cask, nor has a spent nuclear fuel transportation cask ever been punctured, even as the result of an accident. Based on this experience, DOE does not expect that transportation casks passing through the Concord NWS would release it contents or affect the quality of the water supply for Contra Costa Water District via Mallard reservoir or any other path.

DOE would like to point out that the foreign research reactor spent nuclear fuel is neither volatile nor unstable. The spent nuclear fuel that the proposed policy deals with is a solid metal which contains enriched uranium matrixed in, all clad with either aluminum or stainless steel. This type of fuel is very stable. Section 2.6.1 of the EIS presents a detailed description of the foreign research reactor spent nuclear fuel.

Analysis of a severe accident involving a ship at Concord NWS (Section 4.2.2.3 of the EIS) indicates that the resultant contamination would be so small that no cleanup would be required, other than possibly in the immediate vicinity of the accident. To insure this was the case, if such a severe accident were to occur, all water supplies in the area, as well as food and air, would be tested for contamination.

Response to Comment No. 569-5

The economic impacts of an accident involving foreign research reactor spent nuclear fuel to a local jurisdiction would be low in almost every instance. As discussed in Section 2.7 of the EIS, the primary responsibility for emergency response to an incident would reside with State, Tribal, and local authorities. DOE would provide coordination and technical assistance and training to the State, Tribal, and local emergency response

Commentor No. 569: Gayle B. Uilkema, Mayor, City of Lafayette (Cont'd.)

Response to Comment Commentor No. 569: Gayle B. Uilkema, Mayor, City of Lafayette (Cont'd.)

personnel. In addition, DOE has Radiological Assistance Program teams that operate from eight strategically located DOE offices around the country. Upon State, Tribal, or local request, these teams can provide technical expertise and assistance to monitor and assess radiological hazards. The teams are activated on an as-needed basis and generally can be ready to deploy from their home station within four hours of notification.

Other potential local expenses that a local jurisdiction might incur would be associated with follow-up activities after an accident. However, spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident. In the unlikely event of a severe accident, some radioactive material could be released from the cask and distributed into the environment. However, the analyses in Section 4.2.2.3 and Appendix D, Section D.5 of the EIS determined that no decontamination, interaction, or condemnation of property would result from the worst plausible accident. Close in to the accident, near the cask would likely require some cleanup, but the overall impact on the air and water quality in the port would be small. Therefore, even an accident should not economically impact local jurisdictions.

On the issue of environmental impacts, no negative impacts would result from the receipt, handling, and transportation of foreign research reactor spent nuclear fuel. As stated above, spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

COMMENTOR NO. 592:
JANDA VOLKMER, MAYOR, TOWN OF STEILACOOM

Office of Administration

Mayor Janda Volkmer

June 20, 1995

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue
Washington D.C. 20585

RE: Shipment of Spent Nuclear Fuel through Puget Sound and Port of Tacoma

Dear Mr. Head:

I am the Mayor of a small town on the shores of Puget Sound south of Tacoma in the State of Washington. I am writing to express my strong opposition to and dismay at the Department of Ecology's proposal to ship spent nuclear fuel through the Port of Tacoma. 592-1

I realize that the Nuclear Nonproliferation Treaty is designed to restrict the access of irresponsible parties to nuclear materials, however I do not believe DOE's proposal represents the best alternative. 592-2

In order to meet the nonproliferation objectives of the proposed foreign research reactor spent nuclear fuel policy, this country needs to work diligently now with affected parties on a plan that allows them to become self sufficient as soon as possible. Assuming their responsibilities for 10 years merely defers the problem, does not solve it.

Philosophical observations aside, I wish to stress the immediate and negative impact such an action would have on Steilacoom and its environs. The DOE-recommended proposal advocates shipment of highly radioactive waste through the Port of Tacoma and the waters of Puget Sound. This scenario presents a risk to our people, wildlife, fish and environment that should not even be considered - particularly when there exists a feasible alternative. That alternative consists of the U.S. working in collaboration with foreign sources of nuclear fuel services to develop the abilities to store, reprocess and permanently dispose of spent nuclear fuel. Pursuing this alternative would allow foreign governments to assume proper responsibility for protection and disposal of their nuclear resources and would also protect the citizens of this nation from exposure to needless risks. 592-3

I urge you to consider seriously the alternatives available to DOE's recommended proposal and not endanger the health and safety of United States citizens. 592-2 (Cont'd.)

Sincerely,

Janda Volkmer

Janda Volkmer
Mayor

JV/sw

c: Patrick O'Malley
Tacoma Port Commission

1715 Lafayette Steilacoom, WA 98388 Phone (206) 581-1900 FAX (206) 582-3463

RESPONSE TO COMMENT
COMMENTOR NO. 592:
JANDA VOLKMER, MAYOR, TOWN OF STEILACOOM

Response to Comment No. 592-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 592-2

The commentor's preference for overseas storage, reprocessing, and disposal is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

Response to Comment No. 592-3

In regard to the air and water quality as it pertains to the proposed policy of managing foreign research reactor spent nuclear fuel, DOE considers that there would be no significant adverse impacts to any of the ports that might be used to accept the material nor any of the waterways through which the ships pass. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

The analyses in Sections 4.2.2.2, 4.2.2.3 and 4.5 of the EIS demonstrate that the risks to the people in the area of Tacoma, including the Town of Steilacoom, are low.

COMMENTOR No. 646: PORT OF GALVESTON

PORT of GALVESTON

123 Rosenberg
P.O. Box 328
Galveston, Texas 77553

Galveston (409) 766-6103
Houston (713) 286-2484
Fax (409) 766-6171

NOTICE OF MEETING

Ernest Connor
General Manager

THE GALVESTON WHARVES WILL HOLD A PUBLIC MEETING ON THE SUBJECT OF SPENT NUCLEAR FUEL MANAGEMENT ON THURSDAY, JUNE 29, 1995, AT 5:30 P.M. THE PUBLIC IS INVITED TO ATTEND AND TAKE PART IN THESE DISCUSSIONS. THERE WILL ALSO BE A VIDEO ON THIS SUBJECT MATTER SHOWN DURING THE MEETING.

646-1

IF YOU HAVE ANY QUESTIONS, PLEASE CALL (409) 766-6105.

PUBLIC MEETING

PORT OF GALVESTON
5TH FLOOR, SHEARN MOODY PLAZA
123 ROSENBERG, GALVESTON, TEXAS
THURSDAY, JUNE 29, 1995, 5:30 P.M.

RESPONSE TO COMMENT
COMMENTOR No. 646: PORT OF GALVESTON

Response to Comment No. 646-1

The notice of a public meeting held by Galveston Wharves on June 29, 1995 is noted. A public meeting on the draft EIS sponsored by DOE was held in Galveston on May 17, 1995. Responses to comments given at that meeting are provided in this document.

COMMENTOR NO. 678: CLYDE CIVIC IMPROVEMENT ASSOCIATION, INC.

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Juanita J. Price **Phone:** (510) 687-4440

Title and Organization: Clyde Civic Improvement Assn., Inc. & Private Citizen

Address: 146 Park Street

City: Clyde, Concord, **State** CA. **Zip** 94520

*** *COMMENTS* ***

I attended your meeting in Concord and was amazed how unprepared you were in responding to the complaints of those present. We as taxpayers have a right to a voice in matters of this extreme importance since we live right in the middle of the Naval Weapons Station. We are like an island in the midst of the Base. How dare you try to thrust something like this down our throats! We want you to hear our voices LOUD & CLEAR that we will not allow this to happen! Our community has filed many lawsuits over the years and have to lose one yet. Our lives are at stake here and you people could care less. Take the logical move and take contaminated nuclear waste out of our country and leave it with the countries who are using it. If it must come into this country, then send it up to Washington so it will have a short way to travel to the disposal site. Coming up the river and under the Bay Bridge and the Golden Gate Bridge will not be allowed by us! 678-1 678-2

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT COMMENTOR NO. 678: CLYDE CIVIC IMPROVEMENT ASSOCIATION, INC.

Response to Comment No. 678-1

The commentor's preference for keeping the foreign research reactor spent nuclear fuel, covered under this proposed action, overseas is noted. However, this alternative, evaluated as Management Alternative 2a (Section 2.3 of the EIS), would not fully support the U.S. nuclear weapons nonproliferation policy.

Storage in the countries of origin would also cost more than storage in the United States (and cost U.S. taxpayers more), would be technically difficult, if not impossible, in many countries, and would violate the laws of several of the countries. Finally, many countries participated in the U.S.-led research reactor programs on the belief that the United States would eventually accept the spent nuclear fuel.

Response to Comment No. 678-2

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 684:
CRAIG G. KOCIAN, CITY MANAGER, CITY OF OAKLAND

CITY OF OAKLAND

CITY HALL • ONE CITY HALL PLAZA • OAKLAND, CALIFORNIA 94612

Office of City Manager
Craig G. Kocian
City Manager

(510) 238-3301
TTY/TDD (510) 238-3724

June 19, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-7)
US Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Re: Draft EIS Concerning Foreign Reactor Spent Nuclear Fuel - March 1995

Dear Mr. Head:

In response to the US Department of Transportation Draft EIS issued March 1995, the Oakland City Council at its meeting of June 13, 1995 voted 8-0 to oppose the transportation of radioactive spent fuel rods from foreign countries across San Francisco Bay, via air, water, rail or highway, to the Concord Naval Weapons Station or any other private or governmental facility. *684-1*

The Oakland City Council opposes the shipment of spent nuclear fuel into San Francisco Bay for the following reasons:

No permanent disposal option currently exists for spent nuclear fuel. Any spent nuclear fuel returned to the U.S. will require further transportation when permanent disposal options and site(s) are identified. For this reason environmental organizations, including Western States Legal Foundation and Greenpeace oppose the movement of spent nuclear fuel until a permanent disposal option is available. *684-2*

Spent fuel is thermally hot and can spontaneously ignite or explode in contact with air or other chemicals should the casks fail. The release of even a very small quantity of nuclear fuel by leak, fire or explosion would contaminate a large area making that area uninhabitable. *684-3*

The risk of accident is greatest when new processes, procedures and materials are introduced at a facility. The EIS provides no information concerning the ability, capacity or special facilities of Concord NWS to handle spent nuclear fuel, therefore we have no idea of whether they can safely handle this project. *684-4*

RESPONSE TO COMMENT
COMMENTOR NO. 684:
CRAIG G. KOCIAN, CITY MANAGER, CITY OF OAKLAND

Response to Comment No. 684-1

The commentor's opposition and that of the Oakland City Council to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 684-2

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS).

Response to Comment No. 684-3

The foreign research reactor spent nuclear fuel is not pyrophoric and will neither ignite nor explode when it comes in contact with air or chemicals. In fact, the spent nuclear fuel is being shipped in a transportation cask with air as a cooling medium. The radioactive material in spent nuclear fuel is contained within the fuel hybrid (aluminum or zirconium) and is surrounded by a layer of solid aluminum, stainless steel or incoloy, (Appendix B of the EIS). The EIS evaluated accident scenarios involving fire that results in loss of cask integrity. The results of the analyses in Section 4.2.2.3 and Appendix D, Section D.5 of the EIS determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident. The EIS evaluated the consequences of an accident involving a prolonged high intensity fire in response to public concern. The results, as shown in Appendix D, indicate a contamination distance of less than 0.2 mile with a probability of occurrence of one in ten billion (Appendix D of the EIS).

Response to Comment No. 684-4

The experience and facilities that a port must have to safely handle foreign research reactor spent nuclear fuel are discussed in Appendix D, Sections D.1.9.1 and D.1.9.3 of the EIS, respectively. The Concord NWS possesses the necessary experience and facilities.

COMMENTOR NO. 684: CRAIG G. KOCIAN, CITY MANAGER, CITY OF OAKLAND (CONT'D.)

The EIS does not consider all possible risks including San Francisco Bay shipping accidents, congested traffic, earthquake, tidal wave and other risks specific to this area. The current EIS considers the 10 port of entry sites as a group; site specific risks are not discussed. 684-5

The EIS assumes that local emergency responders and local emergency plans are fully capable of handling an emergency in the transportation of spent nuclear fuel. Since it is the policy of the federal government, due to national security, to neither confirm nor deny the movement of weapons and the other sensitive materials, local governments are not always informed. It therefore becomes very difficult to plan for and respond to a potential incident of this nature. 684-6

In the past the Oakland City Council and the Port of Oakland have both vigorously opposed the shipment of spent nuclear fuel through the Port of Oakland. The risks of shipping spent nuclear fuel through San Francisco Bay to the Concord Naval Weapons Station are very similar and objections remain the same. Should an accident occur the region as a whole would be seriously affected.

Sincerely,

Craig G. Kocian
City Manager

cc: Mayor Harris
Members of the City Council
Office of the City Clerk

RESPONSE TO COMMENT COMMENTOR NO. 684: CRAIG G. KOCIAN, CITY MANAGER, CITY OF OAKLAND (CONT'D.)

Response to Comment No. 684-5

The passage from San Francisco Bay to Concord NWS meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). Favorable transit from open ocean is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations such as port population, population along the route to the management site, port experience with handling containers, and port facilities would be considered in making the final selection of ports of entry. Appendix D, Section D.1.9 of the EIS presents details of the port selection process.

The EIS considered severe natural phenomena (i.e., earthquakes, volcanism, etc.) as part of the port selection process (Appendix D, Section D.1.9.6 of the EIS). The probability of severe natural phenomena impacting foreign research reactor spent nuclear fuel shipments is low since there is an extremely short period of risk (typically less than 24 hours). The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (Appendix D, Section D.1.9.2 of the EIS). Appendix D, Section D.5.3.1.3 of the EIS presents a discussion of the determination of the probability of ship accidents used in the EIS.

Response to Comment No. 684-6

As discussed in Section 2.6.4.2 of the EIS, the NRC regulations concerning actual route notification are set forth in 10 CFR Part 73. Shippers are required to submit proposed routes for spent nuclear fuel shipments to NRC for approval, and NRC publishes a public information circular that lists routes that have been evaluated and approved for specific spent nuclear fuel shipments. The regulation also requires DOE to inform the Governor of each State and any Tribal chair, or their designee, along the route at least seven days in advance of the each shipment of hazardous cargoes, including radioactive materials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected these issues include capabilities and training of first emergency responders. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

COMMENTOR NO. 687: CITY OF TACOMA - CITY COUNCIL

City of Tacoma

Office of the City Council

June 19, 1995

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

RE: Draft Environmental Impact Statement (EIS) on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

The City of Tacoma is grateful to the U.S. Department of Energy for the public hearing you have scheduled for June 19, 1995 in our community and the extension on the public comment period to June 30, 1995 recently granted at the request of Congressman Randy Tate, Senator Patty Murray, and the rest of our Washington State Congressional delegation. We feel a matter of this importance needs the opportunity for sufficient consideration by our citizenry.

The City of Tacoma is writing to express its strong opposition to the U.S. Department of Energy's proposal to use the Port of Tacoma as a port of entry for the United States to import spent nuclear fuel from foreign research reactors. The goal of the proposed policy--to prevent the potential for creation of nuclear weapons by carefully regulating the shipment and disposal of high-level nuclear waste from foreign countries--is laudable. The Draft EIS failed to consider or fully ignored, however, a broad range of environmental, health and safety, and economic issues related to our community which undoubtedly will lead to considerable difficulty and possible litigation if the Port of Tacoma is designated as a port of entry.

The summary listed below does not attempt to identify all the issues of concern, but rather attempts to highlight some of the more significant ones. The following points have been incorporated into a resolution which was adopted by unanimous vote of the Tacoma City Council on June 6, 1995. A copy is attached for your reference.

747 Market Street, Room 1200, Tacoma, Washington 98402-3766, (206) 591-5100, FAX (206) 591-5123

RESPONSE TO COMMENT
COMMENTOR NO. 687: CITY OF TACOMA - CITY COUNCIL

COMMENTOR NO. 687: CITY OF TACOMA - CITY COUNCIL (CONT'D.)

Mr. Charles Head
Page 2
June 19, 1995

1. The Port of Tacoma is located in a federally-designated Superfund Site. The Commencement Bay Nearshore/Tideflats Superfund Site is on the National Priority List for cleanup under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Millions of local business, industry, and municipal (community) dollars are being spent in an effort to cleanup this environmentally sensitive area. Additionally, once the federal Superfund cleanup activities are complete, the Natural Resources Damage Assessment process under CERCLA goes beyond the cleanup to recover additional dollars from these same entities to restore, replace, or acquire the equivalent of the injured resources within the Superfund Site.

2. The Draft EIS states: "The absence of conflicting activities at potential commercial ports was considered..." The Draft EIS goes on to state that criteria considered,"...if the port in question also had no potentially dangerous, unavoidable conflicting activities, such as regularly scheduled transport of explosive or flammable cargoes, no petroleum carriers or storage facilities in the immediate vicinity of the foreign research reactor spent nuclear fuel carrying vessels,..." The Port of Tacoma is the sixth largest and busiest commercial container port in the nation. The Draft EIS ignores the potential for conflicting activities at the Port of Tacoma, which pose a very real safety concern to our community. The Port of Tacoma handles explosive cargo through our civilian terminals, but, more importantly, because of the military facilities in our community, the Pierce County terminal handles powerful explosives on a regular basis. Additionally, our Port handles some products which have restricted limits on quantities due to safety reasons, and there are major chemical and petroleum production, storage, and transport facilities located in the immediate vicinity. The Draft EIS also states that recovery of any shipping casks/containers in waters of 200 meters or deeper is difficult, but states areas with those depths only exist in the open ocean. This is not true. The Puget Sound has a number of depressions with waters 200 meters or deeper.

687-1

3. The Draft EIS states, "Primary responsibility for emergency response to a foreign research reactor spent nuclear fuel incident would reside with local authorities (DOE, 1989)." The Port and City of Tacoma have emergency response plans for hazardous materials; however, there is some question whether the training, safety, and response needs addressed in these local plans would be sufficient if a spent nuclear fuel incident should occur. Local officials are very concerned that the burden for funding the proper training and equipment for this

687-2

RESPONSE TO COMMENT COMMENTOR NO. 687: CITY OF TACOMA - CITY COUNCIL (CONT'D.)

Response to Comment No. 687-1

DOE has added a sentence to Appendix D, Section D.2.1.9 of the EIS regarding Commencement Bay being a Superfund Site. The analysis of impacts in Section 4 of the EIS indicates that there would be no significant adverse impacts on the ports, people, or natural environment from shipments of foreign research reactor spent nuclear fuel and the overall impacts to Commencement Bay would be unchanged by the various management alternatives.

Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma as noted by the commentor. The analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Sections 4.2.1.1 and Appendix C, Section C.2 of the EIS). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Based on over 30 years experience shipping spent nuclear fuel, DOE considers that spent nuclear fuel transportation casks passing through the Port of Tacoma, Commencement Bay, or any other port or waterway would not affect air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (Appendix D, Section D.1.9.2 of the EIS). Appendix D, Section D.5.3.1.3 of the EIS presents a discussion of the determination of the probability of ship accidents used in the EIS. Spent nuclear fuel from foreign research reactors is shipped in standard containers, and does not require special handling techniques (Section 2.6.3.2.2 of the EIS).

The security provided for the spent nuclear fuel shipments is required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Section 4.2.1.3 of the EIS has been modified to include this assurance of recovery in coastal

COMMENTOR NO. 687:
CITY OF TACOMA - CITY COUNCIL (CONT'D.)

Mr. Charles Head
Page 3
June 19, 1995

type of emergency could be equivalent to yet another federal unfunded mandate thrust on local government. Even if full funding for training were available, it is unlikely we, as elected officials, would acquiesce to this proposal. We understand that additional emergency response management may be available with those military facilities located within our community, and we question whether they have had sufficient time to comment on the impact of this proposal.

687-2 (Cont'd.)

4. The City of Tacoma has recently been designated an Enterprise Zone Community. The Port of Tacoma is an area within the boundary of that designation. This distinction has been given to communities in need of boosting their socio-economic base and improving the quality of life for their citizens. The stigma of being identified as a port of entry for spent nuclear fuel coupled with the already existing negative implications from our Superfund designation would run counter to the City's efforts to boost our reputation as an area with potential for a thriving economic base.

The precise extent of the impact of this proposal is difficult to predict due to the ambiguous language in the Draft EIS. We question the wisdom of implementing the current proposal to import spent nuclear fuel into the United States through the Port of Tacoma given the absence of proper consideration of the impact on this community and the failure by the U.S. Department of Energy to adequately give a balanced, objective consideration to all three management alternatives in the Draft EIS.

Sincerely,

Harold G. Moss
Mayor

Robert W. Evans
Deputy Mayor

Bill Baarsma
Council Member

Mike Crowley
Council Member

Dave De Forrest
Council Member

Steve Kirby
Council Member

Sharon McGavick
Council Member

Paul Miller
Council Member

Dr. Dolores I. Silas
Council Member

Enclosure (1)

RESPONSE TO COMMENT
COMMENTOR NO. 687:
CITY OF TACOMA - CITY COUNCIL (CONT'D.)

waters. Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters. The impacts of a foreign research reactor spent nuclear fuel transportation cask sinking in coastal and deep waters are estimated in the EIS (Appendix C, Section C.5). The results of this analysis show that both the consequences and the risk of these accidents are low (Appendix C, Sections C.5.4 and C.5.5).

Response to Comment No. 687-2

DOE considers that there is adequate regulatory and emergency preparedness infrastructure to ensure the safe acceptance and transport to designated management sites if the foreign research reactor spent nuclear fuel is managed in the United States. Federal funding to State, Tribal, and local governments for maintaining emergency response programs is discussed in Section 2.7.1 of the EIS. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advise and assistance to the State, Tribal and local agencies involved with a radiological incident. Emergency preparedness, security, and coordination of DOE with local emergency response authorities, and security are discussed in general in Sections 2.7 and 2.8 of the EIS. Details would be contained in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

COMMENTOR NO. 691:
ED DIMMICK, MAYOR, CITY OF WALNUT CREEK

Walnut Creek

Office of the City Manager

June 13, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue
Washington, D.C. 20585-0001

RE: Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

Below are the City of Walnut Creek's comments on the draft EIS regarding the above stated policy. We appreciate this opportunity to comment on the policy's impact on our community.

1. The public does not fully understand the complexity of nuclear waste transport. Nor can we fully assess the possible risks associated with this activity through our community. We need to rely on your assurances that the "risks are minimal." However, one measure of your trustworthiness is the adequacy of your EIS work to date. Unfortunately, we have found the analysis to be wholly inadequate. Not only is the name of the Bay where the port is located misidentified (it is the Suisun Bay not the San Suison Bay that does not exist) but the proposal to use the Concord Naval Weapons Station as a port of entry lacks enough information for local review purposes. *691-1*

For example, there is no description of the incoming 40 mile traffic waterway between the Pacific Ocean and the port. There is no mention of the five major bridges and heavy local ship traffic containing petroleum products associated with local refineries in this Bay. The study does not identify local arterials between the port and the freeway nor does it clearly identify the routes for the possible destinations for the waste.

The biggest problem facing the City of Walnut Creek is traffic. Consequently, the Council has restricted growth through its General Plan. The study does not review traffic patterns or identify major areas of congestion. One of the most congested *691-2*

P.O. Box 8039 ◆ 1666 North Main Street ◆ Walnut Creek, California 94596-4661 ◆ (510) 943-5812 ◆ FAX: (510) 943-5897

RESPONSE TO COMMENT
COMMENTOR NO. 691:
ED DIMMICK, MAYOR, CITY OF WALNUT CREEK

Response to Comment No. 691-1

The errors identified by the commentor have been corrected in the final EIS.

Although there is no detailed description of the passage to the Concord NWS in the EIS (or into any of the other candidate ports), the passage was considered when Concord NWS was evaluated against port selection Criterion 2 (Favorable Transit From Open Ocean). The passage does meet the requirements of Criterion 2 (Appendix D, Section D.1.9.2 of the EIS). The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (Appendix D, Section D.1.9.2 of the EIS). Appendix D, Section D.5.3.1.3 of the EIS presents a discussion of the determination of the probability of ship accidents used in the EIS.

The exact land route out of Concord to the management site(s) was not specified in the EIS because the actual route followed could change over the course of the program (which could be 13 years) as a result of road changes and weather conditions. In general, however, the shortest route that used major highways would be followed.

Concord NWS was one of ten ports that was identified as to be acceptable to receive the foreign research reactor spent nuclear fuel, if the material is to be accepted into the United States. Population of the port and surrounding areas is one of the considerations of the port selection criteria, and one of the reasons the Port of Oakland was not included in the final list of ports. Concord's relatively lower population was a positive aspect. It should also be noted that the National Defense Authorization Act for Fiscal Year 1994 requires that low port population be a criterion for port selection for the receipt of foreign research reactor spent nuclear fuel. The population criterion for port selection (Criterion 5) is discussed in more detail in Appendix D, Section D.1.9.5 of the EIS.

As the result of public comments, eight additional ports were considered, including Everett, WA. Like the rest of the ports analyzed, the risks associated with the use of Everett would be low. The final choice of port or ports to use, if foreign research reactor spent nuclear fuel is accepted into the United States, will be in the Record of Decision.

COMMENTOR NO. 691:
ED DIMMICK, MAYOR, CITY OF WALNUT CREEK (CONT'D.)

intersections in the entire Bay area region is the 680/24 interchange that appears to be a proposed truck travel route to storage sites east of here. This interchange has an inordinately high number of accidents and will remain under construction for at least another year and probably three. There is a temporary flyover that is quite high, steep and particularly dangerous for truck traffic. 691-2 (Cont'd.)

2. The study does not consider the likelihood and consequences of an earthquake. Attached is an Association of Bay Area Government Study. In particular note the elaborate fault structure in the area as well as the soil shaking potential (pp. 9 and 30). The study should analyze this more thoroughly. 691-3

3. The residents of this area already face a higher exposure potential to acutely hazardous materials. Contra Costa County (tied with neighboring Marin County) has the highest breast cancer incidence rate in the state. However, this study does not address the cumulative effects of adding spent nuclear fuel handling and transport to an area already experiencing military and industrial development impacts. Rightly or wrongly, if nuclear fuel is handled and transported from this area, this activity will be blamed for any future higher cancer incidence rates in the area. 691-4

4. Finally, two military ports in the Bay area are slated for closure namely Alameda and Vallejo. Additionally, we understand that the high population density surrounding the Oakland port was one reason for its removal for consideration. The two military ports are closing in part because of the apparent cost effectiveness of the port in Everett, Washington. Why is this port not considered? It's less densely populated than this area and closer to the Hanford Reservation site in Washington. 691-1 (Cont'd.)

In summation, the City of Walnut Creek cannot support the selection of the Concord Naval Weapons Station as the port of entry for nuclear waste from foreign reactors. There needs to be additional analysis addressing our concerns as well as the concerns of the other surrounding communities. Still, our population density, traffic congestion, and proclivity to damage from earthquakes, should eliminate this port from consideration.

Sincerely,

Ed Dimmick

Ed Dimmick
MAYOR

cc Walnut Creek City Council
Congressman Baker
Congressman Miller
Mayors of Concord, Pleasant Hill, and Martinez
Contra Costa County Board of Supervisors

RESPONSE TO COMMENT
COMMENTOR NO. 691:
ED DIMMICK, MAYOR, CITY OF WALNUT CREEK (CONT'D.)

Response to Comment No. 691-2

If the Concord NWS is selected as a port of entry, then DOE would choose the best route to I- 80 in accordance with Department of Transportation regulations (49 CFR Part 397.101 (a)(2)). That route could use Route 4, Route 24, and/or Waterfront Road. These are the local Concord streets that the trucks would probably use. The State of California routing agency can designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103.

Response to Comment No. 691-3

The EIS evaluates the risk associated with marine port activities, ground transportation, and storage at proposed DOE management sites in Section 4.2. The impacts are evaluated for both incident-free and accident conditions. Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident and thus effect the probability of such accidents, however, the number of earthquake-induced ship and road accidents is small compared to other causes.

Response to Comment No. 691-4

The cumulative impacts of foreign research reactor spent nuclear fuel transport through the port areas are addressed in Sections 4.2.2.4 and 4.2.3 of the EIS. The assumptions used for the analysis of potential impacts were very conservative, as discussed in Section 4.2.3.1, and as a result the likely impacts from acceptance of the foreign research reactor spent nuclear fuel into the United States would be much lower than estimated in the EIS.

COMMENTOR No. 731:
WHITE PINE COUNTY NUCLEAR WASTE, PROJECT OFFICE

FLORINDO MARIANI
Coordinator

WHITE PINE COUNTY NUCLEAR WASTE
PROJECT OFFICE
957 Campton Street
Ely, NV 89301
(702) 289-8833
FAX (702) 289-3614

June 15, 1995

U.S. Department of Energy
Environmental Management
1000 Independence Ave., SW
Washington, D.C. 20585
Attn: Mr. Charles Head, EM-37

RE: Comments to Draft EIS On A Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

On behalf of White Pine County, Nevada, I am pleased to submit the following comments to the subject DEIS. White Pine County is one of ten units of local government which have been identified as "affected" by the Secretary of Energy pursuant to the Nuclear Waste Policy Act, as amended. The State of Nevada and the Department of Energy have identified candidate highway and rail routes through White Pine County for shipments of spent nuclear fuel and defense high-level radioactive wastes to the Nevada Test Site (NTS).

Should the Department of Energy select NTS as a site for storage of foreign research reactor fuel, shipments of spent fuel could be transported through White Pine County over a thirteen year period. Such shipments would be in addition to potential shipments of spent fuel from commercial nuclear power plants, other defense high-level wastes, and low-level radioactive wastes from DOE defense nuclear facilities. The draft EIS must consider the possible cumulative risk to the public health, safety and welfare of residents and businesses located in White Pine and other corridor counties from these transportation activities. 731-1

The draft EIS would benefit from a comparative analysis of the exposure risk associated with the management alternatives considered. The risk of transportation and storage of the materials into and within the United States should be compared with those associated with managing the spent fuel at its source location. Managing the wastes at their present locations may pose less risk than moving it to the United States. 731-2

RESPONSE TO COMMENT
COMMENTOR No. 731:
WHITE PINE COUNTY NUCLEAR WASTE, PROJECT OFFICE

Response to Comment No. 731-1

As discussed in Section 4.2.3.4 of the EIS, the cumulative impacts of ground transport of radioactive material were analyzed in the Department of Energy Programmatic Spent Nuclear Fuel and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The transport of foreign research reactor spent nuclear fuel was included as one part of that analysis.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Nevada Test Site.

Response to Comment No. 731-2

The comparative analysis requested by the commentor is in Section 4.8 of the EIS.

COMMENTOR NO. 731: WHITE PINE COUNTY NUCLEAR WASTE, PROJECT OFFICE (CONT'D.)

The draft EIS does not provide adequate consideration of options for mitigation and compensation of impacts. The subsequent Record of Decision should include specific measures to mitigate and/or compensate impacts. With regard to transportation of spent fuel through areas such as White Pine County, such measures should include pre-shipment training and equipping of emergency first responders; pre-notification of public safety officials prior to all shipments; real-time tracking of all shipments; consultation with local public safety officials regarding real-time transportation conditions and constraints; and where necessary to reduce the risk of accidents, infrastructure improvements to enhance highway safety. 731-3

To the extent that the aforementioned comments are not appropriately addressed within the final EIS, DOE will not have sufficiently complied with NEPA concerning foreign research reactor spent nuclear fuel.

Sincerely,

Ferd Mariani

Ferd Mariani
Coordinator

RESPONSE TO COMMENT COMMENTOR NO. 731: WHITE PINE COUNTY NUCLEAR WASTE, PROJECT OFFICE (CONT'D.)

Response to Comment No. 731-3

Measures for impacts which warrant mitigation are discussed in Sections 4.2 and 4.9.4 of the EIS for port activities (Section 4.2.2.5), ground transportation (Section 4.2.3.5), and management sites (Appendix F, Section F.4) of the EIS.

The commentor's preference for geologic disposal of spent nuclear fuel is noted. The impacts of ultimate disposition of spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. A detailed, quantitative discussion of these impacts would have to be the subject of future NEPA documentation.

COMMENTOR NO. 835:
TACOMA-PIERCE COUNTY CHAMBER OF COMMERCE

June 29, 1995

TACOMA-PIERCE COUNTY CHAMBER OF COMMERCE

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

RE: Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

After review of the issue, our Chamber's Board of Directors has adopted policy opposing the importation of spent nuclear fuel through the Port of Tacoma.

The reasons for this opposition are listed below:

- The ILWU Local #23 has declared that they will not handle this cargo, thereby hampering the movement of commercial cargos. Not only is this a potential economic hazard to the local community, but the status of the Port of Tacoma as the sixth largest volume port in North America carries implications for the nation's economy. 835-1

- Shipping containers of nuclear fuel may be breached by the extraordinary conditions of shipboard fires. In addition to a shipboard fire with these conditions having recently occurred in the neighboring community of Seattle, a more recent shipboard fire occurred in our port area. The local fire department experienced extreme difficulties in fighting the fire. 835-2

- As a security benefit, almost all civilian commerce of nuclear material is anonymous. This environmental impact statement, however, will identify the transshipment point. The security normally afforded nuclear shipments will be breached. 835-3

- Terrorists groups don't have to steal and process nuclear materials for bombs to create nuclear incidents. Neither Chernobyl nor Three Mile Island involved nuclear explosions. 835-4

- There are no provisions for funding or training nuclear hazmat (hazardous materials) teams locally. 835-5

- Exposing the Tacoma population to these risks is unnecessary. Whether by rail or road, these shipments will go through Seattle or Portland. Seattle has been excluded in this 835-6

[illegible] PACIFIC AVENUE, SUITE 300, P.O. BOX 1933, TACOMA, WA 98401
PHONE: 206-627-2175, FAX 206-597-7305
AN AFFILIATE OF THE CHAMBER OF COMMERCE OF THE UNITED STATES

RESPONSE TO COMMENT
COMMENTOR NO. 835:
TACOMA-PIERCE COUNTY CHAMBER OF COMMERCE

Response to Comment No. 835-1

DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' status with respect to their clients. This is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions. As such, there should be no adverse commercial or economic reaction to the use of the port. Historically, there were no adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

The possibility of a longshoremen strike was not considered in the port selection process (Appendix D, Section D.1.9 of the EIS) since that factor does not impact on the capability to safely receive containers carrying foreign research reactor spent nuclear fuel. The decision as to which port or ports would be used, if foreign research reactor spent nuclear fuel is accepted into the United States, will be made in the Record of Decision. In either case, the possibility of strikes is one of the many factors that would have to be considered in determining which ports to use.

Response to Comment No. 835-2

The transportation casks that would be used for the foreign research reactor spent nuclear fuel are certified if their design meets certain tests, including a fire test, and if the individual casks pass periodic inspections (Section 2.6.2 of the EIS). These certification standards were developed for use of the transportation casks on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. The duration of a ship fire is directly related to the amount of combustibles carried on board. The number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicate that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures.

In respect to the impact a ship fire might have on a spent nuclear fuel transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship's fire intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it would be almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of the foreign research reactor

COMMENTOR NO. 835:
TACOMA-PIERCE COUNTY CHAMBER OF COMMERCE (CONT'D.)

round of evaluation because of its population size. Shipping through Tacoma, because of infrastructure design, will mean Tacoma's population will be added to those of Seattle or Portland along the route. Further, the population for Tacoma seems to be that for the City only, rather than that for the Tacoma Primary Metropolitan Statistical Area (Pierce County) which is a more accurate area for analysis and comparison.

835-6 (Cont'd.)

- Fears associated with nuclear energy are expected to produce a stigma about whichever port's community is announced as the transshipment point. No mitigation is considered.

835-7

- Rail lines across the mountains here are nearing capacity. Considerations on pairing nuclear containers with other dangerous cargoes will exacerbate shipment and capacity problems. This may mean adverse economic impacts associated with the interruption of normal commerce, and/or the siderailing of nuclear containers as rail tunnels are freed or cleared. Current normal operations involve siderailing of cargos for an hour between tunnel transits while exhaust fumes are cleared.

835-8

Your consideration of these objections and your choice of an alternative that favors reprocessing of nuclear fuels in countries capable of this technology is recommended.

Sincerely,

Gary D. Brackett, Mgr.
Business and Trade Development

RESPONSE TO COMMENT
COMMENTOR NO. 835:
TACOMA-PIERCE COUNTY CHAMBER OF COMMERCE (CONT'D.)

spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).

The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt foreign research reactor spent nuclear fuel. Appendix D, Section D.5.3 of the EIS presents a detailed discussion of accident probabilities and radioactive material source terms and Section D.5.4 presents the results of the analyses.

In conclusion, although long duration ship fires are possible, and have occurred, they are uncommon events. Analyses in the EIS indicate that even in the event of a severe ship fire involving a spent nuclear fuel transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5 of the EIS). Although the nonradiological effects of such a catastrophic accident would obviously impact the local environment, no additional impacts are predicted due to the presence of foreign research reactor spent nuclear fuel.

Response to Comment No. 835-3

As discussed in Section 2.6.4.2 of the EIS, the NRC regulations concerning route notification for civilian shipments of nuclear material are set forth in 10 CFR Part 73. The shipments of foreign research reactor spent nuclear fuel would comply with this regulation, just like similar shipments.

The regulation requires shippers to submit proposed routes for spent nuclear fuel shipments to NRC for approval, and NRC publishes a public information circular that lists routes that have been evaluated and approved for specific spent nuclear fuel shipments. The regulation also requires DOE to inform the Governor of each State and any Tribal chair, or their designee, along a transportation route at least seven days in advance of the each shipment of hazardous cargoes, including radioactive materials.

Security during ground transport is discussed in Section 2.7.5 of the EIS.

Response to Comment No. 835-4

The Chernobyl and Three Mile Island (TMI) accidents are not examples of terrorist activities. These are accidents which occurred during power reactor operations. The radioactive inventory in each of these reactors were millions of times greater than what would be in a transportation cask containing foreign research reactor spent nuclear fuel. It is inaccurate to consider that an incident involving a spent nuclear fuel transportation

COMMENTOR NO. 835:
TACOMA-PIERCE COUNTY CHAMBER OF COMMERCE (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 835:
TACOMA-PIERCE COUNTY CHAMBER OF COMMERCE (CONT'D.)

cask resulting from a terrorist activity, or any others, would have similar consequences as that resulted from either TMI or Chernobyl. The EIS considered and analyzed all potentially significant accidents, including terrorist initiated accidents (Section 4 and Appendices C, D, E, and F of the EIS). The results indicate a very low risk to an individual, or to the general public as a whole, from all accidents considered. It is worth mentioning that the TMI accident, being the worst nuclear reactor accident in the United States, did not result in any measurable radiological damage to either the public or the environment.

Response to Comment No. 835-5

Each port considered in the EIS has developed an Area Contingency Plan. This plan outlines response capabilities, procedures and authorities for responding to and recovering from hazardous material incidents. Additionally, DOE would provide assistance to local authorities to ensure that appropriate measures would be taken in the unlikely event of an accident. As part of this assistance, DOE's Radiological Assistance Program teams, from eight offices strategically located throughout the country, would be used to coordinate and to provide remediation assistance. This type of assistance and coordination would be specified in the Transportation Plan to be prepared prior to any spent nuclear fuel shipment. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected.

Response to Comment No. 835-6

As discussed in Section 4 of the EIS, the risk associated with implementation of the proposed action to human health or the environment would be low. Populations surrounding candidate ports and along representative transportation routes were used in the selection of candidate ports for receipt of spent nuclear fuel from foreign research reactors (Appendix D of the EIS). The analysis of populations surrounding candidate ports was based on enumeration of potentially affected residents within 10 miles (16 km) of the port (Appendix D of the EIS). Population data shown in Appendix A for the Port of Tacoma (Table A-1) of the EIS include the population of Pierce County.

Response to Comment No. 835-7

DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. Under NEPA regulations, the socioeconomic effects evaluated for this EIS do not include those associated with psychological fear of receiving spent nuclear fuel at the Port of Tacoma.

Commentor No. 835:
Tacoma-Pierce County Chamber of Commerce (Cont'd.)

Response to Comment
Commentor No. 835:
Tacoma-Pierce County Chamber of Commerce (Cont'd.)

Response to Comment No. 835-8

As an example, if Management Alternative 1 were adopted and the Port of Tacoma would be used exclusively, then an additional 721 ISO containers could be unloaded at Tacoma over a period of 13 years. This would represent a very small increase to the existing and future truck or rail traffic burden. This subject is discussed further in Section 2.6.4 of the EIS.

COMMENTOR No. 836:
DOUG SUTHERLAND, COUNTY EXECUTIVE, PIERCE COUNTY

Pierce County
Office of the County Executive

930 Tacoma Avenue South, Room 737
Tacoma, Washington 98402-2100
(206) 591-7477 • FAX (206) 596-6628

DOUG SUTHERLAND
Executive

FRANCEA L. McNAIR
Deputy Executive
Executive Office
of Operations

June 30, 1995

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue
Washington, D.C. 20585

Dear Mr. Head:

I am writing to express my adamant opposition to the DOE proposal to ship nuclear waste through the waterways of Tacoma and Pierce County. I believe this proposal would place an unacceptable risk upon the citizens of Puget Sound. 836-1

Millions of dollars and years of civic effort have been invested in ridding Commencement Bay of pollution and improving the economic and social environment of the Tacoma-Pierce County area. Shipping nuclear waste through the Port of Tacoma will hamper our efforts, if not bring them to a halt. The risks are more far reaching than the health of our waterways. The health of our citizens is also at stake and as County Executive, I feel a responsibility to protect the citizens I serve.

I concur with the Commissioners from the Port of Tacoma that Alternative #2 is an acceptable option. It would meet the goals of the nuclear proliferation treaty without returning spent nuclear fuel to the United States, and more specifically, Puget Sound. 836-2

Again, I am vigorously opposed to shipping nuclear waste through the waters of Puget Sound. The potential risks facing our citizens and the environment are just too great.

Thank you for your attention to this matter.

Sincerely,

Doug Sutherland,
Executive

DS:jam

PATRICK KENNEY
Executive Office
of Administration

ANDREW NEDITZ
Executive Office
of Public Safety

DAISY STALLWORTH
Executive Office
of Community and
Human Services

HUDSON STANSBURY
Executive Counsel

BIL BOSS
Special Assistant
to the Executive

BARBARA GELMAN
Assessor-Treasurer

CATHY PEARSALL-STIPEK
Auditor

RESPONSE TO COMMENT
COMMENTOR No. 836:
DOUG SUTHERLAND, COUNTY EXECUTIVE, PIERCE COUNTY

Response to Comment No. 836-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 836-2

The commentor's preference for the overseas management alternative is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

COMMENTOR NO. 845:
CITY OF OLYMPIA - CITY COUNCIL

City of
OLYMPIA
900 Plum Street, P.O. Box 1967, Olympia, WA 98507-1967

June 27, 1995

COUNCIL
Bob Jacobs, Mayor
Mark Foutch Mayor Pro Tem
Pat Cole
Holly Gadbaw
Jeanette Hawkins
Mary Lux
Margaret McPhee

CITY MANAGER
Richard C. Cushing

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue
Washington, DC 20585

Dear Mr. Head:

We are writing in response to a U.S. Department of Energy proposal to ship spent nuclear fuel from foreign research reactors through the Port of Tacoma in the Puget Sound. 845-1

The City of Olympia is strongly opposed to this action. We believe this action could produce a devastating and disproportionate impact on the residents of the Puget Sound area including Olympia.

Instead, we support the alternative developed by the Port of Tacoma which prefers that the United States work collaboratively with foreign sources of nuclear fuel for permanent and appropriate geological disposal in those respective countries. We believe both long term and short term storage can be accommodated for these foreign sources of nuclear waste. We strongly urge you to consider the Port of Tacoma's alternative and to cease any plans to ship those fuels through the environmentally sensitive Puget Sound area. 845-2

845-1 (Cont'd.)

Sincerely,

Bob Jacobs, Mayor
Mark Foutch, Mayor Pro tem
Mary Lux, Councilmember
Pat Cole, Councilmember
Holly Gadbaw, Councilmember
Margaret McPhee, Councilmember
Jeanette Hawkins, Councilmember

5-2025

City Council	753-8450	Community Planning & Development	753-8314	Personnel	753-8442
City Manager	753-8447	Fire	753-8348	Police	753-8200
City Attorney	753-8449	Parks/Recreation/Cultural Services	753-8380	Public Works	753-8362
Administrative Services	753-8325				

RESPONSE TO COMMENT
COMMENTOR NO. 845:
CITY OF OLYMPIA - CITY COUNCIL

Response to Comment No. 845-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, the analysis in the EIS indicates that the risks associated with an accident are low (Sections 4.2.2.3 and 4.5) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Sections 4.2.2.2 and 4.5), and pose no significant risk to port personnel, the local population, or the environment.

Response to Comment No. 845-2

The commentor's preference for the overseas management alternative is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

COMMENTOR NO. 849: GRETCHEN A. WILBERT, MAYOR, CITY OF GIG HARBOR

CITY OF GIG HARBOR
RESOLUTION NO. 448

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF GIG HARBOR, WASHINGTON, EXPRESSING STRONG OPPOSITION TO THE ADOPTION OF A POLICY, BEING PROPOSED JOINTLY BY THE UNITED STATES DEPARTMENT OF ENERGY AND UNITED STATES DEPARTMENT OF STATE, TO ACCEPT AND MANAGE SPENT NUCLEAR FUEL FROM FOREIGN RESEARCH REACTORS BY SHIPMENT THROUGH THE PORT OF TACOMA, WASHINGTON.

WHEREAS, the United States Department of Energy and the United States Department of State are jointly proposing to adopt a policy to manage spent nuclear fuel from foreign research reactors; and

WHEREAS, nuclear fuel containing uranium enriched in the United States of America would be covered by this policy; and

WHEREAS, the purpose of this policy is to promote United States nuclear weapons nonproliferation policy objectives, specifically seeking to reduce highly enriched uranium from civilian commerce, and

WHEREAS, the environmental effects and policy considerations of three management alternative approaches for implementation of the proposed policy and assessed; and

WHEREAS, alternative number one would be the acceptance and management of the spent nuclear fuel by the Department of Energy in the United States; and

WHEREAS, under alternative number one the spent nuclear fuel will be shipped by ocean-going vessels from foreign countries to the United States of America; and

WHEREAS, the City of Gig Harbor is a municipality in the County of Pierce and shares waters in close geographic proximity to the Port of Tacoma; and

WHEREAS, the Port of Tacoma is considered one of ten ports through which the shipment of spent nuclear fuels would occur, and

WHEREAS, the Draft Environmental Impact Statement (DEIS) was prepared to address the Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel; and

A. the DEIS has used outdated information about the Port of Tacoma, its terminals, its operations, and the surrounding area; *849-1*

B. the DEIS did not consider the deep-water depth in the Puget Sound area, which will *849-2*

RESPONSE TO COMMENT
COMMENTOR NO. 849: GRETCHEN A. WILBERT, MAYOR, CITY OF GIG HARBOR

Response to Comment No. 849-1

Updated information on the terminals, rail yards, and waterways at the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS. The evaluated data on populations is from the 1990 census.

Response to Comment No. 849-2

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1000 feet). Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

The transportation casks that would be used for the foreign research reactor spent nuclear fuel are certified if their design meets certain tests, including a fire test, and if the individual casks pass periodic inspections (Section 2.6.2 of the EIS). These certification standards were developed for use of the casks on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. The duraction of a ship fire is directly related to the amount of combustibles carried on board. The number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicate that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures.

In respect to the impact a ship fire might have on a spent nuclear fuel transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship's fire intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it would be almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of the foreign research reactor spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (see Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).

COMMENTOR NO. 849: GRETCHEN A. WILBERT, MAYOR, CITY OF GIG HARBOR (CONT'D.)

cause substantial problems in recovery of nuclear fuel shipping containers in case of accident, especially considering the limited integrity standard for containers pertaining to water;

C. the DEIS fully ignored the harm which can be caused to the population and environment of the area in case of an explosion and fire aboard a vessel navigating Puget Sound; *849-2 (Cont'd.)*

D. the DEIS did not recognize the status of Commencement Bay as a superfund site, the stigma attached to this designation, and the expansion of this stigma by Alternative Number One;

E. the DEIS ignored the significant cleanup effort by the Port of Tacoma, the City of Tacoma, the industries in Commencement Bay, and the associated crippling business interruption issues;

F. the DEIS stated that part of this material would be of interest to unfriendly nations and/or terrorists, and yet did not provide adequate risk and consequence information of a compete, explosive breach of the nuclear fuel by disgruntled persons or terrorists; *849-3*

G. the DEIS did not consider the security aspect of these shipments through the Port of Tacoma, the City of Tacoma, Pierce County, and the State of Washington; *849-4*

H. the DEIS did not adequately address the life cycle costs or benefits and risks of the proposed alternatives; *849-5*

I. the DEIS fully ignored the fairness and equity issues of selecting the smaller ports in lower population areas after implying the risks were virtually inconsequential; and *849-6*

WHEREAS, the record for the safe operation and handling of nuclear materials in United States Department of Energy regulated facilities is less than satisfactory, and there are facilities owned and operated by the United States Government capable of receiving and handling this nuclear material, and *849-7*

WHEREAS, the United States House Budget Resolution eliminates the United States Department of Energy thereby creating funding uncertainties, and *849-8*

WHEREAS, the United States Department of Energy has failed to properly answer a question in a meeting conducted by the Port of Tacoma, in Tacoma on the 22nd of May, 1995, (reference Attachment 'A') pertaining to the effect of radiation in the environment should a shipping cask be damaged during the handling process in the Port, or to respond in writing to that question as promised and; NOW, THEREFORE, *849-9*

THE CITY COUNCIL OF THE CITY OF GIG HARBOR, WASHINGTON HEREBY RESOLVES AS FOLLOWS:

RESPONSE TO COMMENT
COMMENTOR NO. 849: GRETCHEN A. WILBERT, MAYOR, CITY OF GIG HARBOR (CONT'D.)

The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt foreign research reactor spent nuclear fuel. Appendix D, Section D.5.3 of the EIS presents a detailed discussion of accident probabilities and radioactive material source terms and Section D.5.4 presents the results of the analyses.

In conclusion, although long duration ship fires are possible, and have occurred, they are uncommon events. Analyses in the EIS indicate that even in the event of a severe ship fire involving a transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5 of the EIS). Although the nonradiological effects of such a catastrophic accident would obviously impact the local environment, no additional impacts are predicted due to the presence of foreign research reactor spent nuclear fuel.

A sentence has been added to Appendix D, Section D.2.1.9 of the EIS regarding Commencement Bay being a Superfund Site. Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma as noted by the commentor. Nor should it contribute to any dirty port stigma based on the EIS analysis that indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Spent nuclear fuel transportation casks passing through the Port of Tacoma, Commencement Bay, or any other port or waterway cannot leak because the metal fuel is transported dry, thus it would not affect air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

Response to Comment No. 849-3

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk. Section D.5.9 has been added to Appendix D of the EIS to address terrorism and sabotage. All shipments of foreign research reactor spent nuclear fuel would be conducted meeting or exceeding all the security requirements in the Code of Federal Regulations (10 CFR Part 73). Appendix H has been added to the final EIS in response to public comments to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

COMMENTOR NO. 849: GRETCHEN A. WILBERT, MAYOR, CITY OF GIG HARBOR (CONT'D.)

Section 1. The City Council of Gig Harbor, Washington, strongly opposes adoption of a policy, being proposed jointly by the United States Department of Energy and United States Department of State, to accept and manage spent nuclear fuel from foreign research reactors by shipment through the Port of Tacoma, Washington. 849-10

Section 2. Copies of this Resolution shall be transmitted to President Clinton, Vice President Gore, the United States Department of Energy, the United States Department of State, the Washington State Congressional delegation, the Washington State Legislature, the Office of the Governor, the Pierce County Executive, the King County Council and Executive.

RESOLVED by the City Council this 26th day of June, 1995.

APPROVED:

Gretchen A. Wilbert, Mayor

ATTEST/AUTHENTICATED:

Mark E. Hoppen, City Administrator/Clerk

APPROVED AS TO FORM;
OFFICE OF THE CITY ATTORNEY:

BY: _____

FILED WITH THE CITY CLERK: 6/21/95
PASSED BY THE CITY COUNCIL: 6/26/95

RESPONSE TO COMMENT
COMMENTOR NO. 849: GRETCHEN A. WILBERT, MAYOR, CITY OF GIG HARBOR (CONT'D.)

Response to Comment No. 849-4

The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

Response to Comment No. 849-5

Section 4.9 and Appendix F, Section F.7 of the EIS fully address the life cycle costs, risks, and benefits of the proposed action. The use of a net present value approach reflects the life cycle costs. Benefits would be primarily in the form of reduced risks of the proliferation of nuclear weapons to countries who might use them on us or our allies, as well as, income and employment to the management sites and regions conducting the programs and to the nation from reducing the commerce in certain types of nuclear materials. Health and safety risks would be low, as discussed fully Section 4 of the EIS and Appendices C, D, E, and F. Economic risks are described in detail in Appendix F, Section F.7. Particular attention is paid to major cost uncertainties (e.g., waste acceptance criteria, geologic disposal). Economic impacts relating to ports are minor in all respects.

Response to Comment No. 849-6

As demonstrated by the analyses in the EIS, the risk associated with accepting spent nuclear fuel from foreign research reactors through any of the ports analyzed would be low. This result is borne out by the experience gained in over 30 years of shipments of foreign research reactor spent nuclear fuel to the United States. Accordingly, DOE considers that there is no fairness or equity issue to be resolved.

Response to Comment No. 849-7

DOE has safely received and handled foreign research reactor spent nuclear fuel for over 30 years, most of it through commercial ports.

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted. Sections 4.2.2.2 and 4.2.2.3 of the EIS provide the analysis on impacts of incident-free operation and consequences of port accidents, respectively.

COMMENTOR NO. 849:
GRETCHEN A. WILBERT, MAYOR, CITY OF GIG HARBOR (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 849: GRETCHEN A. WILBERT, MAYOR, CITY OF GIG HARBOR (CONT'D.)

Response to Comment No. 849-8

If DOE were abolished in response to action by Congress, the current DOE programs for management of spent nuclear fuel would have to be transferred to some other Federal government agency to protect the health and safety of the public. Since the spent nuclear fuel will not simply go away, these programs cannot simply be abolished.

Response to Comment No. 849-9

DOE responded to this question by letter and fax on June 16, 1995. The response gave the estimated radiation dose rate near the spent nuclear fuel under the assumption that there was no transportation cask to provide shielding, as requested by the Port of Tacoma.

CEQ regulations and guidance do not require a worst case analysis of accidents in an EIS. For the purposes of analysis in the EIS, there is no such thing as a worst case scenario because for any worst case that is postulated, a still more severe accident can be postulated by adding one more drum of gasoline, one more wrecked rail car, one more terrorist, etc. In addition, for each assumption that is made to make a postulated accident more severe, the probability of the accident becomes smaller. The EIS does not contain a worst-case scenario, but a broad range of port accident scenarios, including severe accidents, is discussed in Section 4.2.2.3 of the EIS. Appendix D, Section D.5.4.3.2 of the EIS presents the risks of a very high temperature fire that engulfs a cask, which was part of a sensitivity study on release fractions. In addition, Section D.5.9 has been added to Appendix D of the EIS to address the issue of attack by disgruntled persons or terrorists.

Response to Comment No. 849-10

The opposition of the City Council of Gig Harbor, Washington to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 969: TACOMA CITY COUNCIL MEMBER BILL BAARSMA

City of Tacoma

Council Member Bill Baarsma

June 23, 1995

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

Dear Mr. Head:

I am transmitting my testimony as given at the public hearing on the Proposed Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel in Tacoma on June 19. The testimony is as follows:

I do strongly support Alternative 2 which makes eminent sense in the short- and long-term. The logic for Alternative 1 escapes me. However, I would like to comment on one part of the Draft EIS. On page 26 of that summary, the EIS notes, "In the United States...local governments are required to have emergency management and response programs. These programs must be capable of managing all hazards, ranging from natural disasters to hazardous material incidents on a day-to-day basis. These programs include support from special emergency response teams and emergency operation centers." 969-1

Yes, the Tacoma Fire Department has a hazardous unit. It is a four-member team that provides coverage seven days a week around the clock--it involves 20 highly trained firefighters. The unit is in the tideflats area. Its charge is to handle and control the spillage of oil or other toxic materials. However, this unit has no equipment nor does it have the training or capability to handle accidents involving radioactive materials. Again, our firefighters are highly motivated and skilled. They are among the best anywhere, but they do not have the resources to handle a catastrophic accident involving radioactive waste. Nor, could we, as a city, ask them to take on those additional burdens. 969-2

Our emergency management division of county government does have a hazardous materials management team. But, for radioactive accidents, its capability is limited to monitoring 969-3

747 Market Street, Room 1200, Tacoma, Washington 98402-3766, (206) 591-5100, FAX (206) 591-5123

RESPONSE TO COMMENT COMMENTOR NO. 969: TACOMA CITY COUNCIL MEMBER BILL BAARSMA

Response to Comment No. 969-1

The commentor's preference for the overseas management alternative is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

Response to Comment No. 969-2

The commentor's opposition to Management Alternative 1 as described in Section 2.2 of the EIS is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

Response to Comment No. 969-3

DOE considers that there is adequate regulatory and emergency preparedness infrastructure to ensure the safe acceptance and transport to designated management sites if the foreign research reactor spent nuclear fuel is managed in the United States. Federal funding to State, Tribal, and local governments for maintaining emergency response programs is discussed in Section 2.7.1. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advise and assistance to the State, Tribal and local agencies involved with a radiological incident. Emergency preparedness, security, and coordination of DOE with local emergency response authorities, and security are discussed in general in Sections 2.7 and 2.8 of the EIS. Details would be contained in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

COMMENTOR NO. 969:
TACOMA CITY COUNCIL MEMBER BILL BAARSMA (CONT'D.)

and detection of materials after the fact [using 1950's and 1060's technology, I might note]. It can, in concert with the Tacoma Fire Department, set up perimeters around an affected site. It has no resource capability or training to cleanup or control the extent of an accident, however. 969-3 (Cont'd.)

Finally, we have had a number of shipboard fires in this area recently--two in Commencement Bay alone. In one case, the Fire Department had to tow the vessel to the center of Commencement Bay where it burned to the water line--smoke congregating in the basin area of the Bay and then drifting north with the prevailing winds. The other fire of furnace intensity involved a container ship. In this case, we had to call in support services from Seattle to help control that disaster. 969-4

The Draft EIS places the burden for response to any accidents on local jurisdictions. This is viewed as yet another unfunded federal mandate that we must tax our citizenry for.

Bringing this high-level nuclear waste through the Port of Tacoma poses a financial risk, a security risk, an environmental risk, and a health risk--in sum, an unacceptable risk. 969-5

We are opposed to buying a problem that has great cost and does not benefit this community.

I thank you, Mr. Head, for providing the opportunity for giving this testimony this evening.

Sincerely,

Bill Baarsma
Council Member

RESPONSE TO COMMENT
COMMENTOR NO. 969: TACOMA CITY COUNCIL MEMBER BILL BAARSMA (CONT'D.)

Response to Comment No. 969-4

The transportation casks that would be used for the foreign research reactor spent nuclear fuel are certified if their design meets certain tests, including a fire test, and if the individual casks pass periodic inspections (Section 2.6.2 of the EIS). These certification standards were developed for use of the transportation casks on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. The duration of a ship fire is directly related to the amount of combustibles carried on board. The number of severe fires on ships would be relatively small. Data available on the last 15 years from Lloyd's of London indicates that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures.

In respect to the impact a ship fire might have on a transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the transportation cask would not be exposed for the entire duration of the fire. Second, a ship fire's intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it would be almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of foreign research reactor spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (see Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).

The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt foreign research reactor spent nuclear fuel. Appendix D, Section D.5.3 of the EIS presents a detailed discussion of accident probabilities and radioactive material source terms and Section D.5.4 presents the results of the analyses.

In conclusion, although long duration ship fires are possible, and have occurred, they are uncommon events. Analyses in the EIS indicate that even in the event of a severe ship fire involving a transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5 of the EIS), in spite of the fact that some radioactive material might be released.

COMMENTOR NO. 969:
TACOMA CITY COUNCIL MEMBER BILL BAARSMA (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 969:
TACOMA CITY COUNCIL MEMBER BILL BAARSMA (CONT'D.)

Response to Comment No. 969-5

The commentor's opposition to the use of the Port of Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. Based on the port selection process described in Appendix D of the EIS, the Port of Tacoma is among the ten candidate ports listed in Section 2.2.1.6 of the EIS which could receive foreign research reactor spent nuclear fuel under Management Alternative 1 or 3. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3 of the EIS) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel transportation casks are also low (Section 4.2.2.2 of the EIS).

DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' status with respect to their clients. This is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions. As such, there should be no adverse commercial or economic reaction to the use of the port. Historically, there were no adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security measures employed at any port would be required to meet or exceed all the security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. DOE supports these regulations as being adequate to protect the foreign research reactor spent nuclear fuel in any commercial port.

Appendix H of the EIS describes the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

The benefit to the citizens of the United States from the proposed action, including those in potential ports of entry, along transportation routes, or near potential management sites, is less risk that weapons grade uranium from civil programs could be diverted into the production of nuclear weapons that might be used against us or our allies. On the other hand, the analyses recorded in Section 4 of the EIS demonstrate that the risks from the proposed action are low.

COMMENTOR NO. 970: PORT OF TACOMA

PORT of TACOMA U.S.A.

June 23, 1995

Charles Head
Office of Spent Nuclear Fuel Management
U.S. Department of Energy
1000 Independence AVE
Washington DC 20585

Dear Mr. Head:

I appreciate the opportunity to communicate my concerns regarding the alternatives of the draft Environmental Impact Statement. As a taxpayer and as a public official, I strongly support the goals of the United States non-nuclear proliferation policy, which is to reduce and ultimately eliminate highly enriched uranium from civilian commerce. 970-1

Obviously keeping this type of material out of the hands of both foreign terrorists and those people in the United States who may feel compelled to use violence to make a statement such as the tragedy in Oklahoma City is a national priority.

I find several problems with returning the HEU (highly enriched uranium) to the United States (Alternative #1). First, the United States does not have a workable long term storage and disposal plan for its own spent nuclear fuel and high level waste. Bringing this material to the United States for storage at DOE's Nuclear Weapons Production Sites with the notion that someone, at some future date, can figure out how and when to permanently dispose of it, is an invitation to disaster. 970-2

This lack of long range storage plan, as well as storing nuclear waste at weapon production sites, are extremely poor role models to the international nuclear community.

The second problem with alternative 1 is that absolutely no evidence exists that we as a country will be any better off at the end of the ten year period, than we are today. The policy of returning everything to the United States discourages countries operating research reactors to make meaningful progress towards responsible self sufficiency. Without reprocessing, and effective storage operation, we are placing our own environment at tremendous risk. 970-3

P.O. Box 1837 • Tacoma, Washington 98401-1837 • Telephone: (206) 383-5841
Commissioners: Stephen R. Anderson • Jack A. Fabulich • Mike Fletcher • Patrick O'Malley • Jerry M. Thorpe
Executive Director: John J. Terpstra

RESPONSE TO COMMENT
COMMENTOR NO. 970: PORT OF TACOMA

Response to Comment No. 970-1

The commentor's support for nuclear weapons nonproliferation is noted.

Response to Comment No. 970-2

The United States does have plans for long term storage and disposal of foreign research reactor spent nuclear fuel and high-level waste. The plans for safe storage of the foreign research reactor spent nuclear fuel are discussed in Sections 2.6.5 and 4.2.4 of the EIS.

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS).

Response to Comment No. 970-3

The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). DOE and the Department of State would work with foreign research reactor operators to ensure they were making plans for disposition.

COMMENTOR NO. 970: PORT OF TACOMA (CONT'D.)

PORT OF TACOMA

DOE
June 23, 1995
Page Two

The United States also suffers in other areas. We will eventually pay an unnecessary and extremely high storage and disposal cost for this foreign material, encounter higher public and worker health risks, and face higher environmental risks, all without achieving the necessary shifts in foreign spent fuel management to a non-proliferating self sufficiency. 970-4 970-5

That is why I believe it is imperative that we make the transition in our disposal operations by adopting alternative 2. The benefits are obvious. The United States will no longer set a bad model example as a country endorsing the use of nuclear energy, while ignoring responsibility to implement a long term storage capability.

By adopting Alternative #2, foreign spent fuel management issues will be addressed now, on a case by case basis that is best for each party. It also means that the United States will not subject itself to whatever risks in receiving and transporting foreign highly enriched uranium within the United States borders. 970-6

Rejecting Alternative #2 means that we will exacerbate an already untenable situation, which is our domestic storage and disposal of spent domestic fuel, and defense wastes. No one can forecast the financial cost if we were to come up with a solution, but anyone familiar with the problem realizes the cost will be tremendous. Alternative #2 provides the United States taxpayers with the least costs and best overall short and long term results.

Alternative #2 makes operational sense. Seventy percent (70%) of the foreign spent fuel resides in seven countries with spent fuel capabilities and expertise resulting from their large national commercial nuclear power programs. Interim storage within these countries saves time and money, reduces risk, and can be done under the International Atomic Energy (IAEA) non-proliferation safe guards and controls.

Alternative #2 also makes sense from a recycling standpoint. Three of the seven countries that have major national commercial nuclear power programs, also have spent fuel reprocessing capabilities. This reprocessing is necessary to help transition the foreign research reactor programs to low enriched uranium, incapable of being made into nuclear bombs. 970-7

A current operation in Scotland with reprocessing capabilities is willing and capable of immediately processing and diluting HEU highly enriched uranium. Non-proliferation allies such as France, Japan and the United Kingdom,and others, can immediately begin to help the remaining 34 counties that have the 30% of the total spent fuel inventory, to find acceptable on-site or foreign off-site

RESPONSE TO COMMENT
COMMENTOR NO. 970: PORT OF TACOMA (CONT'D.)

Response to Comment No. 970-4

As discussed in Section 2.2.1.2 and 2.2.2.3 of the EIS, several financing options have been considered, ranging from collection of fees from the research reactor operators that would pay all of the costs of the program to full subsidization of the program by DOE. A compromise between these extremes would be for developed countries to be charged a competitive fee, while U.S. taxpayers would absorb the full costs of the program for developing countries and absorb the amount above a competitive fee for developed countries to accept and manage their spent nuclear fuel. The reasons the United States would pay some of the costs for other countries are: 1) some countries would be unable to afford the costs of the proposed action and would have no safe alternative means of managing their spent nuclear fuel (i.e., the developing countries); and 2) some countries would continue to use and trade weapons-grade nuclear material indefinitely unless the United States charges a competitive fee and absorbs any costs above that fee (i.e., most of the Western European countries). As discussed in Section 4 of the EIS, the environmental burden and human health risks would be low in an absolute sense and very low compared to the risks posed by continued commercial use of highly-enriched (weapons-grade) uranium or unsecure storage of spent nuclear fuel containing HEU in numerous locations overseas.

Response to Comment No. 970-5

As discussed in Sections 1.1 and 1.2 of the EIS, the adoption of a policy to manage the foreign research reactor spent nuclear fuel is necessary to reduce the risk of nuclear weapons proliferation. If that policy is Management Alternative 1, then the United States would have the most influence with the research reactor operators, with the result that most of the reactors would probably be converted to the use of LEU fuel. Contrary to the commentor's statement, DOE and the Department of State considers that the implementation of Management Alternative 1 would achieve the necessary shifts in foreign research reactor spent nuclear fuel management practices to reduce the worldwide risk of nuclear weapons proliferation.

Response to Comment No. 970-6

The commentor's preference for the overseas management alternative is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

Response to Comment No. 970-7

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Section 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 970: PORT OF TACOMA (CONT'D.)

PORT OF TACOMA

DOE
June 23, 1995
Page Three

capabilities for their spent nuclear fuel or a non-proliferating reprocessing option. These efforts should be directed at both short and long term solutions for the affected countries. 970-7 (Cont'd.)

Stated in another manner; the question we are all awaiting the answer to is: Since over 70% of the spent fuel under the proposed policy, resides in 7 countries having major commercial nuclear reactor programs, all having major spent fuel storage capabilities. Three (3) countries have spent fuel reprocessing capabilities and all participate in the IAEA nuclear safe guards program. Why not eliminate Germany, Sweden, Switzerland, France, Canada, Japan, and the United Kingdom from consideration in Alternative #1. 970-8

We can then work with our allies and focus more on the remaining 30% of the problem.

The next question is economic in nature: Why do we want to add more waste when we already don't know what to do with what we already have? 970-9

The least cost alternative that meets the minimum non-proliferation policy guidelines should be selected to minimize everyone's cost. This means selecting Alternative #2 or #3, which have the lowest estimated cost ranging from $750 to $950 million, and as well as some sharing of the specific costs.

As a United States taxpayer I should not have to accept the burden of paying for most of the enriched uranium conversion costs to lower enriched uranium. However, Alternative #1, the U.S. option, has the highest cost in the draft EIS ranging from $850 to $1,850 million (1996 dollars) This alternative should be abandoned immediately. There is no benefit at all to Puget Sound, Washington State, or the Port of Tacoma in handling this material. Indeed there are only additional costs that really constitute unfunded DOE mandates. Our city will be charged with responding to a nuclear accident. Our port will be required to administer and monitor its longshore work force for radiation exposure. 970-10

For example, if there is a nuclear accident at the Port of Tacoma, the City of Tacoma Fire Department will be charged with the primary responsibility in handling this hazard. Obviously, no fire department on the West Coast of the United States has the expertise and the equipment necessary to combat a nuclear accident. Accordingly, training, equipment and capital expenditures will rise. In addition, there is a considerable health hazard to Port employees and longshoremen. This program will cost the Port a substantial amount of money and again will not return any benefit to the Port at all. 970-11

RESPONSE TO COMMENT
COMMENTOR NO. 970: PORT OF TACOMA (CONT'D.)

Response to Comment No. 970-8

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide. If the United States does not include its stable, developed allies in this program, then many of the research reactors in these countries are likely to switch back to (or continue) the use of HEU fuel, or they would have to shut down.

As stated in the EIS, the U.S. has an obligation under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) to assist nonnuclear weapons states with peaceful applications of nuclear energy. Actions which compel a country to shut down a peaceful nuclear research program, or to seek reprocessing, could cast doubt on U.S. commitment to NPT principles. Any perception that the U.S. does not support the NPT, which is the foundation of the entire international nuclear nonproliferation regime, would make it that much harder to negotiate further nuclear nonproliferation agreements.

If the research reactors are forced to shut down, the United States would likely be accused of failing to live up to its obligations under the Treaty on the Non-Proliferation of Nuclear Weapons to assist nonnuclear weapons states with peaceful applications of nuclear technology.

If the reactors switch back to (or continue) the use of HEU fuel, the move towards elimination of the civil use of HEU will be severely diminished.

While it is true that these countries do not pose a threat of nuclear weapons proliferation themselves, they serve as examples for other countries. Furthermore, several of them manufacture and sell research reactors to other countries, including third world countries. If our stable allies continue to use HEU fuel for their research reactors, then the countries which buy reactors from them would demand reactors fueled in the same manner.

The United States is currently attempting to persuade Russia and China to implement programs, similar to that of the United States, to convince their client states to switch their research reactors to LEU fuel. If, through action or inaction, the United States is unable to persuade its allies to discontinue the use of HEU fuel, then we are unlikely to convince Russia and China to cooperate in this effort.

Response to Comment No. 970-9

The amount of spent nuclear fuel in the foreign research reactor program is on the order of 1 percent of U.S. defense waste and 1/10 of 1 percent of U.S. commercial waste. The costs for the foreign research reactor spent nuclear fuel program would be on the order of 1-2 percent of that for the total U.S. program. Adding this material to an already large base of material would not make the resolution of the problem any easier but it would reduce a significant international nuclear weapons proliferation risk at a low incremental cost.

COMMENTOR NO. 970: PORT OF TACOMA (CONT'D.)

PORT OF TACOMA

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An additional human and economic issue is shipboard fires. For example, there have been shipboard fires on Puget Sound that far exceed the design specifications of the cask. In the event the cask is ruptured and radioactive material becomes airborne, there will be a catastrophe of unimaginable proportions. 970-12

Subjecting Americans to this type of danger, when we lack the ability to reprocess, recycle and store for short and long term periods is shortsighted and unacceptable. I strongly question the process at the Department of Energy if Alternative #1 is selected.

The lack of any positive benefits to our community and our society, should compel the Department of Energy to endorse Alternative #2.

Sincerely,

Patrick O'Malley, President
PORT OF TACOMA

POM/c
cc: Congressional Delegation

RESPONSE TO COMMENT
COMMENTOR NO. 970: PORT OF TACOMA (CONT'D.)

In general, the costs for the in-U.S. components of the program will be determined by decisions made in other programs, particularly waste disposal programs. Regardless of these decisions and regardless of how costs are allocated, Management Alternative 3 would almost always have the lowest total costs. Strictly speaking, the lowest cost approach would appear to be maximizing the amount of material reprocessed at Dounreay and chemically separated at the Savannah River Site, with the chemical separation activity taking place early in the program and the Dounreay reprocessing taking place over the duration of the receipts. The United States could be required to accept the reprocessing wastes (strictly speaking, substituted high-level waste from a different British facility.) The feasibility of this plan depends on several factors, including United States and United Kingdom acceptance of the waste substitution components.

The costs for Management Alternative 1 would be at least 25 percent higher than Management Alternative 3 and could be many times higher depending on the resolution of issues outside the foreign research reactor program, particularly the waste acceptance criteria for the high-level waste repository. Managing the spent nuclear fuel overseas would create numerous economic and technical problems and would not be a low-cost option. Many countries have no storage capability. Virtually no countries have a disposal capability. The cost per unit of spent nuclear fuel for a small storage facility is high. Total program costs would be more than just the cost of a spent nuclear fuel transportation cask. The supporting infrastructure required for security, safety, health, etc. exists at management sites in the United States but does not exist in many of the foreign countries.

Response to Comment No. 970-10

The benefit to the citizens of the United States from the proposed action, including those in potential ports of entry, along transportation routes, or near potential management sites, is less risk that weapons grade uranium from civil programs could be diverted into the production of nuclear weapons that might be used against us or our allies. On the other hand, the analyses recorded in Section 4 of the EIS demonstrate that the risks from the proposed action are low.

Response to Comment No. 970-11

DOE considers that there is adequate regulatory and emergency preparedness infrastructure to ensure the safe acceptance and transportation to the designated management sites if foreign research reactor spent nuclear fuel is managed in the United States. As discussed in Section 2.7.1 of the EIS, Federal funding to State, Tribal, and local governments is being provided for maintaining emergency response programs. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advise and assistance to the State, Tribal and local agencies involved with a radiological incident.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The

provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Response to Comment No. 970-12

The transportation casks that would be used for the foreign research reactor spent nuclear fuel are certified if their design meets certain tests, including a fire test, and if the individual casks pass periodic inspections (Section 2.6.2 of the EIS). These certification standards were developed for use of the transportation casks on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. The duration of a ship fire is directly related to the amount of combustibles carried on board. The number of severe fires on ships would be relatively small. Data available on the last 15 years from Lloyd's of London indicates that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures.

In respect to the impact a ship fire might have on a transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the transportation cask would not be exposed for the entire duration of the fire. Second, a ship fire's intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it would be almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of foreign research reactor spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (see Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).

The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt foreign research reactor spent nuclear fuel. Appendix D, Section D.5.3 of the EIS presents a detailed discussion of accident probabilities and radioactive material source terms and Section D.5.4 presents the results of the analyses.

In conclusion, although long duration ship fires are possible, and have occurred, they are uncommon events. Analyses in the EIS indicate that even in the event of a severe ship fire involving a transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5 of the EIS), in spite of the fact that some radioactive material might be released.

Commentor No. 973:
Michael Deal, Mayor, City of Puyallup

RESOLUTION NO. 1256

A RESOLUTION OF THE CITY OF PUYALLUP CITY COUNCIL EXPRESSING STRONG OPPOSITION TO THE ADOPTION OF A POLICY, BEING PROPOSED JOINTLY BY THE UNITED STATES DEPARTMENT OF ENERGY AND UNITED STATES DEPARTMENT OF STATE, TO ACCEPT AND MANAGE SPENT NUCLEAR FUEL FROM FOREIGN RESEARCH REACTORS BY SHIPMENT THROUGH THE PORT OF TACOMA, WASHINGTON.

WHEREAS, the United States Department of Energy and the United States Department of State are jointly proposing to adopt a policy to manage spent nuclear fuel from foreign research reactors; and

WHEREAS, nuclear fuel containing uranium enriched in the United States of America would be covered by this policy; and

WHEREAS, the purpose of this policy is to promote United States nuclear weapons nonproliferation policy objectives, specifically seeking to reduce highly enriched uranium from civilian commerce, and

WHEREAS, the environmental effects and policy considerations of three management alternative approaches for implementation of the proposed policy are assessed; and

WHEREAS, alternative number one would be the acceptance and management of the spent nuclear fuel by the Department of Energy in the United States; and

WHEREAS, under alternative number one the spent nuclear fuel would be shipped by ocean-going vessels from foreign countries to the United States of America; and

WHEREAS the Port of Tacoma is considered one of ten ports through which the shipment of spent nuclear fuels would occur; and

Puyallup City Attorney
218 West Pioneer
Puyallup, Wash. 98371
(206) 841-5525

Response to Comment
Commentor No. 973:
Michael Deal, Mayor, City of Puyallup

COMMENTOR NO. 973:
MICHAEL DEAL, MAYOR, CITY OF PUYALLUP (CONT'D.)

WHEREAS, the Draft Environmental Impact Statement (DEIS) was prepared to address the Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel; and

A. The DEIS has used outdated information about the Port of Tacoma, its terminals, its operations, and the surrounding area; 973-1

B. The DEIS did not consider the deep-water depth in the Puget Sound area, which will cause substantial problems in recovery of nuclear fuel shipping containers in case of accident;

C. The DEIS fully ignored the harm which can be caused to the population and environment of the area in case of an explosion and fire aboard a vessel navigating Puget Sound;

D. The DEIS did not recognize the status of Commencement Bay as a superfund site, the stigma attached to this designation, and the expansion of this stigma by Alternative Number One; 973-2

E. The DEIS ignored the significant cleanup effort by the Port of Tacoma, the City of Tacoma, the industries in Commencement Bay, and the associated crippling business interruption issues;

F. The DEIS stated that part of this material would be of interest to unfriendly nations and/or terrorists, and yet did not provide adequate risk and consequence information of a complete, explosive breach of the nuclear fuel by disgruntled persons or terrorists; 973-3

G. The DEIS did not consider the security aspect of these shipments through the Port of Tacoma, the City of Tacoma, Pierce County, and the State of Washington; 973-4

H. The DEIS did not adequately address the life cycle costs or benefits and risks of the proposed alternatives; 973-5

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Puyallup City Attorney
218 West Pioneer
Puyallup, Wash. 98371
(206) 841-5525

RESPONSE TO COMMENT
COMMENTOR NO. 973:
MICHAEL DEAL, MAYOR, CITY OF PUYALLUP (CONT'D.)

Response to Comment No. 973-1

Updated information on the terminals at the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS.

Response to Comment No. 973-2

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1000 feet). Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

The transportation casks that would be used for the foreign research reactor spent nuclear fuel are certified if their design meets certain tests, including a fire test, and if the individual casks pass periodic inspections (Section 2.6.2 of the EIS). These certification standards were developed for use of the casks on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. The duration of a ship fire is directly related to the amount of combustibles carried on board. The number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicate that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures.

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The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt foreign research reactor spent nuclear fuel. Appendix D, Section D.5.3 of the EIS presents a detailed discussion of accident probabilities and radioactive material source terms and Section D.5.4 presents the results of the analyses.

COMMENTOR NO. 973: MICHAEL DEAL, MAYOR, CITY OF PUYALLUP (CONT'D.)

I. The DEIS fully ignored the fairness and equity issues of selecting the smaller ports in lower population areas after implying the risks were virtually inconsequential; and

WHEREAS, the record for the safe operation and handling of nuclear materials in United States Department of Energy regulated facilities is less than satisfactory, and there are facilities owned and operated by the United States government capable of receiving and handling this nuclear material, and

WHEREAS, the United States House Budget Resolution eliminates the United States Department of Energy thereby creating funding uncertainties, and

WHEREAS, the United States Department of Energy has failed to properly answer a question in a meeting conducted by the Port of Tacoma, in Tacoma on the 22nd day of May, 1995, pertaining to the effect of radiation in the environment should a shipping cask be damaged during the handling process in the Port, or to respond in writing to that question as promised and; NOW, THEREFORE,

BE IT RESOLVED by the Puyallup City Council:

Section 1. The Puyallup City Council strongly opposes adoption of a policy, being proposed jointly by the United States Department of Energy and United States Department of State, to accept and manage spent nuclear fuel from foreign research reactors by shipment through the Port of Tacoma, Washington.

Section 2. Copies of this Resolution shall be transmitted to President Clinton, Vice President Gore, the United States Department of Energy, the United States Department of State, the Washington State Congressional delegation, the Washington State Legislature, the Office of

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973-10

RESPONSE TO COMMENT COMMENTOR NO. 973: MICHAEL DEAL, MAYOR, CITY OF PUYALLUP (CONT'D.)

In conclusion, although long duration ship fires are possible, and have occurred, they are uncommon events. Analyses in the EIS indicate that even in the event of a severe ship fire involving a transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5 of the EIS). Although the nonradiological effects of such a catastrophic accident would obviously impact the local environment, no additional impacts are predicted due to the presence of foreign research reactor spent nuclear fuel.

A sentence has been added to Appendix D, Section D.2.1.9 of the EIS regarding Commencement Bay being a Superfund Site. Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma as noted by the commentor. Nor should it contribute to any dirty port stigma based on the EIS analysis that indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Spent nuclear fuel transportation casks passing through the Port of Tacoma, Commencement Bay, or any other port or waterway cannot leak because the metal fuel is transported dry, thus it would not affect air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

Response to Comment No. 973-3

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk. Section D.5.9 has been added to Appendix D of the EIS to address terrorism and sabotage. All shipments of foreign research reactor spent nuclear fuel would be conducted meeting or exceeding all the security requirements in the Code of Federal Regulations (10 CFR Part 73). Appendix H has been added to the final EIS in response to public comments to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

Response to Comment No. 973-4

The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

Commentor No. 973:
Michael Deal, Mayor, City of Puyallup (Cont'd.)

Governor, the Pierce County Executive, the King County Council and Executive, and all cities and towns in Pierce County.

Passed this 19th day of June, 1995.

Michael W Deal
MICHAEL DEAL, MAYOR

ATTEST:

Barbara J. Price
BARBARA J. PRICE, CITY CLERK

rmshst/nuclear/695

4

Puyallup City Attorney
218 West Pioneer
Puyallup, Wash. 98371
(206) 841-5525

Response to Comment
Commentor No. 973:
Michael Deal, Mayor, City of Puyallup (Cont'd.)

Response to Comment No. 973-5

Section 4.9 and Appendix F, Section F.7 of the EIS fully address the life cycle costs, risks, and benefits of the proposed action. The use of a net present value approach reflects the life cycle costs. Benefits would be primarily in the form of reduced risks of the proliferation of nuclear weapons to countries who might use them on us or our allies, as well as, income and employment to the management sites and regions conducting the programs and to the nation from reducing the commerce in certain types of nuclear materials. Health and safety risks would be low, as discussed fully Section 4 of the EIS and Appendices C, D, E, and F. Economic risks are described in detail in Appendix F, Section F.7. Particular attention is paid to major cost uncertainties (e.g., waste acceptance criteria, geologic disposal). Economic impacts relating to ports are minor in all respects.

Response to Comment No. 973-6

As demonstrated by the analyses in the EIS, the risk associated with accepting spent nuclear fuel from foreign research reactors through any of the ports analyzed would be low. This result is borne out by the experience gained in over 30 years of shipments of foreign research reactor spent nuclear fuel to the United States. Accordingly, DOE considers that there is no fairness or equity issue to be resolved.

Response to Comment No. 973-7

DOE has safely received and handled foreign research reactor spent nuclear fuel for over 30 years, most of it through commercial ports.

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted. Sections 4.2.2.2 and 4.2.2.3 of the EIS provide the analysis on impacts of incident-free operation and consequences of port accidents, respectively.

Response to Comment No. 973-8

If DOE were abolished in response to action by Congress, the current DOE programs for management of spent nuclear fuel would have to be transferred to some other Federal government agency to protect the health and safety of the public. Since the spent nuclear fuel will not simply go away, these programs cannot simply be abolished.

Commentor No. 973:
Michael Deal, Mayor, City of Puyallup (Cont'd.)

Response to Comment
Commentor No. 973:
Michael Deal, Mayor, City of Puyallup (Cont'd.)

Response to Comment No. 973-9

DOE responded to this question by letter and fax on June 16, 1995. The response gave the estimated radiation dose rate near the spent nuclear fuel under the assumption that there was no transportation cask to provide shielding, as requested by the Port of Tacoma.

CEQ regulations and guidance do not require a worst case analysis of accidents in an EIS. For the purpose of analysis in the EIS, there is no such thing as a worst case scenario, because for any worst case that is postulated, a still more severe accident can be postulated by adding one more drum of gasoline, one more wrecked rail car, one more terrorist, etc. In addition, for each assumption that is made to make a postulated accident more severe, the probability of the accident becomes smaller. The EIS does not contain a worst-case scenario, but a broad range of port accident scenarios, including severe accidents, is discussed in Section 4.2.2.3 of the EIS. Appendix D, Section D.5.4.3.2 of the EIS presents the risks of a very high temperature fire that engulfs a cask, which was part of a sensitivity study on release fractions. In addition, Section D.5.9 has been added to Appendix D of the EIS to address the issue of attack by disgruntled persons or terrorists.

Response to Comment No. 973-10

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS demonstrate that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1022:
TACOMA CITY COUNCIL MEMBER BILL BAARSMA

City of Tacoma

Council Member Bill Baarsma

July 3, 1995

Claire F. Hull
Secretary
Wright Park Neighborhood Association
701 South Yakima
Tacoma, WA 98405

Dear Claire:

I want to thank the Wright Park Neighborhood Association for their action supporting the City's efforts to stop nuclear waste imports. I am sending a copy of your letter to Mr. Charles Head of the Department of Energy.

You will be pleased to hear that the Association of Washington Cities fully supports Tacoma's position on this issue as well. Last Friday, the AWC assembly approved our City's resolution by an overwhelming vote.

Again, thank you.

Sincerely,

Bill Baarsma
Council Member

cc: Mr. Charles Head

ss:c(5873)

747 Market Street, Room 1200, Tacoma, Washington 98402-3766, (206) 591-5100, FAX (206) 591-5123

RESPONSE TO COMMENT
COMMENTOR NO. 1022:
TACOMA CITY COUNCIL MEMBER BILL BAARSMA

COMMENTOR NO. 1022: TACOMA CITY COUNCIL MEMBER BILL BAARSMA (CONT'D.)

Wright Park Neighborhood Association

"Together We Can Win!"

19 June 1995

Mayor Harold Moss
Municipal Building, Rm 1200
747 Market St.
Tacoma WA 98402

Dear Mayor Moss:

At the meeting of the Wright Park Neighborhood Association held on Monday, 19 June, the transportation of atomic waste through Tacoma was a subject of discussion. We all wished we could have attended the meeting held specifically to discuss this project.

However, it was the consensus of the 23 people at our meeting that as Secretary of our group, I should send you a letter protesting this action. 1022-1

We have gone on record as being against such a project for the city of Tacoma.

Sincerely,

Claire F. Hull

Claire F. Hull, Secretary
for the WPNA

copies to: City Council ✓
Councilman Evans
Port of Tacoma

701 South Yakima • Tacoma, Washington 98405

RESPONSE TO COMMENT COMMENTOR NO. 1022: TACOMA CITY COUNCIL MEMBER BILL BAARSMA (CONT'D.)

Response to Comment No. 1022-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1050:
CITY OF TACOMA FIRE DEPARTMENT

City of Tacoma
Fire Department

June 30, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. SW
Washington D.C. 20585

Dear Mr. Head:

Subject: Draft Environmental Impact Statement
Foreign Research Reactor Spent Nuclear Fuel

The Tacoma Fire Department is very concerned with sections of this DEIS regarding Emergency Management and Response. It is our belief that the impact on local emergency management and response agencies (i.e. the fire department) has been minimized in this DEIS. Any community burdened with this additional community safety risk will need additional resources. Jurisdictions already appropriately handling quantities of nuclear fuel or nuclear waste could have properly trained teams in place and be more desirable ports than those that do not.

Emergency Management is the planning and organizing of resources which can be called upon in the event of a major emergency. Please understand that our very capable Tacoma/Pierce County Emergency Management Services has NO personnel designed for emergency scene response; they rely on local fire departments for scene response. Good planning is dependent on the availability of good resources to provide an appropriate response.

1050-1

Many local fire departments, including Tacoma, have Hazardous Material Response Teams. The level of training of these teams can vary. Because of the extremely large variety and types of hazardous materials, local teams are trained in general hazardous material response with specific training and education focused on the significant hazards present in their communities. Resources are limited and must be applied toward local problems and conditions. This DEIS mistakenly assumes that, because a jurisdiction has plans for hazardous cargo accidents, no other resources are necessary to appropriately handle a nuclear waste accident.

Page D-35 of the DEIS discusses "Emergency Response Capabilities." This section suggests that "DOE 'could' provide assistance in the development of radiological emergency response plans and training at ports that have no specific response plans for spent nuclear fuel accidents in port." This implies that ports with some plan would not be

901 Fawcett Avenue ▮ Tacoma, Washington 98402-5699 ▮ (206) 591-5737 ▮ FAX (206) 591-5746

RESPONSE TO COMMENT
COMMENTOR NO. 1050:
CITY OF TACOMA FIRE DEPARTMENT

Response to Comment No. 1050-1

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

COMMENTOR NO. 1050: CITY OF TACOMA FIRE DEPARTMENT (CONT'D.)

assisted. It also implies that it would be DOE's prerogative (could provide assistance) whether or not assistance was provided. This should be "will provide" assistance to any port so chosen.

More important, this DEIS does not address the financial burden of radiological equipment for first responders and hazardous materials teams. Nor does it address the resources needed for personal protective equipment, the need for personnel medical surveillance, nor the needs of a local jurisdiction required by State Labor and Industries to protect firefighters. It also fails to mention the on-going training needs and the future requirements for personnel safety.

1050-1 (Cont'd.)

Initial fire department response may appear as a rather minor issue for non-fire service personnel. However, the initial development of a properly prepared response, the details of maintaining good readiness, proper tools, training, and good safety standards for all personnel, and administrating all these elements, including liaison with the Department of Energy, is not a minor issue for those who must "get the job done." All this would be additional resource requirements placed on the local jurisdiction. This DEIS makes no mention of these needs which would result from choosing Option I or III.

It is our recommendation that specific resources be identified and provided to the local jurisdictions which are burdened with this public safety risk. These resources should be to the satisfaction of the local jurisdiction which is responsible for both the emergency response and for maintaining a positive sense of public safety for their community.

We also believe that priority considerations should be given to ports already handling nuclear material.

1050-2

Sincerely,

Ralph W. Johns, Deputy Chief
Prevention and Education

c: United States Congress
Sen. Patty Murray
Sen. Slade Gorton
Rep. Norm Dicks
Rep. Randy Tate
Rep. Jim McDermott
Rep. Jack Metcalf
Rep. Jennifer Dunn
Rep. Linda Smith
Rep. Larry Nethercutt, Jr.
Rep. Rick White
Rep. Doc Hastings

RESPONSE TO COMMENT COMMENTOR NO. 1050: CITY OF TACOMA FIRE DEPARTMENT (CONT'D.)

Response to Comment No. 1050-2

As the port selection process explains in detail (Appendix D, Section D.1.9 of the EIS) the Port of Tacoma is considered to be able to safely handle the foreign research reactor spent nuclear fuel. The experience criterion used in the port selection process evaluates the port's experience in handling containerized cargo (Appendix D, Section D.1.9.1), not in dealing with radioactive material. Similarly, the criterion which evaluates appropriate port facilities (Appendix D, Section D.1.9.3) does not include the evaluation of facilities for handling radioactive material; experience with handling containers is sufficient. Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the casks used to transport it would be low, so no special handling is required; experience with and facilities for handling containers are sufficient. Therefore, the EIS does not consider an individual port's ability to handle radioactive material or residual radioactive waste.

A sentence has been added to Appendix D, Sections D.1.9.1 and D.1.9.3 of the EIS which states: Because containerized spent nuclear fuel requires no special port experience or facilities specific to the handling of radioactive material, ports were not eliminated from consideration because of lack of such experience or facilities.

COMMENTOR NO. 1063: NORTH PLATTE FIRE DEPARTMENT

[Billing Code 6450-01-P]

DEPARTMENT OF ENERGY

Extension of the Public Comment Period for the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

AGENCY: Department of Energy

ACTION: Extension of the Public Comment Period

SUMMARY: The Department of Energy is extending the public comment period through July 20, 1995, for the draft Environmental Impact Statement (EIS) on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. All comments received by that date will be considered by the Department in the preparation of the final EIS. Comments received after the close of the comment period will be considered to the extent practicable. The Department had earlier announced (60 FR 19899, April 21, 1995) that the comment period would end on June 20, 1995. Comments can be mailed to Mr. Charles Head, Office of Spent Fuel Management, EM-37, U.S. Department of Energy, 1000 Independence Avenue, SW, Washington, D.C. 20585-0001. For more information on the draft EIS please call 1-800-736-3282.

3 July 1995

Issued in Washington, D.C. on June 20, 1995.

My thoughts on this issue are mixed I can understand the benefits of this program, in that we can ensure that the spent fuel will be stored properly and we'll know where it is and be able to make sure it is secure. Selling this to the general public however, I feel is an effort in futility. We were not even able to get the public to buy in to the necessity of establishing the state compacts for the low level storage of our own waste. The public will perceive the United States as the world's nuclear waste dump and associate with all kinds of negative visions such as Hiroshima and Nagasaki, nuclear meltdown, etc. Opponents will be very vocal. Fear of nuclear storage will prevail, no one will have the intestinal fortitude to make the

(on back)

Mark W. Frei

Mark W. Frei
Acting Special Associate Deputy Assistant
Secretary for Waste Management
Environmental Management

1063-1

RESPONSE TO COMMENT
COMMENTOR NO. 1063: NORTH PLATTE FIRE DEPARTMENT

Response to Comment No. 1063-1

This EIS evaluates the environmental effects of various options for managing spent nuclear fuel from foreign research reactors (Sections 2.2 through 2.4 of the EIS). It also evaluates the environmental effects of taking no action to manage foreign research reactor spent nuclear fuel (Section 2.5 of the EIS). As in any technical document, the presentation should be objective and factual. No attempt was or should be made in an EIS to influence public opinion except through an objective presentation of the findings of the study.

No management alternative evaluated in the EIS would compel the United States to permanently serve as a repository for foreign research reactor spent nuclear fuel. Foreign research reactor spent nuclear fuel is neither explosive nor flammable. It is radioactive, but it cannot be used to make a nuclear weapon without reasonably sophisticated chemical processing and an associated weapons technology.

As indicated in this document, most of the comments concerning the proposed action were opposed to acceptance of foreign research reactor spent nuclear fuel (Management Alternative 1, Section 2.2 of the EIS).

An assessment of the environmental effects of federal actions is required under NEPA (Section 5 of the EIS). No sooner than 30 days following publication of this final EIS, DOE, after consultation with the Department of State, will publish its Record of Decision on a policy to manage foreign research reactor spent nuclear fuel. The environmental evaluation provided in this EIS is one factor in that decision. As discussed in Section 4 of the EIS, the risks associated with implementation of the proposed action to human health and environment would be low. Thus, there is no environmentally preferred alternative, and the decision would be based on considerations other than the environment.

COMMENTOR NO. 1063: NORTH PLATTE FIRE DEPARTMENT (CONT'D.)

decision to proceed against public sentiment, and a lot of time, effort and tax dollars will be spent to no avail.

Paul Coleman
Fire Chief
North Platte Fire Dept.
715 South Jeffers St.
North Platte, Ne.
69101

308-534-8382

RESPONSE TO COMMENT
COMMENTOR NO. 1063: NORTH PLATTE FIRE DEPARTMENT (CONT'D.)

COMMENTOR NO. 1075:
THURSTON COUNTY BOARD OF COUNTY COMMISSIONERS

THURSTON COUNTY
SINCE 1852

Judy Wilson
District One
Diane Oberquell
District Two
Dick Nichols
District Three

BOARD OF COUNTY COMMISSIONERS

June 28, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management
Mail Stop EM-37
U. S. Department of Energy
1000 Independence Ave. SW
Washington, D.C. 20585

Dear Mr. Head:

We are writing as the Board of County Commissioners and Board of Health for Thurston County in regards to the Foreign Research Reactor Spent Nuclear Fuel project. This project includes as one option, the shipment of high level nuclear waste through the Port of Tacoma in Washington State. In your evaluation of the alternative transportation routes for this project we request you give a high consideration to protection of drinking water supplies.

While the current Environmental Impact Statement for this project does not include rail transportation as an alternative from the Port of Tacoma site, we understand transport by rail is still a possibility. Our concern in this regard is that the main rail line from the Port of Tacoma to the South runs directly through the McAllister Springs recharge area. McAllister Springs is a vital water supply resource to our community, supplying the majority of drinking water to the residents of Olympia, and also being a significant source of water supply to the City of Lacey. In developing the federally mandated wellhead protection program for McAllister Springs, it has been identified that the single most catastrophic event which could affect this source of water supply is a train accident occurring on the main rail line. Due to its close proximity to the springs, a rail accident involving hazardous/nuclear material could wipe out this vital community resource virtually over night. It is of interest to note that the only two derailments which have occurred in Thurston County over the past several years have taken place in close proximity to McAllister Springs.

1075-1

While the City of Olympia, Thurston County, and the state of Washington will continue to work with Burlington Northern Railroad to address safety issues along this stretch of rail line, we also thought it important to bring this issue to your attention so that wellhead protection, and

Building #1, Room 269, 2000 Lakeridge Drive SW, Olympia, Washington 98502-6045 (360) 786-5440
T.D.D. (360) 754-2933

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RESPONSE TO COMMENT
COMMENTOR NO. 1075:
THURSTON COUNTY BOARD OF COUNTY COMMISSIONERS

Response to Comment No. 1075-1

The commentor's concern for the protection of drinking water supplies is noted. The chance of a transportation cask carrying foreign research reactor spent nuclear fuel crashing near McAllister Springs is low. Even if such an accident did occur, however, the cask would be expected to survive the crash without releasing any radioactive material. (Appendix B, Section B.2 and Section 2.6.2 of the EIS.)

Commentor No. 1075: Thurston County Board of County Commissioners (Cont'd.)

Charles Head
June 28, 1995
Page 2

protection of municipal water supplies, can be a factor in your evaluation of transportation alternatives. Thank you for your consideration.

Sincerely,

THURSTON COUNTY BOARD OF COUNTY COMMISSIONERS
THURSTON COUNTY BOARD OF HEALTH

Judy Wilson, Chairman

Diane Oberquell, Commissioner

Dick Nichols, Commissioner

cc. City of Olympia

Response to Comment Commentor No. 1075: Thurston County Board of County Commissioners (Cont'd.)

COMMENTOR NO. 1076:
CITY OF PORTLAND COMMISSIONER CHARLES HALES

CITY OF
PORTLAND, OREGON
DEPARTMENT OF PUBLIC SAFETY

Charlie Hales, Commissioner
1220 S.W. Fifth Avenue
Room 404
Portland, Oregon 97204
(503) 823-4682
FAX (503) 823-4040

July 7, 1995

U.S. Department of Energy
Office of Environmental Management (EM-37)
Attn: Charles Head
1000 Independence Ave., S.W.
Washington, D.C. 20585-0001

Re: City of Portland's official comments on draft EIS on *Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel*

Dear Mr. Head:

I am transmitting the following resolution, passed unanimously by the Portland City Council on July 6, 1995, as our official comment on DOE's draft EIS on the shipment of foreign research reactor spent nuclear fuel. The City Council is in strong support of the State of Oregon's previously expressed opposition to the potential shipment of such nuclear waste through our city to either Hanford Nuclear Reservation or the Idaho National Engineering Laboratories. The Council feels its has sound reasons, as do our sister cities of Seattle and Tacoma, Washington, to oppose such shipments..

We realize it is the role of the federal government to develop a nonproliferation policy. However, we feel strongly that any shipment of additional nuclear material to Hanford or the Idaho labs is an unsound and unsafe policy due to the ongoing environmental and safety problems at both sites as well as the fact that neither facility is a likely permanent storage location for this material. I would urge you to keep Portland city officials informed as you continue into the full EIS process later this year. Thank you for you acceptance of comments and please feel free to contact me with any question you may have concerning the City's position on this matter.

Sincerely,

Charlie Hales, City Commissioner

cc: Mayor Vera Katz
Commissioner Earl Blumenauer
Commissioner Gretchen Kafoury
Commissioner Mike Lindberg
Fire Chief Robert Wall

RESPONSE TO COMMENT
COMMENTOR NO. 1076:
CITY OF PORTLAND COMMISSIONER CHARLES HALES

COMMENTOR NO. 1076: CITY OF PORTLAND COMMISSIONER CHARLES HALES (CONT'D.)

RESOLUTION No. 35418

Join the State of Oregon in opposition to the shipment of foreign research reactor spent nuclear fuel through Portland (Resolution)

WHEREAS, the U.S. Department of Energy is now accepting comments on the "Draft Environmental Impact Statement (EIS) on a proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel."

WHEREAS, the Port of Portland is one of 10 potential U.S. ports of entry for the foreign research reactor spent nuclear fuel.

WHEREAS, there are major environmental problems and concerns associated with both the Hanford site and the Idaho National Engineering Laboratories where foreign research reactor spent nuclear fuel shipped through the Port of Portland is proposed to be stored.

WHEREAS, the Oregon Department of Energy is the State's lead agency for policies relating to the disposal and transportation of nuclear waste, and is on the record in its comments on the EIS opposing the shipments stating that "no shipment should go to Hanford or to Idaho and therefore no shipments should come through Portland." 1076-1

WHEREAS, the recently completed Tri-Party Agreement on the cleanup of Hanford negotiated by the state of Washington, the U.S. Department of Energy and the U.S. Environmental Protection Agency does not take into account the receipt of additional spent nuclear fuel for long-term storage and such storage would seriously detract from the vital cleanup work currently planned. 1076-2

WHEREAS, the U.S. Department of Energy Draft EIS finds that "age, condition, available capacity of the [facilities at Hanford] and the Tri-Party Agreement milestones generally prevent the use of existing facilities for the storage of foreign research reactor spent nuclear fuel."

WHEREAS, the cities of Seattle, Federal Way, Milton and Tacoma, Wash., Pierce County, Wash. and the Port of Tacoma have all formally opposed the shipment of foreign research reactor spent nuclear fuel through their communities.

WHEREAS, the period of public comment on the draft EIS process is open to July 20, 1995.

NOW, THEREFORE BE IT RESOLVED by the Council of the City of Portland, a municipal corporation of the state of Oregon, finds that the U.S. Department of Energy has failed to answer the fundamental question of why nuclear fuel should be shipped through the City of Portland to Hanford Nuclear Reservation or the Idaho National Engineering Laboratories. 1076-3

NOW THEREFORE BE IT FURTHER RESOLVED, by the Council of the City of Portland that the Council joins the State of Oregon in opposing the shipment of foreign research reactor spent nuclear fuel through Portland to Hanford or Idaho National Engineering Laboratories. 1076-4

AND BE IT FURTHER RESOLVED that copies of this resolution be transmitted immediately to office of Oregon Governor John Kitzhaber, the U.S. Department of Energy, the Congressional delegation of the state of Oregon and President William Jefferson Clinton.

ADOPTED by the Council, JUL 0 5 1995

Commissioner Hales
Marc Zolton
June 29 1995

BARBARA CLARK
Auditor of the City of Portland
By Barbara Clark

RESPONSE TO COMMENT
COMMENTOR NO. 1076: CITY OF PORTLAND COMMISSIONER CHARLES HALES (CONT'D.)

Response to Comment No. 1076-1

The commentor's opposition to the use of Portland as a port of entry and the use of either the Hanford Site or the Idaho National Engineering Laboratory as a management site for foreign research reactor spent nuclear fuel under Management Alternative 1 or 3 is noted. Based on the criteria used for identifying the ports of entry for evaluation (Section 2.6.3.1 of the EIS), the selection of a management site does not directly affect the port identification.

Response to Comment No. 1076-2

DOE is committed to the Tri-party agreement for cleanup activities at the Hanford Site; however, the cleanup at the Hanford Site is beyond the scope of this EIS. Section 4.2.4 and Appendix F, Section F.4.3 of the EIS, discuss the impacts of foreign research reactor spent nuclear fuel storage at the Hanford Site.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 1076-3

As a part of the overall evaluation of environmental impacts associated with the shipment of foreign research reactor spent nuclear fuel, the EIS identifies ports of entry in the United States that are acceptable for the receipt and handling of foreign research reactor spent nuclear fuel. Evaluation criteria were developed to use in determining the final selection of ports of entry (Appendix D, Section D.1.9 of the EIS). The criteria include such factors as transit from open ocean, port population, population along the route to the management site, port experience with handling containers, and port facilities. While 161 ports were initially considered, only the ports which are determined to be acceptable might be used in the case that foreign research reactor spent nuclear fuel is accepted by the United States.

Commentor No. 1076: City of Portland Commissioner Charles Hales (Cont'd.)

Response to Comment
Commentor No. 1076: City of Portland Commissioner Charles Hales (Cont'd.)

Portland was one of 161 ports (153 commercial and eight military ports) considered. These ports were evaluated against selection criteria, resulting in 10 ports that met all of the criteria. Appendix D, Sections D.1.8 and D.1.9 of the EIS present a detailed discussion of the process and results.

Response to Comment No. 1076-4

The Portland City Council's resolution in opposition to bringing foreign research reactor spent nuclear fuel through the Port of Portland is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Portland, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1120:
PETER MURRAY, MAYOR, CITY OF PINOLE

Pinole California
2131 Pear Street Pinole, CA 94564 (510) 724-9000

July 18, 1995

Secretary Hazel R. O'Leary
Secretary of Energy
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

Dear Secretary O'Leary:

This is written on behalf of the City Council of the City of Pinole, Contra Costa County, to express our unanimous opposition to the use of the Concord Naval Weapons facility as a port of entry for the importation and transport of foreign research reactor spent nuclear fuel. *1120-1*

The City of Pinole is a community of 18,300 population located in Western Contra Costa County. Our community abuts the San Pablo Bay and therefore is on the San Francisco Bay-Sacramento/San Joaquin Delta Estuary water route. We are also traversed by the Santa Fe and Southern Pacific Railroad lines and bisected by Interstate 80. We believe, therefore, that we will be directly affected by most any access route chosen to haul these most dangerous products to the Concord Naval Weapons Station.

The Pinole City Council is opposed to the use of the Concord Naval Weapons Station for the intake and trans-shipment of spent nuclear fuel based on concerns for the cumulative impacts of the proposed program on the City of Pinole, Contra Costa County, and the Bay Area. We are already affected by military installations, nuclear research facilities, petroleum refineries, and chemical industries. We are also concerned about the handling of accidents and security. *1120-1 (Cont'd.)*

Further, we support the position of the Contra Costa County Board of Supervisors that the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel is inadequate for evaluating the potential impacts of the use of the Concord Naval Weapons Station on this city, the County, and the Bay Area.

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RESPONSE TO COMMENT
COMMENTOR NO. 1120:
PETER MURRAY, MAYOR, CITY OF PINOLE

Response to Comment No. 1120-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

DOE considers that if foreign research reactor spent nuclear fuel is managed in the United States, there is adequate regulatory and emergency preparedness infrastructure to ensure its safe acceptance and transportation to the designated management site. As discussed in Section 2.7.1 of the EIS, Federal funding to State, Tribal, and local governments is being provided for maintaining emergency response programs. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advice and assistance to the State, Tribal and local agencies involved with a radiological incident. DOE is also required to inform the Governor of each State and any Tribal chair, or their designee, along a transportation route at least seven days prior to shipment of hazardous cargos, including radioactive materials. It would be the responsibility of the Governor to provide any further notification to State and local officials.

Emergency preparedness, security, and coordination of DOE with local emergency response authorities that would be involved with the acceptance and transportation of foreign research reactor spent nuclear fuel will be discussed in detail in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

In regard to cumulative impacts, the receipt and transshipment of the foreign research reactor spent nuclear fuel would not affect the environment. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

DOE has not yet selected ports, routes, or transport modes for the foreign research reactor spent nuclear fuel. If the Concord NWS is selected, then DOE would choose the best route to I-680 in accordance with Department of Transportation regulations (49 CFR 397.101(a)(2)). That route could use route 4, Route 24, and/or Waterford Road. These are the local Concord streets that the trucks would probably use. The State of California routing agency can designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103.

COMMENTOR NO. 1120:
PETER MURRAY, MAYOR, CITY OF PINOLE (CONT'D.)

Secretary Hazel R. O' Leary
July 18, 1995

In this regard, we urge you to seriously address the specific concerns raised by Contra Costa County in their June 6, 1995 report on this subject, which is attached for your reference. *1120-2*

In short, we oppose this proposal because of its cumulative impacts and because the site proposed and the transportation routes to it are too close to Pinole. Further, before any further consideration is given at all to this proposal, the Environmental Impact Statement is inadequate and should be made more comprehensive and realistic. *1120-1 (Cont'd.)* *1120-3*

Thank you for your consideration. Once again, we urge you to oppose the use of the Concord Naval Weapons facility as a port of entry for the importation and transport of foreign research reactor spent nuclear fuel.

Very truly yours,

Peter Murray
Mayor of Pinole

PM:se

Attachment

cc: Charles Head, Program Manager, Office of Spent Nuclear Fuel Management (EM-37)
President William Clinton
Senator Barbara Boxer
Senator Dianne Feinstein
Congressman George Miller
Governor Pete Wilson
Senator Dan Boatwright
Assemblyman Robert Campbell
Dr. William B. Walker, County Health Officer
Contra Costa Board of Supervisors
Pinole City Council

\Mayor\O'Leary

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RESPONSE TO COMMENT
COMMENTOR NO. 1120:
PETER MURRAY, MAYOR, CITY OF PINOLE (CONT'D.)

Response to Comment No. 1120-2

DOE has provided its detailed responses to the Board of Supervisors' comments. DOE responses are included in this document and can be located by consulting the list of commentors.

Response to Comment No. 1120-3

Potential environmental effects which could result from implementation of the proposed action were evaluated during preparation of this EIS. As discussed in Section 4 of the EIS, implementation of the proposed action would result in no significant benefits or risks to human health or the environment at candidate ports, along representative transportation routes, or at candidate management sites. Conservative assumptions were made during the analyses (Sections 4.2.2, 4.2.3, and 4.2.4 of the EIS). More realistic assumptions would result in even lower estimated values of radiological risks.

COMMENTOR NO. 1123: CONTRA COSTA WATER DISTRICT

CONTRA COSTA WATER DISTRICT
1331 Concord Avenue
P.O. Box H20
Concord, CA 94524
(510) 674-8000 FAX (510) 674-8122

July 19, 1995

Sent by Facsimile
(202) 586-5256

Directors
Joseph L. Campbell
President
Elizabeth R. Anello
Vice President
Bette Boatmun
Donald P. Freitas
James Pretti
Walter J. Bishop
General Manager

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
1000 Independence Avenue, SW
Washington, D. C. 20585

Subject: Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

By courtesy of the City of Concord, the Contra Costa Water District (CCWD) has been provided the opportunity to review the Summary and the Draft EIS covering the Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. The following comments are prompted by what appears to be a very general and inadequate treatment of the environmental conditions and potential impacts from accidental nuclear contamination relative to the Port of Concord - one of ten seaports being considered by the Department of Energy (DOE) to receive spent nuclear fuel from foreign research reactors. The Port of Concord, located at the Naval Weapons Center Concord, is in close proximity to public water supplies and facilities operated by the Contra Costa Water District (CCWD) serving approximately 400,000 residents, commercial, industrial and public agencies in central and eastern Contra Costa County. The Draft EIS fails to address potential impacts to these water supplies and facilities, potential inability to effect facility repairs following a localized or regional event causing damage, and other aspects related to the immediate proximity of the water utility and its customers. *1123-1*

CCWD's water supply flows within the open Contra Costa Canal which provides conduit from the San Joaquin Delta to CCWD and customer treatment plants, including the Bollman Treatment Plant in the north Concord area. The Canal is located within 1.5 miles of the dock facilities at the Port of Concord which is located in the Naval Weapons Station Concord (see copy of Figure 3-24, enclosed, which has been modified to identify and highlight the Canal and Mallard Reservoir). Mallard Reservoir, located less than three miles from Port of Concord, is an open, fully exposed 200 acre surface facility providing emergency storage for the Central County service area. The primary concern raised in the following comments would involve the potential for the release of nuclear contaminated materials resulting from an explosion or fire with resulting fallout into the nearby public water supplies.

The following specific comments are made on the Summary document first, followed by comment on a portion of the full Draft EIS.

RESPONSE TO COMMENT
COMMENTOR NO. 1123: CONTRA COSTA WATER DISTRICT

Response to Comment No. 1123-1

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive contents have ever been released from a spent nuclear fuel transportation cask, nor has a spent nuclear fuel shipping cask ever been punctured, even as the result of an accident. Based on this experience, DOE considers that spent nuclear fuel transportation casks passing through the Concord NWS would not affect the quality of the water supply for Contra Costa Water District via Mallard reservoir or any other path. Analysis of a severe accident involving a ship at Concord NWS (Section 4.2.2.3 of the EIS) indicates that the resultant contamination would be so small that no cleanup would be required, other than possibly in the immediate vicinity of the accident. This means that contamination of Mallard Reservoir would be minimal. To ensure this was the case, if such a severe accident were to occur, all water supplies in the area, as well as food and air, would be tested for contamination.

DOE would like to point out that the foreign research reactor spent nuclear fuel is neither volatile nor unstable. The fuel that the proposed policy deals with is a metal which contains enriched uranium matrixed in, all clad with either aluminum or stainless steel. This type of fuel is very stable. Section 2.6.1 of the EIS presents a detailed description of the foreign research reactor spent nuclear fuel.

COMMENTOR NO. 1123: CONTRA COSTA WATER DISTRICT (CONT'D.)

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
July 19, 1995
Page 2

Summary of Draft EIS

Page 27, second paragraph, lines 6-9,14 and 15. It is stated that "radiological impacts were calculated in terms of absorbed dose and associated health effects in the exposed populations" and that "non-radiological impacts to the environment", including water quality, were also analyzed. The conclusion is that "no significant health or environmental effects were found for the total population", which presumably includes all ports and fuel management or storage sites under consideration. However, the analysis of radiological impacts appears to be confined to the past incidence of worker exposure rather than to a "what if..." containment breaching and fire event causing massive exposure at a port site (note: radioactive contamination from accelerated releases, such as by fire, were evaluated only for the five storage sites, DEIS, pages 4-41 and -42). An analysis should be made of such a hypothetical event in order to properly address mitigation measures and emergency response planning that can be applied at the selected port site. Given the general nature of analysis (i.e., a program level) based on a number of alternative sites, it may be appropriate to consider preparation of site specific EIS for each port and storage site following their selection. The present Draft EIS has failed to consider impacts on CCWD's water supplies and customer agencies. *1123-2* *1123-3*

Page 37, S.4.4.4.2 Potential Health and Safety Accident-Related Impacts. The analysis for accidental radioactive releases is confined to storage locations and does not address such a potential event at port facilities, as noted above, for DEIS pp. 4-41-42. While it does address the impacts of releases upon "sites, population distributions and food production and consumption rates within 80 km (50 mi) of the storage location", it does not identify an analysis of impacts on water supplies (including both human ingestion of contaminated water and supply restriction). *1123-4*

Draft EIS

Page 3-27, Figure 3-24 NWS Concord, CA. This map, showing the Port of Concord, fails to identify the Contra Costa Canal although its outline is shown. Please note the proximity of the Port of Concord to the open Canal facility (1.5 miles, as stated, above) and the San Francisco Bay/San Joaquin Delta from which CCWD takes its water supplies. Mallard Reservoir, owned and operated by CCWD, is shown; however, there is no recognition of these resources or analysis in the appropriate section of the document that covers potential impacts from radioactive contamination to public water supplies in the event of an explosive release into the atmosphere and the resultant water supply restriction to the general population. It is estimated that CCWD currently has only three to five days water supply storage capacity which includes the three major exposed, open reservoirs (Mallard, Martinez and Contra Loma). CCWD's Bollman Treatment Plant, which serves approximately 200,000 customers in the Central Contra Costa County area, is located on the south side of Mallard Reservoir (less than three miles from Port Concord) and could be impacted from an event at Port Concord. The enclosed copy of Figure 3-24 is modified by yellow highlighting for the Contra Costa Canal and Mallard Reservoir with the Canal identified by name in red lettering. *1123-4 (Cont'd.)*

RESPONSE TO COMMENT COMMENTOR NO. 1123: CONTRA COSTA WATER DISTRICT (CONT'D.)

Response to Comment No. 1123-2

Containment breaching and fire scenarios at ports are discussed in detail in Appendix D and Section 4.2.2.3 of the EIS. In addition, Section 2.7 of the EIS discusses emergency management capabilities. Because the EIS considers a range of low probability accident scenarios, and demonstrates that resulting consequences would not adversely affect human health or environmental resources, any impacts to local waters would be correspondingly low.

The transportation casks that would be used for the foreign research reactor spent nuclear fuel are certified if their design meets certain tests, including a fire test, and if the individual casks pass periodic inspections (Section 2.6.2 of the EIS). These certification standards were developed for use of the casks on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. The duration of a ship fire is directly related to the amount of combustibles carried on board. The number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicate that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures.

In respect to the impact a ship fire might have on a spent nuclear fuel transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship's fire intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it would be almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of the foreign research reactor spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (see Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).

The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt foreign research reactor spent nuclear fuel. Appendix D, Sections D.5.3 and D.5.4 present a detailed discussion of accident probabilities and radioactive material source terms and the results of the analyses, respectively. In conclusion, although long duration ship fires are possible, and have occurred, they are uncommon events. Analyses in the EIS indicate that even in the event of a severe ship fire involving a spent nuclear fuel transportation

COMMENTOR NO. 1123: CONTRA COSTA WATER DISTRICT (CONT'D.)

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
July 19, 1995
Page 3

Page 4-27, 4.2.2.5 Port Activities Mitigation Measures. No mitigation measures are noted for impacts on water quality and supplies at port sites since there was no evaluation of a release into the atmosphere at port sites.

Page 4-49, 4.2.4.2.7 Water Quality. The Draft EIS is inadequate in failing to evaluate potential impacts and possible mitigation measures. The water quality impacts discussion covers only water supply demands (i.e., a "non-radiological impact"). There should be a separate analysis of water quality impacts from the potential for radiological releases.

1123-5

Page 4-42. The second paragraph on this page addressing "Conservative Assumptions and Accident-Related Impacts", shows that potential food contamination was addressed up to 50 miles from an accident location considering various meteorological conditions. The discussion notes that continued consumption of contaminated food products would be suspended if levels exceeded EPA guidelines. However, there is no indication that the analysis of impacts on food was extended to cover water supplies which is obviously distributed differently than food supplies.

In summary, the Draft EIS fails to address potential impacts on public water supplies as a result of a radioactive discharge either into the atmosphere or otherwise (such as into a groundwater aquifer). This issue should be addressed in the Final EIS. If the Port of Concord is selected as the port facility to receive foreign research reactor spent nuclear fuel, it is recommended that a site specific Draft EIS be prepared with adequate time (at least 60 days) for circulation, public review (including hearings or scoping sessions) and comment. Please place the Contra Costa Water District on your mailing list (attention: Dennis Pisila, Senior Planner) on matters involving the Port of Concord.

Sincerely,

Arthur R. Jensen
Director of Planning

ARJ/DP/rlr - 3

cc: David Goleck, Planning Director, City of Concord

Enclosure: Copy of Figure 3-24, modified

RESPONSE TO COMMENT COMMENTOR NO. 1123: CONTRA COSTA WATER DISTRICT (CONT'D.)

that even in the event of a severe ship fire involving a spent nuclear fuel transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5 of the EIS). Also see Appendix D, Section D 5.4.3.2 of the EIS

Response to Comment No. 1123-3

DOE considers that if foreign research reactor spent nuclear fuel is managed in the United States, there is adequate regulatory and emergency preparedness infrastructure to ensure its safe acceptance and transportation to the designated management site. As discussed in Section 2.7.1 of the EIS, Federal funding to State, Tribal, and local governments is being provided for maintaining emergency response programs. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advise and assistance to the State, Tribal and local agencies involved with a radiological incident. DOE is also required to inform the Governor of each State and any Tribal chair, or their designee, along a transportation route at least seven days prior to shipment of hazardous cargos including radioactive materials. It would be the responsibility of the Governor to provide any further notification to State and local officials.

Emergency preparedness, security, and coordination of DOE with local emergency response authorities that would be involved with the acceptance and transportation of foreign research reactor spent nuclear fuel will be discussed in detail in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

Emergency response planning for the foreign research reactor spent nuclear fuel is discussed in Section 2.7 of the EIS. The commentor's request for site-specific EISs for each port and management site is noted, but the necessary site-specific analyses are already included in Section 4.2 of the EIS and in the Appendices.

See also the response to Comment 1123-1, above.

Response to Comment No. 1123-4

The analysis of the consequences and risk associated with an accident in port involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 and Appendix D, Section D.5 of the EIS.) and that the risks associated with accidents in port for the entire proposed action, are low. The analysis in the EIS indicates that some radioactive material could be released from the spent nuclear fuel cask and distributed into the environment. However, the analyses in Section 4.2.2.3 and

Commentor No. 1123: Contra Costa Water District (Cont'd.)

Response to Comment Commentor No. 1123: Contra Costa Water District (Cont'd.)

Appendix D, Section D.5 of the EIS determined that no decontamination, interdiction or condemnation of property would result for the worst plausible accident. Close in to the accident, near the cask would likely require some cleanup, but the overall impact on water supplies, air quality, property, and structures in the port would be low.

Response to Comment No. 1123-5

In regard to water quality, DOE is convinced that there would be no significant adverse impacts to any of the ports that could be used to receive the foreign research reactor spent nuclear fuel. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

Since neither the incident-free operation nor the accident situation would result in any significant contamination, no mitigation measures were developed.

Air and water quality impacts from facility construction and operation activities at the management sites have been addressed in Appendix F of the EIS. The overall conclusion for each of the sites considered is that radiological and nonradiological effects on air and water quality from the construction and operation of facilities used for the management of foreign research reactor spent nuclear fuel would be low, and that cumulative pollutant concentrations would be well within allowable air and water quality standards. Similarly, as discussed in Section 4.2.4.1, under Secondary Impacts of Accidents, no measurable impacts to water quality would be expected from the postulated accidents involving foreign research reactor spent nuclear fuel.

Therefore, the contribution to the individual and population dose from a water consumption pathway, would be very small compared to the contributions from direct exposure, inhalation, and the food ingestion pathway.

COMMENTOR NO. 1124: PORT OF PORTLAND

Port of Portland

Box 8529, Portland, Oregon 97208
503/231-5000

VIA FAX AND OVERNIGHT MAIL

July 19, 1995

Mr. Charles Head
Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Re: Port of Portland's Comments on Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

The Port of Portland is here submitting its written comments on the Draft Environmental Impact Statement ("Draft EIS") on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. These written comments are submitted under the provisions of the National Environmental Policy Act and the regulations of the United States Department of Energy ("DOE") on or before July 20, 1995, the extended date for submission set by DOE.

Please take these comments into account as you prepare the Final Environmental Impact Statement and provide a specific response to the issues raised herein.

EXECUTIVE SUMMARY

The Port of Portland supports the U.S. nuclear nonproliferation objectives. We agree that the U.S. should take reasonable and prudent steps to mitigate the spread of nuclear materials capable of being assembled into nuclear explosive devices. While all three alternatives discussed in the Draft EIS can accomplish varying degrees of this objective, we believe Alternative 2, the foreign management alternative, is the best policy for the U.S. over the short and long-term.

1124-1

1124-2

To successfully meet the nonproliferation objectives of this proposed foreign research reactor spent nuclear fuel policy, the U.S. needs to work diligently now with the affected parties on a plan that allows them to become self sufficient in a nonproliferating way as soon as possible. We reject the notion that resurrecting the highly subsidized, "return all your spent fuel to the U.S." policy (Alternative 1) for ten years will yield a lasting, acceptable nonproliferation strategy. At a minimum, the return strategy suggested as Alternative 1 will only serve to postpone the inevitable

1124-3

Port of Portland offices located in Portland, Oregon, U.S.A.; Chicago, Illinois; Washington, D.C.; Hong Kong; Seoul; Taipei; Tokyo

RESPONSE TO COMMENT
COMMENTOR NO. 1124: PORT OF PORTLAND

Response to Comment No. 1124-1

The commentor's support for the proposed nuclear weapons nonproliferation policy and development of a policy to manage spent nuclear fuel from foreign research reactors to prevent its use in nuclear weapons, is noted.

Response to Comment No. 1124-2

The commentor's preference for the overseas management alternative is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

Response to Comment No. 1124-3

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States (Management Alternatives 1 or 3; Sections 2.2 and 2.4 of the EIS, respectively) is noted. Section 2.3 of the EIS describes other alternatives under consideration.

transition to responsible independence that must occur with these foreign research reactors.

If the decision is to proceed with Alternative 1, then the Port of Portland opposes the use of its facilities at Portland or any facility at other commercial ports for the movement of spent nuclear fuel. If the U.S. determines that the return of spent nuclear fuel to the United States is in the national interest then Federal military installations should be used for the receipt, handling and sequential shipment of such cargo. Adequate security cannot be provided at Portland, nor can the Port's sole container terminal be utilized for the proposed purpose without significant commercial disruption and economic loss. In addition, DOE's risk analysis does not address the true worst case for the citizens of Portland and this region. These issues were not adequately discussed in the Draft EIS.

1124-4

1124-5

1124-4 (Cont'd.)

DISCUSSION

1. SPENT FUEL SHOULD NOT BE BROUGHT BACK TO THE U.S.

Two problems exist with Alternative 1:

1. The U.S. doesn't have a workable storage and disposal plan yet for its own spent nuclear fuel and high level wastes. Alternative 1 attempts to gather up all enriched uranium in research reactors around the world (41 countries) and ship it to the U.S. for storage at DOE's nuclear weapons production sites until someone can figure out how and when to permanently dispose of it. Not having a workable domestic plan and having to use weapons production sites are setting two very bad examples as role models for our foreign research reactor friends.

1124-6

2. The other problem is that there is no solid evidence that we will be any better off at the end of the ten-year period than we are today. Foreign dependence on such a "return everything to the U.S." policy can demotivate and suppress meaningful progress towards responsible, self-sufficiency on the part of our foreign research reactor friends. Complacency and procrastination can work against the real changes that need to occur for responsible self-sufficiency to become a near-term reality. The U.S. will, in the meantime, have realized unnecessary and extremely high storage and disposal costs, higher public and worker health risks, and higher environmental risks - all without achieving the necessary shifts in foreign spent fuel management to a nonproliferating self-sufficiency.

1124-7

We support facing the transition issues now by adopting Alternative 2 (foreign management alternative). This means that foreign spent fuel management issues will be addressed now on a case-by-case basis to find the best solutions for each party. It also means that the U.S. will not subject itself to whatever risks there are of receiving and transporting foreign spent fuel within U.S. borders. Lastly, it means that we will not have exacerbated an already untenable situation in our own domestic storage and disposal of spent domestic fuel and defense wastes -- at who knows what ultimate cost increases.

1124-2 (Cont'd.)

Response to Comment No. 1124-4

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Portland is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Portland, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1124-5

Ten ports that are considered to be able to safely receive foreign research reactor spent nuclear fuel were identified using the port selection criteria discussed in Appendix D, Section D.1.9 of the EIS. Examination of the port selection criteria will show that there is no stated preference for military ports, contrary to the comment. Either military or commercial ports, if they meet the selection criteria, are equally acceptable. Risks associated with accidents in both military and commercial ports are discussed in Appendix D, Section D.5.5.

Response to Comment No. 1124-6

The commentor's concern that the U.S does not have a storage and disposal plan for its own wastes is noted. Storage in the United States of the foreign research reactor spent nuclear fuel is Management Alternative 1 or 3, which are discussed in Sections 2.2, 2.4, 4.2, 4.3, and 4.5 of the EIS. Storage technologies are discussed in Section 2.6.5.1 of the EIS.

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS). As stated in Sections 2.1 and 4.2.7 of the EIS, if a geologic repository was not prepared to accept the foreign research reactor spent nuclear fuel or the high level radioactive waste form resulting from the chemical separation or other processing of such spent nuclear fuel, by the end of the 40-year program period, DOE would continue to manage the spent nuclear fuel, or the high level waste forms, until such a geologic repository were available.

Response to Comment No. 1124-7

The commentor's suggestion that implementation of Management Alternative 1 could demotivate and suppress meaningful progress towards self sufficiency on the part of foreign research reactor operators, is noted. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactors time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

COMMENTOR NO. 1124: PORT OF PORTLAND (CONT'D.)

The least cost Alternative that meets the minimum nonproliferation policy guidelines should be selected to minimize everyone's costs. This means selecting Alternative 2 or Alternative 3. Management Alternatives 2/3 had the lowest estimated costs ranging from $750 million to $950 million (1996 $'s in 1996). 1124-8

Alternative 2 should provide the least cost, best overall short-term and long-term nonproliferation result. Several acceptable foreign spent fuel management scenarios are available as options in working through each foreign countries specific set of circumstances. Several of these are suggested for your consideration:

1. Over 70 percent of the foreign spent fuel resides in countries with spent fuel storage capabilities and expertise resulting from large, national commercial nuclear power programs. Interim storage within these countries saves time and money, reduces risk and can be done under IAEA nonproliferation safeguards and controls.

2. Nearly half of those that have major national commercial nuclear power programs also have spent fuel capabilities. Three nuclear power states (France, Japan and the United Kingdom) have major spent fuel handling, storage, and processing capability. Four nuclear power states (Canada, Germany, Sweden and Switzerland) have major spent fuel handling and storage capability. Where reprocessing is necessary to help transition the foreign research reactor program to low enriched uranium incapable of being made into nuclear bombs, the capability now exists with at least one reprocessor willing and capable of immediately processing and diluting the high enriched uranium. 1124-9

3. The U.S. and its nonproliferation allies can begin immediately to help the remaining 34 countries that have 30 percent of the total spent fuel inventory find acceptable on-site or foreign off-site storage capability for the spent nuclear fuel or a nonproliferating reprocessing option. These efforts should be directed at both short-term and long-term solutions for the affected countries.

4. Subsidies, if necessary, can be used to leverage the desired outcome of this effort.

Our strong preference is for the U.S. to work collaboratively with foreign sources of nuclear fuel services ranging from spent fuel storage and reprocessing to permanent geologic disposal. By working with the research test reactor personnel and their political leaders, it should be possible to structure a mutually acceptable arrangement that provides foreign, self sufficient, responsible, nonproliferating, short and long-term fuel management of foreign research reactor spent nuclear fuel.

A large fraction, nearly 50 percent, of the foreign research reactors are still operating on high enriched uranium (HEU) and their spent fuel will require reprocessing until fully converted to low enriched uranium (EL). Even after conversion to EL, many reactor operators will find it advantageous to reprocess their low enriched uranium spent fuel. Many of these reactors are closer to the UK and France than they are the U.S. Thus, the overall spent fuel and HEU transportation routes, under Alternative 2, will be shortened considerably compared to the Alternative 1 case. 1124-10

RESPONSE TO COMMENT
COMMENTOR NO. 1124: PORT OF PORTLAND (CONT'D.)

Response to Comment No. 1124-8

The final EIS shows that the least costly alternative is a hybrid that involves reprocessing overseas, chemical separation at the Savannah River Site, and management at the Idaho National Engineering Laboratory. Chemical separation of aluminum-based elements in the U.S. (without overseas reprocessing) and management of TRIGA elements in the U.S. has about the same costs as the hybrid, depending on how fixed costs at the Savannah River Site are allocated. There is no technically feasible alternative that excludes U.S. receipt of either the spent nuclear fuel or the high-level waste resulting from overseas reprocessing, regardless of cost. Even if all the spent nuclear fuel could be reprocessed overseas (which it cannot), a substantial fraction of the high-level waste would have to come back to the United States. Storage of the spent nuclear fuel in the countries that cannot contract for reprocessing for whatever reason would be significantly more costly than storage in the United States, assuming equivalent levels of security and safeguards. Distributed overseas storage suffers from extremely large diseconomies of scale. Finally, no foreign country has expressed any interest in accepting the spent nuclear fuel or the reprocessing waste from other countries.

Response to Comment No. 1124-9

The commentor's scenarios for implementation of the proposed action are noted. Several issues, however, should be noted. Many of the foreign research reactor operators do not currently have means for storage or other disposition of their spent nuclear fuel. This is a result of a long standing policy of cooperation with the United States to prevent proliferation whereby the United States was accepting the spent nuclear fuel from these research reactors. Thus, the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

Response to Comment No. 1124-10

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

The purpose of this proposed policy is to promote United States nuclear weapons nonproliferation policy objectives by seeking to reduce and ultimately eliminate highly enriched uranium from civilian commerce. However, the Draft EIS doesn't adequately address the fact that nearly half of the aluminum-based fuel (35 reactors) and 25 percent of the TRIGA reactor fuel (5 reactors) still operate with high enriched uranium. Somehow, until these reactors are converted, shipments of high enriched uranium (HEU) or fresh fuel elements containing HEU will continue to occur resulting in a significant potential security or proliferation issues. This bomb-grade material is the most proliferation sensitive material in the fuel cycle. Appropriately, details are not available in the Draft EIS as to how this material will be shipped or by whom. 1124-11

More work needs to be done on the 'Foreign' Alternatives 2 and 3. The 'bring it all back to the U.S. case (Alternative 1) was analyzed in substantial detail. The alternative cases involving all or partial foreign solutions were analyzed less thoroughly. For example in the Summary, of the Draft EIS at page 5: 1124-12

1. *"Currently, overseas reprocessing results in separated HEU that is placed back into commerce for use as a new reactor fuel."*

Nothing is mentioned about potential changes in this current policy to one that is proliferation-proof, i.e., tri-party agreements (U.S., foreign reprocessor, reactor owner) that requires the High Enriched Uranium to be diluted to Low Enriched Uranium before it is shipped back to the foreign reactor.

2. *The overseas reprocessing facilities (e.g., Dounreay in Scotland) currently do not have the capability to reprocess the high-density LEU fuels that the United States is encouraging foreign research reactors to use to replace the HEU fuels."* 1124-13

The Dounreay facilities can handle now the bulk of the HEU fuels and with modifications or added facilities could handle all of the HEU fuels (including the TRIGA fuel rods), and with modifications or added facilities could handle the high-density LEU fuels that the U.S. is encouraging foreign research reactors to use to replace HEU fuels.

3. *"Thus, any foreign research reactor that wishes to use reprocessing to control its inventory of spent nuclear fuel must continue to use, or convert back to, fuel containing HEU."*

Not true. A short-term storage solution needs only to be found to allow Dounreay or any other foreign reprocessor (others in the UK, France, or Japan) time to make the necessary modifications to their reprocessing facilities. In the interim the storage solutions include, at least, the foreign countries with the research reactors, one or more of the seven countries having major commercial nuclear power programs and existing spent fuel storage areas (Canada, France, Germany, Japan, Sweden, Switzerland, UK), and the potential reprocessors (France, Japan, and the UK). 1124-14

Response to Comment No. 1124-11

HEU is weapons-grade material. Many of the foreign research reactors are still operating with HEU fuels. One of the major goals of the proposed action is to encourage those foreign research reactor operators still using HEU fuels to convert to LEU fuels (Sections 1.2 and 1.3 of the EIS). By accepting the spent nuclear fuel from the foreign research reactor operators, research reactors still using HEU fuel would be provided with a limited period of time to convert to operating with LEU fuel.

Response to Comment No. 1124-12

As discussed in Section 2.3 of the EIS, certain arrangements in support of U.S. nuclear weapons nonproliferation policy would have to be established with the foreign reprocessors and research reactor operators before overseas reprocessing could be implemented with U.S. assistance. These could include steps such as blending the HEU down to LEU, developing the capability to reprocess high-density LEU spent nuclear fuel, and converting the research reactors to the use of LEU. There is no guarantee that such arrangements can be worked out, but DOE and the Department of State are discussing these issues with the appropriate parties.

Response to Comment No. 1124-13

DOE acknowledges that the Dounreay Site has the capability now to reprocess the bulk of the existing inventory of foreign research reactor spent nuclear fuel. The current lack of capability applies to the new high-density LEU fuel made of a uranium-silicon-aluminum alloy. As stated in Section 1.1 of the EIS, it is not clear whether the extra equipment necessary to reprocess this new fuel will be installed at the Dounreay Site.

Response to Comment No. 1124-14

The sentence cited by the commentor has been revised in response to this comment and also in response to Comment 311-4.

COMMENTOR NO. 1124: PORT OF PORTLAND (CONT'D.)

4. *"For most foreign research operators, construction of a new storage facility would not be practical due to the very high cost of storing small amounts of spent nuclear fuel and the long time required to design, license, and construct facilities."*

1124-15

The U.S. commercial reactor operators are facing the same problems: either shut down needed nuclear electrical power generators, construct new storage facilities; or ship their spent nuclear fuel offsite for storage and ultimate disposal. The best short-term and long-term solution is for the U.S. to help the foreigners find a foreign solution while the U.S. is helping the U.S. reactors find a U.S. solution.

1124-16

There is a definite bias throughout the Draft EIS slanted towards Alternative 1, and to a lesser extent, Alternative 3 (the hybrid alternative). This bias shows up a number of ways including the absence of clear flow diagrams for all three alternatives like those presented in Figure S-4 and S-5 for Alternative 1. Importantly, no cost data is clearly summarized for Management Alternative 2. A Hybrid Alternative is defined as one of the options and the only clearly defined cost analyses are for: I) acceptance/storage in the U.S. (pure Alt. 1); II) chemical separation/vitrification in the United States (option 6 for Alt. 1); and finally the Hybrid Alternative (Alts. 2 and 3). [See Section F.7 beginning on page F-284 for additional proof of this gross bias and absence of key alternative assessments.]

1124-17

Ninety-one operating research reactors in forty-one countries depend on stable, low cost supplies of fuel, reprocessing services, and assistance in fuel storage and high level waste storage/disposal. Management Alternative 2 is the only means of achieving such stability. With U.S. assistance, this Alternative can be tailored to meet the U.S. nonproliferation objectives and the reactor operator's objectives.

1124-18

Reprocessing spent research reactor fuel is an economic necessity when the enrichments are over 20 percent (HEU). Reprocessing, with today's fuel cycle costs, is probably uneconomical for enrichments down in the 2 percent to 3 percent range. The transition between uneconomical and economical reactor operations probably occurs in the range of 4 percent and 8 percent enriched. To achieve operational stability and achieve the U.S. nonproliferation objectives, some form of a long-term commitment to reprocessing is a requirement.

2. FEDERAL MILITARY INSTALLATIONS SHOULD BE UTILIZED IF AN AMERICAN PORT BECOMES NECESSARY

The Port of Portland is recognized internationally as a very efficient port, yet handling spent nuclear fuel at Portland poses significant problems and costs including:

1124-19

- Significant local citizen, neighborhood association, employee, union, political and environmental opposition.

1124-20

- The likelihood of severely restrictive safety requirements being placed on the fuel-handling operation, which would significantly interfere with normal commercial operations.

RESPONSE TO COMMENT
COMMENTOR NO. 1124: PORT OF PORTLAND (CONT'D.)

Response to Comment No. 1124-15

The commentor's preference for Management Alternative 2 is noted again. The disadvantages of overseas storage are discussed briefly in the Summary, and more thoroughly in Sections 2.3 and 4.4.1 of the EIS.

Furthermore, as discussed in Section 1.2 of the EIS, it is in the self interest of the U.S. to implement the proposed action as a means to reduce and eventually eliminate the use of highly enriched (weapon-grade) uranium in civil programs worldwide. No such considerations apply to the storage of spent nuclear fuel from domestic nuclear power plants.

Response to Comment No. 1124-16

In terms of detailed cost data for options that are either addressed in less detail than might be possible or that are not described as possible options, the following points are relevant:

- Management of the spent nuclear fuel in the countries of origin would cost many hundreds of millions of dollars more than management of the fuel in the United States. The two major non-shipping phases of the program —storage/separation and spent nuclear fuel/high-level waste disposal — have very large economies of scale. Any management alternative that substitutes tens of sites for the two or three in the EIS would increase the costs substantially. The EIS already addresses the practical, legal, political, etc. difficulties associated with such an approach. The final EIS discusses costs and summarizes the problems with their approach.
- All logistically realistic hybrids that involve chemical separation at the Savannah River Site and reprocessing at Dounreay cost about the same as the hybrid described for Management Alternative 3. Costs could be significantly reduced only through accelerated receipt of spent nuclear fuel at the Savannah River Site for chemical separation concurrently with materials from other programs and long-term usage of existing storage facilities at the Idaho National Engineering Laboratory. The reason more hybrids are not costed in great detail is that they all depend on the timing of the receipts at the Savannah River Site, the acceptability of concurrent operations and the use of marginal costing at the Savannah River Site, and the usage of existing facilities at the Idaho National Engineering Laboratory. Subject to constraints on the rate at which Dounreay could reprocess spent nuclear fuel, other issues (e.g., the split between U.S. and overseas management, between LEU and HEU, between aluminum-based fuel and TRIGA fuel, between developed countries and developing countries, etc.) would not substantially affect costs. The key cost drivers are fully and completely outlined in Appendix F. Uncertainties are treated separately.

Response to Comment No. 1124-17

The commentor's preference for Management Alternative 2 is noted. This alternative is discussed in Sections 2.3 and 4.4 of the EIS.

- The inability of the Port of Portland and the commercial sector to protect itself against business losses due to closed channels, operational shut-downs, evacuation, or whatever procedures may be ordered by the U.S. Coast Guard. 1124-21
- The inability of the Port of Portland, without significant additional expenditures, to provide adequate security and protection against seizure by third parties, including hostile countries, foreign terrorists or domestic terrorist organizations. 1124-22
- The lack of adequately trained personnel to appropriately handle the spent fuel and thus the subsequent expense and lost time necessary to undertake and complete the necessary training. 1124-23
- The sensitive nature of the Columbia River environment as a critical habitat for several high-profile and nearly extinct endangered species. 1124-24
- The presence of significant conflicting uses including high volumes of recreational boating and tourism associated with commercial cruise ship usage of the Columbia.

Many of these significant problems and costs are solved or reduced if a Federal military installation is used. The Draft EIS gives insufficient consideration to both the problems listed above and this potential solution. 1124-25

Five (5) military ports were rejected because of an alleged lack of "appropriate port experience". Undue weight was given to "appropriate container-handling experience" and insufficient weight was given to experience in handling highly dangerous cargo requiring special security provisions. If port experience had been evaluated in this manner, fewer military ports would have been rejected and the Port of Portland might very well have been rejected.

Security Concerns:

There are several factors unique to the Port of Portland, its location and its facilities that make the job of providing adequate security for the proposed shipments either extremely difficult or impossible. These factors, discussed below, were not adequately considered and addressed in the Draft EIS. 1124-22 (Cont'd.)

The Port of Portland's only container terminal is readily accessible to vehicles and pedestrians during normal working hours and frequently after normal working hours. The container terminal is also readily accessible from the riverside of the facility - there is no riverside security. Nor are any of the Port's security officers trained to monitor for river side security breaches, or for that matter any security breaches involving nuclear cargo. The Port does not operate a marine facility where anti-terrorist security has ever been an issue and thus that training and experience has not been obtained. The City Police, who provide back-up to our security officers are terribly overloaded and could not be relied upon as a component of an enhanced security system should one prove necessary. The air space above the terminal is not restricted in any manner and is subject to frequent overflights. Immediately adjacent to the terminal is a heavily wooded natural area frequented by the public. The container terminal is also the only

Response to Comment No. 1124-18

Chemical separation of spent nuclear fuel from foreign research reactors is not really an economic necessity when the enrichments are over 20 percent. Nevertheless, the commentor's support for some form of chemical separation is noted.

Response to Comment No. 1124-19

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Portland is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Portland, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1124-20

No special handling or loading/unloading procedures would be required for the foreign research reactor spent nuclear fuel when it is contained in a cask that is inside a standard shipping container.

Response to Comment No. 1124-21

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that the use of any of the ports indicated by the port selection process, including Portland, would not impact normal commercial operations, and therefore not endanger the ports' status with respect to their clients. This position is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions. As such, there should be no adverse commercial or economic reaction to the use of the port. Historically, there were no adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

Response to Comment No. 1124-22

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

COMMENTOR NO. 1124: PORT OF PORTLAND (CONT'D.)

location where the Port's employees can park their vehicles, further complicating any efforts to afford high security.

1124-22 (Cont'd.)

One unique access issue arises from the fact that there is an adjacent city park with a swimming area. At low tides swimmers use the river area immediately in front of the container terminal. There is heavy recreational use of the river in front of the terminal by boaters, water-skiers, jet-skiers and fishermen. These uses frequently occur within fifty feet of the dock. A major and heavily fished Columbia White Sturgeon fishing hole is very near the container facility. Moreover, the terminal is in the middle of a rapidly growing section of the city. The population is dramatically increasing and thus recreational use will also increase, making security a difficult if not impossible matter for the cargo proposed. This issue and these facts were not adequately discussed in the Draft EIS.

1124-26

The Port of Portland is a public agency responsible for the operation and maintenance of Portland's harbor facilities. These facilities, including the container terminal, are the major public port facilities in Oregon. The Port is responsible for providing efficient and uninterrupted cargo throughput services from the terminals to the adjacent transportation network, via truck, rail or barge. The nature of the Port, its role in the community, and its importance to the Region's economy make access restrictions very difficult to adopt and enforce. The Port has a constant stream of tenants and users accessing the only container facility in a necessary manner and that is totally inconsistent with appropriate security for the proposed cargo.

1124-27

The Port of Portland's container terminal facilities lie in the middle of a growing metropolitan area surrounded by residential neighborhoods that have designated themselves "nuclear free" and populated with some of the nations most energetic environmental activists. The 100-mile river transit from the open sea, not to mention the 400-mile rail or truck trip, represents an extended target for activist groups whose protests could severely disrupt the transportation network and threaten public safety. Consequently, even without the threat of terrorists, security concerns arising from dedicated activists in the City of Portland should militate against selecting Portland as the preferred Port.

1124-28

Commercial and Economic Concerns:

In addition, Portland is unsuitable as a Port of Entry for Spent Nuclear Fuel (SNF) shipments because Portland has only a single container terminal to serve the regional shipping community. Spent Nuclear Fuel shipments will disrupt operations for the Port and, without a local alternative, regional shippers would be harmed. Consequently, the Port could see an erosion of its customer base as shippers look elsewhere for the certainty and reliability required in the container business.

1124-29

Significant disruptions of existing business can be expected in several areas related to the shipment of SNF. First, it is the position of the longshoremen that they will not handle SNF shipments. The federal government has been aware of the unwillingness of labor to handle the SNF cargo for some time. Unfortunately however, the Draft EIS does not address the issue of port handling in any detail. For example, who would operate the cranes, etc. if the only labor pool with the experience to do it, the

1124-30

RESPONSE TO COMMENT
COMMENTOR NO. 1124: PORT OF PORTLAND (CONT'D.)

Appendix H has been added to the final EIS in response to public comments to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site(s).

DOE is confident that the foreign research reactor spent nuclear fuel can safely be transported to the management site(s), if the foreign research reactor spent nuclear fuel is accepted into the United States. The security measures employed would meet or exceed all the security requirements in the Code of Federal Regulations (10 CFR Part 73). DOE supports these regulations as being adequate to protect the foreign research reactor spent nuclear fuel. Section 2.8 of the EIS discusses domestic security.

Response to Comment No. 1124-23

Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the transportation casks would be low. No special handling or loading/unloading procedures would be required for the foreign research reactor spent nuclear fuel when it is contained in standard shipping containers; experience with handling containers is sufficient. Therefore, no special training of longshoremen is required.

Response to Comment No. 1124-24

The EIS analyses determined that there would be no significant adverse impacts to the ecology of any of the ports that might be used to receive the material (Sections 4.2.4.2.8 and 4.5 of the EIS). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident (Section 2.6.2 of the EIS). Spent nuclear fuel transportation casks passing through Portland, or any port, cannot leak (the spent fuel would be shipped dry), so it would not affect either the air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality. No significant human health, safety, or environmental risks were found to exist at any of the candidate commercial or military ports selected (Section 4.2.2 of the EIS).

Response to Comment No. 1124-25

The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port snip traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated

COMMENTOR NO. 1124: PORT OF PORTLAND (CONT'D.)

longshoremen, will not? What training and experience will replacement labor be given? How will the Port be compensated for and insured for use of its equipment by others? These difficult issues may well be irresolvable. If so, the Port can not guarantee its customers that their operations in Portland will remain unaffected. 1124-30 (Cont'd.)

Secondly, if Portland were to be designated as a Port of Entry for SNF shipments, we would anticipate serious conflicts between these shipments, and those of our customers on regularly scheduled liner services. These conflicts will take the form of shipment delays, loss of service at the dock, and will likely result in losing available berthing space during critical windows of operation. 1124-31

The Port concurs with the Draft EIS conclusion that there is a greater likelihood that the shipments will come in chartered breakbulk/general cargo vessels, with a significant number of new (additional) vessel calls rather than using scheduled liner services. The availability of scheduled liner service calling Terminal 6 is more limited than at larger Ports and Portland serves as an export gateway rather than as an import center. 1124-32

At this time, all liner services calling Portland's Terminal 6 utilize Portland as a last or middle port of call. This means that Portland is not the first US port on the sailing schedule of the liner services and thus SNF shipments would have already been carried in and out of the ports of Tacoma, Seattle, Vancouver, Los Angeles, Long Beach, or Oakland. Shipping by such round-about means is hardly responsible and is not addressed in the Draft EIS. 1124-33

Unscheduled charter service is difficult to accommodate at Terminal 6, particularly if it takes precedence over the Port's normal business. With only one terminal available in Portland, we are currently often at capacity. For instance, berth space is limited or unavailable several days of the week at Terminal 6 at existing levels of business. Unscheduled charter services carrying SNF shipments would arrive at random at Terminal 6 and would conflict with normal scheduled commercial liner services from time to time. SNF shipments would command the highest priority in berth space, crahage, and other shoreside capacity to the detriment of existing business. 1124-34

The berth and terminal conflicts between commercial vessels and SNF charters are likely to increase with time because Terminal 6 is the fastest growing container terminal on the West Coast. We project to exceed total terminal capacity within the next 10 year period. New terminal capacity is on the planning horizon, but a practical means for funding it has not yet been identified. 1124-35

If the Port of Portland is selected, a separate special purpose facility would be required in order to ensure adequate security and reduce conflicts in use. This need was not identified in the draft EIS, but should be included and addressed in the final EIS. The Port would need significant financial assistance in providing this necessary special purpose facility and restrictive regulations, not otherwise pre-empted by federal authorities, would need to be adopted. These restrictive regulations would govern handling procedures, security measures, personnel training issues, specific state law concerns and Endangered Species Act mandated conservation measures. 1124-36

RESPONSE TO COMMENT
COMMENTOR NO. 1124: PORT OF PORTLAND (CONT'D.)

with navigational hazards and distances from the port to the open ocean or a large bay (Appendix D, Section D.1.9.2 of the EIS). Appendix D, Section D.5.3.1.3 of the EIS presents a discussion of the determination of the probability of ship accidents used in the EIS.

As a result of public comments, eight additional military ports were considered, and the selection criteria were carefully applied in order to properly balance military experience with handling containers and hazardous cargos. Spent nuclear fuel from foreign research reactors is shipped in standard containers, and does not require special handling techniques (Section 2.6.3.2.2 of the EIS) or additional security beyond that required by NRC regulation (which can readily be provided in any of the commercial or military ports). No special precautions are required by the U.S. Coast Guard (Section 2.6.3.2.2 of the EIS).

Response to Comment No. 1124-26

The Port of Portland's opposition to using their port on the basis of high recreational use of the waters around the terminal is noted, and will be taken into consideration when choosing ports, if foreign research reactor spent nuclear fuel is accepted into the United States. Recreational use of waters around the port is one of the considerations discussed in Appendix D, Section D.1.9.6 of the EIS, Desirable Port Attributes.

Security would be provided for all shipments of foreign research reactor spent nuclear fuel, as required by the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. The general security provisions are provided in Appendix H of the EIS. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit.

Response to Comment No. 1124-27

See the response to Comment 1124-21, above.

Response to Comment No. 1124-28

Dealing with demonstrations is the responsibility of the local and State governments, as well as the military if such demonstrations occur on military bases. However, if the demonstrations were the result of the receipt of foreign research reactor spent nuclear fuel, DOE would support local, State, or military organizations in dealing with demonstrations.

Response to Comment No. 1124-29

See response to Comment No. 1124-24, above.

COMMENTOR NO. 1124: PORT OF PORTLAND (CONT'D.)

These issues of the disruption of normal business are of critical importance to the Port of Portland because we and the community we serve rely on a single terminal and there are no alternatives within the region. The Port cannot meet its mission to its constituency if forced to handle SNF. 1124-34 (Cont'd.)

DOE Risk Assessment is Inadequate:

DOE's risk assessment, as it relates to the Port of Portland, is inadequate. DOE performed this risk assessment based on the traditional principles of combining an estimate of the frequency at which such a situation is expected to occur with consequence estimates.

While this method of weighting the probability of an occurrence with the consequence estimates may be scientifically correct, the real issue for the people of Oregon is "what happens if a major, even abnormal, severe breach of the fuel occurs in the vicinity of the Port or Oregon and Washington's populated areas along the transportation routes?" 1124-37

All we know today is the consequences of a major breach of the spent fuel cask are "very severe". Mr. Patrick Schwab, Science Applications International Corporation, provided that qualitative assessment at the May 22, 1995 public meeting with DOE. Mr. Schwab was one of the principals who wrote the Draft EIS under contract to DOE.

Rough extrapolated estimates of the consequences of a high level waste cask breach were approximated in the Draft EIS. The estimate was made for high level vitrified waste. It was assumed that only 0.000001 or 1 part per million of the radioactive material would be released from its packaging. 5 percent of the aerosolized release was respirable, and a buoyant plume rise resulted from an assumed fire. The worst (urban) case resulted in 970 person-rem and 0.48 LCF consequence for the population, and a dose of 0.29 rem and a 0.00015 LCF consequence for the maximum exposed individual. 1124-38

However, a worst case "credible" accident is not the same as a worst case incident. A worst case incident can assume sabotage and other forms of human intervention, unlikely but possible accidents (like long-term, high temperature ship board fires), and combinations of the two. On page 4-11 the document states, "Assuming the cask was damaged by a severe collision; and the ship remained afloat despite the severe collision; and the cask was engulfed in flames for a time sufficient to release a radio active plume, there would likely be no human population on the ocean (excluding the crew) who could be affected." The DEIS does not address the occurrence of such an event during the 100 mile trip along the Columbia River navigation channel, long portions of which the human population is considerable. Nor does it appear in the risk analysis beginning at page 4-23 that the risk of an accident in the 100 mile channel between the bar and Terminal 6 is considered. There still is not an adequate answer to the question of what are the consequences to Portland area citizens and the environment from a severe breach of the cask and fuel rods, i.e., a breach that substantially exceeds the design limits of the cask such as a fire, with air flow, that raises the spent fuel temperatures will above 1,160 degrees Fahrenheit for a period of hours? 1124-39

RESPONSE TO COMMENT
COMMENTOR NO. 1124: PORT OF PORTLAND (CONT'D.)

Response to Comment No. 1124-30

The possibility of the longshoremen's refusal to off-load this material was not considered in the port selection process (Appendix D, Section D.1.9 of the EIS) since that factor does not impact on the capability to safely receive containers carrying foreign research reactor spent nuclear fuel. The decision as to which port or ports would be used, in the case that foreign research reactor spent nuclear fuel is accepted into the United States, would be made in the Record of Decision. The possibility of strikes is one of the many factors that would be considered in determining which ports to use. DOE will work with local officials and port authorities to ensure that the foreign research reactor spent nuclear fuel can be safely received, if accepted into the United States.

Response to Comment No. 1124-31

See response to Comment No. 1124-24, above.

Response to Comment No. 1124-32

The Port of Portland is incorrect in stating that the draft EIS concluded that there is a greater likelihood that the shipments would come in chartered vessels. The EIS concludes that either commercial or chartered vessels were acceptable due to both having low risk with no discernible difference (Section 4.2.2 of the EIS). The Record of Decision will state the type(s) of vessels that would be used if foreign research reactor spent nuclear fuel is to be accepted into the United States.

Response to Comment No. 1124-33

The EIS did address the likelihood that, if commercial shipping were to be used, there would be intermediate port calls before arrival at Portland (Section 4.2.2.1 of the EIS). The risk associated with a journey that included two intermediate port calls, including two high population-density ports, was calculated and is presented in Section 4.2.2.3 of the EIS. The risk of a journey that includes two intermediate port stops is slightly higher than a direct trip, but the risk associated with both journeys is low.

Response to Comment No. 1124-34

The Port of Portland's assumptions about how foreign research reactor spent nuclear fuel would be shipped and how it would affect other ship handling at the port are not based upon the EIS, but are based on speculation on how the shipments would be implemented if the foreign research reactor spent nuclear fuel is accepted by the United States. In the event that the Record of Decision indicates that foreign research reactor spent nuclear fuel is to be accepted by the United States, DOE will do everything practical to minimize any disruption to the operation of the port(s) of entry.

DOE has analyzed release fractions from spent nuclear fuel in its Draft EIS (Table E-6), page E-44) for worst case "credible" accidents. However, the release fractions appear low for any fire that substantially exceeds the cask and spent fuel design limits or a combination of fire and explosion. Such releases are based on what appear to be minor breaches in the integrity of the spent fuel shipping cask. DOE has not addressed the issue of what happens if a major breach occurs, i.e., shipboard fire of such intensity and duration that the shipping cask design limits are substantially exceeded? Worst case "credible" release fractions in DOE's Draft EIS are:

Substance	Aluminum Clad Fuel	TRIGA Fuel
Inert Gas	63%	63%
Iodine	0.085%	4.3%
Cesium	0.001%	0.2%
Ruthenium	0.00024%	0.048%
Particulate	0.00001%	0.002%

1124-40

While these releases are higher than for the case of vitrified high level waste discussed above, they remain based on a worst case "credible" accident.

The Port's conclusion is that DOE did not properly evaluate and determine the impact of a severe fire or explosion involving a shipping cask of nuclear spent fuel, which would cause severe damage and have long-term effects on a large area near the disaster site. Furthermore the effects of crippling many businesses in the area affected was also not determined.

1124-37 (Cont'd.)

In addition, DOE did not properly address first response capability of the local fire and emergency agencies in case of a shipping cask breach and the spread of radiation from the accident site. No provision was made in the DEIS for upgrading and training of local first response teams.

1124-41

CONCLUSION

For all of the reasons set forth above, the Port submits that the analysis set forth in the Draft EIS is flawed and inadequate to support a decision to select Alternative 1, that is to transport to the U.S. foreign research reactor spent nuclear fuel. The Draft EIS fails to adequately address Alternative 2, the foreign management alternative, and is biased against that Alternative. In addition, the Draft EIS's discussion of the Port of Portland is flawed in that it does not take account of the real security, commercial and environmental problems associated with the use of the Port of Portland's container terminal. If those problems were fairly and thoroughly evaluated, they would weigh in favor of using a Federal Military Facility if the spent fuel is to be shipped to the U.S. Finally, DOE's risk analysis, as it relates to the Port of Portland does not accurately identify and evaluate the real risk to the people of Portland and the Northwest.

1124-3 (Cont'd.)
1124-2 (Cont'd.)
1124-22 (Cont'd.)
1124-25 (Cont'd.)
1124-37 (Cont'd.)

Response to Comment No. 1124-35

The Port of Portland's information regarding the projected growth of usage of the port is noted and will be considered when the Record of Decision is developed, if foreign research reactor spent nuclear fuel is to be accepted by the United States.

Response to Comment No. 1124-36

DOE does not agree with the Port of Portland on the need to build a special-purpose facility for the handling of the foreign research reactor spent nuclear fuel, if the spent nuclear fuel were to be received in Portland. The port evaluation and selection process, which indicated that the Port of Portland was an acceptable port, was based upon the assessment of the port's existing facilities. If DOE decides to accept the maximum quantity of foreign research reactor spent nuclear fuel in the United States under the basic implementation of Management Alternative 1 (Section 2.2.1 of the EIS), the number of single-cask shipments expected to be received at West Coast ports would be approximately 185 over 13 years, or about one a month. Other possible amounts of foreign research reactor spent nuclear fuel that might be accepted on the West Coast under the hybrid alternative range from 185 to zero. If chartered ships were used, more than one cask would be shipped at a time, so the number of ships to be received would be less. This amount of traffic would neither impact existing facilities, nor require a new special-purpose facility.

Response to Comment No. 1124-37

The commentor's opinion that the DOE's risk assessment is scientifically correct, but still inadequate, is noted. The commentor's focus on the consequences of what happens if scenarios is also noted. See the response to Comment 1124-39 below.

Appendix D, Section D.5.4.3.2 presents the risks of a very high temperature fire that engulfs a spent nuclear fuel transportation cask, which was part of a sensitivity study on release fractions. In addition, Section D.5.9 has been added to Appendix D of the EIS to address the issue of attack by disgruntled persons or terrorists.

Response to Comment No. 1124-38

Commentor's characterization of the approach and assumptions used for vitrified high-level waste accident analysis in the EIS is correct. This accident scenario is discussed in Section 4.4.2.3 under the subheading, Impacts of Accidents During Port Activities and in Appendix D, Section D.5.7 of the EIS. The results mentioned by the commentor (970 person-rem, 0.48 LCF, etc.) are not the same as the results presented in the EIS. The source of these results is not clear to DOE.

COMMENTOR NO. 1124: PORT OF PORTLAND (CONT'D.)

Consequently, the Port of Portland asks that DOE carefully reconsider the alternatives evaluated and take the other steps necessary to act upon the comments here provided before issuing a Final EIS and making a decision.

Yours very truly,

Mike Thorne
Executive Director

RESPONSE TO COMMENT
COMMENTOR NO. 1124: PORT OF PORTLAND (CONT'D.)

Response to Comment No. 1124-39

Section D.5.9 has been added to Appendix D of the EIS to address the consequences of sabotage or terrorism. In this section the results of an explosion from a terrorist-placed shape-charge on the spent nuclear fuel transportation cask are presented. The result of the explosion is assumed to release 1 percent of the fuel as aerosols and all of the noble gasses.

The spent nuclear fuel transportation casks that would be used for the foreign research reactor spent nuclear fuel are certified if their design meets certain tests, including a fire test, and if the individual casks pass periodic inspections (Section 2.6.2 of the EIS provides these details). These certification standards were developed for use of the casks on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. The duration of a ship fire is directly related to the amount of combustibles carried on board. The number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicate that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures.

In respect to the impact a ship fire might have on a spent nuclear fuel transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship's fire intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it would be almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of foreign research reactor spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (see Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).

The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt research reactor nuclear fuel. Appendix D, Section D.5.3 provides a detailed discussion of accident probabilities and radioactive material source terms and Section D.5.4 provides the results of the analyses. In conclusion, although long duration ship fires are possible, and have occurred, they are uncommon events. Analyses in the EIS indicate that even in the event of a severe ship fire involving a transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5).

Combination of the severe ship fire and terrorism event, both unlikely in themselves, is not considered plausible. The analysis of accidents in port (Appendix D, Section D.5) were also performed at the worst location in the approach to the port (Appendix D, Section D.5.3.2); these are called channel locations in the analyses. In the case of Portland, this analysis was assumed to occur at the St. Johns Bridge. The results of these channel calculations, like the port or dock locations, all showed low risk (Section 4.2.2.3 of the EIS).

Response to Comment No. 1124-40

The release fractions quoted by the commentor are those that were used for land transportation accidents (Appendix E, Section E.6.4.2 of the EIS). As the commentor noted, these release fractions are inappropriate for a severe accident, such as might occur with a severe ship accident involving cask damage and an engulfing fire. The EIS did analyze this type of accident, and used release fractions that represent the release of more of the most biologically important isotopes. Also, Appendix D, Section D.5.4.3.2 of the EIS discusses very high temperature effects on release fractions. The high fuel temperatures discussed in this section are considered extremely unlikely.

Response to Comment No. 1124-41

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H of the EIS contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Commentor No. 1141:
City Council of the City of Galveston

RESOLUTION NO. 95-56

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF GALVESTON, TEXAS, OPPOSING THE U. S. DEPARTMENT OF ENERGY'S PROPOSED PLAN TO TRANSFER NUCLEAR WASTE THROUGH THE PORT OF GALVESTON; PROVIDING FOR FINDINGS OF FACT AND PROVIDING FOR AN EFFECTIVE DATE.

WHEREAS, the U. S. Department of Energy is considering importing spent fuel for storage in the United States to guard against the fuel's use in producing nuclear weapons by other countries; and

WHEREAS, the fuel contains highly enriched uranium, which is a weapons-grade nuclear material; and

WHEREAS, the U. S. Department of Energy is considering using the Port of Galveston as an entry location for the fuel; and

WHEREAS, if the fuel enters the United States through the Port of Galveston, it will be loaded onto rail cars or trucks for transportation to other areas of the United States; and

WHEREAS, the use of the Port of Galveston as the entry location for the fuel is potentially hazardous to Galveston, and produces no economic benefits to either the City or the Port of Galveston, and will have a detrimental effect on the tourist industry; and

WHEREAS, public hearings have been conducted and the residents of Galveston do not support the U.S. Department of Energy's proposed plan;

WHEREAS, the City Council of the City of Galveston deems it in the public interest to oppose the U. S. Department of Energy's proposed plan to use the Port of Galveston as an entry level of the fuel;

Response to Comment
Commentor No. 1141:
City Council of the City of Galveston

Commentor No. 1141:
City Council of the City of Galveston (Cont'd.)

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF GALVESTON, TEXAS:

SECTION 1. The findings and recitations set out in the preamble to this Resolution are found to be true and correct and they are adopted by the City Council and made a part hereof for all purposes.

SECTION 2. The City Council of the City of Galveston, Texas strongly opposes the proposed plan by the U. S. Department of Energy to use the Port of Galveston to transfer nuclear waste. *1141-1*

SECTION 3. The City Council of the City of Galveston, Texas, directs the City Secretary to send a certified copy of this Resolution to the U.S. Department of Energy; to Ernest Connor, Director of the Port of Galveston, and to all members of the Galveston Wharves Board.

SECTION 3. The City Council requests that the Port of Galveston and the Wharves Board continue to apprise the City Council of any developments concerning the U.S. Department of Energy's proposed plan.

SECTION 4. This Resolution shall be and become effective immediately.

APPROVED AS TO FORM:

Barbara E. Roberts

BARBARA E. ROBERTS
CITY ATTORNEY

I, ANNA LEE, Secretary of the City Council of the City of Galveston, do hereby certify that the foregoing is a true and correct copy of a Resolution adopted by the City Council of the City of Galveston at its regular meeting held on the 13th day of July, 1995, as the same appears in records of this office.

[illegible] 2

Response to Comment
Commentor No. 1141:
City Council of the City of Galveston (Cont'd.)

Response to Comment No. 1141-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1141:
CITY COUNCIL OF THE CITY OF GALVESTON (CONT'D.)

IN TESTIMONY WHEREOF, I subscribe my name hereto officially under the corporate seal of the City of Galveston this _____ day of _____, 19___.

_____
Secretary for the City Council
of the City of Galveston

RESPONSE TO COMMENT
COMMENTOR NO. 1141:
CITY COUNCIL OF THE CITY OF GALVESTON (CONT'D.)

COMMENTOR NO. 1207: PORT OF GALVESTON

PORT of GALVESTON

123 Rosenberg
P.O. Box 328
Galveston, Texas 77553

Galveston (409) 766-6103
Houston (713) 286-2484
Fax (409) 766-6171

Ernest Connor
General Manager

July 18, 1995

Charles R. Head
Office of Spent Fuel Management
Office of Waste Management, EM-37
Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

Dear Mr. Head:

The following comments represent a summary of the numerous points raised by Galveston during its EIS review process. We would hope and expect that serious attention be given to these points prior to your decisions on both the particular alternative and a designation of ports. They should not be considered an exhaustive list.

1. Serious attention should be given to **Alternative 2** as it may in fact be a superior choice. It does not seem to us to have received full attention as a viable alternative for the US to adopt. *1207-1*

2. Adverse risk to the **economics of Galveston** are of great concern. Galveston is a major tourist destination and large fruit, food and grain importer and exporter. Perceived contaminant difficulties may injure future port/city business and critical future commercial investments. In the event of an actual accident (as small a probability as this may be) financial interest surely could be affected. *1207-2*

3. Galveston has only **one appropriate transportation roadway off the Island** and therefore does not meet your criteria. This is not a fact which would have been easy for you to have discovered. I-45 northbound directly into downtown Houston is fine but only after one successfully traverses the causeway bridges connecting Galveston Island to mainland Texas. Neither the ferry route or the San Luis pass/bridge route would be suitable as alternate routes. Serious auto/truck breakdowns and/or crashes can literally stop all traffic for hours during which time even the emergency vehicles have serious difficulty getting to and leaving the scene. *1207-3*

4. Nuclear **allies should bear much more** of the worldwide problem's cost than the EIS options seem to suggest. Again Alternative two should be a first option to consider. *1207-1 (Cont'd.)*

5. Taxpayer's **cost are too high** for the apparent gain. The gain for Galveston would appear to be none. The Houston metroplex and its transportation problems should be re-reviewed very carefully. Proper routing , temporally and spatially, is critical. Again we believe we should be exempt due to inappropriate alternate routes off the island. *1207-3 (Cont'd.)*

RESPONSE TO COMMENT
COMMENTOR NO. 1207: PORT OF GALVESTON

Response to Comment No. 1207-1

The commentor's agreement with Management Alternative 2 is noted. Sections 2.3 and 4.4 of the EIS discuss the advantages and disadvantages of overseas storage and reprocessing.

Response to Comment No. 1207-2

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Under NEPA regulations, the socioeconomic effects evaluated for this EIS do not include those associated with psychological fear of receiving spent nuclear fuel. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Galveston would have no detrimental effect on tourism or future business development at the port.

Response to Comment No. 1207-3

The criteria for port selection do not include multiple roadways for exiting the port. The Port of Galveston is served by an interstate highway (I-45) and alternate routes are not necessary.

The routes near Houston and throughout the State of Texas would be selected in consultation with the State. A State routing agency could designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103. As for temporal routing, DOE's policy is for the trucks to leave the port as soon as they

COMMENTOR NO. 1207: PORT OF GALVESTON (CONT'D.)

6. Why should Galveston have such perceived risks to its economy, if no other alternatives are shown to be preferred? There seems to be no actual national need to exercise Alternative one, so why select it? The image of distrust arises whenever it appears that Alternative one is the only option DOE is seriously considering. This is the perception we get when studying the EIS draft documents. It really does seem that the benefits/advantages of Alternative 2 have not been fully brought out and highlighted by the EIS statement. *1207-4* *1207-1 (Cont'd.)*

7. Too little risk related attention is given to the not unlikely possibility that a cask would find itself in a very hot fire with chemicals and significant air flow for a number of hours. We have experienced such events minus the radiation (both truck related and ship related) in the Houston-Galveston area on a number of occasions. What would be our risks if such a situation did occur? Please do not argue its remoteness since such events have occurred near Galveston and are a matter of record. Such terrifically hot fires have raged for days on ships. *1207-5*

8. DOE suggested that there would be no additional training for local first responders: fire, emergency, etc. This was surely not properly or adequately considered. *1207-6*

9. The actual impact of Alternative 1 versus others on a reduction in the proliferation of nuclear weapons was inadequately discussed. It might be argued successfully that the marginal impact of Alternative 1 when compared with others is negligible. *1207-7*

10. It would appear that, rather than wait for 10-13 more years for other countries to take care of their spent fuel, the process should begin now. There is little incentive for them to speed up the process so long as we will take it back. They should be assisted and encouraged to do what the US was going to do under Alternative 1 at great cost and increased risk, real and perceived. The non-proliferation goals are admirable and should be supported by us all. If alternatives to Alternative 1 can be found which accomplish that goal, they should receive high priority. The US does not yet have adequate storage capability for its own spent nuclear fuel! *1207-8*

Mr. Head after due consideration of the EIS and your hearing, followed recently by our own meeting, and after reviewing the comments and documents of other interested stake holders, the Port of Galveston respectfully requests to be withdrawn as a receiver port for foreign spent nuclear research fuel. We support the non-proliferation intent of the US but are concerned that the alternatives which maintain the spent nuclear fuel in the foreign countries have received inadequate attention and consideration to date. We believe that Alternative 2 with perhaps some modification is philosophically and politically correct and can be rendered technically sound. *1207-9* *1207-1 (Cont'd.)*

If however we are not ultimately withdrawn from consideration, it would be our intent to initiate whatever actions are necessary to prevent our receipt of such shipments until the economic and safety issues we have raised have received satisfactory attention and resolution. Radiation is not like any other toxic agent in that the *public's perception* of the "never ending contamination of everything around radiation release", no matter how small, could mean economic disaster for a small city's port and tourist industry like Galveston Island's. *1207-10*

RESPONSE TO COMMENT
COMMENTOR NO. 1207: PORT OF GALVESTON (CONT'D.)

are ready to go. Under normal circumstances, spent nuclear fuel transportation cask should spend no more than 24 hours at the port of entry. Each shipment would be made in conjunction with the State Police, who would help the trucks avoid traffic. Furthermore, traffic problems were taken into account in the risk calculations in Appendix E. The results presented in Section 4.2.3 of the EIS include the possibility of traffic jams.

The gain for Galveston and for all the citizens of the United States would be a reduction in the risk that weapons grade uranium from civil programs would be diverted into production of nuclear weapons that might be used against us or our allies.

Response to Comment No. 1207-4

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States (Management Alternatives 1 or 3; Sections 2.2 and 2.4 of the EIS, respectively), is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration. The environmental and policy impacts of Management Alternatives 2 and 3 are discussed in Sections 4.4 and 4.5, respectively. The cost associated with each of the management alternatives is discussed in Section 4.9 of the EIS.

Response to Comment No. 1207-5

The transportation casks that would be used for the foreign research reactor spent nuclear fuel are certified if their design meets certain tests, including a fire test, and if the individual casks pass periodic inspections (Section 2.6.2 of the EIS). These certification standards were developed for use of the transportation casks on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. The duration of a ship fire is directly related to the amount of combustibles carried on board. The number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicates that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures. Hence, contrary to the commentor's assertion, long duration fires are not usual.

In respect to the impact a ship fire might have on a transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship fire's intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it would be almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of research reactor fuel. The probability of

We believe the ever increasing problem of storing, disposing, and/or reprocessing present and future domestic and defense spent nuclear fuel in *the USA* must be resolved satisfactorily and with increased speed. 1207-11

We appreciate the difficulties associated with your responsibilities and will try to assist whenever and wherever we are able in the best interests of our community's personal and economic safety.

Sincerely,

Ernest Connor
General Manager
Port of Galveston

Elbert Whorton, Ph.D.
Trustee, Galveston Wharves Board
Professor, University of Texas

Attachments: Resolution, City Council
Resolution, Downtown Revitalization Coalition
Tape of Public Meeting June 29,1995

cc: Members, Galveston Wharves Board
Barbara Crews Mayor
Members, City Council
Doug Matthews, City Manager

reaching such a temperature was calculated to be less than one in a billion (Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).

The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt research reactor nuclear fuel. Appendix D, Sections D.5.3 and D.5.4 present a detailed discussion of accident probabilities and radioactive material source terms and the results of the analyses, respectively.

In conclusion, although long duration ship fires are possible, and have occurred, they are uncommon events. Analyses in the EIS indicate that even in the event of a severe ship fire involving a spent nuclear fuel transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5 of the EIS).

Response to Comment No. 1207-6

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. The assessment on the capability of local first responders is included in these issues.

Response to Comment No. 1207-7

One measure of the nonproliferation effectiveness is the amount of HEU that could be removed from civil commerce under each alternative. This subject is discussed in Section 4.8.1 and the comparison is presented in Figure 4-21. DOE hopes that all 41 nations involved in the proposed action decide to participate so that the maximum amount of HEU could be removed from civil commerce. This maximum amount (4.6 MTHM of HEU, or 5.2 MTHM of HEU if target material is included) is the same under any of the management alternatives considered (Section 4.8.1 of the EIS).

Response to Comment No. 1207-8

Many foreign research reactor operators do not have immediate means for disposition of their own spent nuclear fuel. Thus, the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). These arrangements could be completed within the policy period provided foreign research reactor operators immediately begin developing them.

COMMENTOR NO. 1207: PORT OF GALVESTON (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 1207: PORT OF GALVESTON (CONT'D.)

As demonstrated by the analyses in Section 4 of the EIS, the risks associated with implementation of the proposed action to human health or the environment would be low. Local benefits (other than nonproliferation benefits) would, as noted, be low. These benefits would be associated with increased port activity. Overseas management of spent nuclear fuel from foreign research reactors (Management Alternative 2) is discussed in Section 2.3 of the EIS. Management in the United States would be technically, politically, and economically more advantageous than management in as many as 41 separate countries.

Storage in the countries of origin would cost more than storage in the United States (and cost U.S. taxpayers more), would be technically difficult, if not impossible, in many countries, and would violate the laws of several of the countries. Finally, many countries participated in the U.S.-led research reactor programs on the belief that the United States would eventually accept the spent nuclear fuel. Failure of the United States to accept the spent nuclear fuel could endanger the entire program to substantially eliminate the use of highly enriched (weapons-grade) uranium in civilian programs worldwide.

Section 2.6.5 and Appendix F of the EIS describe interim storage for foreign research reactor spent nuclear fuel in the event that a policy of management in the United States is adopted. As discussed in Section 4.2.7 of the EIS, foreign research reactor spent nuclear fuel could be safely managed in the United States pending ultimate disposition.

Response to Comment No. 1207-9

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

Response to Comment No. 1207-10

The Port of Galveston is one of ten candidate ports of entry under consideration to receive foreign research reactor spent nuclear fuel. The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risks associated with receipt of this spent nuclear fuel at the Port of Galveston, or any other potential port, is low. DOE acknowledges that, in many instances, the perception by the public of risks associated with spent nuclear fuel may be greater than the actual risk, or than risk from other even more hazardous activities. Sections 4.2.2, 4.2.3 and 4.5 of the EIS demonstrate that the risk to port personnel and the general public from receipt and transport of the foreign research reactor spent nuclear fuel is low.

Response to Comment No. 1207-11

The commentor's concerns about ultimate disposition of domestic and defense spent nuclear fuel are noted. Ultimate disposition is discussed qualitatively in Section 4.2.7 of the EIS.

COMMENTOR NO. 1212:
BEN TARVER, MAYOR, CITY OF PLEASANTON

CITY OF PLEASANTON

July 18, 1995

OFFICE OF THE MAYOR
BEN C. TARVER

Charles Head
Program Manager
Office of Spent Nuclear Fuel Management
U.S. Department of Energy
1000 Independence Avenue
Washington D.C. 20585-0001

Re: Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head,

The Pleasanton City Council has considered the Department of Energy's Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, and offers the following comments.

We do not comment on the overall appropriateness of the Nuclear Nonproliferation Policy, but address only the potential impact on the City of Pleasanton's resources should shipments pass through the Interstate 580/680 corridor. In general, our comments would apply regardless of the port of entry that is chosen, although the only site that would have an impact on our community would be the Concord Naval Weapons Station. We believe that the EIS inadequately addresses several areas that could have a significant effect on the City of Pleasanton's ability to ensure public health and safety if shipments pass through our community.

First, the draft EIS does not disclose the local street and highway routes that could be used to ship the fuel casks to their final storage sites, and does not specify how -- or even if -- local authorities will be notified in advance of shipments passing through their jurisdictions. Consideration of the potential routes and advance notice could significantly affect emergency response by local jurisdictions. Our Fire Department's ability to respond to accidents involving fuel casks, and therefore our ability to control the accident's effect on the surrounding area, would be greatly enhanced by adequate advance notice of shipment routes and times.

1212-1

We believe that the EIS should specifically describe potential transportation routes and describe how local jurisdictions will be notified of the shipments.

123 MAIN STREET • P.O. BOX 520 • PLEASANTON, CA 94566-0802 • (510) 484-8001 • FAX (510) 484-8236

RESPONSE TO COMMENT
COMMENTOR NO. 1212:
BEN TARVER, MAYOR, CITY OF PLEASANTON

Response to Comment No. 1212-1

DOE has not yet selected ports, routes, or transport modes for the foreign research reactor spent nuclear fuel. If Concord NWS is selected, then DOE would choose the best route to I-680 in accordance with Department of Transportation regulations (49 CFR Part 397.101 (a)(2)). Representative Interstate Highway routes for the trucks are shown in Figure E1-11 in Appendix E. Some of these routes go south on I-680 and turn east on I-580. A State of California routing agency could designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103.

As discussed in Section 2.6.4.2 of the EIS, the NRC regulations concerning actual route notification are set forth in 10 CFR Part 73. Shippers are required to submit proposed routes for spent nuclear fuel shipments to NRC for approval, and NRC publishes a public information circular that lists routes that have been evaluated and approved for specific spent nuclear fuel shipments. The regulation also requires DOE to inform the Governor of each State and any Tribal chair, or their designee, along the transportation route at least seven days prior to each shipment of hazardous cargoes, including radioactive materials.

COMMENTOR NO. 1212: BEN TARVER, MAYOR, CITY OF PLEASANTON (CONT'D.)

Charles Head
Page 2

Second, the draft EIS does not adequately describe security precautions for the shipments. It is unclear to what extent Pleasanton's Police Department would be called upon to ensure safe passage of the shipments through Pleasanton. We do not know whether the shipments will receive a military escort, or what role our Police Department would be asked to play in responding to a security threat. 1212-2

The EIS should clearly state the types of security precautions that will be taken, including a description of any participation that DOE expects from local law enforcement agencies.

Finally, we are concerned that the draft EIS does not include a comparative analysis of the several ports of entry under consideration. A side-by-side analysis of the various sites is not only desirable, but necessary, to properly assess the complex impacts associated with the various sites. 1212-3

Thank you for the opportunity to comment on the draft EIS, and for extending the public review period to allow the City time to present comments. Please call me or our staff if you wish to discuss the City's position further.

Sincerely,

Ben Tarver
Mayor

cc: City Council
Alameda County Board of Supervisors
City of Concord
City of Livermore
City of Dublin
Representative Bill Baker
Senator Dianne Feinstein
Senator Barbara Boxer
Governor Pete Wilson
State Senator Dan Boatwright
State Senator Bill Lockyer
Assemblymember Richard Rainey
Assemblymember Michael Sweeney
Assemblymember Liz Figueroa
Association of Bay Area Governments

RESPONSE TO COMMENT COMMENTOR NO. 1212: BEN TARVER, MAYOR, CITY OF PLEASANTON (CONT'D.)

Response to Comment No. 1212-2

The requirements for physical protection of spent nuclear fuel shipments are specified in 10 CFR Part 73.37. The principal points are (1) cooperation with local law enforcement agencies, (2) armed escorts, and (3) communications with a communications center that is staffed 24 hours per day. (Section 5.4.2 of the EIS.)

For truck shipments in heavily populated areas, one escort vehicle containing an armed guard would lead the truck and another escort vehicle containing another armed guard would follow the truck. In less populated areas, there would be only one escort vehicle instead of two. For rail shipments, the escort would ride on the train in a location that permits observation of the shipment car while the train is in motion. (Section 2.7.5 and Appendix H of the EIS.)

In addition, to further address this issue, individual Transportation Plans would be prepared for any shipments actually scheduled for acceptance through the Concord NWS (or any other port of entry). These Transportation Plans would be prepared in consultation with appropriate State and/or local officials to ensure that details of the transportation process are understood, that the individuals or organizations who would perform all required activities are specified and that these individuals and parties know what is expected of them (Section 2.7.5 and Appendix H of the EIS).

Response to Comment No. 1212-3

Section 4.2.2.3 of the EIS provides the results of analyses on the impacts of port activities at all of the candidate ports. These impacts are presented in text and in table form for comparison purposes. The impacts are low at all of the candidate ports.

COMMENTOR NO. 1216:
GALVESTON COUNTY COMMISSIONERS

COUNTY OF GALVESTON

JAMES D. YARBROUGH
COUNTY JUDGE

July 20, 1995

VIA FAX (202) 586-6256

Mr. Charles Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585-1110

Dear Mr. Head:

Enclosed is a Resolution passed by the Galveston County Commissioners Court on July 20, 1995, expressing its opposition to utilizing the Port of Galveston as a port of entry for spent nuclear fuel from foreign research reactors. The Resolution, I believe, is self explanatory.

The Commissioners Court feels very strongly about this subject and hopes the Department of Energy will not allow the Port of Galveston to be used in this manner.

Thank you very much for your consideration in this matter.

Sincerely,

JAMES D. YARBROUGH

sak
Enclosure

COUNTY COURTHOUSE 722 MOODY GALVESTON, TEXAS 77550 (409) 766-2244

RESPONSE TO COMMENT
COMMENTOR NO. 1216:
GALVESTON COUNTY COMMISSIONERS

COMMENTOR NO. 1216: GALVESTON COUNTY COMMISSIONERS (CONT'D.)

THE COUNTY OF GALVESTON

On this the 13th day of July, 1995, the Commissioners' Court of Galveston County, Texas convened in a regularly scheduled meeting with the following members thereof present:

JAMES D. YARBROUGH, County Judge;
EDDIE BARR, Commissioner, Precinct No. 1;
EDDIE JANEK, Commissioner, Precinct No. 2;
WAYNE JOHNSON, III, Commissioner, Precinct No. 3;
ED STUART, Commissioner, Precinct No. 4; and
PATRICIA RITCHIE, County Clerk

when the following proceedings, among others, were had, to-wit:

WHEREAS, the UNITED STATES DEPARTMENT OF ENERGY and the UNITED STATES DEPARTMENT OF STATE are jointly proposing to adopt a policy to manage spent nuclear fuel from foreign research reactors; and

WHEREAS, a portion of the policy identifies the Port of Galveston as the Port of entry for this material;

WHEREAS, the people of Galveston Island have toiled to create a tourist mecca to attract people to enjoy the sites on Galveston and the glittering beauty of the waters of the Gulf of Mexico; and

WHEREAS, their efforts have been placed in danger by this proposal inasmuch as the perception of danger associated with nuclear fuel will act as a deterrent to many individuals; and

WHEREAS, the University of Texas Medical Branch at Galveston, one of the State of Texas' foremost medical and teaching institution, its over ten thousand employees, two thousand five hundred students and its thousands of patients and visitors is located in the immediate vicinity of the Port of Galveston and the proposed area where the nuclear fuel will arrive; and

WHEREAS, the City of Galveston, being a barrier island, is extremely susceptible and sensitive to the extreme destruction caused by hurricanes in the Gulf of Mexico. In addition, as a barrier island it has one main access route to the inland portions of the State and can not quickly provide alternate routes of travel in time of imminent disaster; and

WHEREAS, the climate of Galveston is influenced by wetlands and bayous, which together with high humidity, favors the development of both ground and advective fog. This negative condition continually impacts on transportation throughout Galveston County and increases the potential of accidents occurring; and

WHEREAS, the Commissioners' Court of Galveston County believes the portion of the proposal utilizing the Port of Galveston to be environmentally unsound, ill-advised and contrary to the best interests of all citizens of Galveston County.

NOW, THEREFORE, BE IT RESOLVED that the COMMISSIONERS' COURT OF GALVESTON COUNTY unanimously opposes utilizing the Port of Galveston in this manner and requests the Department of Energy and the Department of State to reject same in order to preserve and prevent any further damage to our coastal area caused by man.

1216-1

RESPONSE TO COMMENT
COMMENTOR NO. 1216: GALVESTON COUNTY COMMISSIONERS (CONT'D.)

Response to Comment No. 1216-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. The Port of Galveston was one of ten ports that was indicated to be acceptable to receive the foreign research reactor spent nuclear fuel, if the material is to be accepted into the United States. Population of the port and surrounding areas to a radius of ten miles is one of the considerations of the port selection criteria. Galveston's lower population was a positive aspect. The population criterion for port selection (Criterion 5) is discussed in more detail in Appendix D, Section D.1.9.5 of the EIS.

DOE considers that the use of any of the ports identified by the port selection process, including Galveston, would not impact normal commercial operations, and therefore not endanger the ports' economic development. Nor should it contribute to any stigma because the analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2). This consideration is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions. As such, there should be no adverse cultural or economic reaction to the use of the port. Historically, there were no adverse economic or cultural impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

Any ship that would be used to transport foreign research reactor spent nuclear fuel would be equipped with long range communication equipment and remain in contact with weather advisory services. Therefore, the ship would be aware of the existence of a hurricane or other dangerous storm with sufficient advance notice in order to avoid being in the Port of Galveston specifically, or any port or other restricted waterway when such a storm hit. Since docking the ship and unloading would be accomplished quickly, typically within a day, the foreign research reactor spent nuclear fuel would not be caught in restricted spaces due to an extended port stay. Even if the ship were to experience a collision or sink as the result of a severe storm or other cause, the analysis in the EIS indicates that the risk to people nearby is low. Appendix D, Section D.5 presents details on the calculation of consequences and risk associated with accidents in port and their approaches.

The evaluations of accident probabilities, both marine and land, were based on national accident rates, which include locale-specific conditions only as they impact the national statistics. However, local hazards, such as fog, can serve as accident initiators and may therefore slightly increase the probability of an accident. However, they would not increase the consequences (results) of the accident, which were found to be minor (Section 4.2.2.3). Therefore, the overall low risk is essentially unchanged due to foggy conditions in the Port of Galveston.

Commentor No. 1216:
Galveston County Commissioners (Cont'd.)

BE IT FURTHER RESOLVED that a copy of this Resolution be spread upon the minutes of this Court and that the Original hereof be furnished to CHARLES HEAD, of the OFFICE OF SPENT FUEL MANAGEMENT, UNITED STATES DEPARTMENT OF ENERGY.

UPON MOTION DULY MADE AND SECONDED the above Resolution was passed this 13th day of July, 1995.

COUNTY OF GALVESTON, TEXAS

BY: _____
JAMES D. YARBROUGH, County Judge

_____
EDDIE BARR, Comm., Pct.#1

_____
EDDIE JANEK, Comm., Pct.#2

_____
WAYNE JOHNSON, III, Comm., Pct.#3

_____
ED STUART, Comm., Pct.#4

ATTEST:

_____
PATRICIA RITCHIE,
County Clerk

Response to Comment
Commentor No. 1216:
Galveston County Commissioners (Cont'd.)

COMMENTOR NO. 1223:
ROBERT A. MOLIKE, MAYOR, CITY OF SUMNER

RESOLUTION NO. 884

CITY OF SUMNER, WASHINGTON

A RESOLUTION of the City of Sumner opposing the adoption of a policy, being proposed jointly by the United States Department of Energy and United States Department of State, to accept and manage spent nuclear fuel from foreign research reactors by shipment through the Port of Tacoma, Washington.

WHEREAS, the United States Departments of Energy and State are jointly proposing to adopt a policy to manage spent nuclear fuel from foreign research reactors; and

WHEREAS, nuclear fuel containing uranium enriched in the United States of America would be covered by this policy; and

WHEREAS, the purpose of this policy is to promote United States nuclear weapons nonproliferation policy objectives, specifically seeking to reduce highly enriched uranium from civilian commerce; and

WHEREAS, the environmental effects and policy considerations of three management alternative approaches for implementation of the proposed policy are assessed; and

WHEREAS, alternative number one would be the acceptance and management of the spent nuclear fuel by the Department of Energy in the United States; and

WHEREAS, under alternative number one the spent nuclear fuel would be shipped by ocean-going vessels from foreign countries to the United States of America; and

WHEREAS, the Port of Tacoma is considered one of ten ports through which the shipment of spent nuclear fuels would occur; and

WHEREAS, the Draft Environmental Statement (DEIS) was prepared to address the Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel; and

A. The DEIS has used outdated information about the Port of Tacoma, its terminals, its operations, and the surrounding area; 1223-1

B. The DEIS did not consider the deep-water depth in the Puget Sound area, which will cause substantial problems in recovery of nuclear fuel shipping containers in case of accident; 1223-2

1

RESPONSE TO COMMENT
COMMENTOR NO. 1223:
ROBERT A. MOLIKE, MAYOR, CITY OF SUMNER

Response to Comment No. 1223-1

Updated information on the terminals at the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS. The evaluated data on populations is from the 1990 census. Although corrected information has been included in the port information for the Port of Tacoma, the analyses provided in Sections 4.2.2 and 4.5 of the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port.

The acceptance of foreign research reactor spent nuclear fuel through the Port of Tacoma would neither affect the activities being conducted in Commencement Bay as a result of being a Superfund Site, nor would it add any additional burden to this designation. The transport of the spent nuclear fuel on the Bay would not add any hazardous material to the Bay or the environment. DOE has added a sentence to Appendix D, Section D.2.1.9 of the EIS recognizing the designation of the Commencement Bay as a Superfund Site. The analysis of impacts, as documented in Section 4 of the EIS, shows that there would be no significant adverse impacts on the port, people, or natural environment from shipments of foreign research reactor spent nuclear fuel through any of the ports of entry.

Response to Comment No. 1223-2

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Section 4.2.1.3 of the EIS has been modified to include this assurance of recovery in coastal waters. Appendix C, Section C.5.5 of the EIS presents information on the probability of a spent nuclear fuel transportation cask sinking in coastal and deep ocean waters.

Appendix D, Section D.5.3.1 describes several accident scenarios that involve fire. The results of the analysis of these accidents can be found in Section D.5.4. The analysis indicates that even in the event of a severe ship fire, neither the consequences nor risks are great (Appendix D, Section D.5.5). Although the nonradiological effects of such a catastrophic accident would obviously impact the local environment, no additional impacts are predicted due to the presence of foreign research reactor spent nuclear fuel.

As stated above, the acceptance of foreign research reactor spent nuclear fuel through the Port of Tacoma would neither affect the activities being conducted in Commencement Bay as a result of being a Superfund Site, nor would it add any additional burden to this designation. The notion that the spent nuclear fuel shipments, but not other more hazardous material shipments, passing through the Port of Tacoma would create a stigma is an unjustified concern. The analysis of impacts, as documented in Section 4 of the EIS,

COMMENTOR NO. 1223: ROBERT A. MOLIKE, MAYOR, CITY OF SUMNER (CONT'D.)

C. The DEIS fully ignored the harm which can be caused to the population and environment of the area in case of an explosion and fire aboard a vessel navigating Puget Sound; 1223-2 (Cont'd.)

D. The DEIS did not recognize the status of Commencement Bay as a superfund site, the stigma attached to this designation, and the expansion of this stigma by Alternative Number One; 1223-1 (Cont'd.)

E. The DEIS ignored the significant cleanup effort by the Port of Tacoma, the City of Tacoma, the industries in Commencement Bay, and the associated crippling business interruption issues; 1223-3

F. The DEIS stated that part of this material would be of interest to unfriendly nations and/or terrorists, and yet did not provide adequate risk and consequence information of a complete, explosive breach of the nuclear fuel by disgruntled persons or terrorists; 1223-4

G. The DEIS did not consider the security aspect of these shipments through the Port of Tacoma, the City of Tacoma, Pierce County, and the State of Washington; 1223-5

H. The DEIS did not adequately address the life cycle costs or benefits and risks of the proposed alternatives; 1223-6

I. The DEIS fully ignored the fairness and equity issues of selecting the smaller ports in lower population areas after implying the risks were virtually inconsequential; and 1223-7

WHEREAS, the record for the safe operation and handling of nuclear materials in United States Department of Energy regulated facilities is less than satisfactory, and there are facilities owned and operated by the United States government capable of receiving and handling this nuclear material, and; 1223-8

WHEREAS, the United States House Budget Resolution eliminates the United States Department of Energy thereby creating funding uncertainties; and 1223-9

WHEREAS, selection of Alternative 2 would significantly reduce the amount of spent nuclear waste into the United States: 1223-10

WHEREAS, the United States Department of Energy has failed to properly answer a question in a meeting conducted by the Port of Tacoma, in Tacoma on the 22nd day of May, 1995, pertaining to the effect of radiation in the environment should a shipping cask be damaged during the handling process in the Port, or to respond in writing to that question as promised and; NOW, THEREFORE,

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RESPONSE TO COMMENT
COMMENTOR NO. 1223: ROBERT A. MOLIKE, MAYOR, CITY OF SUMNER (CONT'D.)

shows that there would be no significant adverse impacts on the port, people, or natural environment from shipments of foreign research reactor spent nuclear fuel through any of the ports of entry. Historically, there were no adverse economic or cultural impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' status with respect to their clients. This position is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions. As such, there should be no adverse commercial or economic reaction to the use of the port.

Response to Comment No. 1223-3

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk. Section D.5.9 has been added to Appendix D of the EIS to address terrorism and sabotage. All shipments of foreign research reactor spent nuclear fuel would be conducted meeting or exceeding all the security requirements in the Code of Federal Regulations (10 CFR Part 73). Appendix H has been added to the final EIS in response to public comments to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

Response to Comment No. 1223-4

The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

Response to Comment No. 1223-5

Section 4.9 and Appendix F, Section F.7 of the EIS fully address the life cycle costs, risks, and benefits of the proposed action. The use of a net present value approach reflects the life cycle costs. Benefits would be primarily in the form of reduced risks of the proliferation of nuclear weapons to countries who might use them on us or our allies, as

COMMENTOR NO. 1223: ROBERT A. MOLIKE, MAYOR, CITY OF SUMNER (CONT'D.)

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SUMNER, WASHINGTON

Section 1. That the City opposes adoption of a policy, being proposed jointly by the United States Department of Energy and United States Department of State, to accept and manage spent nuclear fuel from foreign research reactors by shipment through the Port of Tacoma, Washington. *1223-1 (Cont'd.)*

Section 2. That the City urges the United States Department of Energy and the United States Department of State to reconsider the adoption of a spent waste policy as presented in Alternative 2. *1223-9 (Cont'd.)*

Section 3. That copies of this Resolution shall be transmitted to President Clinton, Vice-President Gore, the United States Department of Energy, and United States Department of State, the Washington State Congressional delegation, the Washington State Legislature, the Office of Governor, the Pierce County Executive, the King County Council and Executive, Port of Tacoma, and all cities and towns in Pierce County.

ADOPTED AND APPROVED this 17th day of July, 1995.

Robert A. Molike
Mayor

Attest:

Barbara J. Vaughan
City Clerk

Approved as to form:

Mark C. Scheggia
City Attorney

RESPONSE TO COMMENT
COMMENTOR NO. 1223: ROBERT A. MOLIKE, MAYOR, CITY OF SUMNER (CONT'D.)

well as, income and employment to the management sites and regions conducting the programs and to the nation from reducing the commerce in certain types of nuclear materials. Health and safety risks would be low, as discussed fully Section 4 of the EIS and Appendices C, D, E, and F. Economic risks are described in detail in Appendix F, Section F.7. Particular attention is paid to major cost uncertainties (e.g., waste acceptance criteria, geologic disposal). Economic impacts relating to ports are minor in all respects.

Response to Comment No. 1223-6

DOE considers that the port selection criteria fairly and equally indicate those ports that can safely handle foreign research reactor spent nuclear fuel. The EIS demonstrates that the use of any of the ports indicated by the port selection process, if foreign research reactor spent nuclear fuel is accepted into the United States, it would not pose any significant risk to either the port personnel or the population near the port. DOE considers the port selection process and results presented in the EIS, Appendix D, Sections D.1.8 and D.1.9, to be fair, rational and objective.

It should also be noted that Section 3151 of Public Law 103-160 (the National Defense Authorization Act for the fiscal year 1994), requires that the Secretary of Energy shall, "if economically feasible and to the maximum extent practicable, provide for the receipt of spent nuclear fuel...at a port of entry in the United States which...had the lowest human population in the area surrounding the port of entry..." Public Law 103-160 was signed on November 30, 1993, which is after completion of the scoping process for this EIS. While the National Defense Authorization Act was written specifically to regulate the receipt and storage of foreign research reactor spent nuclear fuel at DOE's Savannah River Site, DOE elected to apply this criterion, among others, in identifying ports of entry to the maximum extent practicable. DOE included consideration of Section 3151 of Public Law 103-160 by including Criterion 5 in the port selection criteria for this EIS (Appendix D, Section D.1.9.5). Application of this criterion resulted in cities such as Seattle being dropped from the list of proposed ports of entry, while Tacoma stayed on the list.

Response to Comment No. 1223-7

DOE has safely received and handled foreign research reactor spent nuclear fuel for over 30 years, most of it through commercial ports.

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to

Commentor No. 1223: Robert A. Molike, Mayor, City of Sumner (Cont'd.)

Response to Comment Commentor No. 1223: Robert A. Molike, Mayor, City of Sumner (Cont'd.)

satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted. Sections 4.2.2.2 and 4.2.2.3 of the EIS provide the analysis on impacts of incident-free operation and consequences of port accidents, respectively.

Response to Comment No. 1223-8

If DOE were abolished in response to action by Congress, the current DOE programs for management of spent nuclear fuel would have to be transferred to some other Federal government agency to protect the health and safety of the public. Since the spent nuclear fuel will not simply go away, these programs cannot simply be abolished.

Response to Comment No. 1223-9

The commentor's preference for the overseas management alternative is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

Response to Comment No. 1223-10

DOE responded to this question by letter and fax on June 16, 1995. The response gave the estimated radiation dose rate near the spent nuclear fuel under the assumption that there was no transportation cask to provide shielding, as requested by the Port of Tacoma.

CEQ regulations and guidance do not require a worst case analysis of accident in an EIS. For the purposes of an analysis in the EIS, there is no such thing as a worst case scenario, because for any worst case that is postulated, a still more severe accident can be postulated by adding one more drum of gasoline, one more wrecked rail car, one more terrorist, etc. In addition, for each assumption that is made to make a postulated accident more severe, the probability of the accident becomes smaller. The EIS does not contain a worst-case scenario, but a broad range of port accident scenarios, including severe accidents, is discussed in Section 4.2.2.3 of the EIS. Appendix D, Section D.5.4.3.2 of the EIS presents the risks of a very high temperature fire that engulfs a cask, which was part of a sensitivity study on release fractions. In addition, Section D.5.9 has been added to Appendix D of the EIS to address the issue of attack by disgruntled persons or terrorists.

COMMENTOR NO. 1249:
ROBERTA COOPER, MAYOR, CITY OF HAYWARD

CITY OF HAYWARD

Mayor Roberta Cooper
July 17, 1995

Heart of the Bay

Honorable Hazel R. O'Leary
Secretary of Energy
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Secretary O'Leary:

We understand that on June 6, 1995, the Contra Costa County, California, Board of Supervisors, unanimously voted to strongly oppose the use of the Concord Naval Weapons Station (located in Contra Costa County) as port of entry for foreign research reactor spent nuclear fuel.

The Concord Naval Weapons Station is one of three West Coast ports which are currently under review as ports of entry in the U.S. Department of Energy's *Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel*.

As a neighboring community, The City of Hayward joins Contra Costa County in its strong opposition the use of the Concord Naval Weapons Station as a proposed port of entry for foreign research reactor spent nuclear fuel. *1249-1*

In 1988, the members of the City Council adopted Ordinance Number 87-024, establishing "Nuclear Free Hayward". Among the findings contained in the ordinance, the council determined in Section 3 (c) among other issues, that: *1249-2*

> *"The use, storage or transportation of weapons-related radioactive nuclear materials or wastes within or through the City of Hayward poses serious health, safety and environmental risks to the residents of the City".*

Given its close proximity to our community, we believe, unequivocally, that using the Concord Naval Weapons Station poses serious health, safety and environmental risks to the residents of Hayward. *1249-1 (Cont'd.)*

Therefore, consistent with the provisions of our Ordinance, and in the interest of the health and safety of the residents of the City of Hayward, I strongly urge you to direct that the Concord Naval Weapons Station be excluded from the list of those being considered as ports of entry for spent nuclear reactor fuel.

Sincerely,

Roberta Cooper
Mayor

copy: Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 20585

William B. Walker, M.D., Health Officer
Contra Costa County
Health Services Department
20 Allen Street
Martinez, CA 94553

25151 Clawiter Road, Hayward, CA 94545-2731 • (510) 293-5342 • FAX (510) 293-1989 • TDD (510) 293-1990

RESPONSE TO COMMENT
COMMENTOR NO. 1249:
ROBERTA COOPER, MAYOR, CITY OF HAYWARD

Response to Comment No. 1249-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1249-2

DOE is convinced, and has established in the EIS, that the activities associated with implementing the foreign research reactor spent nuclear fuel proposed policy can and would occur in a manner that would not present human health, safety, and/or environmental risks to the populations surrounding the ports, transportation routes, or potential management sites. The local ordinance of the City of Haywood is noted.

Commentor No. 1251:
Edward D. Hansen, Mayor, City of Everett

OFFICE OF THE MAYOR

Edward D. Hansen
Mayor

July 18, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 20585

Dear Mr. Head:

We have recently become aware of the U.S. Department of Energy's plan to ship spent nuclear fuel through a Puget Sound port for storage in other areas. We wish to submit for the record a statement of our opposition to such a plan. We believe that if it is necessary to bring spent nuclear fuel from foreign countries, there are alternative shipping routes which are more suitable. 1251-1

Thank you for allowing us to submit this letter of opposition to your plan.

Respectfully submitted,

Carl Gipson, Council President

Edward D. Hansen, Mayor

Frank Anderson, Councilmember

Doug Campbell, Councilmember

Bob Overstreet, Councilmember

Dale Pope, Councilmember

Mark Soine, Councilmember

Ann Weinzierl, Councilmember

PB:tm

cc: Harold G. Moss, Mayor of Tacoma
Washington Congressional Delegation
Port of Tacoma Commissioners

CITY OF EVERETT • 3002 Wetmore Ave. • Everett, WA 98201 • (206) 259-8700 • Fax (206) 259-8729

Response to Comment
Commentor No. 1251:
Edward D. Hansen, Mayor, City of Everett

Response to Comment No. 1251-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Commentor No. 1255: Jack Geraghty, Mayor, City of Spokane

SPOKANE

Office of the Mayor
808 W. Spokane Falls Blvd.
Spokane, Washington 99201-3335
(509) 625-6250

Jack Geraghty
Mayor

July 14, 1995

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

Re: Utilization of Washington Ports and Cities to Address the "Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuels"

Dear Mr. Head:

I have concerns over the fact that Washington cities and facilities play such a significant, and appears only, role in the Department of Energy's management of the world's spent nuclear fuels. There are alternative ports and storage facilities that should be considered. 1255-1

The City of Spokane is the hub for almost all rail lines serving the northwest's port cities. With plans calling for up to 721 shipments of radioactive materials over a 13 year period, I can't help feeling a little uneasy. Even with all the safety and security plans that exist, accidents do occur. 1255-2

The transportation and storage of radioactive materials seems to always evoke the worst case response in most people. It's difficult to measure these negative impacts upon a community, but they do exist. I feel that Washington, and especially Spokane, have little to gain by seemingly being singled out as the only solution. Alternates involving other nations as to reprocessing and storage appear to share the impacts with a much larger whole. 1255-1 (Cont'd.) 1255-3

I appreciate the opportunity to comment on this plan and ask that you seriously reconsider the other options that are available.

Sincerely,

Jack Geraghty
Mayor

cc: Harold G. Moss
Mayor of Tacoma, WA

Response to Comment Commentor No. 1255: Jack Geraghty, Mayor, City of Spokane

Response to Comment No. 1255-1

DOE did not specify a preferred alternative in the draft EIS. DOE's preferred alternative is specified in this final version of the EIS (Sections 2.9 and 4.7). DOE has noted the commentor's objection to the use of Puget Sound and the Port of Tacoma, as well as to storage at the Hanford Site. The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford site.

Response to Comment No. 1255-2

The risks of ground transportation are discussed in Section 4.2.3 and Appendix E of the EIS. In all cases, the risks are shown to be low.

Response to Comment No. 1255-3

The commentor's preference for Management Alternative 2 is noted. This alternative is discussed in Sections 2.3 and 4.4 of the EIS.

COMMENTOR NO. 1265: PORT OF TACOMA

PORT of TACOMA U.S.A.

July 20, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
US Department of Energy
1000 Independence Avenue
Washington, DC 20585

Dear Mr. Head:

As an elected body, the Port of Tacoma Commission is vitally concerned with the health, safety, security, efficiency and economic viability of the Port and the thousands of people employed by businesses operating in and around the Port. It is with these concerns in mind that the Commission unanimously opposes the Port of Tacoma's listing as a possible port of entry for spent nuclear fuel from foreign research reactors.

The Port of Tacoma cannot and will not accept spent nuclear fuel shipments. *1265-1*

Virtually the entire Tacoma - Pierce County area has joined the Port in opposing the proposed shipments. There is simply no demonstrable benefit to the Port or the community it serves. Indeed, the proposal contains a number of drawbacks including risks to the health, safety and well-being of workers, the general public and the environment. From the standpoint of port operations, receiving the shipments would place unacceptable burdens on the Port related to costs, scheduling, security and interruption of regular commerce.

In addition, the training and equipment costs related to preparing the Tacoma Fire Department to deal with the possibility of an accident involving spent nuclear fuel would, in effect, be an unfunded federal mandate placed upon the taxpayers of Tacoma. *1265-2*

Furthermore, the Department of Energy has never fully addressed the risks posed by shipboard fire. Although the Draft EIS states that the shipment casks have been tested to withstand fires that reach temperatures as high as 1,160 degrees for up to 30 minutes, shipboard fires in Tacoma and Seattle over the past decade have exceeded 2,000 degrees and lasted much longer than 30 minutes. DOE has never clearly stated what the results would be if a fire were to breach a cask and airborne radioactive smoke, steam and dust escaped into the environment. This worst-case scenario must be thoroughly investigated and a credible answer must be provided. *1265-3*

In addition to the real problems these shipments would cause, the commission is concerned with their effect upon the community's image and identity. The Port of Tacoma and the *1265-4*

P.O. Box 1837 • Tacoma, Washington 98401-1837 • Telephone: (206) 383-5841
Commissioners: Stephen R. Anderson • Jack A. Fabulich • Mike Fletcher • Patrick O'Malley • Jerry M. Thorpe
Executive Director: John J. Terpstra

RESPONSE TO COMMENT
COMMENTOR NO. 1265: PORT OF TACOMA

Response to Comment No. 1265-1

The opposition of the Port of Tacoma Commission to the use of the Port of Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. Based on the port selection process described in Appendix D of the EIS, the Port of Tacoma is among the ten candidate ports listed in Section 2.2.1.6 of the EIS which could receive foreign research reactor spent nuclear fuel under Management Alternative 1 or 3. The analyses provided in the EIS indicate that the use of any of the ports identified by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3 and 4.5) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Section 4.2.2.2 and 4.5).

The benefit to the citizens of the United States from the proposed action, including those in potential ports of entry, along transportation routes, or near potential management sites, is less risk that weapons grade uranium from civil programs could be diverted into the production of nuclear weapons that might be used against us or our allies. On the other hand, the analyses recorded in the EIS (Section 4) demonstrate that the risks from the proposed action are low.

DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' status with respect to their clients. This position is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions. As such, there should be no adverse commercial or economic reaction to the use of the port. Historically, there were no significant adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security measures employed at any port would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). DOE supports these regulations as being adequate to protect the foreign research reactor spent nuclear fuel in any commercial port. If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

Mr. Charles Head
July 20, 1995
Page 2

citizens of the Tacoma - Pierce County area are particularly sensitive to the stigma these shipments would attach to the community. 1265-4

Federal, state and local governments have spent millions of dollars to clean up a number of contaminated sites in and around Commencement Bay. The community is just now beginning to reap the benefits of cleanup efforts. Shipments of spent nuclear fuel, coupled with a possible nuclear accident, would jeopardize the progress that has been made in cleaning up both the environment and the image of Tacoma - Pierce County. 1265-1 (Cont'd.)

But concern over this issue goes far beyond the desire to prevent these shipments from passing through the Port of Tacoma. While the Commission supports the goals of nuclear nonproliferation, careful research and consideration has led to the conclusion that Alternative 1, as presented in the Draft EIS, is *not* the best, safest, fastest, most economical way to achieve those goals. 1265-5

The Commission strongly urges DOE to reconsider Alternative 2. We believe Alternative 2 will achieve the goals of nuclear nonproliferation faster, at a lower cost and with less risk to the environment, the health of US citizens, and the economies of communities along possible transportation routes within the US. 1265-6

The Draft EIS does not dispute the fact that Alternative 1, which is clearly favored in the Draft EIS, would cost nearly $1 billion more than Alternative 2. Even more alarming is the fact that the costs for upgrades to DOE facilities and equipment are not charged against the storage and treatment of the fuel in modernized US facilities. Consequently, the costs of Alternative 1 could spiral to well over $1 billion more than Alternative 2 (see footnote, page F-269, DEIS). Indeed, the Draft EIS states that the cost of Alternative 1 could be five to ten times greater than Alternative 2. 1265-5 (Cont'd.)

There is no evidence in the Draft EIS that the foreign reprocessing option has a significantly higher proliferation risk than storing the fuel in the US, provided bilateral agreements can be reached to assure that the High Enriched Uranium is diluted to Low Enriched Uranium. 1265-6 (Cont'd.)

While the Draft EIS does discuss upgrading US storage and reprocessing facilities, there is no evidence that DOE explored upgrading overseas storage and treatment facilities (e.g., Dounreay, Scotland). By not fully analyzing alternatives 2 and 3, DOE has demonstrated a lack of fairness and due diligence which tends to discredit the Draft EIS. It may also provide grounds for successful technical challenges. 1265-7

Please take note of the attached Port resolution and "Issues and Concerns," which, for the record, expand upon the topics addressed in this letter. The attached documentation also includes questions the Commission would like to see answered in the Final EIS.

RESPONSE TO COMMENT
COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

Appendix H has been added to the final EIS in response to public comments to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site(s).

Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma as noted by the commentor. The analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Based on over 30 years experience shipping spent nuclear fuel, DOE considers that spent nuclear fuel transportation casks passing through the Port of Tacoma, Commencement Bay, or any other port or waterway would not affect air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact

Response to Comment No. 1265-2

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

As stated above, Appendix H of the EIS contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

In the event that DOE determines that Alternative 1 will be a significant part of its foreign spent fuel policy, the Commission urges you to consider staging the fuel in secure, temporary overseas storage facilities. At periodic intervals the fuel could be shipped to the US through military ports by properly trained personnel under appropriate security conditions. Carefully controlled overland transportation through minimally populated corridors could bring the fuel to its final destination. Although this approach would keep the fuel out of the Port of Tacoma, we believe it is inferior to the more permanent solution achievable under Alternative 2.

1265-8

Thank you for the opportunity to comment on the Draft EIS. We look forward to seeing a Final EIS that addresses the deficiencies described in this letter and the attachments.

Sincerely,

PATRICK O'MALLEY
President of the Port Commission

MIKE FLETCHER
Vice President of the Port Commission

JERRY M. THORPE
Secretary of the Port Commission

JACK A. FABULICH
Assistant Secretary of the Port Commission

STEPHEN R. ANDERSON
Assistant Secretary of the Commission

PO:mac;CommHead.doc

RESPONSE TO COMMENT
COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

Response to Comment No. 1265-3

Appendix D, Section D.5.3.1 of the EIS describes several accident scenarios that involve fire. The results of the analysis of these accidents can be found in Appendix D, Section D.5.4. The analysis shows that even in the event of a severe ship fire, neither the consequences nor risks are great (Appendix D, Section D.5.5). Although the nonradiological effects of such a catastrophic accident would obviously impact the local environment, no additional impacts are predicted due to the presence of foreign research reactor spent nuclear fuel.

The transportation casks that would be used for the foreign research reactor spent nuclear fuel are certified if their design meets certain tests, including a fire test, and if the individual casks pass periodic inspections (Section 2.6.2 of the EIS). These certification standards were developed for use of the casks on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. The duration of a ship fire is directly related to the amount of combustibles carried on board. The number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicate that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures. Hence, contrary to the commentor's assertion, long duration fires are not usual.

In respect to the impact a ship fire might have on a transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship's fire intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it would be almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of the foreign research reactor spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (see Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).

The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt foreign research reactor spent nuclear fuel. Appendix D, Section D.5.3 of the EIS presents a detailed discussion of accident probabilities and radioactive material source terms and Section D.5.4 presents the results of the analysis.

COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

1. NATIONAL NEED FOR NUCLEAR NONPROLIFERATION "BUT ....."

Nonproliferation Support -- We support the U.S.'s nuclear nonproliferation objectives. No responsible, law abiding citizen in the U.S. wants to add to the potential for small, powerful nuclear explosive devices to get into the hands of a few terrorists or people deeply frustrated in the U.S. or elsewhere. The U.S. should take all reasonable and prudent steps to mitigate the spread of nuclear materials capable of being assembled into nuclear explosive devices. While all three alternatives can accomplish varying degrees of this objective, we believe Alternative 2, the foreign management alternative, is the best policy for the U.S. over the short and long term as explained below. 1265-9 1265-10

To successfully meet the nonproliferation objectives of this proposed foreign research reactor spent nuclear fuel policy, the U.S. needs to work diligently now with the affected parties on a plan that allows them to become self sufficient in a nonproliferating way as soon as possible. We reject the notion that resurrecting the highly subsidized, "return all your spent fuel to the U.S." policy (Alternative 1) for ten years will yield a lasting, acceptable nonproliferation strategy. At a minimum, the return strategy suggested as Alternative 1 will only serve to postpone the inevitable transition to responsible independence that must occur with these foreign research reactors. 1265-9 (Cont'd)

Problems With Alternative 1 -- Two problems exist with Alternative 1:

1) The U.S. doesn't have a workable storage and disposal plan yet for its own spent nuclear fuel and high level wastes. Alternative #1 attempts to gather up all U.S. enriched uranium in research reactors around the world (41 countries) and ship it to the U.S. for storage at DOE's nuclear weapons production sites until someone can figure out how and when to permanently dispose of it. Not having a workable domestic plan and having to use weapons production sites are setting two very bad examples as role models for our foreign research reactor friends. 1265-11

2) The other problem is that there is no solid evidence that we will be any better off at the end of the ten year period than we are today. Foreign dependence on such a "return everything to the U.S." policy can demotivate and suppress meaningful progress towards responsible, self sufficiency on the part of our foreign research reactor friends. Complacency and procrastination can work against the real changes that need to occur for responsible self sufficiency to become a near term reality. The U.S. will, in the meantime, have realized unnecessary and extremely high storage and disposal costs, higher public and worker health risks, and higher environmental risks -- all without achieving the necessary shifts in foreign spent fuel management to a nonproliferating self sufficiency. 1265-12

Transition Now With Alternative 2 -- We support facing the transition issues now by adopting Alternative 2 (foreign management alternative). This means that the U.S. will not set any bad 'role model' examples. It also means that foreign spent fuel management issues will be addressed now on a case by case basis to find the best solutions for each party. It also means that the U.S. will not subject itself to whatever the risks there are of receiving and transporting foreign spent fuel within U.S. borders. Lastly it means that we will not have exacerbated an already untenable situation in our own domestic storage and disposal of spent domestic fuel and defense wastes -- at who knows what ultimate cost increases. 1265-13

Best Results With Alternative 2 -- Alternative 2 should provide the least cost, best overall short and long term nonproliferation result. Several acceptable foreign spent fuel management scenarios are available as 1265-14

1

RESPONSE TO COMMENT
COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

In conclusion, although long duration ship fires are possible, and have occurred, they are uncommon events. Analyses in the EIS indicate that even in the event of a severe ship fire involving a transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5 of the EIS).

Response to Comment No. 1265-4

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor fuel was accepted into the United States in the past. Under NEPA regulations, the socioeconomic effects evaluated for this EIS do not include those associated with psychological fear of receiving spent nuclear fuel, such as the stigma referred to by the commentor. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Tacoma would not create the stigma anticipated by the commentor.

Response to Comment No. 1265-5

The commentor's assessment that Management Alternative 1 (Management of foreign research reactor spent nuclear fuel in the United States) is not the best, safest, fastest, and most economical way to achieve the goals of nuclear weapons nonproliferation, is noted. Management Alternative 1 is described in Section 2.2 of the EIS. Costs are described in Section 4.9 of the EIS.

Response to Comment No. 1265-6

The commentor's preference for Management Alternative 2 is noted. This alternative is discussed in Sections 2.3 and 4.4 of the EIS.

Response to Comment No. 1265-7

The commentor's preference for upgrading overseas storage and treatment facilities, including those in Scotland, is noted. Overseas options are included under Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

As for the commentor's concern that DOE did not fully analyze Management Alternatives 2 and 3, DOE considers that the analysis of the alternatives in the EIS fully complies with the requirements of NEPA.

COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

options in working through each foreign countries specific set of circumstances. Several of these are suggested for your consideration:

1) Over 70% of the foreign spent fuel resides in countries with spent fuel storage capabilities and expertise resulting from large, national commercial nuclear power programs. Interim storage within these countries saves time and money, reduces risk and can be done under IAEA nonproliferation safeguards and controls.

2) Nearly half of those that have major national commercial nuclear power programs also have spent fuel reprocessing capabilities. Where reprocessing is necessary to help transition the foreign research reactor program to low enriched uranium incapable of being made into nuclear bombs, this capability now exists with at least one reprocessor willing and capable of immediately processing and diluting the high enriched uranium.

3) The U.S. and its nonproliferation allies can begin immediately to help the remaining 34 countries that have 30% of the total spent fuel inventory find acceptable on-site or foreign off-site storage capability for the spent nuclear fuel or a nonproliferating reprocessing option. These efforts should be directed at both short term and long term solutions for the affected countries.

4) U.S. subsidies, if necessary, can be used to leverage the desired outcome of this effort.

1265-14 (Cont'd)

Strong Preference -- Our strong preference is for the U.S. to work collaboratively with foreign sources of nuclear fuel services ranging from spent fuel storage, reprocessing, and permanent geologic disposal. By working with the research test reactor personnel and their political leaders, it should be possible to structure a mutually acceptable arrangement that provides foreign, self sufficient, responsible, nonproliferating, short and long term fuel management of foreign research reactor spent nuclear fuel.

2

RESPONSE TO COMMENT
COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

Response to Comment No. 1265-8

As discussed in Appendix D, Section D.1 of the EIS, both commercial and military ports were evaluated. Environmental effects of Management Alternatives 1 and 3 at candidate commercial and military ports were evaluated and found to be low (Sections 4.2.2 and 4.5). There is no reason to prefer commercial or military ports based on environmental consequences. As discussed in Appendix D, there is no environmental basis for preferring military vessels to commercial vessels.

Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the spent nuclear fuel transportation casks would be low. No special handling or loading/unloading procedures would be required for the foreign research reactor spent nuclear fuel when it is contained in standard shipping containers; experience with handling containers is sufficient. Therefore, no special training of longshoremen is required.

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

Selection of land transportation routes is, in part, selected based on the population along the routes. All routing is approved by the Nuclear Regulatory Commission at the time of the shipment to ensure that the best route has been chosen for the exact circumstances. The risk is low for all routes that would be taken by the foreign research reactor spent nuclear fuel (Sections 4.2.3.2 and 4.2.3.3 of the EIS).

Response to Comment No. 1265-9

The commentor's support for nuclear weapons nonproliferation objectives of the United States is noted. As discussed in Sections 1.2 and 2.1 of the EIS, the intent of the proposed policy is to provide foreign research reactors with a limited time to arrange for disposition of their spent nuclear fuel, while avoiding disruptions in research reactor operations and encouraging the use of LEU fuel in research reactors. These arrangements will take time to develop, but they can be developed within the proposed policy period provided foreign reactor operators begin immediately. This EIS notifies foreign research reactor operators that immediate action to develop these arrangements is required.

COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

2. TRANSPORTATION SECURITY VS. FOREIGN SOLUTIONS

The Foreign Reprocessing Option Is Required -- A large fraction, nearly 50%, of the foreign research reactors are still operating on high enriched uranium (HEU) and their spent fuel will require reprocessing until fully converted to low enriched uranium (LEU). Even after conversion to LEU, many reactor operators will find it advantageous to reprocess their low enriched uranium spent fuel. Many of these reactors are closer to the UK and France than they are the U.S. Thus, the overall spent fuel and HEU transportation routes, under Alternative 2, will be shortened considerably compared to the Alternative 1 case. 1265-15

Nonproliferation Objectives -- The purpose of this proposed policy is to promote United States nuclear weapons nonproliferation policy objectives by seeking to reduce and ultimately eliminate highly enriched uranium from civilian commerce.

Management Alternative 1 -- Accept and manage foreign research reactor spent nuclear fuel in the United States. This alternative could potentially require that the Port of Tacoma and the City, region and balance of State establish round-the-clock security to prevent theft, sabotage, and public/worker overexposure to harmful ionizing radiation emanating from the stored or transported shipping containers. 1265-16

Management Alternative 2 -- Facilitate the management of foreign research reactor spent nuclear fuel overseas, is a proposed new policy alternative that can be sold as the permanent or long term U.S. spent fuels policy.

Two kinds of transportation nonproliferation problems under Alternative 1:

1) Incoming Spent Nuclear Fuel -- The highly radioactive spent nuclear fuel is relatively secure because of its residual radiation levels and massive size and weight. Most of the security issues that the Port of Tacoma workers and transporters along the transportation route will have to face deal with safety issues associated with inadvertent contact or close proximity to the shipping casks by the general public or by workers handling or transporting the shipping casks. 1265-16 (Cont'd)

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2) Outgoing High Enriched Uranium -- The Draft EIS doesn't adequately address the fact that nearly half of the aluminum-based fuel (35 reactors) and 25% of the TRIGA reactor fuel (5 reactors) still operate with high enriched uranium. Somehow, until these reactors are converted, shipments of high enriched uranium (HEU) or fresh fuel elements containing HEU will continue to occur resulting in a significant potential security or proliferation issue. This virtually non-radioactive, bomb-grade material is the most proliferation sensitive material in the fuel cycle. Appropriately, details are not available in the Draft EIS as to how this material will be shipped or by whom. 1265-17

Management Alternative 2 -- Facilitate the management of foreign research reactor spent nuclear fuel overseas. A large fraction, nearly 50%, of the foreign research reactors are still operating on HEU and their spent fuel will probably require reprocessing until fully converted to low enriched uranium. Many of these reactors are closer to the UK and France than they are the U.S. Thus, the overall spent fuel and HEU transportation routes will be shortened considerably compared to the Alternative 1 case. Assuming similar care, due diligence, and oversight, Management Alternative 2 should provide the more proliferation resistant scenario.

3

RESPONSE TO COMMENT
COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

Response to Comment No. 1265-10

The commentor's preference for Management Alternative 2 is noted. Sections 2.3 and 4.4 of the EIS (Management Alternative 2) discusses the advantages and disadvantages of overseas storage and reprocessing.

Response to Comment No. 1265-11

The commentor's concern that the U.S. does not have a storage and disposal plan for its own wastes is noted. Storage in the United States of the foreign research reactor spent nuclear fuel is Management Alternative 1 or 3, which are discussed in Sections 2.2, 2.4, 4.2, 4.3, and 4.5 of the EIS. Storage technologies are discussed in Section 2.6.5.1 of the EIS.

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS).

Response to Comment No. 1265-12

The commentor's suggestion that implementation of Management Alternative 1 could demotivate and suppress meaningful progress towards self sufficiency on the part of foreign research reactor operators, is noted. On the other hand, DOE considers that the removal of the HEU covered by the ten year policy from civilian programs will be beneficial in reducing the risk of nuclear weapons proliferation. Given the financial cost discussed in Section 4.9 of the EIS, the relatively modest environmental impacts of the proposed action are fully justified in light of the nuclear weapons nonproliferation policy goals.

Response to Comment No. 1265-13

The commentor's preference for Management Alternative 2 is noted. This alternative is discussed in Sections 2.3 and 4.4 of the EIS.

DOE and the Department of State consider that accepting foreign research reactor spent nuclear fuel into the United States for the next 13 years would not set any bad 'role model' examples, as suggested by the commentor (see the response to Comment 1265-11, above). It would give the foreign nations and their reactor operators time to develop their own spent nuclear fuel management solutions, but the transition would still be required at the end of the policy period. Forcing each country to transition now could cause some

3. MARKET STABILITY AIDS NONPROLIFERATION – SHORT & LONG TERM

Market Stability: The Key to Nonproliferation – 91 operating research reactors in 41 countries depend on stable, low cost supplies of fuel, reprocessing services, and assistance in fuel storage and high level waste storage/disposal. Management Alternative 2 (and perhaps Alternative 3) are the only means of achieving such stability. With U.S. assistance, these Alternatives can be tailored to meet the U.S. nonproliferation objectives and the reactor operator's objectives.

Important Background Factors

Nonproliferation Objectives – The purpose of this proposed policy is to promote United States nuclear weapons nonproliferation policy objectives by seeking to reduce and ultimately eliminate highly enriched uranium from civilian commerce.

Management Alternative 1 – Accept and manage foreign research reactor spent nuclear fuel in the United States, is a revisit of the former U.S. "Off Site Fuels Policy" that was terminated causing foreign reactor operators much grief after collaborating with the U.S. on its Reduced Enrichment for Research and Test Reactors (RERTR) program.

Management Alternative 2 – Facilitate the management of foreign research reactor spent nuclear fuel overseas, is a proposed new policy alternative that can be sold as the permanent or long term U.S. spent fuels policy.

Management Alternative 3 – A hybrid, or a combination of components of Management Alternatives 1 and 2.

The U.S. is already viewed as an unreliable trading partner. The U.S. has not accepted high enriched uranium (HEU) for six years now except for the recent "urgent relief" shipment of 153 spent fuel elements from four countries. Consequently, many foreign research reactor operators will soon run out of spent fuel storage capacity or face safety/regulatory issues. 1265-18

The U.S. has already announced its intention of being out of the foreign spent fuel storage and disposal business in 10 years, providing an appearance of short term fix.

The U.S.'s own commercial spent fuel disposal program and defense waste treatment and disposal program is in a shambles – not setting a good precedence for foreign partners.

The Bottom Line – Reprocessing spent research reactor fuel is an economic necessity when the enrichments are over 20% (HEU). Reprocessing, with today's fuel cycle costs, is probably uneconomical for enrichments down in the 2-3% range. The transition between uneconomical and economical reactor operations probably occurs in the range of 4-8% enriched. To achieve operational stability and achieve the U.S. nonproliferation objectives, some form of a long term commitment to reprocessing is a requirement. Management Alternative 1 must be rejected. 1265-19

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of them to adopt crash programs. The best solution for each party may take time to develop. In the meantime, the risk of nuclear weapons proliferation can be reduced by eliminating existing inventories of HEU fuel overseas and converting reactors to the use of LEU fuel.

Sections 4.2.2 and 4.2.3 of the EIS demonstrate that the risks of receiving and transporting the foreign research reactor spent nuclear fuel within U.S. borders would be very low.

DOE considers it is reasonable to consider importing more spent nuclear fuel for the purpose of nonproliferation because the foreign research reactor spent nuclear fuel involved would increase DOE's total inventory by a small amount. The increase would be less than one percent of the mass of heavy metal and less than ten percent of the volume. The estimated costs are presented in Section 4.9 of the EIS.

Response to Comment No. 1265-14

The commentor's preference for Management Alternative 2 is noted. Section 2.3 of the EIS discusses overseas storage of foreign research reactor spent nuclear fuel. It should be noted, however, that management in the United States would be technically, politically, and economically more advantageous than management in as many as 41 separate countries, especially in the countries with no spent nuclear fuel or nuclear waste handling, storage, or disposal infrastructure.

Because of scale economies associated with storing spent nuclear fuel, storage in the countries of origin would cost more than storage in the United States (and cost U.S. taxpayers more), would be technically difficult, if not impossible, in many countries, and would violate the laws of several of the countries. Also, many countries participated in the U.S.-led research reactor programs on the belief that the United States would eventually accept the spent nuclear fuel. Failure of the United States to accept the spent nuclear fuel could endanger the entire program to substantially eliminate civilian use of weapons-grade nuclear material.

Response to Comment No. 1265-15

HEU spent nuclear fuel does not require reprocessing, as suggested by the commentor. There are advantages and disadvantages to reprocessing both LEU and HEU spent nuclear fuels. The commentor is correct that many of the reactors are closer to the United Kingdom and France than they are to the United States. Thus, shipping the spent nuclear fuel there under Management Alternative 2 would involve less ocean transport than would shipping it to the United States under Management Alternative 1.

COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

4.0 DESPITE THE EIS BIAS TOWARDS THE U.S. OPTION, FOREIGN OPTION IS BETTER

Issue -- There's a substantial price tag on any nonproliferation issue, especially this one. Since this program benefits all parties interested in resolving nonproliferation issues associated with high enriched uranium (HEU), two courses of action are recommended:

1) The least cost Alternative that meets the minimum nonproliferation policy guidelines should be selected to minimize everyone's costs. This means selecting Alternative 2 or Alternative 3. Management Alternatives 2/3 had the lowest estimated costs ranging from $750-$950 million (1996 $'s in 1996), and

2) Some sharing of specific costs should be pursued. The U.S. taxpayer should not have to accept the burden of paying for most of the HEU to LEU conversion costs (i.e., the RERTR) program. Furthermore, Management Alternative 1, the U.S. option, has the highest costs in the Draft EIS ranging from $850-1,850 million (1996 $'s in 1996) and should be abandoned immediately. When one figures in the recent cost overruns of several major DOE programs, Management Alternative 1 is probably 2-3 times more costly than Alternatives 2 or 3.

1265-19

There is a definite bias throughout the Draft EIS slanted towards Alternative 1, and to a lesser extent, Alternative 3 (the hybrid alternative). This bias shows up a number of ways including the absence of clear flow diagrams for all three alternatives like those presented in Figure S-4 and S-5 for Alternative 1. Importantly, no cost data is clearly summarized for Management Alternative 2. A Hybrid Alternative is defined as one of the options and the only clearly defined cost analyses are for i) acceptance/storage in the U.S. (pure Alt. 1), ii) chemical separation/vitrification in the United States (option 6 for Alt. 1), and finally the Hybrid Alternative (Alts. 2 and 3). See Section F.7 beginning on page F-264 for additional proof of this gross bias and absence of key alternative assessments.

1265-20

Examples of the hard costs associated with the proposed policy are:

Converting foreign research reactors to the Reduced Enrichment for Research and Test Reactors (RERTR) program, i.e., a fuel/reactor design enriched to less than 20% U-235 to prevent the fabrication of nuclear bombs out of the fuel

Increased operating costs of running the reactor under the RERTR program

Greater quantity of fuel required to achieve same performance as the high enriched uranium (HEU)

Increased costs of storing, reprocessing & ultimately disposing of the low enriched uranium (LEU)

Cost of the incentives to get reactor operators to convert and operate under the RERTR program

An example of the higher costs can be obtained from the current prices that the Atomic Energy Authority (A.E.A.) is charging for reprocessing spent HEU fuel at the British facilities at Dounreay. Their reprocessing charge is in the $5,000 to $6,000 per kilogram of total metal (not Heavy Metal or Uranium as per many unit prices). A rough estimate for the total 'metal-to-heavy metal' ratio in the aluminum clad fuel is ~8. This means that the unit price to reprocess the HEU fuel at Dounreay is approximately $40,000 to $50,000 per kilogram of heavy metal (mostly uranium).

1265-21

5

RESPONSE TO COMMENT
COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

Response to Comment No. 1265-16

The analysis of the consequences and risk associated with an accident in port involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 and Appendix D, Section D.5 of the EIS) and that the risk associated with accidents in port for the entire proposed action was low. Likewise the consequences and risks associated with marine transport were found to be low (Section 4.2.1.3).

The radiation dose that anyone would receive handling, working or traveling near a transportation cask is below the limit that is allowed to the public in an unrestricted area by NRC regulations (10 CFR Part 20). As such, no special precaution would be required from anyone in the area of a cask carrying foreign research reactor spent nuclear fuel.

Security requirements are contained in 10 CFR Part 73. The shipper is required to ensure that the security requirements are met, including port and land transportation security requirements. Also, no additional responsibilities would be created for city, county, or State law enforcement agencies by DOE or other Federal agencies. However, some State and local governments impose additional requirements on shipments of foreign research reactor spent nuclear fuel. These additional requirements may impact State and local law enforcement agencies. Historically, shipments of foreign research reactor spent nuclear fuel were treated as any other hazardous material shipments and received no special attention.

No special handling or loading/unloading procedures would be required for the foreign research reactor spent nuclear fuel when it is contained in a cask that is inside of an ISO container. As to isolating the casks from other freight, this is not necessary for radiation or any other reasons. The small amount of radiation coming from the transportation cask is gamma radiation which does not irradiate nor contaminate other materials, so there is no need to isolate it.

See also the 5th paragraph of the response to Comment 1265-1, above.

Response to Comment No. 1265-17

DOE recognizes the fact that many foreign research reactors continue to operate on HEU fuel. This fact supports the need for implementation of the proposed action in a manner that will encourage these reactor operators to convert to LEU fuels, thereby reducing the proliferation risks stated by the commentor. Under the proposed action, only spent nuclear fuel from those countries that agree to convert to LEU fuels would be considered for management. In accordance with the Energy Policy Act of 1992, the United States is not permitted to sell HEU fuel to foreign countries, except under very special circumstances. Since passage of the Act, no new export licenses for HEU have been issued by the United States.

COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

5. WHY ADD TO THE "OUT OF CONTROL" NUCLEAR COST LEGACY?

OR

"WHY DO WE WANT TO ADD MORE WHEN WE DON'T KNOW WHAT TO DO WITH WHAT WE'VE ALREADY GOT?"

Issue: According to recent reports, the commercial spent nuclear fuel disposal program in the U.S. is in shambles with cost overruns of at least billions of dollars and a decade behind schedule (GAO/RCED-94-299 9/94). The high level waste cleanup efforts at the DOE's former production sites, including Hanford, just 200+ miles away is also in shambles (see Train Wreck ... below; Sen. Frank Murkowski P.R. 5/15/95; Sen. Bennett Johnston P.R. 5/26/95). Things are going so badly for DOE that the Congress has a major move underway to shut down DOE and extract and reassign some of its valuable parts to other agencies. GAO, groups of members from Congress, special audits by Congressional Committees, e.g., by the Senate Energy and Natural Resources ("Train Wreck Along the River of Money - An Evaluation of the Hanford Cleanup" March 1995), and others continue to severely criticize and search for ways to fix DOE and the system that got us where we are today. Exacerbating this dismal agency track record, are pressures from Congress and the Administration to balance the budget, reinvent better ways of doing things, do a major reorganization of the DOE, all this while steady and substantially reducing DOE's budget and personnel. Credibility appears to be at an all time low, while costs appear to be at an all time high. Paraphrasing Senator Murkowski's comment about the U.S. taking N. Korea's nuclear waste at taxpayer's expense... "I find it astounding that we apparently have the money to compound the problems at Hanford, but we lack the money to clean them up": Why add to this alleged disaster by seriously considering an option of "buying" 41 countries spent nuclear fuel back so we could nearly double the spent commercial fuel that we still don't know what to do with?

1265-22

Serious examination and independent review needs to be made of any Alternative 1 (U.S. disposal option) considerations that are considered by the DOE.

Rejection of any Alternative 2 recommendations at this public meeting or elsewhere also need to be critically examined by an outside, independent reviewer.

DOE is obligated to present a balanced, even handed review of the Draft EIS providing European and Japanese reprocessors and commercial nuclear power countries to assess their willingness to participate in implementing an all "foreign" solution to the proposed policy (Management Alternative 2).

At the minimum, unless DOE does serious due diligence on Management Alternatives 2 and 3 (separately), Congress should hold hearings to get the facts and establish a public record before DOE makes its Record of Decision. The final decision to hold such hearings can be made as soon as DOE identifies its preferred alternative in the Final EIS. For whatever reason(s), DOE appears to be on a course of trying to justify a decision that it has already made. Perhaps the overwhelming majority of the many, diverse and prestigious recent critics of DOE are close to the mark. We prefer to believe not and that DOE is equally interested and attempting to find the best solutions relative to each of the three management alternatives. We sincerely hope so!

1265-23

6

RESPONSE TO COMMENT
COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

Response to Comment No. 1265-18

The commentor's position that the United States is already viewed as an unreliable trading partner is noted. As evidenced by comments received from foreign research reactor operators concerning the draft EIS, the United States would be viewed as an unreliable trading partner if no action were taken to provide relief for foreign research reactor operators who have immediate disposition needs for their spent nuclear fuel. Section 1.1 of the EIS summarizes the history of support for foreign research reactors by the United States.

Response to Comment No. 1265-19

Reprocessing would not be an economic necessity for LEU or HEU, either in the United States or Europe. As used in the EIS, reprocessing in Europe or chemical separation in the United States would be a means of converting the spent nuclear fuel to a form more suitable for geologic disposal. The economic benefits of reusing the uranium and the enrichment services would not be insignificant, but they were not the basis for the alternative.

The least costly alternative is a hybrid involving reprocessing at Dounreay in the 1996 to 2008 period, chemical separation at the Savannah River Site (assuming concurrent operations with other programs) during the 1997 to 2003 period, and management at the Idaho National Engineering Laboratory. Since no other programs are currently envisioned to be using the chemical separation facilities in the period immediately after 2003, either the receipts after this period would be managed or the program would bear the full costs to operate a Canyon. In all cases, the management alternatives that involve receipt of the spent nuclear fuel by the United States include management at the Idaho National Engineering Laboratory.

The EIS does not address the costs of HEU to LEU conversions under the RERTR program as a component of the cost to the U.S. taxpayer under the foreign research reactor spent nuclear fuel program.

Response to Comment No. 1265-20

In terms of detailed cost data for options that were either addressed in less detail than might be possible or that were not described as possible options, the following points are relevant:

- Management of the spent nuclear fuel in the countries of origin would cost many hundreds of millions of dollars more than management of the fuel in the United States The two major non-shipping phases of the program — storage/chemical separation and spent nuclear fuel/high-level waste disposal — have very large economies of scale.

COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

6. PORT, TACOMA & REGION GET ALL THE RISKS AND COSTS BUT NO GAIN

Issue: Generally for anything to be mutually satisfactory, each of the parties have to perceive something of value. At the present time, here's what the balance sheet looks like from a local citizen's perspective:

Perceived Negatives (of Alternate 1 or 3 if Port of Tacoma is selected for shipping):

1. **NO NATIONAL IMPERATIVE! Nonproliferation arguments are unconvincing especially with apparent solution of all concerns via Management Alternative 2 (foreign option)** — *1265-24*
2. **Health and safety risks to workers and public** — *1265-25*
3. **Financial risk to business owners and employees if there's any kind of accident** — *1265-26*
4. **Financial drain and business disruptions, even without any accidents, from training, readiness, practice sessions, extra administration, extra security, false alarms, etc.**
5. **Financial losses due to increased negative image or stigma associated with farm produce or clean cargo co-located with "dangerous" radioactive spent fuel** — *1265-27*
6. **Contamination of shipping channels into/out of the Port due to cask lost @ >200 meters** — *1265-28*
7. **Security risks - Port becomes a target for terrorists, disgruntled people, pranksters**
8. **Crippling health, safety, environmental, and business costs if abnormal accident breaches** — *1265-26 (Cont'd)*
9. **Taxpayer costs are high and not justified by Draft EIS**
10. **Incomplete information in Draft EIS prevents assessment of life cycle costs, justifications**
11. **Philosophically opposed to "buying" problem from strong, nuclear allies who should help** — *1265-29*
12. **Distrust, fear -- don't know what to do with what we've got; why "buy" more**

Perceived Positives (of Alternate 1 or 3 if Port of Tacoma is selected for shipping):

1. **none - no jobs, increased business, quality of life, reduced nuclear threat, nothing!** — *1265-26 (Cont'd)*

RESPONSE TO COMMENT
COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

Any management alternative that substitutes tens of sites for the two or three in the EIS increases costs substantially. The EIS already addresses the practical, legal, political, etc. difficulties with such an approach. It did not address costs since desegregated storage/disposal was not considered economically plausible.

- All logistically realistic hybrids that involve chemical separation at the Savannah River Site and reprocessing at Dounreay cost about the same as the hybrid described in Management Alternative 3. Costs can be significantly reduced only through accelerated receipt of spent nuclear fuel at the Savannah River Site for chemical separation concurrently with materials from other programs and long-term usage of existing storage facilities at the Idaho National Engineering Laboratory. The reason more hybrids were not costed in great detail is that they all depend on the timing of the receipts at the Savannah River Site, the acceptability of concurrent operations and the use of marginal costing at the Savannah River Site, and the usage of existing facilities at the Idaho National Engineering Laboratory. Subject to constraints on the rate at which Dounreay can reprocess spent nuclear fuel, other issues (e.g., the split between United States and overseas management, between LEU and HEU, between aluminum-based fuel and TRIGA fuel, between developed countries and developing countries, etc.) would not substantially affect costs. The key cost drivers were fully and completely outlined in Appendix F. Uncertainties were treated separately.

Response to Comment No. 1265-21

The ratio of total metal to heavy metal in the aluminum-based spent nuclear fuel would be closer to 5 than to 8. The cost per kg of heavy metal using this conversion factor is misleading since parts of the non-spent nuclear fuel matrix (e.g., supports, tube ends) could be sheared off before reprocessing to reduce the total metal.

Response to Comment No. 1265-22

The Record of Decision for Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement issued on May 30, 1995 designates the Savannah River Site and the Idaho National Engineering Laboratory as management sites for domestic and foreign research reactor spent nuclear fuel. The Hanford Site was not selected.

Spent nuclear fuel from North Korea is not included in the proposed action (Tables 2-1 and 2-2 of the EIS), and would not be managed under any of the management alternatives (Sections 2.2.2.3 or 2.4 of the EIS).

7. "EVEN SMALL RISKS ARE TOO MUCH WITHOUT NATIONAL IMPERATIVE"

Issues: If there's no benefit for me, my business, my association, why take any risks -- no matter how small? 1265-26 (Cont'd)

If there's no benefit for the Greater Tacoma Area, why take any risks -- no matter how small?

If there's no national imperative, why take any risks -- no matter how small? 1265-29 (Cont'd)

If there are alternatives that accomplish virtually the same or better result without imposing risks on me or the region, why take any risks -- no matter how small? 1265-30

To the informed or even the uniformed observer, Management Alternative 2 (the foreign option) does not ship highly radioactive fuel into the Port of Tacoma and it does or can satisfy this Nation's nuclear nonproliferation objectives.

If Management Alternative 2 doesn't do it, Management Alternative 3 (hybrid option) certainly can. It too can avoid shipments to Tacoma because of the greatly reduced number of shipments. It should be possible to get a 70% to 90% reduction in DOE's Alternative 1 quantities. Note however, DOE uses an estimate of reducing the "basic Alternative {1}" only about 40%. We completely disagree with DOE's low reduction estimate. 1265-31

It's highly speculative whether or not the real risks have been adequately identified. Clearly the benefits of Management Alternative 2 have not been identified very well by DOE! 1265-32

Sometimes, "NIMBY" or Not In My Back Yard is justified. This is one of those times.

Acceptance of spent nuclear fuel from foreign research reactors would increase the existing spent nuclear fuel inventory by approximately one percent in mass and ten percent in volume (Section 2.2.1.3 of the EIS). As discussed in Section 4 of the EIS, foreign research reactor spent nuclear fuel could be safely managed at one or more of the interim management sites pending final disposition.

Response to Comment No. 1265-23

The basic purpose of this EIS is to provide an evaluation of environmental effects which would result from implementation of the proposed action and its alternatives. Implementation of Management Alternative 2 (overseas management, Section 2.3 of the EIS) would have no significant environmental impacts within the United States (Section 4.4 of the EIS). As discussed in Section 4 of the EIS, none of the policy options would, if implemented, result in significant benefits or risks to human health or the environment. DOE considers that overseas management and the hybrid alternative (Management Alternative 3) are discussed in enough detail to allow a decision maker to utilize this EIS in the decision process.

Response to Comment No. 1265-24

The commentor's support for overseas management of spent nuclear fuel from foreign research reactors is noted. Overseas management (Management Alternative 2) is discussed in Section 2.3 of the EIS. All of the management alternatives described in Section 2 of the EIS are intended to support nuclear weapons nonproliferation objectives of the United States. As discussed in Section 4 of the EIS, no significant benefits or risks to human health or the environment would result from implementation of any of the management alternatives.

Response to Comment No. 1265-25

Section 4.2 of the EIS demonstrates that health and safety risks to workers and the public at the Port of Tacoma would be low. No significant environmental risks were found to result from the implementation of the proposed action.

Response to Comment No. 1265-26

The commentor enumerates a number of perceived negatives if the Port of Tacoma is selected for shipping. Among these, financial risk from accidents, incident-free activities, and stigma associated with the shipping activities. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor fuel was accepted into the United States in the past. Under NEPA regulations, the

COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

8. ABNORMAL ACCIDENTS: "RISK ASSESSMENTS NOT IN SYNC WITH ANGRY FEW"

Issues: DOE performed this risk assessment based on the traditional principles of combining an estimate of the frequency at which such a situation is expected to occur with consequence estimates.

While this method of weighting the probability of an occurrence with the consequence estimates may be scientifically correct, the real issue for the people of Tacoma is "what happens if a major, even abnormal, severe breach of the fuel occurs in the vicinity of the Port or Tacoma's populated areas along the transportation routes."

The reason for understanding the worst case accident is simply one of prudent management and planning. The Valdez, Three Mile Island, Chernobyl, Oklahoma bombing, plane crash landing on the White House lawn, etc., accidents or events all had very low estimates of risks associated with them. However, when they occurred the probability of the occurrence went to 1 or 100%.

We simply want DOE to tell us what happens when the probability goes to 100% that a severe breach occurs in the spent fuel shipping cask while it's in a populated area. *1265-33*

We asked for this answer because of the "angry few" theory. We used to worry some about armed, vicious terrorists doing substantial harm to someone or something. Today, we've learned that unfortunately we've also got to take into account the angry or disgruntled few who, maybe without even knowing the full consequences of what they are doing, will do something unthinkable. Such was the Oklahoma bombing – unthinkable and extremely low risk – until it happened.

Drive around federal buildings today. You will see vehicle barriers being installed. Concrete blocks, "Jersey" barriers, and in DC., even large potted reinforced concrete "potters" around the Capitol and the White House. Pennsylvania Avenue may have to be renamed because these "potters" now block or interrupt the Avenue.

All we know today is the consequences of a major breach of the spent fuel cask are "very severe." Mr. Patrick Schwab, Science Applications International Corporation, provided that qualitative assessment at the May 22, 1995 public meeting with DOE. Mr. Schwab was one of the principals who wrote the Draft EIS under contract to DOE.

Rough extrapolated estimates of the consequences of a high level waste cask breach were approximated in the Draft EIS. The estimate was made for high level waste (vitrified?). It was assumed that only 0.000001 or 1 part per million of the radioactive material would be released from its packaging, 5 percent of the aerosolized release was respirable, and a buoyant plume rise resulted from an assumed fire. The worst (urban) case resulted in 970 person-rem and 0.48 LCF consequence for the population, and a dose of 0.29 rem and a 0.00015 LCF consequence for the maximum exposed individual. Estimates of the radioactive releases from breaches in spent nuclear fuel casks are estimated in the next issue paper. *1265-34*

RESPONSE TO COMMENT
COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

socioeconomic effects evaluated for this EIS do not include those associated with psychological fear of receiving spent nuclear fuel, such as those enumerated by the comment.

The commentor cites crippling health, safety, environmental, and business costs if abnormal accidents should occur. Several accident scenarios, including severe accidents were analyzed during preparation of the EIS. Results of the accident analysis at the ports are given in Section 4.2.2 of the EIS with supporting detail in Appendix D, Section D.5. No catastrophic effects were found to result from severe accidents involving foreign research reactor spent nuclear fuel.

Response to Comment No. 1265-27

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Section 4.2.1.3 of the EIS has been modified to include this assurance of recovery in coastal waters. Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

Response to Comment No. 1265-28

See the 4th and 5th paragraphs of the response to Comment 1265-1, above.

Response to Comment No. 1265-29

Many of the foreign research reactor operators have no immediate means for disposition of their spent nuclear fuel, including research reactors operated by our close allies (Section 1.2 of the EIS). Thus the intent of the proposed action is to provide foreign research reactor operators with a limited period of time to arrange for disposition of their spent nuclear fuel outside of the United States, while avoiding research reactor shut downs and encouraging the continued use of or conversion to LEU fuel (Section 1.2 of the EIS). It is in the national interest of the United States to do so because it reduces the risk of weapons-grade materials falling into the hands of nations that would seek to develop a nuclear weapons capability.

Response to Comment No. 1265-30

The EIS evaluates environmental effects that would result from four basic policy alternatives. Sections 2.2 through 2.5 describe these policy alternatives and the advantages and disadvantages for implementation of each option. As discussed in Section 4 of the EIS, implementation of the proposed action would pose no significant risks to human health or the environment. Thus, there is no environmentally preferred alternative, and the Record of Decision for this action will be based on non-environmental considerations.

COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

9. "RELEASE FRACTIONS FROM SPENT NUCLEAR FUEL 'ABNORMAL' INCIDENT APPEAR UNREALISTICALLY LOW"

Issue: A worst case "credible" accident is not the same as a worst case incident. A worst case incident can assume sabotage and other forms of human intervention, unlikely but possible accidents (like long term, high temperature ship board fires), and combinations of the two. Despite repeated questions of the DOE, including a letter to Mr. Charles Head by the Port, there still is not an adequate answer to the question of what are the consequences to Tacoma area citizens and the environment from a severe breach of the cask and fuel rods, i.e., a breach that substantially exceeds the design limits of the cask such as a fire, with air flow, that raises the spent fuel temperatures well above 1,160 degrees Fahrenheit for a period of hours?

DOE has analyzed release fractions from spent nuclear fuel in its Draft EIS (Table E-6, page E-44) for worst case "credible" accidents. However, the release fractions appear low for any fire that substantially exceeds the cask and spent fuel design limits or a combination of fire and explosion. Such releases are based on what appear to be minor breaches in the integrity of the spent fuel shipping cask. DOE has not responded to the question of what happens if a major breach occurs, i.e., shipboard fire of such intensity and duration that the shipping cask design limits are substantially exceeded? Worst case "credible" release fractions in DOE's Draft EIS are:

Substance	Aluminum Clad Fuel	TRIGA Fuel
Inert Gas	63%	63%
Iodine	0.006%	4.3%
Cesium	0.001%	0.2%
Ruthenium	0.00024%	0.048%
Particulate	0.00001%	0.002%

While these releases are higher than for the case of vitrified high level waste reported earlier, they remain based on a worst case "credible" accident.

The Port of Tacoma Commissioners and others are interested in knowing what the consequences are of "abnormal" radioactive releases, e.g., say 50% releases or many orders of magnitude higher than the above "credible" range, for a single shipping cask at the Port of Tacoma carrying an average load of spent fuel elements from the foreign reactors.

1265-34 (Cont'd)

10

RESPONSE TO COMMENT
COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

Response to Comment No. 1265-31

The commentor's preference for any management alternative that would avoid shipments through the Port of Tacoma, is noted.

As discussed in Section 4.5 of the EIS, the hybrid alternative that was used as an example in the EIS (Section 2.4 of the EIS) would require approximately 63 percent of the number of shipments required under the basic implementation of Management Alternative 1 (a 37 percent reduction). Other hybrid alternatives, not specifically evaluated in the EIS, may require a higher or lower number of shipments depending on the scenario.

Response to Comment No. 1265-32

DOE considers that the real risks have been adequately identified, estimated, and presented in Chapter 4 of the EIS. The benefits of Management Alternative 2 are discussed along with other policy considerations in Sections 2.3 and 4.4.2.1 of the EIS.

Response to Comment No. 1265-33

The commentor's opinion that the DOE's risk assessment is scientifically correct, but still inadequate, is noted. The commentor's focus on the consequences of what happens if scenarios is also noted.

Appendix D, Section D.5.4.3.2 of the EIS presents the risks of a very high temperature fire that engulfs a cask, which was part of a sensitivity study on release fractions. In addition, Section D.5.9 has been added to Appendix D of the EIS to address the issue of attack by an angry few disgruntled persons or terrorists.

Response to Comment No. 1265-34

CEQ regulations and guidance do not require a worst case analysis of accidents in an EIS. For the purpose of analysis in this EIS, there is no such thing as a worst case scenario, because for any worst case that is postulated, a still more severe accident can be postulated by adding one more drum of gasoline, one more wrecked rail car, one more terrorist, etc. In addition, for each assumption that is made to make a postulated accident more severe, the probability of the accident becomes smaller. The EIS does not contain a worst-case scenario, but a broad range of port accident scenarios, including severe accidents, is discussed in Section 4.2.2.3 of the EIS. Appendix D, Section D.5.4.3.2 of the EIS presents the risks of a very high temperature fire that engulfs a cask, which was part of a sensitivity study on release fractions.

COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

10. WHERE'S THE DOE ANALYSIS OF THE WORST DISASTER CASE?

At the public meeting on May 22, 1995 the Port Commissioners repeatedly asked the question of Mr. Edward Fei (DOE), Mr. Patrick Wells (DOE), and Mr. Patrick Schwab (SAIC) as to what would be the consequences of a serious breach of the shipping cask in a populated area.

No substantive answer was provided, although DOE did commit to respond in writing as soon as they got back to DC As of June 13, no response has been received from DOE. Consequently, a follow-up fax was sent to DOE's offices (Mr. Charles Head) on Monday afternoon, June 12 to apprise him of our serious interest in receiving a DOE response to the Commissioners' question.

1265-35

RESPONSE TO COMMENT
COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

Response to Comment No. 1265-35

DOE responded to the question in a fax dated June 16, 1995. Also see the response to Comment 1265-33, above.

RESPONSE TO QUESTION RAISED DURING THE MAY 22 PORT OF TACOMA COMMISSIONER'S MEETING
June 16, 1995

QUESTION: What is the estimated effect of released radiation on humans and the environment should a shipping cask and the spent fuel rods contained therein be severely breached* in the vicinity of the Port of Tacoma?

- Discussion at the meeting covered a range of "breaching" mechanisms including shipboard, storage or transportation fires in the vicinity of the harbor, dock or Tacoma transportation routes that substantially exceeded the design limits of the shipping casks; explosions resulting from hazardous cargo transported to/from the Port or handled at the Port, and acts of terrorism or revenge by terrorists or disgruntled persons, respectively.

ANSWER:

1. Port accidents are discussed in the *Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel* (the draft HIS) in Section 4.2.2.3 of Volume 1, and in Appendix D. The consequences of credible port accidents are discussed starting on page 4-21. The most severe credible accident is a cask breach followed by a Category 6 fire that engulfs the shipping cask. This fire is not hot enough and long enough to raise the fuel temperature up to the point (about 1,160°F) at which the TRIGA fuel would burn and the aluminum-based fuel would melt. However, this accident is defined to include long duration airflow surrounding the cask. The accident which breaches the cask would be expected to also breach the spent fuel cladding and allow some of the fission products in the spent fuel to escape, while the air flow would disperse these fission products.

   An Oklahoma-type bomb explosion right next to a cask would be less severe (radiologically) than an accident involving a Category 6 fire because there would be no long duration air flow surrounding the cask. Thus, even if the spent fuel cladding were damaged, there would be no mechanism to disperse any radioactive material released. The explosion would probably move the cask laterally, and perhaps, depending on the strength of the explosion, breach the cask, and break some of the cladding on the spent fuel. However, there would be no fire to drive radioactive material up into the air. Furthermore, the spent fuel would probably still be in the cask and the cask's shielding.

2. The Port of Tacoma question also requested that DOE assume the accident occurs at the worst of three possible locations (in the vicinity of the harbor, dock or Tacoma transportation routes). The port analysis in the draft HIS covers the first two locations. The HIS does not contain such analysis for specific points on Tacoma transportation routes because the ground transport calculations are based on summations of the total risk to the public along the entirety of representative routes. Specific individual locations for ground transport accidents were not selected and airborne dispersion calculations from those points have not been performed.

COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

The consequences of an accident followed by Category 6 fire in the vicinity of the harbor and at the dock for the Port of Tacoma are presented in Table 4-6 on page 4-22 of Volume 1. The consequences are worst if the accident occurs at the dock. In this case, the consequence is estimated to be 0.8 latent cancer fatalities. This means that, if the accident occurs, there would be an 80 percent chance one additional cancer would occur among all the people exposed to the radioactive material. The chance of two additional cancers occurring among all the exposed people would be significant, but lower than 80 percent.

These calculations were based on the unrealistic assumption that people do not evacuate the area.

3. We further understand that the Port of Tacoma is interested in the consequences of accidents that would be even more severe than those discussed in the draft EIS. We have performed calculations on such an accident and we present the results here, but we wish to emphasize that we consider that this accident scenario is not credible. The scenario that we analyzed is simply that a full cask load of thirty of the hottest possible spent nuclear fuel elements is sitting on a dock, with no cask around it. We also ignored not only the effects of any shielding from dock structure, surrounding buildings, equipment or other materials, but also the effect of self-shielding (i.e., spent fuel elements in front block radiation from any spent fuel behind them). Thus, the calculation unrealistically assumes that there is no shielding of any kind and that anyone in the area would be exposed to direct radiation from all of the spent fuel.

The calculations show that, in this unrealistic case, the dose rate on contact with the spent fuel would be on the order of hundreds of thousands of rem per hour. Anyone exposed at this unrealistic rate would probably die within an hour or two. However, the radiation dose rate would decrease with distance, so that, even in this unrealistic case, at about 6/10 of a mile (one kilometer) away from the unshielded spent nuclear fuel, the dose rate would be down to 10 mrem/hr. This dose rate was selected because it is the regulatory limit for anyone standing two meters away from a truck carrying a cask of spent nuclear fuel under normal conditions. In effect, the cask provides the same shielding as about a kilometer of air.

RESPONSE TO COMMENT
COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

11. U.S. OPTION (ALTERNATIVE 1) RELIES TOO MUCH ON ADMINISTRATIVE CONTROLS

Excluding medical diagnostics, the radiation limit from man-made sources for the general public is 100 millirem per year. In contrast radioactive materials workers' limit is 5,000 millirem per year. The best estimate of the radiation field at about 2 meters distance is about 2 millirem. Therefore a truck driver who exceeds 50 hours of driving/traveling time will exceed the maximum licensed exposure limit of 100 millirem. DOE plans to use "administrative controls" to regulate and monitor the exposed workers.

Administrative controls should be used as the last resort in situations like this. Administrative controls should be accompanied by personnel dosimeters to permit individual monitoring, especially as one approaches closer to the license limit.

1265-36

Response to Comment No. 1265-36

Personnel dosimeters would permit individual monitoring of onsite radiation workers and truck drivers for radiation exposure. The use of such personnel dosimeters is generally part of an administrative controls system.

COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

12. MORE WORK NEEDS TO BE DONE ON THE 'FOREIGN' ALTERNATIVES #2 AND #3

Issue: The 'bring it all back to the U.S.' case (Alternative 1) was analyzed in substantial detail. The alternative cases involving all or partial foreign solutions were analyzed less thoroughly. For example in the Summary, page S:

1. ***"Currently, overseas reprocessing results in separated HEU that is placed back into commerce for use as new reactor fuel."*** — 1265-37

Nothing is mentioned about potential changes in this current policy to one that is proliferation-proof, i.e., tri-party agreements (U.S., foreign reprocessor, reactor owner) that requires the High Enriched Uranium to be diluted to Low Enriched Uranium before it is shipped back to the foreign reactor.

2. ***"The overseas reprocessing facilities (e.g., Dounreay in Scotland) currently do not have the capability to reprocess the high-density LEU fuels that the United States is encouraging foreign research reactors to use to replace the HEU fuels."*** — 1265-38

A phone call to the Dounreay facilities in Scotland indicated that a) the Dounreay facilities can handle <u>now</u> the bulk of the HEU fuels and with modifications or added facilities could handle all of the HEU fuels (including the TRIGA fuel rods), and b) with modifications or added facilities could handle the high-density LEU fuels that the U.S. is encouraging foreign research reactors to use to replace the HEU fuels!

3. ***"Thus, any foreign research reactor that wishes to use reprocessing to control its inventory of spent nuclear fuel must continue to use, or convert back to, fuel containing HEU."*** — 1265-39

Not true. A short term storage solution needs only to be found to allow Dounreay or any other foreign reprocessor (others in the UK, France, or Japan) time to make the necessary modifications to their reprocessing facilities. In the interim the storage solutions include, at least, the foreign countries with the research reactors, one or more of the seven countries having major commercial nuclear power programs and existing spent fuel storage areas (Canada, France, Germany, Japan, Sweden, Switzerland, UK), and the potential reprocessors (France, Japan, and the UK).

4. ***"For most foreign research reactor operators, construction of a new storage facility would not be practical due to the very high cost of storing small amounts of spent nuclear fuel and the long time required to design, license, and construct facilities."*** — 1265-40

The U.S. commercial reactor operators are facing the same problems: either shut down needed nuclear electrical power generators, construct new storage facilities, or ship their spent nuclear fuel offsite for storage and ultimate disposal. The best short term and long term solution is for the U.S. to help the foreigners find a foreign solution while the U.S. is helping the U.S. reactors find a U.S. solution!

15

RESPONSE TO COMMENT
COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

Response to Comment No. 1265-37

As discussed in Section 2.3 of the EIS, certain arrangements in support of U.S. nuclear weapons nonproliferation policy would have to be established with the foreign reprocessors and research reactor operators before overseas reprocessing could be implemented with U.S. assistance. These could include steps such as blending the HEU down to LEU, developing the capability to reprocess high-density LEU spent nuclear fuel, and converting the research reactors to the use of LEU. There is no guarantee that such arrangements can be worked out, but DOE and the Department of State are discussing these issues with the appropriate parties.

Response to Comment No. 1265-38

DOE acknowledges that the Dounreay Site has the capability now to reprocess the bulk of the existing inventory of foreign research reactor spent nuclear fuel. The current lack of capability applies to the new high-density LEU fuel made of a uranium-silicon-aluminum alloy. As stated in Section 1.1 of the EIS, it is not clear whether the modifications necessary to reprocess this new fuel will be installed at the Dounreay Site.

Response to Comment No. 1265-39

The sentence cited by the commentor has been revised in response to this comment and also in response to Comment 311-4, above.

Response to Comment No. 1265-40

The commentor's preference for Management Alternative 2 is noted again. The disadvantages of overseas storage are discussed briefly in the Summary, and more thoroughly in Sections 2.3 and 4.4.1 of the EIS.

As discussed in Section 1.2 of the EIS, it is in the self interest of the U.S. to implement the proposed action as a means of reducing and eventually eliminating the use of highly-enriched (weapons-grade) uranium in civil programs worldwide. No such considerations apply to the storage of spent nuclear fuel from domestic U.S. nuclear power plants.

Comments on the US Department of Energy

Draft Environmental Impact Statement
on a
Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

I. The Department of Energy (DOE) used outdated information on the Port of Tacoma. The DEIS lists only one terminal through where these shipments would potentially be shipped. The Port of Tacoma has 6 Container Terminals. The map displayed in the DEIS is incorrect in that the configuration of these terminals is shown in a state in existence in the year 1980 or before. On-dock rail yard configurations are not shown at all and waterways are shown incorrectly. Similar mistakes are made for the Port of Seattle map.
Given these errors in analyzing facilities for handling these shipments there certainly is no guarantee that the nearby population centers were shown correctly and evaluated correctly. In addition transport routes in the Port area may also be incorrect. 1265-41

II. DOE described in the DEIS that it would be very difficult or impossible to recover fuel casks from depth greater than 200 meters in case of an accident. The DEIS states that those depths are only found in the ocean. DOE did not correctly research this matter since there are several areas in the Puget Sound region showing water depth of over 200 meters in major shipping lanes to and from the Port of Tacoma. 1265-42

III. Commencement Bay and the Port of Tacoma are located in a federally designated Superfund site. This site is on the National Priority list for cleanup under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Over two hundred million dollars have and will be spent in efforts to clean up this environmentally sensitive area. DOE did not recognize that the shipment of nuclear materials would contribute to the "Dirty Port " stigma. 1265-43

IV. DOE did not properly evaluate and determine the impact of a severe fire or explosion involving a shipping cask of nuclear spent fuel, which would cause severe damage and have long-term effects on a large area near the disaster site. Further more the effects of crippling many businesses in the area effected was also not determined. 1265-44

V. DOE did not adequately address the security requirements for these shipments. This material is useable in nuclear weapons and therefore highly attractive to terrorists. Proper security measures to counter possible acts by terrorists were not provided for in the DEIS. 1265-45

VI. DOE did not properly address first response capability of the local fire and emergency agencies in case of a shipping cask breach and the spread of radiation from the accident site. No provision were made in the DEIS for upgrading and training of local first response teams. 1265-46

IL

Response to Comment No. 1265-41

Updated information of the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS.

Besides the known outdated information on the Port of Tacoma, DOE is unable to address the commentor's concern about inaccurate information on the Port of Seattle without knowing which information the commentor feels should be included.

Response to Comment No. 1265-42

See the response to Comment 1265-27, above.

Response to Comment No. 1265-43

The acceptance of foreign research reactor spent nuclear fuel through the Port of Tacoma would neither affect the activities being conducted in Commencement Bay as a result of being a Superfund Site, nor would it add any additional burden to this designation. The transport of the foreign research reactor spent nuclear fuel on the Bay would not add any hazardous material to the Bay or the environment. DOE has added a sentence to Appendix D, Section D.2.1.9 of the EIS recognizing the designation of the Commencement Bay as a Superfund Site. The notion that the spent nuclear fuel shipments, but not other more hazardous material shipments, passing through the Port of Tacoma would add to the designation stigma is an unjustified fear. The analysis of impacts, as documented in Section 4 of the EIS, shows that there would be no significant adverse impacts on the port, people, or natural environment from shipments of foreign research reactor spent nuclear fuel through any of the ports of entry.

Response to Comment No. 1265-44

See the response to Comment 1265-3, above.

Response to Comment No. 1265-45

See the 4th and 5th paragraph of the response to Comment 1265-1, above.

Response to Comment No. 1265-46

See the response to Comment 1265-2, above.

COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

VII. DOE did not analyze the effects of an accident classified as a disaster on the local area infrastructure and population. *1265-47*

VIII. DOE did not address effects and costs incurred in the local area should an accident occur. *1265-48*

XI. DOE fully ignored fairness and equity issues by selecting smaller Ports. *1265-49*

RESPONSE TO COMMENT
COMMENTOR NO. 1265: PORT OF TACOMA (CONT'D.)

Response to Comment No. 1265-47

See the response to comments 1265-33, -34, and -35 above.

Response to Comment No. 1265-48

The EIS contains an analysis of the risk of accidents at the potential ports of entry (Section 4.2.2.3), along the ground transport routes (Section 4.2.3.3), and at the management sites (Section 4.2.4.3 and Appendix F, Section F.4). In all cases, the risk was found to be low. Furthermore, DOE would not expect that the local population would incur any cost in the case of an accident.

Under the Price-Anderson Act, DOE would indemnify contractors for public liability with respect to spent nuclear fuel if there is a nuclear incident, as defined under law. In pertinent part, a nuclear incident is one that causes, for example, injury or sickness or property damage, resulting from radioactive, toxic, explosive, or other hazardous properties of the material. DOE does provide funding to States and Tribes, as described in Section 2.7.3.1 of the EIS, for transportation related issues. Such funding can enhance a jurisdiction's emergency management and planning capabilities.

Response to Comment No. 1265-49

The Port of Tacoma was one of ten ports that has been determined to be acceptable to receive the foreign research reactor spent nuclear fuel, if the material is to be accepted into the United States. Population of the port and surrounding areas is one of the considerations of the port selection criteria, and one of the reasons some other more populous ports were not included in the final list of ports. It should also be noted that the 1993 National Defense Authorization Act requires that low port population be a criteria for port selection for the receipt of foreign research reactor spent nuclear fuel. The population criteria for port selection (Criterion 5) is discussed in more detail in Appendix D, Section D.1.9.5 of the EIS.

COMMENTOR NO. 1274: PORT OF ANACORTES

PORT OF ANACORTES
FIRST AND COMMERCIAL AVENUE · P.O. BOX 297 · ANACORTES, WA 98221 USA
(206) 293-3134 · FAX (206) 293-9606

July 18, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
US Department of Energy
1000 Independence Avenue
Washington, DC 20585

Dear Mr. Head:

As an elected body, the Port of Anacortes Commission is responsible for the health, safety, security, efficiency and economic viability of our Port District, as well as the thousands of people employed by businesses that operate in and around our state's waterways. It is with these responsibilities in mind that the Port of Anacortes Commission unanimously supports the opposition of the Port of Tacoma's listing as a possible port of entry for spent nuclear fuel from foreign research reactors.

The Port of Tacoma should not be required to accept spent nuclear fuel shipments. 1274-1

The Port of Anacortes has joined the Port of Tacoma in opposing the proposed shipments. There is simply no demonstrable benefit to the Port of Tacoma or the community it serves. Indeed, the proposal contains a number of drawbacks including risks to the health, safety and well-being of workers, the general public and the environment. From the standpoint of Port operations, receiving the shipments would place unacceptable burdens on the Port related to costs, scheduling, security and interruption of regular commerce.

In addition, the training and equipment costs related to preparing the Tacoma Fire Department to deal with the possibility of an accident involving spent nuclear fuel would, in effect, be an unfunded federal mandate placed upon the taxpayers of Tacoma. 1274-2

Furthermore, the Department of Energy has never fully addressed the risks posed by shipboard fire. Although the draft EIS states that the shipment casks have been tested to withstand fires that reach temperatures as high as 1,160 degrees and lasted much longer that 30 minutes, DOE has never clearly stated what the results would be if a fire were to breach a cask and airborne radioactive smoke, steam and dust escaped into the environment. This worst-case scenario must be thoroughly investigated and a credible answer must be provided. 1274-3

In addition to the real problems these shipments would cause, there is the issue of perception. The Port of Tacoma and the citizens of the Tacoma - Pierce County area have indicated that they are particularly sensitive to the stigma these shipments would attach to the community. 1274-1 (Cont'd.)

Federal, state and local governments have spent millions of dollars to clean up a number of contaminated sites in and around Commencement Bay. The community is just now beginning to reap the benefits of cleanup efforts. Shipments of spent nuclear fuel would jeopardize the progress that has been made in cleaning up both the environment and the image of Tacoma - Pierce county.

RESPONSE TO COMMENT
COMMENTOR NO. 1274: PORT OF ANACORTES

Response to Comment No. 1274-1

The Commissioners of the Port of Anacortes' opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Candidate ports were chosen from among commercial and military ports along the eastern seaboard, western seaboard, and the Gulf of Mexico. The selection process is described in Appendix D, Section D.1 of the EIS. No significant human health, safety, or environmental risk were found to exist at any of the candidate commercial or military ports selected (Section 4.2.2 of the EIS). Spent nuclear fuel from foreign research reactors is shipped in standard containers, and does not require special handling techniques (Section 2.6.3.2.2 of the EIS) or additional security beyond that required by NRC regulation (which can readily be provided in any of the commercial or military ports). No special precautions are required by the U.S. Coast Guard (Section 2.6.3.2.2 of the EIS).

The benefit to the citizens of the United States from the proposed action, including those in potential ports of entry, along transportation routes, or near potential management sites, is less risk that weapons grade uranium from civil programs could be diverted into the production of nuclear weapons that might be used against us or our allies. On the other hand, the analyses recorded in the EIS (Section 4) demonstrate that the risks from the proposed action are low.

Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma as noted by the commentor. Nor should it contribute to any dirty port stigma because the analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Based on over 30 years of experience shipping spent nuclear fuel, DOE considers that spent nuclear fuel transportation casks passing through the Port of Tacoma, Commencement Bay, or any other port or waterway would not affect air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' status with respect to their clients. This belief is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States

COMMENTOR NO. 1274: PORT OF ANACORTES (CONT'D.)

Page Two
Mr. Charles Head, Office of Spent Nuclear Fuel Management (RW-37)

But concern over this issue goes far beyond the desire to prevent these shipments from passing through the Port of Tacoma. While the Commission supports the goals of nuclear nonproliferation, careful research and consideration has led to the conclusion that Alternative 1, as presented in the Draft EIS, is not the best, safest, fastest, most economical way to achieve those goals. 1274-4

The Commission strongly urges DOE to reconsider Alternative 2. We believe Alternative 2 will achieve the goals of nuclear nonproliferation faster, at a lower cost and with less risk to the environment, the health of US citizens, and the economies of communities along possible transportation routes within the US. 1274-5

The draft EIS does not dispute the fact that Alternative 1, which is clearly favored in the Draft EIS, would cost nearly $1 billion more than Alternative 2. Even more alarming is the fact that the costs for upgrades to DOE facilities and equipment are not charged against the storage and treatment of the fuel in modernized US facilities. Consequently, the costs of Alternative 1 could spiral to well over $1 billion more than Alternative 2 (see footnote, page F-269 DEIS). Indeed, the Draft EIS states that the cost of Alternative 1 could be 5 to 10 times greater than Alternative 2. 1274-4 (Cont'd)

There is no evidence in the Draft EIS that the foreign reprocessing option has a significantly higher nonproliferation risk than storing the fuel in the US, provided bilateral agreements can be reached to assure that the High Enriched Uranium is diluted to Low Enriched Uranium. 1274-5 (Cont'd.)

While the Draft EIS does discuss upgrading US storage and reprocessing facilities, there is no evidence that DOE explored upgrading overseas storage and treatment facilities (e.g., Dounreay, Scotland). By not fully analyzing Alternatives 2 and 3, DOE has demonstrated a lack of fairness and due diligence which tends to discredit the Draft EIS. It may also provide grounds for successful technical challenges.

In the event that DOE determines that Alternative 1 will be a significant part of its foreign spent fuel policy, the Commission urges you to consider staging the fuel in secure, temporary overseas storage facilities. At periodic intervals the fuel could be shipped to the US through military ports by properly trained personnel under appropriate security conditions. Carefully controlled overland transportation through minimally populated corridors could bring the fuel to its final destination. Although this approach would keep the fuel out of the Port of Tacoma, we believe it is inferior to the more permanent solution achievable under Alternative 2. 1274-6

Thank you for the opportunity to communicate our opposition to the Port of Tacoma's listing as a possible port of entry for spent nuclear fuel shipments and to comment on the Draft EIS. We look forward to seeing a Final EIS that addresses the deficiencies described in this letter and the attachments.

Sincerely,
The Commissioners of the Port of Anacortes:

Francis Barcott, President
Ken Moore, Secretary
[illegible], Vice President
Merrill Thibert, Commissioner
Richard T. Nelson, Commissioner

cc: Port of Tacoma Commissioners

RESPONSE TO COMMENT
COMMENTOR NO. 1274: PORT OF ANACORTES (CONT'D.)

in standard shipping containers that would require no special handling or precautions. As such, there should be no adverse commercial or economic reaction to the use of the port. Historically, there were no significant adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

Response to Comment No. 1274-2

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Response to Comment No. 1274-3

The fire scenario that the commentor is referring to has been analyzed in the EIS. The details of the analysis is documented in Appendix D, Section D.5.4.3.2 and Attachment D5, of the EIS. The results indicate that the risk associated with an on-board ship severe fire is very small (See Table D-39 of Appendix D).

Response to Comment No. 1274-4

The commentor's assessment that Management Alternative 1 (management of foreign research reactor spent nuclear fuel in the United States) is not the best, safest, fastest, and most economical way to achieve the goals of nuclear weapons nonproliferation, is noted. Management Alternative 1 is described in Section 2.2 of the EIS.

Response to Comment No. 1274-5

The commentor's preference for Management Alternative 2 is noted. This alternative is discussed in Sections 2.3 and 4.4 of the EIS. As to the nuclear weapons proliferation risks under Management Alternative 2 versus Management Alternative 1, Section 4.8.1 addresses the amount of HEU that would be removed from commerce under each of the alternatives and compares the risks of diversion of the material under each alternative. As for the commentor's concern that DOE did not fully analyze Management Alternatives 2 and 3, DOE considers that the analysis of the alternatives in the EIS fully complies with the requirements of NEPA.

Response to Comment No. 1274-6

As discussed in Appendix D, Section D.1 of the EIS, both commercial and military ports were evaluated. Environmental effects of Management Alternative 1 and 3 at candidate commercial and military ports were evaluated and found to be low (Sections 4.2.2 and 4.5 of the EIS). There is no basis to prefer commercial or military ports based on environmental consequences. As discussed in Appendix D, there is no environmental basis for preferring military vessels to commercial vessels.

Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the spent nuclear fuel transportation casks would be low. No special handling or loading/unloading procedures would be required for the foreign research reactor spent nuclear fuel when it is contained in approved shipping containers; experience with handling containers is sufficient. Therefore, no special training of longshoremen is required.

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security measures employed at any port would meet or exceed all the security requirements in the Code of Federal Regulations (10 CFR Part 73). DOE supports these regulations as being adequate to protect the foreign research reactor spent nuclear fuel in any commercial port. If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

Appendix H has been added to the final EIS to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

COMMENTOR NO. 1274: PORT OF ANACORTES (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 1274: PORT OF ANACORTES (CONT'D.)

The Port of Anacortes Commission's preference for Management Alternative 2 is noted.

Response to Comment No. 1274-7

With respect to the comments on costs, the following comments are material:

- Management Alternative 1 is distinguished from Management Alternative 2 on the basis of the site of the activities. Storage or chemical separation in the United States would not cost $1 billion more than storage or reprocessing outside the United States. Storage and disposal in the individual countries would be the most costly alternative, as described in the final EIS.

- Chemical separation of foreign research reactor spent nuclear fuel at the Savannah River Site would take place only if a Canyon (H or F) were in operation (at least during the 1997 to 2003 period) pursuant to other requirements. Restarting one or more canyons under the Interim Management of Nuclear Materials EIS is considered possible. In this case, the foreign research reactor spent nuclear fuel program would bear only the marginal costs of additional processing during the period of concurrent operations and the full cost during any subsequent period. Using the IMNM EIS as a reference, the period of concurrent operations would be 1997 through 2002 or earlier. Processing on a stand-alone basis without a period of concurrent operations is economically infeasible. Processing on a stand-alone basis after concurrent operations is possible. Under no circumstances would the foreign research reactor spent nuclear fuel program be the cost driver for upgrades. Only in the pure stand-alone mode, would foreign research reactor spent nuclear fuel be the cost driver for operations. All costs in the EIS were based on the marginal effect of the foreign research reactor spent nuclear fuel, not the average effect.

COMMENTOR NO. 1275:
JERRY RUBIER, MAYOR, CITY OF RIO VISTA

CITY OF RIO VISTA

One Main Street P.O. Box 745 RIO VISTA, CALIFORNIA 94571-0745

July 17, 1995

COUNCIL
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FIRE CHIEF
Keith Tadewald
PUBLIC WORKS SUPT.
Donald DeSilva

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department Of Energy
1000 Independence Avenue
Washington, D.C. 20585-0001

Dear Mr. Head:

The City of Rio Vista cannot support the selection of the Concord, California Naval Weapons Station as a port of entry for foreign reactor nuclear waste. The Environmental Impact Statement prepared in connection with this proposal is inadequate in that it lacks information needed for local review and support. First, there is no description of the incoming forty miles of waterway between the Pacific Ocean and the port, an area containing five major bridges and subject to heavy ship and recreational boat traffic. Second, the use of State Highway 12 as a truck route for spent fuel has not been addressed. This highway is the only way in and out of Rio Vista and has a high occurrence of accidents. Its use as such a truck route would increase the risk of hazardous material exposure to the citizens of Rio Vista and the surrounding area. Third, the impact statement fails to consider the likelihood and consequence of an earthquake. The elaborate fault structure found in this area and the resulting high earthquake potential has not been carefully considered in connection with the proposed use of the Concord location. 1275-1

The public does not fully understand the complexities of nuclear waste transport, and the inadequacy of the Environmental Impact Statement makes it impossible for the Council to fully assess the risks associated with the occurrence of this activity in or near our community. It is, therefore, respectfully requested that you eliminate Concord from consideration as a port of entry for foreign spent nuclear fuel. 1275-2 1275-3 1275-1 (Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 1275:
JERRY RUBIER, MAYOR, CITY OF RIO VISTA

Response to Comment No. 1275-1

The physical constraints of the passage from San Francisco Bay to Concord NWS was considered as part of the port selection process and did not alter the determination that it meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (Appendix D, Section D.1.9.2). Appendix D, Section D.5.3.1.3 presents a discussion of the determination of the probability of ship accidents used in the EIS. In regard to the size of vessels, increased volumes of hazardous cargos, say gasoline, would not change the accident consequences because the most severe accidents analyzed already assumed a collision with a tanker and that the resulting fire was not limited by quantity of fuel available (Attachment D5 to Appendix D).

DOE does not agree that the draft EIS is inadequate for evaluating the risks associated with the use of the Concord NWS. The EIS considers that the incident-free impacts would be negligible (Section 4.2.1.2 of the EIS) and the accident risk to the health and safety of potentially affected populations around the Concord NWS and along the routes to the management site(s) is low (Section 4.2.1.3).

Response to Comment No. 1275-2

DOE has not yet selected ground transportation routes, or transport modes for the foreign research reactor spent nuclear fuel. If the Concord NWS is selected, then DOE would choose the best route to I-680 in accordance with Department of Transportation regulations (49 CFR Part 397.101 (a)(2)). That route could use Route 4, Route 24, Route 12, and/or Waterfront Road. These are the local Concord streets that the trucks would probably use. The State of California routing agency can designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103.

Response to Comment No. 1275-3

The EIS evaluates the risk associated with marine and port activities and ground transportation in Section 4.2 of the EIS. The impacts are evaluated for both incident-free and accident conditions. Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation

COMMENTOR NO. 1275:
JERRY RUBIER, MAYOR, CITY OF RIO VISTA (CONT'D.)

July 17, 1995
Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
Page 2.

Sincerely,

JERRY RUBIER
Mayor

cc: Congressman Fazio

Hazel R. O'Leary
Secretary of Energy

Board of Supervisors
Contra Costa County

JR:vs

RESPONSE TO COMMENT
COMMENTOR NO. 1275:
JERRY RUBIER, MAYOR, CITY OF RIO VISTA (CONT'D.)

casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident and thus effect the probability of such accidents, however, the number of earthquake-induced ship and road accidents is small compared to other causes.

Commentor No. 1275:
Jerry Rubier, Mayor, City of Rio Vista (Cont'd.)

RESOLUTION NO. 95-36

RESOLUTION OPPOSING THE USE OF CONCORD NAVAL WEAPONS STATION AS A PROPOSED PORT OF ENTRY FOR FOREIGN SPENT NUCLEAR FUEL

WHEREAS, it has been proposed that the Concord, California Naval Weapons Station be used as a port of entry for foreign spent nuclear fuel; and,

WHEREAS, the Environmental Impact Statement prepared in connection with said proposal is inadequate in many areas including but not limited to the following:

1. The effect of implementation of the proposal on traffic and transportation on the major highways and waterways in the area has not been addressed; *1275-2 (Cont'd.)*

2. The elaborate fault structure in the area and the potential impact of earthquakes has also not been addressed. *1275-3 (Cont'd.)*

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF RIO VISTA, that said Council does not support the use of the Concord Naval Weapons Station as a port of entry for foreign spent nuclear fuel. *1275-1 (Cont'd.)*

I, ANITA REINEKE, CITY CLERK OF THE CITY OF RIO VISTA and ex-officio Clerk of the City Council of said City, do hereby certify the above and foregoing to be a full, true and correct copy of a Resolution of said City Council which was regularly introduced, passed and adopted by said City Council at a regular meeting thereof, by the following vote:

AYES: COUNCILMEMBERS Harris, Bidou, Madere, Brown, Rubier
NOES: COUNCILMEMBERS None
ABSENT: COUNCILMEMBERS None

WITNESS my hand and seal of said City this 20 day of July, 1995.

Anita Reineke

ANITA REINEKE, CMC, CITY CLERK

Response to Comment
Commentor No. 1275:
Jerry Rubier, Mayor, City of Rio Vista (Cont'd.)

COMMENTOR NO. 1279:
CONTRA COSTA COUNTY BOARD OF SUPERVISORS

The Board of Supervisors
County Administration Building
651 Pine Street, Room 106
Martinez, California 94553-1293
Jim Rogers, 1st District
Jeff Smith, 2nd District
Gayle Bishop, 3rd District
Mark Ross, 4th District
Tom Torlakson, 5th District

Contra Costa County

Phil Batchelor
Clerk of the Board and
County Administrator
(510) 646-2071

July 12, 1995

The President
The White House
1600 Pennsylvania Avenue
Washington, D.C. 20500

Dear Mr. President:

The Board of Supervisors of Contra Costa County requests your help in opposing the U.S. Department of Energy and Department of State proposal to use the Concord Naval Weapons Station (in Contra Costa County) as a port of entry for the importation of foreign research reactor spent nuclear fuel originally provided by the United States. Our Board is opposed to the proposal because Contra Costa County is already disproportionately impacted by nuclear programs at federal facilities in and near our county and by the operations of several oil refineries and chemical plants. A number of upsets have occurred at the refineries and chemical plants in recent years.

Additionally, our Board is concerned because the Draft Environmental Impact Statement on the proposed federal policy to re-import the spent nuclear fuel scarcely addresses the local impacts of using the Concord Naval Weapons Station. We have asked the U.S. Department of Energy to include local information in the Final Environmental Impact Statement, but it is not apparent how local officials and the public will have the opportunity to review and comment on it before a decision is made on the proposal. *1279-1*

Our Board already has asked local governments in Contra Costa County and adjoining counties to join us in opposing the proposal. We are now asking you and those who represent us in the federal government to aid us.

Sincerely,

Gayle Bishop
Chair, Board of Supervisors

c.c.: Claudia Rhed, Program Manager
Office of Spent Nuclear Fuel Management
U.S. Department of Energy

RESPONSE TO COMMENT
COMMENTOR NO. 1279:
CONTRA COSTA COUNTY BOARD OF SUPERVISORS

Response to Comment No. 1279-1

The port selection process that determined that Concord NWS was an acceptable port considered the population of the port and surrounding areas (Appendix D, Section D.1.9.5). Additionally, all population within a fifty mile radius of the Concord NWS was considered when analyzing the potential impact of a range of hypothetical port accidents. The risks were found to be low (Appendix D, Section D.5).

The passage from San Francisco Bay to Concord meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). Land-based facilities, such as refineries, have no direct impact on the risk associated with the shipment of foreign research reactor spent nuclear fuel because the addition of some mishap at a land-based facility would not add to the severity of the worst plausible accident, which is considered to be the collision of the ship carrying the foreign research reactor spent nuclear fuel with a petroleum tanker. In this accident, the transportation cask is damaged in the collision, then subjected to a fire that resulted from the collision (Appendix D, Section D.5). Section 4.2.2.3 discusses the assumptions that went into the port accident analysis and the results of those analyses. Land-based facilities themselves are not a threat to the transportation cask due to the distance from any of the facilities to the ship and the robustness of the cask.

COMMENTOR NO. 1279:
CONTRA COSTA COUNTY BOARD OF SUPERVISORS (CONT'D.)

Thank you for your letter. I appreciate your concern about spent nuclear fuel management, as it particularly affects the Concord Naval Weapons Station in Contra Costa County.

My Administration remains committed to developing a plan for permanent nuclear waste disposal. I am working with Secretary O'Leary to carry out the program in a way that is technically and economically feasible and that will lead to the safe, fair, and permanent disposal of high-level waste as soon as possible. I have forwarded a copy of your letter to Secretary O'Leary, and I know that she will take your views into careful consideration. You should be getting a response from the Department of Energy that addresses your concerns.

I value your insight on issues involving spent nuclear fuel transportation, and I hope you will continue to share your thoughts.

RESPONSE TO COMMENT
COMMENTOR NO. 1279:
CONTRA COSTA COUNTY BOARD OF SUPERVISORS (CONT'D.)

COMMENTOR NO. 1280: PORT OF ANACORTES

A WASHINGTON PUBLIC PORT OWNED BY THE RESIDENTS OF THE LOCAL COMMUNITY

PORT OF ANACORTES EST. 1926

FIRST AND COMMERCIAL AVENUE · P.O. BOX 297 · ANACORTES, WA 98221 USA
(206) 293-3134 · FAX (206) 293-9608

July 18, 1995

Hazel O'Leary
Secretary
US Department of Energy
1000 Independence Avenue SW
Washington, DC 20585

Dear Secretary O'Leary,

We are writing to express our concerns over the alternatives proposed in the Department of Energy's (DOE) Draft Environmental Impact Statement (DEIS) on the management of spent nuclear fuel (SNF) from foreign research reactors. We are concerned about the proposed option of importing the foreign SNF through commercial ports such as Tacoma, WA. 1280-1

While the desire to encourage other nations' research reactors to switch to low-enriched uranium (LEU) from high-enriched uranium (HEU) is an integral component of the United State's overall nuclear nonproliferation policy, importing foreign SNF through commercial ports may not be necessary. The DOE DEIS lists two military ports among the ten possible ports of entry for the SNF. We feel the DOE should limit further consideration of importing SNF to these or other appropriate military ports because of the considerable concern among citizens and city officials about importing SNF through commercial ports. 1280-2

First, there is significant apprehension created about the threats to public health by importing this SNF through commercial ports. DOE has stated that the threats to public health are not significant given the state of the material and the overly cautious design of the storage casks. We feel a public health risk still exists. There is public concern that longshoremen, sailors, and average citizens could potentially become exposed to significant radiation levels. Whether this risk is real or only perceived is irrelevant. Importing foreign SNF through commercial ports would at best threaten public confidence and citizen's sense of security and at worst pose a significant threat to public health. 1280-3

Second, the DEIS states: "Primary responsibility for emergency response to a foreign research reactor SNF incident would reside with local authorities." Although the port and city of Tacoma have emergency response plans for hazardous materials, neither the Police and Fire Departments or the Port workers are properly equipped or trained to contend with a significant radiation emergency. Proper equipment and training of these people would add a significant and unnecessary cost to the overall proposal. In addition, it is not clear that Tacoma police officers, fire fighters, and port workers would be willing to undergo such training, knowing that it opens them up to potential future radiation exposure. In fact, port workers in Tacoma may declare their unwillingness to handle the material during even a routine transport procedure, let alone emergencies. 1280-4

Third, importing SNF through commercial ports runs contrary to the overall policy objective of reducing the world-wide availability of HEU and other nuclear waste. If lengthy, unnecessary and relatively low-security transportation of SNF occurs through commercial ports, the increased opportunities for theft, hijacks, and sabotage could result in greater accessibility to the SNF than desired. As current events have 1280-5

RESPONSE TO COMMENT
COMMENTOR NO. 1280: PORT OF ANACORTES

Response to Comment No. 1280-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1280-2

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security provided for the foreign research reactor spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted.

Response to Comment No. 1280-3

The commentor's opposition to the use of commercial ports is noted. DOE considers, however, that the real risk is important. DOE has estimated the real risk, found it to be low, and presented it to the public in a straightforward manner in this EIS. (Section 4.1.4 of the EIS)

Response to Comment No. 1280-4

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency

Page Two
Secretary O'Leary, US Department of Energy

unfortunately revealed, the United States is not immune to foreign or domestic terrorism. The fact is that this material could be used in the making of nuclear weapons. Transporting this material through commercial ports would create an unnecessary threat to national security.

These concerns present a compelling case for DOE to preclude further consideration of commercial ports like Tacoma, WA, for importation of foreign SNF. While removing HEU and other nuclear waste from the global marketplace is an essential aspect of nuclear nonproliferation, importing this material through military ports may prove more reasonable, given the increased protection that could be provided to public health, safety and national security.

1280-5 (Cont'd)

In summary, we would appreciate DOE limiting further consideration of this proposal to military ports. Thank you for your consideration.

1280-2 (Cont'd)

Sincerely,
The Commission of the Port of Anacortes:

Francis Barcott, President

Ken Moore, Secretary

Stan Karowski, Vice President

Merrill Thibert, Commissioner

Robert T. Nelson, Commissioner

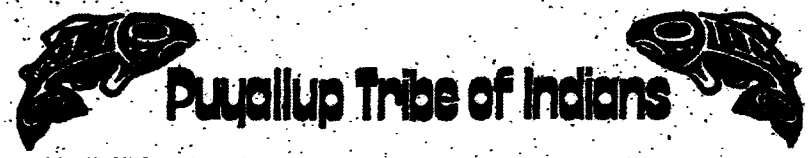
cc: Port of Tacoma Commissioners
Gov. Mike Lowry
Sen. Slade Gorton
Sen. Patty Murray
Sen. Harriet Spanel
Rep. Norm Dicks
Rep. Jim McDermott

management and security issues specific to the communities that would be affected. These issues would include capabilities and training of first emergency responders. The commentor's assessment that the Tacoma port workers and emergency preparedness personnel would not be willing to participate in any training activities, or routinely handle the cargo, is noted.

Response to Comment No. 1280-5

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk of such actions. Security would be provided for all shipments of foreign research reactor spent nuclear fuel, as required by the Code of Federal Regulations (10 CFR Part 73). The security provisions are summarized in Appendix H of the EIS. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit. For discussion of commercial port security, refer to response to Comment 1280-2, above.

Section 2.4
Native American Groups



May 22, 1995

The Honorable Hazel O'Leary
Secretary
United States Department of Energy
1000 Independent Avenue S.W.
Washington, D.C. 20585

RE: DEIS for Proposed Nuclear Weapons Non-Proliferation Policy Concerning Foreign Research Reactor Fuel

Dear Madame Secretary:

Enclosed are the preliminary comments of the Puyallup Tribe of Indians concerning the possible selection of the Port of Tacoma to receive spent nuclear fuel rods from research reactors from 41 countries.

The Puyallup Tribe of Indians Reservation is located on the east side of Puget Sound in the vicinity of what is now the City of Tacoma (Figure 1. Location of Puyallup Reservation). The Treaty of Medicine Creek in 1854 and Executive Order of January 20, 1857 set aside a reservation for the Tribe at the mouth of the Puyallup River.

Just seven years ago, the United States approved the Puyallup Land Claims Settlement Act. This Agreement provides approximately 400 acres of industrial property within the eight waterways of the Port of Tacoma. Additionally, a small Tribal residential community is located immediately south of the Blair Waterway.

Members of the Puyallup Tribe rely upon Commencement Bay's fishery resources for our economic, subsistence, and spiritual livelihood. We have been and always will be stewards of the Bay's fishery and natural resources.

During the past 100 years, we have witnessed a dramatic decline in the Bay's fishery resources. Part of this decline was caused by habitat modifications related to municipal and industrial development, however, a substantial and continuing cause of decline in the Bay's fishery is chemical pollution. 70-1

Health advisories warn against consumption of Commencement Bay's fish and shellfish resources due to chemical contamination. Loss of these resources takes food off our tables and puts the Tribe's commercial fishermen out of work. Chemical pollution in the Commencement Bay area impacts the quality of life in our community, and reduces recreational fishing and boating. The 70-2

2002 East 26th Street • Tacoma, Washington 98404 • 206/597-6310

Response to Comment 70-1

The Puyallup Tribe's concern over the impact on Commencement Bay's fishery resources is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk of bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. The analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports, bays, or waterways that the spent nuclear fuel might pass through or near. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. As stated in Section 2.6.2 of the EIS, to date, after more than 30 years of spent nuclear fuel shipments, no spent nuclear fuel transportation cask has ever released any of its contents (radioactive material). Based on this past experience, DOE considers that transportation casks passing through the Port of Tacoma would not release their radioactive contents, and would thereby not affect the quality of the water. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

Response to Comment 70-2

Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant fish and shellfish resources in Commencement Bay. The analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2 of the EIS). Historically, there were no adverse economic or cultural impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was accepted into the United States in the past. This is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions.

COMMENTOR NO. 70: PUYALLUP TRIBE OF INDIANS (CONT'D.)

protection of this contamination also stigmatizes and unfairly limits the economic development potential of businesses such as the Tribe's Chinook Landing Marina on the Hylebos Waterway developed by the Tribe under the Puyallup Land Claims Settlement Act approved by Congress in 1989.

70-3

The Settlement Act approved by Congress in 1989 ratified the Puyallup Land Settlement Agreement of August 27, 1988, which had as its twin goals strengthening Commencement Bay's economy and restoration of Commencement Bay fishery resources. Parties to the Settlement Agreement included the State of Washington, the Cities of Tacoma, Fife and Puyallup, Pierce County, the Port of Tacoma, Union Pacific and Burlington Northern Railroads, private parties, and the United States. Thus, the Tribe's goals of restoring Commencement Bay's fishery resources and economy enjoy wide support in the public and private sectors of Commencement Bay.

In 1980, the Environmental Protection Agency placed Commencement Bay on the NPL Superfund List. Since that time the Puyallup Tribe in cooperation with the EPA, State of Washington Department of Ecology and many of the potentially responsible parties have spent hundreds of millions of dollars to clean up the Bay. The Natural Resource Damage Trustees (of which the Puyallup Tribe is a member) are moving almost successfully negotiating settlements and initiating the first Superfund NRD restoration project in Commencement Bay. Furthermore, the Trustees have started the process of preparing a comprehensive restoration plan and EIS for future restoration projects. Implementation of the Superfund cleanup as well as well-planned, cost-effective restoration projects at the earliest possible date is of critical importance to the Puyallup Tribe and its members as well as all user groups and stakeholders in Commencement Bay.

70-4

With this in mind the Puyallup Tribe of Indians is astonished that the U.S. DOE is proposing to select the Port of Tacoma as a possible site to transport spent nuclear fuel. To date, no one from your office has notified the Tribe of this proposal. The federal government has a fiduciary responsibility to Indian Tribes. Under federal law, a Trust relationship exists between the federal government and Indian Tribal governments. The Puyallup Tribe of Indians respectfully requests that your office take immediate steps to correspond with our Tribe on a government to government basis and that you send copies of the DEIS to the tribe for their review and comment. We also request that the formal meeting scheduled for May 24, 1995 in the City of Sea-Tac be postponed for at least one month. This meeting should be held in the city and county affected: Tacoma, Pierce County, Washington. The Puyallup Tribe needs sufficient time to review the DEIS in order to safeguard the interests of our Tribal members and natural resources.

70-5

Finally, it is inconceivable to our Tribe that this area is being considered as a site to transport nuclear waste. The Puyallup Tribe has endured decades of every environmental injustice known to mankind except for nuclear waste. The Tribe, community, industry and local and state governments have made great progress in the cleanup and restoration of the Commencement Bay environment. We can't believe that we have spent hundreds of millions of dollars to clean up and restore this embayment only to have spent nuclear fuel transported to and from the Port of Tacoma. The stigma of having nuclear waste transported to and from our Reservation is totally

70-6

RESPONSE TO COMMENT
COMMENTOR NO. 70: PUYALLUP TRIBE OF INDIANS (CONT'D.)

Response to Comment 70-3

DOE agrees that chemical contamination could have detrimental effects on the economic development of the area. However, there is no identifiable mechanism by which transportation activities of foreign research reactor spent nuclear fuel would affect the existing levels of chemical contamination in the areas of question. As discussed in the response to Comment 70-8 below, the shipments would have no effect on the quality of the marine environment.

Response to Comment 70-4

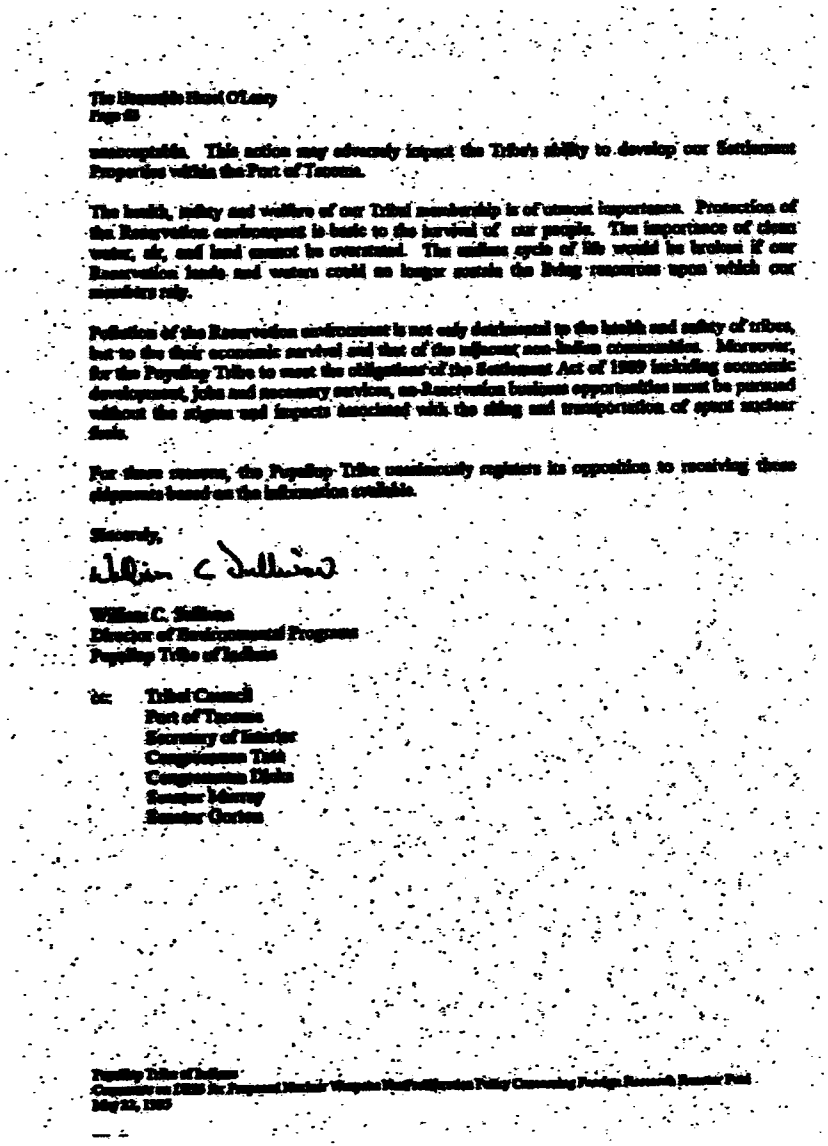
The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment 70-5

The interest and concern of the Puyallup Tribe of Indians in this matter is noted. Agency coordination with the Puyallup Tribe of Indians was initiated by letter from J. Lytle of DOE to W. Sullivan on June 6, 1995. At the request of the Puyallup Tribe of Indians and others, a second public meeting in the Tacoma area was held on June 19, 1995. The period for acceptance of public comments was expanded from 60 days to 90 days, ending on July 20, 1995.

Response to Comment 70-6

Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma as noted by the commentor. DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' economic development. Nor should it contribute to any stigma based on the EIS analysis which indicates that there would be no significant



The Puyallup Tribe of Indians
Page 03

unacceptable. This action may adversely impact the Tribe's ability to develop our Settlement Properties within the Port of Tacoma. 70-6 (Cont'd.)

The health, safety and welfare of our Tribal membership is of utmost importance. Protection of the Reservation environment is basic to the survival of our people. The importance of clean water, air, and land cannot be overstated. The endless cycle of life would be broken if our Reservation lands and waters could no longer sustain the living resources upon which our members rely. 70-7

Pollution of the Reservation environment is not only detrimental to the health and safety of tribes, but to the their economic survival and that of the adjacent non-Indian communities. Moreover, for the Puyallup Tribe to meet the obligations of the Settlement Act of 1989 including economic development, jobs and necessary services, on-Reservation business opportunities must be pursued without the stigma and impacts associated with the siting and transportation of spent nuclear fuels. 70-8

For these reasons, the Puyallup Tribe consistently registers its opposition to receiving these shipments based on the information available.

Sincerely,

William C. Sullivan
Director of Environmental Programs
Puyallup Tribe of Indians

bc: Tribal Council
Port of Tacoma
Secretary of Interior
Congressman Tate
Congressman Hicks
Senator Murray
Senator Gorton

Puyallup Tribe of Indians
Comments on DEIS for Proposed Shipment of Foreign Research Reactor Spent Fuel
May 22, 1995

adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2 of the EIS). See also response to Comment 70-1, above.

Response to Comment 70-7

DOE agrees with the commentor's concerns about the importance of a clean environment. Section 4.2 of the EIS demonstrates that accepting foreign research reactor spent nuclear fuel into the United States probably would not adversely affect Tribal members, nor any other potential population.

Response to Comment 70-8

The environmental impacts associated with port activities and ground transportation of foreign research reactor spent nuclear fuel, if managed in the United States, are discussed in Sections 4.2.2 and 4.2.3 of the EIS, respectively. The risk to the environment or the health and safety of nearby workers or members of the public as a result of the radioactive nature of the spent nuclear fuel has been demonstrated to be low. In addition, as discussed in Section 4.2.2.2 of the EIS, the shipments would have no impact on the air and water quality at the port or along the transportation route other than the effects expected from conventional marine or ground transportation traffic.

Commentor No. 335: Puyallup Tribal Council

Puyallup Tribe of Indians

PUYALLUP TRIBAL COUNCIL
RESOLUTION NO. 150695

A RESOLUTION to express strong opposition to the United States Department of Energy and United States Department of State to jointly adopt a policy to accept and manage spent nuclear fuel from foreign research reactors by shipment through the Port of Tacoma, Washington; and the declaration of the Puyallup Tribe of Indians Reservation as a **NUCLEAR FREE ZONE.**

WHEREAS, the Puyallup Tribe of Indians has existed since creation as the aboriginal people, located on the east side of Puget Sound in the immediate vicinity of what is now the city of Tacoma and Port of Tacoma; and

WHEREAS, the Puyallup Tribe is an independent sovereign nation having historically negotiated with several foreign nations including the United States in the Medicine Creek Treaty; and

WHEREAS, the Puyallup Tribal Council is the governing body of the Puyallup Tribe of the Puyallup Reservation in accordance with the authority of their sovereign rights as the aboriginal owners and the guardians of their lands and waters as reaffirmed in the Medicine Creek Treaty, and their Constitution and By-Laws as amended and approved by the Tribe and the Assistant Secretary of the Interior on the first day of June, 1970; and

WHEREAS, the Puyallup Tribe has authority, responsibility, and jurisdiction to protect our natural environment and resources; and

WHEREAS, the lives, health, survival and cultural values, and economic security of members of the Puyallup Tribe depend on the natural resources in and around Commencement Bay; and

WHEREAS, the United States Department of Energy and the United States Department of State are jointly proposing to adapt a policy to manage spent nuclear fuel from foreign research reactors; and

WHEREAS, nuclear fuel containing uranium enriched in the United States Department of State would be covered by this policy; and

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Response to Comment
Commentor No. 335: Puyallup Tribal Council

Puyallup Tribal Resolution No._____
Page 2

WHEREAS, the purpose of this policy is to promote U.S. nuclear weapons nonproliferation policy objectives, specifically seeking to reduce highly enriched uranium from civilian commerce; and

WHEREAS, the Puyallup Tribe of Indians is not opposing the nonproliferation policy objectives of the United States of America; and

WHEREAS, the environmental effects and policy is to promote U.S. nuclear weapons nonproliferation policy objective, specifically seeking to reduce highly enriched uranium from civilian commerce; and

WHEREAS, alternative number one would be the acceptance and management of the spent nuclear fuel by the Department of Energy in the United States; and

WHEREAS, under alternative number one the spent nuclear fuel would be shipped by ocean going vessels from foreign countries to the United States of America; and

WHEREAS, the Port of Tacoma is considered one of ten ports through which the shipment of spent nuclear fuels would occur; and

WHEREAS, the Draft Environmental Impact Statement (DEIS) was prepared to address the Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, and the DEIS

A. Has ignored information about the Puyallup Tribe of Indians, its Reservation, people, natural resources and environmental justice impacts, — 335-1

B. Did not consider the deep water depth in the Puget Sound Area, which will cause substantial problems in recovery of nuclear fuel shipping containers in case of an accident, — 335-2

C. Fully ignored the harm which can be caused to the population and environment of the area in case of an explosion and fire aboard a vessel navigating the Puget Sound,

D. Did not recognize the status of Commencement Bay as a Superfund site, the stigma attached to this designation and the expansion of this stigma by alternative one,

E. Ignored the significant cleanup effort by the Port of Tacoma, the City of Tacoma and the industries in Commencement Bay, and the associated crippling business interruption issues, — 335-3

F. Did not consider the impacts of this proposal on the federally approved Settlement Act of 1989 between the Puyallup Tribe, Port of Tacoma, City of Tacoma, State of Washington and United States, — 335-4

G. Did not consider the impacts on the federally protected treaty rights of the Puyallup Tribe of Indians,

H. Did not consider the security aspect of these shipments through the Puyallup Tribe's Reservation Port of Tacoma, the City of Tacoma, Pierce County and the State of Washington,

Response to Comment No. 335-1

The potentially affected environment surrounding the Port of Tacoma is described in Section 3.2.1.9 of the EIS. The racial and ethnic composition of the population in the potentially affected area is shown in Figure 3-34 of the EIS. As discussed in Appendix A, demographic data for the environmental justice analysis were obtained from U.S. Bureau of the Census data files. These data files provide racial and ethnic information for any given geographic area of the United States based on the latest census, but do not provide information on individual Tribes which responded to the 1990 census. Environmental effects were evaluated and the risks to the general population, including minority populations and low-income populations were determined to be low (Section 4.2.2 of the EIS). Environmental justice at candidate ports is discussed in Section 4.2.2.6 of the EIS with supporting analysis in Appendix A.

Response to Comment No. 335-2

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Section 4.2.1.3 of the EIS has been revised to include the above clarification. Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

Appendix D, Section D.5.3.1 of the EIS describes several accident scenarios that involve fire. The results of the analysis of these accidents can be found in Section D.5.4. The analysis shows that even in the event of a severe ship fire, neither the consequences nor risks are great (Section D.5.5). Although such a catastrophic accident would obviously impact the local environment, no significant impacts are predicted due to the presence of foreign research reactor spent nuclear fuel. In fact, the analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 and Appendix D, Section D.5 of the EIS).

The effects of a severe explosion on a foreign research reactor spent nuclear fuel transportation cask were not evaluated because the radiological impacts of the fire discussed above would be worse, or bound the results of an explosion. The energy content of a severe fire greatly exceeds that of a severe explosion. With a severe fire not only is the cask violated, as it might be by a large explosion, but the heat of the fire would lift what is released from the cask, spreading the radioactive material farther, affecting more people. The impacts of an explosion followed by a severe fire is equivalent to the category 6 accident which results in a violated cask being engulfed by a severe fire (Appendix D, Section D.5.3.1.1), which is discussed above.

COMMENTOR NO. 335: PUYALLUP TRIBAL COUNCIL (CONT'D.)

Puyallup Tribal Resolution No. 150695
Page 3

I. Did not adequately address life cycle costs, benefits and risks of the proposed alternatives, — 335-5

J. Fully ignored the fairness and equity issues of selecting the smaller ports in lower population areas after implying the risks were virtually inconsequential, and — 335-6

WHEREAS, the record for the safe operation and handling of nuclear material in U.S. Department of Energy regulated facilities is less that satisfactory, and there are facilities owned and operated by the U.S. Government capable of receiving and handling this nuclear material, and — 335-7

WHEREAS, the U.S. House Budget Resolution eliminates the U.S. Department of Energy thereby creating funding uncertainties, and — 335-8

WHEREAS, the U.S. Department of Energy is failing to provide adequate procedural due process in that it is not making a record of its hearings thereby foreclosing individuals' abilities to challenge the adequacy of the EIS, and — 335-9

NOW THEREFORE IT BE RESOLVED by the Puyallup Tribal Council of the Puyallup Tribe of Indians that it opposes shipments of spent nuclear fuel through any facilities of the Port of Tacoma. — 335-10

BE IT FURTHER RESOLVED, that the Puyallup Tribal Council declares that the Puyallup Reservation be declared a NUCLEAR FREE ZONE and the Tribe unanimously registers its opposition to the transportation,storage and/or disposal of any nuclear wastes on or through the exterior boundaries of the Puyallup Reservation. — 335-11

CERTIFICATION

I, Sherry Richardson, Secretary of the Puyallup Tribal Council, hereby certify that the above resolution was duly adopted at a regular meeting of the Puyallup Tribal Council on the 15 day of June, 1995, a quorum being present with the vote of 6 FOR, 0 AGAINST, and 0 ABSTAINING.

Sherry Richardson
Sherry Richardson, Secretary
Puyallup Tribal Council

ATTEST:
Herman Dillon
Herman Dillon, Chairman
Puyallup Tribal Council

RESPONSE TO COMMENT
COMMENTOR NO. 335: PUYALLUP TRIBAL COUNCIL (CONT'D.)

Sections 4.2.1 and 4.2.2 of the EIS provide an evaluation of consequences and risks of on-board ship fires. Supporting details are given in Appendix D. If a policy to accept foreign research reactor spent nuclear fuel is adopted, fuel elements would be shipped in casks which are resistant to destruction by collision and fire (Section 2.6.2). In the unlikely event that a cask is breached by collision and/or fire, the radiological consequences would be small and the associated risks would be low (Section 4 of the EIS).

DOE has added a sentence to Appendix D, Section D.2.1.9 of the EIS regarding Commencement Bay being a Superfund Site. The analysis of impacts for Management Alternative 1 in Sections 4.2 and 4.3 of the EIS demonstrate that there would be no significant adverse impacts on the ports, people, or natural environment from shipments of foreign research reactor spent nuclear fuel and the overall impacts to Commencement Bay would be unchanged by the various management alternatives.

Response to Comment No. 335-3

Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma as noted by the commentor. The analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2 of the EIS). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Based on over 30 years of experience shipping spent nuclear fuel, DOE considers that spent nuclear fuel transportation casks passing through the Port of Tacoma, Commencement Bay, or any other port or waterway analyzed in the EIS would not affect air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality. Similarly, DOE considers that based on the experience of ports that have received spent nuclear fuel in the past, there would be no significant adverse impacts to any businesses or industry in the Commencement Bay/Port of Tacoma area from shipments of foreign research reactor spent nuclear fuel.

Response to Comment No. 335-4

The EIS demonstrates that the receipt of foreign research reactor spent nuclear fuel at the Port of Tacoma (Section 4.2.2.3 of the EIS) and its transportation through the Puyallup reservation (Section 4.2.3.3 of the EIS) poses essentially no risk to the lives or health, and economic security of members of the Puyallup Tribe in or around the port and Commencement Bay.

On the issue of air and water quality as it pertains to the proposed policy of managing foreign research reactor spent nuclear fuel, DOE considers that there would be no significant adverse impacts to any of the ports that might be used to accept the material.

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident. Since the transportation of foreign research reactor spent nuclear fuel would not impact the air or water quality, it would not violate the Commencement Bay fishery resources and should not, therefore, violate the Settlement Act. Likewise, nonpolluting use of the Port of Tacoma should not violate the other thrust of the Settlement Act which is strengthening Commencement Bay's economy, because increased traffic increases port and area income.

Appendix H has been added to the final EIS in response to public comments to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

Response to Comment No. 335-5

Section 4 of the EIS and associated Appendices D, E and F address in detail the risks and benefits from the proposed action under the three management alternatives described in Sections 2.2, 2.3 and 2.4 of the EIS. A comparison of these alternatives is addressed in Section 4.8. The costs associated with the alternatives is discussed in Section 4.9.

Response to Comment No. 335-6

DOE considers that the port selection criteria successfully indicate ports that can safely handle foreign research reactor spent nuclear fuel. The EIS concludes that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel or the population near the port. The port selection process only indicates ports that are acceptable for the receipt and handling of foreign research reactor spent nuclear fuel, it does not determine which ports are best.

Section 3151 of Public Law 103-160 (the National Defense Authorization Act for the Fiscal Year 1994), requires that the Secretary of Energy shall, "if economically feasible and to the maximum extent practicable, provide for the receipt of spent nuclear fuel...at a port of entry in the United States which...had the lowest human population in the area surrounding the port of entry..." While the National Defense Authorization Act was written specifically to regulate the receipt and management of foreign research reactor spent nuclear fuel at DOE's Savannah River Site, DOE elected to apply this criterion, among others, in identifying potential ports of entry, to the maximum extent practicable.

Since the EIS demonstrates that there are no significant impacts of the proposed action (other than the beneficial support of United States nuclear weapons nonproliferation policy), DOE considers that there is no fairness or equity issue.

COMMENTOR NO. 335: PUYALLUP TRIBAL COUNCIL (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 335: PUYALLUP TRIBAL COUNCIL (CONT'D.)

Response to Comment No. 335-7

DOE has safely received and handled foreign research reactor spent nuclear fuel for over 30 years, most of it through commercial ports.

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted. Sections 4.2.2.2 and 4.2.2.3 of the EIS provide the analysis on impacts of incident-free operation and consequences of port accidents, respectively.

Response to Comment No. 335-8

If DOE were abolished in response to action by Congress, the current DOE programs for management of spent nuclear fuel would have to be transferred to some other Federal government agency to protect the health and safety of the public. Since the spent nuclear fuel will not simply go away, these programs cannot simply be abolished.

Response to Comment No. 335-9

DOE did request that comments be submitted in writing, however, all oral comments presented at each hearing were summarized and have been addressed along with the written comments in this Volume 3 of the final EIS. All comments, written and oral, are part of the public record.

Response to Comment No. 335-10

The Puyallup Tribe Council's opposition to the use of the Port of Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. Based on the port selection process described in Appendix D of the EIS, the Port of Tacoma is among the ten candidate ports listed in Section 2.2.1.6 of the EIS which could receive foreign research reactor spent nuclear fuel under Management Alternative 1 or 3. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Sections 4.2.2.3 and 4.5 of the EIS) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Section 4.2.2.2 and 4.5 of the EIS).

COMMENTOR NO. 335: PUYALLUP TRIBAL COUNCIL (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 335: PUYALLUP TRIBAL COUNCIL (CONT'D.)

Response to Comment No. 335-11

The commentor's opposition to transportation, storage and/or disposal of nuclear waste on Puyallup Reservation Land, is noted.

COMMENTOR NO. 412: PUYALLUP TRIBE FISH COMMISSION

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I AM A PUYALLUP INDIAN, & CHAIRMAN OF THE PUYALLUP TRIBE FISH COMMISSION, AS A FISHERMAN I DONT EVEN WANT TO THINK WHAT THIS KILLER POISON WOULD DO TO OUR SALMON & OTHER SEA FOOD. IF THERE WAS A ACCIDENT WITH THIS KILLER POISON, OUR SALMON SMALLER & FEWER AS IT IS

412-1

Name and Address: VERNON LOUIE CHAIRMAN
PUYALLUP TRIBE FISH CIMMISSION
3314 96 ST. S. TACOMA WA 98409
PH 206-581 4436

RESPONSE TO COMMENT
COMMENTOR NO. 412: PUYALLUP TRIBE FISH COMMISSION

Response to Comment No. 412-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

NEPA TEAM

DOE/EIS-0218F
February 1996

Volume 3

FINAL ENVIRONMENTAL IMPACT STATEMENT

on a

Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Public Comments and Department of Energy Responses
Part 2 – Organizations and Foreign Entities

United States Department of Energy
Assistant Secretary for Environmental Management
Washington, DC 20585

Volume 3 is organized into three sections:

- Section 1 - Overview
- Section 2 - Written Comments and Responses
- Section 3 - Public Hearings

The Overview sets the tone for the document by summarizing the public comment process, by explaining how the receipt of written comments and the public hearing process were handled, and by summarizing the major issues raised by commentors and DOE's responses to these issues.

Section 2 of Volume 3, "Written Comments and Responses" contains all of the written comments received by DOE on the draft EIS. Upon receipt, these documents were assigned a sequential log number to be used in tracking during the comment response process. For presentation in Volume 3, these documents maintained their original log number, but were separated into the following seven distinct "affiliation" categories:

Section 2.1 - Federal Government
Section 2.2 - State Government
Section 2.3 - Local Government
Section 2.4 - Native American Groups
Section 2.5 - Non-Government Organizations
Section 2.6 - Foreign Entities
Section 2.7 - Individuals

Since these documents retained their original log number, the reader should note that while the documents in each respective section are in ascending order, their numbering therein is not sequential.

In order for a reader to find a specific document, a full "List of Commentors" has been included in each book (or part) of Volume 3, immediately following the "Table of Contents." This "List of Commentors" has been compiled alphabetically using either the commentors last name, the name of the submitting organization, or the name of a Federal, State, Tribal, or local government branch. City and State government bodies are listed under "City of" or "State of." Members of Congress are listed by the Senator's or Representative's name, with the government branch following.

To locate a document(s):

1. Find the "List of Commentors" and the name of the individual submitting the comment (or the name of the organization or agency if the comments were submitted on their behalf), and note the page number assigned to the first page of the comment document (i.e., a document from a Native American Group would be number 2.4-1, etc.).

2. Find the Volume 3 book (or part) that contains the section and page number for which you are looking and turn to the appropriate page to find a scanned copy of the document along with the responses to each of the comments delineated therein.

the written comments, the comments received during each of the 17 public hearings. Oral comments provided at these hearings have been summarized, rather than individually identified by each respective speaker. As such, there is not a list of speakers or identification of the commentors at the public hearings. A list of all registered attendees is provided immediately following the summary of each of the public hearings.

Public Comments and Department of Energy Responses

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Attachment 1

Transcript of Public Hearing Held in Tacoma, Washington on June 19, 1995 on the Draft Environmental Impact Statement on the Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel A.1

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Section 2.5
Non-Government Organizations

COMMENTOR NO. 7: THE EDLOW GROUP

**STATEMENT BY THE "EDLOW GROUP"
OF FOREIGN RESEARCH REACTORS**

on

**The Department of Energy's Draft Environmental Impact Statement
on a Proposed Nuclear Weapons Nonproliferation Policy
concerning Foreign Research Reactor Spent Nuclear Fuel**

May 1995

1. The "Edlow Group" is an association of 14 foreign research reactor facilities from Germany, Japan, Switzerland, Belgium, Sweden, Canada, Greece, the Netherlands, Denmark, Sweden, Austria, Australia, and Italy. These facilities are among the largest and most important research and test reactor facilities in the world. This group is administered by Edlow International Company, an international traffic management firm with more than 30 years of experience in the transport of nuclear materials.

2. The facilities comprising the Edlow Group supply most of the radioisotopes used by U.S. hospitals to treat U.S. citizens with radiopharmaceuticals and other important radio-medical applications. Everyone who has ever had a blood test has relied on services from a research reactor. Nearly every major industry in this country has relied on research reactors for key testing applications.

3. We commend DOE for completing its draft EIS on the management of U.S.-origin highly-enriched foreign research reactor spent fuel. This matter has been under intensive study by DOE now for over 6 years. For the most part, we think DOE has done an excellent job, although we are disheartened that the draft was not completed much earlier.

4. We share DOE's and the State Department's goal of reducing civil inventories worldwide of highly-enriched uranium. Like DOE and the State Department, we regard this goal as vital to global nonproliferation efforts.

5. When we received our highly-enriched fuel from the United States, we relied on the assurances of the U.S. government that the United States would accept the return of our spent fuel.

6. Furthermore, when the United States began its RERTR program for reducing the enrichment of our fuel cycles, we agreed to participate in this program, at great cost to our facilities, but only after we were assured by the United States that our spent fuel could continue to be returned.

RESPONSE TO COMMENT
COMMENTOR NO. 7: THE EDLOW GROUP

COMMENTOR NO. 7: THE EDLOW GROUP (CONT'D.)

7. We understand that times have changed, and we are preparing now to meet the long term challenges of managing our own spent fuel. We did not create this problem, however, and have relied on repeated assurances by the United States that the problem would be solved. This, in fact, has delayed our finding a solution of our own.

8. In the interim, we have no place to put our spent fuel, and even if we did, it is the policy of the United States not to foster the storage throughout the world of highly-enriched spent fuel which could conceivably be used in nuclear weapons. We have respected that policy.

9. Although delays in renewing DOE's take-back policy have caused one of our facilities to shut down prematurely, for the most part, our facilities are too valuable to our hospitals, universities, industries, and governments to be shut down. Therefore, to keep these facilities operating, we will be forced to reprocess our spent fuel in Europe or elsewhere if the United States cannot receive the spent fuel for at least a limited period of time.

10. Reprocessing in Europe will almost certainly mean that we must continue to rely on highly-enriched civil commerce in uranium. In cases where some of us have already converted our facilities to operate on less-dangerous lower-enriched fuels, it could mean a reversion back to operation on highly-enriched fuels. This result would be contrary to U.S. nonproliferation objectives since 1978.

11. Return shipments of our spent fuel to the U.S. have been occurring for three decades without incident. The risks associated with transport of this material are infinitesimally small. We follow all applicable Department of Transportation and Nuclear Regulatory Commission rules, as well as the requirements of the International Atomic Energy Agency.

12. Receipt of all of our spent fuel for the limited time period proposed by DOE, as well as that from the other foreign research reactors covered in DOE's proposed program, would amount to a minuscule fraction (less than 1%) of the amount of spent nuclear fuel that is already under DOE's auspices. In contrast, the benefits to be achieved by eliminating civil commerce in highly-enriched uranium are too large to be calculated.

13. We will be filing extensive written comments on the draft EIS. Although we generally support its analysis, we have fundamental concerns in the following areas:

RESPONSE TO COMMENT
COMMENTOR NO. 7: THE EDLOW GROUP (CONT'D.)

COMMENTOR NO. 7: THE EDLOW GROUP (CONT'D.)

- **Preferred Alternative:** We are extremely disappointed that the draft EIS does not recommend a preferred alternative. Our understanding is that DOE and the State Department jointly developed a preferred alternative which was subject, of course, to completion of the National Environmental Policy Act review requirements. That preferred alternative was specified in a July 13, 1993 submittal by Secretary O'Leary to Secretary of State Warren Christopher, which has been made public. That preferred alternative was to return the spent fuel to the United States over a ten-year period, and to place it in dry storage until it could be put into the repository. Our understanding is that this proposed alternative, moreover, is the only alternative discussed in the draft EIS that is consistent with President Clinton's classified NonProliferation Policy Directive PDD-13. 7-1

- **Legal Obligations:** The draft EIS is inexplicably silent on DOE's legal obligations to receive the spent fuel. Many of us have contracts, or other documents evidencing written commitments on which we justifiably relied, that DOE will receive our spent fuel. Assurances to this effect were repeatedly published in the Federal Register over the past three decades. Indeed, many of our facilities were purchased from the U.S. with this understanding. 7-2

- **Price:** The draft does not address price issues in any significant way. Obviously, if the price established by DOE for receipt and storage of the spent fuel is prohibitively high, it will make any such alternative illusory. We are willing to pay a truly cost-based price, and are not asking the U.S. taxpayers to subsidize our fuel cycle. DOE's preliminary price estimates, however, have been exceptionally high and appear unjustified on the basis of actual cost. 7-3

- **Further Delays:** We are extremely concerned that any further delays by DOE in completing the final EIS, or in issuing a Record of Decision, would cause several operational emergencies for many of us which absolutely must ship spent fuel early in 1996, at the latest. 7-4

- **"No Action:"** We think DOE's assessment that there will be no adverse U.S. environmental impacts if the U.S. adopts the "no action" alternative is incorrect. "No action" will precipitate both the widespread shutdown of many research reactors and reversion of others to reliance on a highly-enriched uranium fuel cycle. Both will have impacts in the U.S. Research reactor shutdowns will dramatically affect both the availability and the prices of medical radioisotopes for U.S. hospitals and medical testing laboratories. 7-5

  More importantly, if those reactors which continue to operate revert to reliance on highly-enriched uranium, this will mean the loss of a major U.S. nonproliferation

RESPONSE TO COMMENT
COMMENTOR NO. 7: THE EDLOW GROUP (CONT'D.)

Response to Comment No. 7-1

The EIS has evaluated several reasonable alternatives including the management of the spent nuclear fuel in the United States. The preferred alternative was not developed until all public comments were received during the comment period for the draft EIS. Sections 2.9 and 4.7 of the final EIS specify DOE's preferred alternative.

Response to Comment No. 7-2

With the exception of cases in which DOE has executed contracts for acceptance of spent nuclear fuel from specific foreign research reactors, DOE considers that neither DOE nor the United States Government has any legal obligation to receive spent nuclear fuel from foreign research reactors.

DOE also considers that it is in the best interests of the United States to implement the proposed action to support long standing U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide. Failure to do so would subject the United States and its allies to the risk that some of the HEU intended for use in research reactors might be diverted into the production of nuclear weapons and used against them, or otherwise harm U.S. nuclear weapons nonproliferation programs.

Response to Comment No. 7-3

Appendix F, Section F.7 of the EIS provides an extensive assessment of life-cycle costs, including discussions of each major cost component, allocation issues (marginal, average, fixed, variable, etc.) sensitivities, uncertainties, and financial accounting. This data will provide the basis for discussions of any fee to be charged for management of spent nuclear fuel from foreign research reactors. DOE is pleased to see that the group of research reactor operators represented by the commentor is not asking the U.S. taxpayer to subsidize their fuel cycle.

Response to Comment No. 7-4

DOE and the Department of State have expedited the completion of the EIS after considering the public comments and evaluating reasonable alternatives to the proposed action. The Record of Decision is scheduled for publication no sooner than 30 days after the release of the final EIS.

Response to Comment No. 7-5

As required by NEPA, Section 4.6 of the EIS does provide adequate analysis on the impacts of the No Action Alternative on the local environments of the U.S. Section 4.6 of the EIS also addresses the detrimental impacts on the RERTR program that could result if the No Action Alternative were adopted.

COMMENTOR NO. 7: THE EDLOW GROUP (CONT'D.)

program that has succeeded until now, and the reinstitution of civil commerce in materials which can be bought and sold commercially and used directly in nuclear weapons, increasing the risks that nuclear weapons will find their way to terrorist organizations or nations unfriendly to the U.S. This impact dwarfs the minuscule environmental risks associated with returning and storing the fuel in the U.S.

Moreover, "no action" will significantly harm U.S. diplomatic relations with its allies, compromise U.S. negotiations with Euratom and for the Treaty on the Nonproliferation of Nuclear Weapons, and could lead to sizable monetary claims against the U.S. government by foreign reactor facilities.

We look forward to the public input that is necessary for any alternative to be successfully implemented by the Department of Energy.

For additional information or answers to questions, please contact either:

Jack Edlow, President
Edlow International Company
1666 Connecticut Ave. Suite 200
Washington, DC 20009
(202) 483-4959

or

Joseph R. Egan, Esq.
Egan & Associates, P.C.
2300 N Street, N.W.
Washington, DC 20037
(202) 663-9200

RESPONSE TO COMMENT
COMMENTOR NO. 7: THE EDLOW GROUP (CONT'D.)

COMMENTOR NO. 8: CSX TRANSPORTATION

5/11/96

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Charles [redacted] Stowell Phone: (609) 359-1765

Title and Organization: Market Manager, CSX Transportation

Address: 500 Water St.

City: Jacksonville State FL Zip 32258

*** COMMENTS ***

Need to include information on the Price-Anderson Act

- effect on ground transportation modes should there be an incident involving the spent fuel. 8-1
- when Price-Anderson would be implemented 8-2
- who implements Price-Anderson (who makes the decision to implement the Price-Anderson act) 8-3

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 8: CSX TRANSPORTATION

Response to Comment No. 8-1

The Price-Anderson Act does not differentiate among transportation modes in terms of indemnification of contractors against public liability for nuclear incidents arising out of or in connection with contract activities. Price-Anderson neither precludes nor recommends any form of transportation. As long as the transportation activity is being carried out under a DOE contract containing an indemnity agreement, Price-Anderson shall apply if there is a nuclear incident arising out of or in connection with the contract activity.

Response to Comment No. 8-2

The Price-Anderson Act's indemnification requirements pertaining to DOE contract activities must be complied with whenever DOE enters into a contract with a person who will carry out activities under that contract that involves the risk of public liability. The specific language of the indemnification agreement that would be included in the contract is contained in 48 CFR Part 952.250-70. In order for indemnification to take place, there must first be a nuclear incident as defined by the regulations.

Response to Comment No. 8-3

DOE implements the indemnification provisions of the Price-Anderson Act, as amended, that concern DOE contract activities that involve the risk of public liability. DOE implements the indemnification procedures through DOE's regulations found at 48 CFR Part 950.70. If the incident is one that constitutes an extraordinary nuclear occurrence, DOE must comply with regulations found at 10 CFR Part 840.

COMMENTOR NO. 12: R.O.B.I.N. FOUNDATION

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: DEE EVANS Phone: (409) 763-5129
Title and Organization: ENVIRONMENTAL ACTIVIST R.O.B.I.N. FOUNDATION
Address: P.O. BOX 3243
City: TEXAS CITY State TX Zip 77590

*** COMMENTS ***

HOW MANY PEOPLE HAVE TO OBJECT THE PROPOSAL OF BRINGING THE WASTE INTO THE PORT OF GALVESTON - TO HAVE THE SHIPMENT DIVERTED TO ANOTHER PORT OF ENTRY. OR ARE THERE ANY OTHER METHODS THAT CAN BE USED - TO CONVINCE YOU, TO TAKE IT ELSE WHERE. GALVESTON COUNTY HAS BEEN USED AS A TOXIC CHEMICAL DUMP FOR TOO LONG.

12-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 12: R.O.B.I.N. FOUNDATION

Response to Comment No. 12-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Galveston, or any port analyzed would have a low impact on workers and the general population. Moreover, the need to manage the covered material to further U.S. nuclear weapons nonproliferation goals is laid out in Section 1.1 of the EIS.

COMMENTOR NO. 14: GALVESTON BAY FOUNDATION

GALVESTON
BAY
FOUNDATION

COMMENTS OF THE GALVESTON BAY FOUNDATION
ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE PROPOSED TRANSPORT OF SPENT NUCLEAR FUEL
THROUGH THE PORT OF GALVESTON

May 1995

The Galveston Bay Foundation is a nonprofit organization dedicated to the preservation and enhancement of Galveston Bay for its multiple uses, through education, conservation, research and advocacy. Members of the Foundation represent all of the diverse users of the Bay.

While the Foundation recognizes the importance to the United States of the development of a plan for the disposal of spent nuclear fuel, the proposal to consider the Port of Galveston as a transfer point raises several concerns related to Galveston Bay which do not seem to be adequately addressed in the Draft Environmental Impact Statement (DEIS) for the project.

1. While the document mentions the bird use and fisheries resources of the bay system, it does not note that Galveston Bay has been named an "estuary of national significance" by the U.S. Congress. As a participant in the U.S. Environmental Protection Agency's National Estuary Program, some $5 million (mostly in federal monies) has been spent to develop a comprehensive conservation and management plan for the Bay, and efforts are currently underway to implement the plan to protect this valuable resource. 14-1

2. The DEIS notes that there is heavy traffic in the Galveston entrance channel but does not state that the Port of Houston (which uses the same entrance channel through Bolivar Roads) is the third largest port in the country and first in foreign tonnage. This high risk use increases the potential for collision and spills. 14-2

3. A key consideration which is not examined in the DEIS are the potential risks to the Bay associated with the transshipment of the nuclear fuel via road and railroad causeways which cross the Bay between the island and the mainland. An accident resulting in a spill over such a crossing could have catastrophic impacts on the Bay. 14-3

Finally, it seems inefficient to ship through Galveston when other ports are much closer to the final storage destination sites. 14-4

17324-A HIGHWAY 3 • WEBSTER, TX 77598 • (713) 332-3381

RESPONSE TO COMMENT
COMMENTOR NO. 14: GALVESTON BAY FOUNDATION

Response to Comment No. 14-1

The information regarding Galveston Bay as an estuary of national significance has been added to Section 3.2.1.2 of the EIS.

Response to Comment No. 14-2

The fact that the Port of Houston is the third busiest port in the United States in terms of tonnage handled has been added to Appendix D, Section D.2.1.2 of the EIS. Appendix D, Section D.5.3.1.3 includes a discussion of the probability of ship collisions.

The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (Appendix D, Section D.1.9.2 of the EIS). Appendix D, Section D.5.3.1.3 presents a discussion of the determination of the probability of ship accidents used in the EIS.

Foreign research reactor spent nuclear fuel in a transportation cask cannot spill because it is solid metallic fuel and is shipped dry. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident.

Response to Comment No. 14-3

An accident on a causeway could result in a cask falling into the Bay. The consequences of this accident would be the same as those described in Section 4.2.1.3 of the EIS under the subheading Sunken Cask. This section has been revised in the final EIS specifically to note that it pertains to cask immersion in inland waterways and estuaries such as Galveston Bay, as well as in the open ocean and coastal waters. A discussion has also been inserted into Section 4.2.3.3 of the EIS to refer the reader interested in causeway accidents to the Sunken Cask discussion.

Response to Comment No. 14-4

The distance from the port to the management site is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations such as port population, route population, port experience with handling containers, and access to the ocean would be considered in making the final selection of port of entry. Appendix D, Section D.1.9 presents details of the port selection process.

COMMENTOR NO. 16: SNAKE RIVER ALLIANCE

Snake River Alliance
P.O. Box 1731 · Boise ID 83701 · 208/344-9161
P.O. Box 4090 · Ketchum ID 83340 · 208/726-7271
P.O. 310 E. Center · Pocatello ID 83201 · 208/234-4762

May 18, 1995

Re: Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

The following comments are made on behalf of the 1,200 individual, family, and business members of the Snake River Alliance, an Idaho-based citizens group that has monitored activities at the Idaho National Engineering Laboratory since 1979. I will confine my remarks to two points, though I am submitting previous comments and additional information.

1. A recent Louis-Harris poll found that 88% of Idahoans are opposed to further spent fuel shipments into Idaho. The pollster characterized Idahoans' stance as "militant unanimity." That attitude might be dismissed as blind NIMBYism, but here in Idaho, we're a lifetime too late to say "Not in my backyard." I suggest Idahoans attitude has grown from direct experience. The Department of Energy, based on its own analyses and standards, has not stored spent fuel safely at INEL or anywhere else. Given the current budget crunch and the bleakness of all projections, how can the DOE guarantee that any spent fuel brought to Idaho from any source, including foreign research reactors, will be stored more safely than spent fuel has been in the past? A proposal to take over management of foreign spent fuel seems to overlook the DOE's history of mismanaging its own. 16-1

2. The Department of Energy seems unable or unwilling to cleave to a coherent set of objectives that make sense in the post-Cold War world. The DOE continues to propose actions that contradict one another and/or its nonproliferation policy, such as it is. An example is the DOE's proposal to build an HEU-fueled tritium production reactor even as it proposes to bring HEU spent fuel to the US based on the proliferation threat it poses. I attach a September 7, 1993, letter from the State Department to the DOE outlining steps to support the Reduced Enrichment for Research and Test Reactor program. The State Department urges the DOE to consider "conversion of DOE's existing research reactors to low enriched fuels." How does a US HEU-fueled production reactor fit with the RERTR program? 16-2

A far more egregious example is found within the foreign research reactor draft EIS itself, particularly when it is read in light of the environmental management memos 16-3

RESPONSE TO COMMENT
COMMENTOR NO. 16: SNAKE RIVER ALLIANCE

Response to Comment No. 16-1

Spent nuclear fuel from foreign research reactors has been safely managed in the United States for over 30 years (Section 1.1 of the EIS). As discussed in Section 2.6.5.3.2 of the EIS, both wet and dry storage facilities at the Idaho National Engineering Laboratory are available for interim storage of foreign research reactor spent nuclear fuel. These storage technologies are described in Section 2.6.5.1 of the EIS. In the event that additional foreign research reactor spent nuclear fuel were to be shipped to the Idaho National Engineering Laboratory, any required new storage facilities would be constructed in compliance with the existing, mature technology for storage of spent nuclear fuel (Section 2.6.5.3.2 and Appendix F of the EIS). As part of the DOE Programmatic Spent Nuclear Fuel and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs EIS (DOE/EIS-0203-F) issued May 30, 1995, identifiable site-specific problems at the Idaho National Engineering Laboratory were addressed in Volume 2 of the EIS.

Response to Comment No. 16-2

The potential tritium production facility would be a part of the U.S. nuclear weapons production complex and would not be a research reactor, such as those addressed by the Reduced Enrichment for Research and Test Reactors (RERTR) program. Thus, the use of HEU in a tritium production facility has no relationship to the proposed action. Rather, the intent of proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide to assist in precluding the spread of nuclear weapons to nonnuclear weapons states.

In any case, the Final Programmatic Environmental Impact Statement for Tritium Supply and Recycling (DOE/EIS-0161) analyzed a number of different technologies for tritium production, including the Heavy Water , Modular High Temperature Gas-Cooled Reactor, Accelerator Production of Tritium, and Advanced Light Water Reactor. Of these, only the Heavy Water Reactor and the Modular High Temperature Gas-Cooled Reactor would be fueled by HEU. The DOE preferred alternative for that EIS is not to select a tritium supply source that is fueled by HEU.

Response to Comment No. 16-3

Regionalization by fuel type would facilitate chemical separation, as the commentor states. It is not true, however, that this is the only rationale. The regionalization by fuel type alternative would also facilitate safe handling and storage. The Savannah River Site has the most experience in managing aluminum-based fuels and the Idaho National Engineering Laboratory has the most experience in managing other kinds of fuels.

and position paper I have attached and against the background of the DOE's preferred alternative for the spent fuel programmatic EIS.

Even though the DOE describes US chemical processing as a nonpreferred alternative, it has not shut the door on that activity. In fact, the only rationale for regionalizing spent fuel by cladding type is to facilitate processing it. That is an unacceptable option. Restarting spent fuel processing here or supporting it abroad violates our own policy and undercuts our ability to persuade other countries to forego the separation of weapons-usable fissile materials. Furthermore, the DOE's past chemical processing has led to significant environmental degradation, worker exposure, and a substantial increase in the quantity and forms of waste to be managed. Finally, it cost a lot of money then, and it will cost even more now.

The draft EIS before us now seems to leave the door open for a later political decision to be made by the likes of Strom Thurmond. The DOE has a grave responsibility to the communities that continue to bear the burden of the Cold War. Spent fuel processing and initiatives that encourage it can only increase that burden. They must be rejected.

16-3 (Cont'd.)

Respectfully submitted,

Beatrice Brailsford
Program Director

Attached:
9.7.93 State Department letter
4.20.95 Jill Lytle memo
12.28.94 Tom Grumbly memo
undated reprocessing position paper
2.12.95 group letter to T. Grumbly
3.7.94 Alliance emergency EA comments
11.9.93 Alliance FRREIS scoping comments
5.95 Alliance newsletter
3.95 Alliance bulletin
12.93 Alliance bulletin
5.8.95 Alliance hearing request
5.5.95 Mike Crapo hearing request

The commentor's opposition to chemical separation is noted. DOE's estimates of environmental impacts, worker exposures, waste generation, and costs are all presented in Section 4.3.6, 4.5, and 4.9 of the EIS .

Commentor No. 17:
Blue Ridge Environmental Defense League

BLUE RIDGE ENVIRONMENTAL DEFENSE LEAGUE

Central office: PO Box 88 Glendale Springs, NC 28629 (910) 982-2691 fax: (910) 982-2954

COMMENTS OF JANET M. HOYLE ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT ON A PROPOSED NUCLEAR WEAPONS NONPROLIFERATION POLICY CONCERNING FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL

May 22, 1995, Wilmington, NC

The Draft Environmental Impact Statement on proposed high-level nuclear waste imports is inadequate and misleading. The foreign waste import program is itself contradictory, unsound, and dangerous.

1. Having shown no capability of dealing with high-level nuclear waste produced by nuclear utilities and the nuclear weapons program in this country, the US Department of Energy is planning to bring in high-level nuclear waste from 41 countries. No final waste management technology exists; no final place or method of disposition has been developed. Importing foreign wastes is ill-conceived and ill-timed at best when our own nuclear waste management program is in disarray. We would be moving this highly dangerous material around the globe with no end game in site. *17-1*

2. Shipping high-level nuclear waste over sea and over land is a proliferation risk. The emergence of domestic terrorism makes the DEIS obsolete. If members of grassroots environmental organizations can track the shipments, *as we did with the Maria and the Marcus last September,* there isn't enough money in the US Treasury to make these shipments secure. Moving this waste gives terrorists thousands of miles of opportunities to secure nuclear weapons capability. Americans are afraid now. Uneasiness will become panic when our home-grown terrorists are armed with nuclear weapons. The rise of domestic terrorism and the tragic example of Oklahoma City make Denmark, Sweden, and Switzerland much safer places than our country to store high-level nuclear waste. *17-2*

3. The DEIS has gaps in information and logic. The tiny differential in radiation risk between the non-accident and an accident situation defies reason. The use of statistics to spread the risks across all the shipment miles is designed to give a false sense of security to a transport corridor community. The reality is that the waste containers have never been tested in real world conditions. The truth is that a high-level nuclear waste transport accident will *17-3* *17-4*

Response to Comment
Commentor No. 17:
Blue Ridge Environmental Defense League

Response to Comment No. 17-1

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS).

Response to Comment No. 17-2

Weapons-grade uranium in some of the spent nuclear fuel from foreign research reactors is a nuclear weapons nonproliferation threat because that uranium could conceivably be removed from the spent nuclear fuel and used in production of one or more nuclear weapons. However, to do so would require that the spent nuclear fuel be reprocessed to chemically separate the uranium from the structure of the spent nuclear fuel elements, fission products in the uranium, and other impurities that are integral parts of the spent nuclear fuel. This separation requires a sophisticated chemical processing plant as well as time and money.

Chemical separation of the weapons-grade uranium could conceivably be accomplished if the spent nuclear fuel were left in an irresponsible nation having the required technology, time, and financial resources, or if it were released to a well-funded terrorist organization. However, such actions are not possible in the relatively short time that the spent nuclear fuel would be in transit. During transit, the spent nuclear fuel would be sealed in transportation casks weighing 25 tons or more. The sheer size and weight of these casks, coupled with the radioactive nature of the spent nuclear fuel itself, make movement of spent nuclear fuel a time consuming, difficult task. Conversely, these characteristics make spent nuclear fuel an unattractive target for theft during transit, thus, a low proliferation risk during transportation. Furthermore, since spent nuclear fuel shipments are guarded and their schedules are not announced, these shipments are also resistant to terrorism. During the past 40 years, hundreds of shipments have been made in similar casks. There have been no terrorism or proliferation problems with any of these shipments. The physical security provisions used during transit have proven to be effective.

Appendix H was added to the final EIS in response to public comments to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management sites.

COMMENTOR NO. 17:
BLUE RIDGE ENVIRONMENTAL DEFENSE LEAGUE (CONT'D.)

page 2 COMMENTS-Janet M. Hoyle

happen somewhere. It is only a matter of time. No one knows how these untested containers will perform in an accident situation. The reliance on the shippers for route selection and other decisions places communities in grave danger. The cheapest way may not be the safest way. 17-4 (Cont'd.)

The claims of little or no cancer risk to people who live near the transport routes are ridiculous. The nuclear industry and the DOE are not held to the same one-in-a-million standards that EPA mandates for hazardous materials. 17-5

Further, the DEIS does not delineate the non-cancer risks to affected populations. Its risk assessment is based solely on latent cancer fatalities. Acute effects from radiation exposure are simply dismissed. 17-6

The handling of environmental justice issues is insulting. Despite claims of no effect, rail shipments would travel through poor and minority communities. Last March, when I posed the question of disproportionate risk, a DOE official stated, "We can't move the tracks." The response of the Blue Ridge Environmental Defense League is "Don't move the wastes." 17-7

4. Last fall the people of southeastern North Carolina were sneaked up on by the so-called urgent relief rail shipment of imported wastes. Many of these people are being sneaked up on again. The mere publication of a DEIS and the holding of hearings long distances from many transport corridors are just not enough. We request at least four additional hearings in North Carolina. 17-8

RESPONSE TO COMMENT
COMMENTOR NO. 17:
BLUE RIDGE ENVIRONMENTAL DEFENSE LEAGUE (CONT'D.)

Response to Comment No. 17-3

The small differential in radiation risk between the incident-free and accident scenarios is accurate. The analysis to support this judgment is presented in Section 4 and Appendices C, D, E, and F of the EIS.

Response to Comment No. 17-4

If a policy to accept and manage spent nuclear fuel from foreign research reactors is adopted (Management Alternative 1 or 3; Sections 2.2 and 2.4 of the EIS), the foreign research reactor spent nuclear fuel would be shipped in "Type B" casks (Section 2.6.2 and Appendix B.2 of the EIS). Spent nuclear fuel has been transported in "Type B" transportation casks on highways and rail lines in the United States for over four decades. During that time, no "Type B" cask has ever been punctured or released its contents, including "Type B" casks involved in highway accidents. The likelihood of an accident during transport of spent nuclear fuel is low, the likelihood of cask failure during transport is lower yet (Section 4 of the EIS).

The shipper of record must comply with applicable U.S. Department of Transportation and NRC regulations discussed in Section 5 of the EIS. Routes for transport of spent nuclear fuel from foreign research reactors are selected in compliance with U.S. Department of Transportation regulations and approved by NRC.

Response to Comment No. 17-5

The estimates in the EIS of cancer risk to people who live near the transport routes are accurate. The analysis to support this judgment is provided in Section 4 and Appendices D and E of the EIS.

Response to Comment No. 17-6

The EIS discusses noncancer risks in Section 4.1.3, General Radiological Health Effects. A large dose of radiation can cause prompt death, but such a dose of radiation is not possible in any reasonable accident scenario involving the transport of foreign research reactor spent nuclear fuel.

Response to Comment No. 17-7

It is evident from the analysis provided in Appendix A and Sections 4.2.2.6, 4.2.3.7,

COMMENTOR NO. 17:
BLUE RIDGE ENVIRONMENTAL DEFENSE LEAGUE (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 17:
BLUE RIDGE ENVIRONMENTAL DEFENSE LEAGUE (CONT'D.)

and 4.2.4.5 that despite the potential for transport of the spent nuclear fuel by truck , barge or rail through minority, as well as non-minority communities, no disproportionately high and adverse human health or environmental effects were found to result from implementation of the proposed action.

Response to Comment No. 17-8

Seventeen public hearings were held on the draft of this EIS in the locations determined most likely to be directly affected by the EIS alternatives, specifically in the ports of entry and at the potential management sites. In addition to accepting comments from the public during these hearings, written comments were also welcomed, and encouraged. DOE considers that these actions have provided ample opportunity for the public to comment on the draft EIS.

COMMENTOR NO. 23: NUREMBERG ACTIONS

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Greg Scott Phone: 510-746-1168

Title and Organization: Nuremberg Actions

Address: P.O. Box 1637

City: Pittsburg State Ca Zip 94565

*** COMMENTS ***

\# 100 accidents (including of nuclear materials) exposed in Ch. 2 story by Roland DeWolk a couple years ago. — 23-1

* Where is it going? Most of the proposed sites are native land where people are fewer because of policies like forcing radioactive smallpox blankets on them. Must we cooperate w/ further genocide? — 23-2

* If they can succeed in forcing this on others it will encourage the continued production and dissemination of the most poisonous substance on Earth, a single molecule of which can kill by cancer or mutation — 23-3

* On July 17, 1944 & Sept 1, 1987 their excuse was that they were accidents. They weren't but they have lots of accidents. — 23-4

\# Nuclear Power is a cover for Nuclear weapons programs (over) — 23-5

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 23: NUREMBERG ACTIONS

Response to Comment No. 23-1

The commentor's assertion that 100 accidents were exposed in a Channel 2 story by Ronald DeWolk a couple of years ago, is noted. Several accident scenarios, including severe accidents, were analyzed during preparation of the EIS. Results of the accident analysis at the ports are given in Section 4.2.2 of the EIS with supporting detail in Appendix D, Section D.5. The risk to health and safety of the public from these accidents is assessed to be low.

Response to Comment No. 23-2

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Proposed management sites do not have low populations because of spent nuclear fuel management activities were forced on them in the past.

Response to Comment No. 23-3

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). The analysis demonstrates that acceptance of this foreign research reactor spent nuclear fuel in the U.S. would not pose a significant radiological risk (Section 4.8.3 of the EIS) either to the human population or the environment. In fact, the reduction of potential availability of the HEU outside the U.S. is a primary goal of our nuclear weapons nonproliferation policy.

Response to Comment No. 23-4

As the result of public concern born from a September, 1993 television report, the Contra Costa County Board of Supervisors initiated an investigation of the safety at Concord NWS. Their report on the subject, Safety at the Concord NWS dated November 2, 1993, concluded in part, "There were no incidents involving explosions or radiation exposure....Many of the reported incidents were not accidents caused by Weapons Station employees but, rather, were discoveries by employees that materials being received had been damaged during loading or transit. In some cases the shipments had not been properly blocked, braced or banded."

COMMENTOR NO. 23: NUREMBERG ACTIONS (CONT'D.)

and the criminality inherent in preparing for indiscriminate mass annihilation. 23-5 (Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 23: NUREMBERG ACTIONS (CONT'D.)

In fact, the safety record at Concord NWS is significantly better than that of ports in the private sector with similar activities. According to the Department of Labor statistics, for the category of marine cargo handling, the number of lost workday cases per 100 full-time workers for 1993 was 7.1 nationwide (current data not available), which is typical. The number of lost workday cases per 100 workers at Concord NWS for the first three quarters of fiscal year 1995 was 5.3, which is also typical for Concord.

Response to Comment No. 23-5

Foreign research reactors are used for medical therapy, analysis, and research. They are also used to conduct research on materials and the environment, and to produce radioisotopes for leak detection. Foreign research reactors are not used for weapons or commercial power production. Section 1.1 of the EIS describes medical and commercial applications of foreign research reactors.

COMMENTOR NO. 32:
SAN FRANCISCO BAY CHAPTER OF THE SIERRA CLUB

Text of oral comments by Lara Hilder on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, Concord, CA, 22 May 1995. Lara Hilder is Chair of the Disarmament Subcommittee of the San Francisco Bay Chapter of the Sierra Club and has served as a member of the national Military Impacts on the Environment Committee (1990-1995).

The Sierra Club supports the goals of the Nuclear Non-Proliferation Treaty. The Club also has serious concerns about transportation, storage and potential environmental impacts of nuclear materials. For a long time the Sierra Club has been involved with the issue of with shipment of spent nuclear reactor fuel into the US. For example, several years ago the Club pursued legal action to force DOE to prepare this Environmental Impact Statement before accepting spent fuel rods (of US origin) from countries with research reactors.

Because permanent disposal methods are not yet available, the Club urges DOE, whenever possible, to pursue continued secure storage of the spent fuel rods in the countries where they have been used. More than three quarters of the source countries are affluent nations that are strong allies of the US, and they already have experience with nuclear materials: Canada, Austria, Japan, Sweden, Finland, Netherlands, Germany, Denmark, the United Kingdom, for example. With appropriate input from the US, proliferation risks can be minimized. *32-1*

The Club is concerned that, by continuing to accept these spent fuel rods, the US encourages other nations to recklessly pursue nuclear power and the production of medical and industrial isotopes without accepting the consequences of confronting the need for permanent disposal of both high and low level enriched wastes. The situation is especially bizarre with respect to the United Kingdom. Under the proposed action the UK will ship spent fuel rods to the US for permanent storage; however the UK would be happy to accept such material from other countries for reprocessing as long as the country of origin were to accept the final vitrified waste products! *32-2* *32-3*

The Sierra Club has an umbrella structure, with a national organization and local chapters. As such, each chapter may raise specific concerns with the DEIS. For example, the San Francisco Bay Chapter shares with many other citizens, legislators, officials and groups numerous concerns about safe handling and transportation of the spent fuel rods in boats through the heavily traveled San Francisco Bay and in trucks and trains through populated areas of the western states. But merely transferring the risk to other areas of the country will not solve the long term problem of disposal. Souce reduction and permanent disposal methods are essential. *32-4* *32-5*

Further written comments on the DEIS will be submitted.

RESPONSE TO COMMENT
COMMENTOR NO. 32:
SAN FRANCISCO BAY CHAPTER OF THE SIERRA CLUB

Response to Comment No. 32-1

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

Response to Comment No. 32-2

An objective of the proposed action is to reduce the risk of nuclear weapons proliferation (Section 1.2 of the EIS). Because of the research, medical, commercial, and educational benefits available from research reactors, foreign nations are reluctant to shut down their research reactors. Thus, the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). In addition, the U.S. accrues significant benefits from the operation of foreign research reactors - including Moly-99 and other medical isotopes.

Response to Comment No. 32-3

The EIS discusses the acceptance of spent nuclear fuel from the United Kingdom and it also discusses the possibility of assisting other nations in shipping their spent nuclear fuel to the United Kingdom to be reprocessed there. These actions are included among the wide range of reasonable alternatives in this EIS because such alternatives accomplish the goal of reducing the risk of nuclear weapons proliferation. The Department of State is currently negotiating with the United Kingdom in an effort to assure that any of the HEU spent nuclear fuel that might be reprocessed there would be blended down to LEU at the reprocessing site, which would support the goal of nuclear weapons nonproliferation.

Response to Comment No. 32-4

The passage from San Francisco Bay to Concord NWS meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). Favorable transit from open ocean is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. The population distribution within the port(s) and along truck and rail routes was considered in the EIS (Appendix D, Section D.1.9.5 and Attachment D3 of the EIS). Other considerations, such as port population, port experience with handling containers, and port facilities, have also been considered in making the final selection of ports of entry. Appendix D, Section D.1.9 presents details of the port selection process.

Response to Comment No. 32-5

DOE agrees with this comment. Source reduction and permanent disposal methods are essential, but these subjects are outside the scope of this EIS.

COMMENTOR NO. 36: SEATTLE WOMEN ACT FOR PEACE

To: Charles Head, Program manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

From: Kathryn A. Crandall – commenting for Seattle Women Act for Peace
1215 Queen Anne Ave. No. #5
Seattle, WA 98109

Date: May 24, 1995

Comments on Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

This hearing and current Environmental Impact Statement (EIS) process is another round in an elaborate shell game USDOE is playing with some of the most lethal stuff on earth. Shipping high level nuclear waste through the Puget Sound has been proposed several times - and each time we have said no, and we have asked that minimal common sense safety issues be addressed. The citizens of Washington State have said no, elected officials have said no, the longshoremen have said no and a federal court has said no to high-level waste imported this way. Still with arrogance and lack of common sense this plan has been resurrected again, Leaving us to ask: What part of NO is it hat USDOE does not understand? Again we are asked to accept the world's nuclear waste, at our taxpayer expense, via commercial transport with little to no preparation for major safety problems - like a shipboard fire. 36-1

Worse, USDOE does not present in this EIS credible plans for the long-term storage and management for this spent nuclear fuel (SNF). USDOE's management is akin to saying, "Quick the elephants are here, should we build a zoo?" Now, Hanford and all the other "zoos" are overcrowded and there's no funding for more. Hanford has significant complicated problems dealing with the fuel rods and other nuclear waste it has now. It is completely unacceptable to just pile SNF higher and deeper at the same time USDOE is in the process of turning its back on the commitment to cleanup the mess its already made at Hanford and other sites. Further, if USDOE plans (as one option states) to transport the SNF all the way across the country to Savannah River, or another Eastern site, hearings should be held in every single community between here and there along the transport route. 36-2 36-3 36-4

RESPONSE TO COMMENT
COMMENTOR NO. 36: SEATTLE WOMEN ACT FOR PEACE

Response to Comment No. 36-1

The commentor's opposition to the proposed action is noted. DOE is considering accepting the foreign research reactor spent nuclear fuel at any of 10 ports selected on the basis of specific criteria described in Section 2.6.3.1 of the EIS. For each port selected, the impacts from activities related to the shipments of foreign research reactor spent nuclear fuel were evaluated in Section 4.2.2. The evaluation includes impacts from routine activities, credible accidents (including shipboard fires), emergency management and response, cumulative impacts, mitigation measures, and environmental justice concerns. The risk to the environment and the health and safety of workers and public resulting from the proposed action for all candidate ports was determined to be low.

Response to Comment No. 36-2

Ultimate disposition of DOE's spent nuclear fuel, including the foreign research reactor spent nuclear fuel that may be accepted into the United States, is a high priority. For planning purposes, DOE has determined that its spent nuclear fuel, including foreign research reactor spent nuclear fuel, that is not otherwise dispositioned (e.g., chemically separated, with the high-level waste being converted into a vitrified glass for repository disposal) is authorized for disposal in a geologic repository. However, since the repository characterization program is in its early stages, the waste acceptance criteria for deposit of DOE's spent nuclear fuel in a repository have not been developed. Thus, a determination cannot be made at this time as to the requirements that must be met to allow placement of the foreign research reactor spent nuclear fuel in the repository. As a result, the analysis in the EIS for the time period beyond 40 years is qualitative rather than quantitative. The impacts due to ultimate disposition are discussed qualitatively in Section 4.2.7 of the EIS.

Response to Comment No. 36-3

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

The richest irony in this EIS is USDOE's justification that this importation plan furthers nonproliferation goals. It sounds good, since we all want to prevent nuclear weapons proliferation, but this goal is not met by USDOE's plans to import nuclear waste. First, many of the countries we are taking SNF from do not pose any threat of pursuing increased nuclear arms development (Sweden, Australia, Denmark, for example.) Second, much of the SNF is low enriched uranium which is difficult, at best, to divert into a nuclear weapons program. Otherwise, would we really be providing nuclear reactors to countries like North Korea? Finally, Nitric Acid laced with nuclear waste is right now, today in fact, being shipped from Hanford to Britain, to be reprocessed by British Nuclear Fuels. Britain is among the countries that we are taking SNF back from. Talk about two ships passing in the night. With our right hand we are taking poisonous candy (SNF) away from Britain, and with our left hand we're giving it back. 36-5

Moreover, problems with a nitric acid sample last Fall demonstrate the problems in shipping weapons useable and lethal nuclear material. The sample shipment was miss-directed or as the British press stated "lost in the Post." USDOE has done little to prevent diversion by terrorists in this transport of these SNF shipments. After Oklahoma City, we should be especially concerned about diversion of weapons useable material in this country.

If the U.S. really wants to strengthen the non-proliferation regime, we would get busy at Hanford and share cleanup and safe management technologies with other countries. Already technology is available to safely store their nuclear waste where it is - alleviating any need to reprocess it or ship it all around the world , inviting accidents or terrorist diversion. By opening Hanford and other sites to full inspection by the International Atomic Energy Association, and encouraging other countries to do the same, we can create the transparency and verification needed for a strong non-proliferation regime. Most importantly the U.S. really ought to redouble its efforts to adhere to its treaty obligation under Article VI of the Non-proliferation Treaty, and work toward nuclear disarmament. 36-6

Response to Comment No. 36-4

It would not be feasible, nor does NEPA require, a hearing be held in every community along a potential transportation route. As such, a total of seventeen public hearings were held on the draft EIS in the locations determined most likely to be directly affected by the EIS alternatives, specifically in the ports of entry and at the potential management sites.

Response to Comment No. 36-5

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly-enriched (weapons-grade) uranium in civil programs worldwide. Successful implementation of the proposed policy would remove as much U.S.-origin HEU as possible from civil programs worldwide while giving foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

Overseas management of spent nuclear fuel is one of three management alternatives under consideration (Sections 2.2 through 2.4 of the EIS). The option of overseas reprocessing will be evaluated in terms of actions which support the reduction of international commerce in HEU.

Response to Comment No. 36-6

International Atomic Energy Agency inspection efforts at the Hanford Site and other candidate management sites are outside the scope of this EIS. Section 2.6.5 describes storage technologies and site management options that would be used if a policy of acceptance into the United States were adopted.

The proposed action lends important support to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) and the nuclear weapons nonproliferation efforts of the United States because it would reduce international commerce in highly enriched (weapons-grade) uranium and encourage the use of LEU in civil programs worldwide. Removing HEU from commerce and supporting peaceful uses of nuclear energy as stated in Article 4 of the NPT would help further the cause of nuclear disarmament as called for in Article 6 of the NPT.

COMMENTOR NO. 37: HEART OF AMERICA NW

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: CYNTHIA SARTHOU Phone: 382-1014

Title and Organization: HEART OF AMERICA NW

Address: 305 4th St., SUITE 408

City: SEATTLE State WA Zip 98101

*** COMMENTS ***

RESPONSE TO COMMENT
COMMENTOR NO. 37: HEART OF AMERICA NW

Presentation on Spent Fuel

Transport Risks One option listed in the EIS is to truck the foreign spent fuel from the Port of Entry to either INEL or Savannah River. From Tacoma, this would require transport down I-5 to Portland and then across the Columbia River Corridor.

Trucks are not an extremely safe method of transportation of this material. This material would be hauled by Commercial Carriers. The 1991, Washington State Department of Health's compilation of data on commercial haulers of radioactive waste showed that up to 50% of the firms in this state handling this material has been cited for major safety deficiencies when inspected at the state border. Nevertheless, because of the government veil of security surrounding these shipments, they will not be inspected at the state border or anywhere else along the route. 37-1

Just as importantly,USDOE has failed and refused to assist communities along these transportation routes in equipping themselves to handle a possible accident. In fact, USDOE has, in the past, resisted efforts by communities to obtain USDOE funding for monitoring, training and equipping local emergency responders. Local fire fighters simply do not presently have the necessary radiation training and equipment necessary to respond to an accident involving spent fuel shipments. 37-2

So in this hearing, we must insist that if USDOE continues with its plans, they pay the full costs of training, equipment and monitoring required by local emergency responders to safeguard the health and safety of the public along the transportation routes. And, that this be provided before the begin shipment of this material.

Hanford as the Storage Site USDOE's proposal includes Hanford as a possible site for storage of this fuel after receipt. The EIS speaks in terms of Hanford as a Phase II storage facility, that is, the fuel would be shipped to INEL and/or Savannah River until a new facility, on the 200 Area Plateau intended for long term storage, could be constructed at Hanford (est. at approx. 10 years). Then it would be shipped from Savannah River and/or INEL to the Hanford facility. 37-3

Hanford is clearly not an acceptable site for the storage of foreign reactor fuel. Hanford already has a leaking storage pool of High Level spent fuel, known as the K Basin, which sits alongside the Columbia River. Although USDOE has conceded that K Basins are a major problem at Hanford, they are having difficulty coming up with the money to solve that problem. They have proposed construction of a new facility at Hanford to hold the K Basin fuels. Construction of this facility and removal of the spent fuel from K Basins is, and should remain the number one priority of USDOE at Richland. This facility should not be expanded, and transfer of spent fuel from K Basins delayed, so that Hanford can become the garbage can for the worlds nuclear waste.

The time estimates for storage of this spent fuel are unknown, but the EIS speaks in terms of storage until final disposition. The only options for disposition being considered are Yucca Mtn. Since the House Budget Resolution zero funds Yucca Mtn., this is probably no longer an option. In fact, the Congress is considering an "existing USDOE Site" for storage of the commercial fuel intended for Yucca Mtn. So if Hanford gets the foreign spent fuel you can bet your bippie that we will get the Commercial spent fuel as well. 37-4

The second option being discussed is reprocessing. Hanford's processing facilities are antiquated and cannot safely be restarted. Moreover, USDOE is already having extreme trouble attempting to handle and dispose the waste produced by its last efforts at reprocessing. (In fact, we still have 144 tanks full of that waste that has not been adequately addressed.) Clearly, USDOE should not consider reprocessing as an option. 37-5

Response to Comment No. 37-1

DOE contacted the Commercial Vehicle Division of the Washington State Highway Patrol in response to this comment, but was not able to ascertain the source of the commentor's statistic about 50 percent of the trucking firms having serious safety defects. From January 1 through August 15, 1995, out of 301 radioactive shipment inspections performed by the Highway Patrol at Plymouth, WA, only ten vehicles were issued citations. This is a citation rate of only three percent, not fifty percent. Furthermore, none of the ten citations were for serious safety defects. DOE would not attempt to prevent the State from conducting inspections. DOE recognizes its responsibility to assure that its hazardous materials are transported safely. DOE has developed and implemented a mandatory Motor Carrier Evaluation Program (MCEP). The criteria for evaluating motor carriers in the MCEP include checks of the following attributes:

Hazardous Material Transport Experience,
Equipment Profile,
Insurance Requirements,
Financial Stability,
Carrier Safety Programs,
Drivers (including: Training Program, Selection Criteria, Turnover Rate, and Incentive Program),
Carrier Management,
Equipment Maintenance Program,
Hazardous Material Routing Policy,
Security,
U.S. Department of Transportation OMC Safety Rating, and
Carrier Interviews.

Trucking firms with poor safety records would be excluded from transporting the foreign research reactor spent nuclear fuel under the mandatory MCEP, which is described above.

Response to Comment No. 37-2

DOE considers that there is adequate regulatory and emergency preparedness infrastructure to ensure the safe acceptance and transport to designated management sites if the foreign research reactor spent nuclear fuel is managed in the United States. Federal funding to State, Tribal, and local governments for maintaining emergency response programs is discussed in Section 2.7.1. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advise and assistance to the State, Tribal and local agencies involved with a radiological incident. Emergency preparedness, security, and coordination

COMMENTOR NO. 37: HEART OF AMERICA NW (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 37: HEART OF AMERICA NW (CONT'D.)

of DOE with local emergency response authorities, and security are discussed in general in Sections 2.7 and 2.8 of the EIS. Details would be contained in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

Response to Comment No. 37-3

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 37-4

If it is accepted into the United States, the foreign research reactor spent nuclear fuel would be managed until ultimate disposition in a geologic repository. This is Management Alternative 1 or 3, as discussed in Sections 2.2 and 2.4 of the EIS. A repository may be ready as early as 2015, but the environmental impact calculations in this EIS are based on an assumed management period of 40 years. DOE did not examine the possibility of management for longer periods of time because the scope of the EIS is limited to 40 years. The candidate repository at Yucca Mountain, NV, is still under consideration.

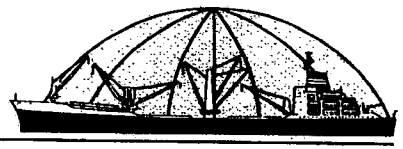
The potential acceptance of commercial spent nuclear fuel at the Hanford Site is outside the scope of this EIS.

Response to Comment No. 37-5

See response to comment 37-3, above.

COMMENTOR NO. 38: INTERNATIONAL LONGSHOREMEN'S AND WAREHOUSEMEN'S UNION

International Longshoremen's and Warehousemen's Union
LOCAL 23
(206) 383-2468
1710 MARKET STREET
TACOMA, WASHINGTON 98402



May 24, 1995

Gentlemen;

When our union was informed that we may be chosen as a port of entry for the spent nuclear waste, many questions immediately came to mind. The natural fear of what would happen if there was an accident, and what precautions would be taken in order to prevent this from occurring. The Longshore Union in Tacoma is not only concerned about possible exposure to themselves if an accident were to occur, we are also concerned with what devastation could happen to our community, and what local agencies are trained to handle such an accident. 38-1

Security is another concern. The Port of Tacoma has relatively easy access, whereas the security in the two government ports under consideration, Military Ocean Terminal, Sunny Point, North Carolina, and Navel Weapons Station, Concord, California, have a far superior degree of security already in place. This must be considered with today's social climate with regard to acts of terrorism against the government. The Puget Sound has two of the busiest ports in the nation, Tacoma and Seattle; both being in the top ten in the country, therefore the amount of ship traffic should have been a consideration when choosing possible sites and we feel this was not done. 38-2 38-3

Tacoma is proud of its Port and the Longshore Union is equally as proud of its accomplishments. I started working on the Tacoma Docks in 1964, and I have seen and been a small part of the growth since then. It has taken years of dedication, cooperation, and hard work from City Officials to laborers from Port Officials to shipping companies. The entire community has contributed to making the Port of Tacoma achieve its "Major Port Status" worldwide. We believe to choose Tacoma as a Port of Entry for spent nuclear waste would turn that completely around, and this could make companies take a second look at relocating their business in the Port of Tacoma. 38-4

You have mentioned cost as being a factor and we wonder if you have given any consideration to what price we in Tacoma may have to pay. We loudly say the price is to high!

Sincerely,

Dick Marzano
President Local #23

nuclear/wd/ds/DM

RESPONSE TO COMMENT
COMMENTOR NO. 38: INTERNATIONAL LONGSHOREMEN'S AND WAREHOUSEMEN'S UNION

Response to Comment No. 38-1

Several accident scenarios, including severe accidents, were analyzed during preparation of the EIS. Results of the accident analysis at the ports are given in Section 4.2.2 of the EIS with supporting detail in Appendix D, Section D.5. No catastrophic effects were found to result from severe accidents involving foreign research reactor spent nuclear fuel at any of the ports analyzed.

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Response to Comment No. 38-2

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted.

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures can greatly reduce the risk of such actions. Security would be provided for all shipments of foreign research reactor spent nuclear fuel, as required by the Code of Federal Regulations (10 CFR Part 73). The

COMMENTOR NO. 38: INTERNATIONAL LONGSHOREMEN'S AND WAREHOUSEMEN'S UNION (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 38: INTERNATIONAL LONGSHOREMEN'S AND WAREHOUSEMEN'S UNION (CONT'D.)

security provisions are summarized in Appendix H of the EIS. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit.

Response to Comment No. 38-3

The port selection process does not specifically consider the amount of marine traffic as a criterion. The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (Appendix D, Section D.1.9.2 of the EIS). Appendix D, Section D.5.3.1.3 presents a discussion of the determination of the probability of ship accidents used in the EIS.

Response to Comment No. 38-4

DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' status with respect to their clients. This is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions. As such, there should be no adverse commercial or economic reaction to the use of the port. Historically, there were no adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

COMMENTOR NO. 45:
BRADWOOD, OREGON PRIVATE PORT

Jess E. Minium, Jr.
Attorney at Law
P.O. Box 120
Kelso, WA., 98626
Phone: (360) 577-5606
Fax: (360) 577-5606
(Phone before faxing)

May 25, 1995

Director
U.S. Department of Energy
Washington D.C.

RE: Public Hearing for environmental impact statement on use of Port of Portland, Oregon for return of foreign nuclear reactor rods to United States.

Dear Sir:

Please enter this letter as part of the written responses to the public hearing on the above referred matter and note that the following objections are made:

1. Port of Portland is a PUBLIC port. All decisions are subject to the Committee process. As a public port, many varied interests will compete for a decision for or against any question. Timely decisions are impossible. **45-1**

2. The Port of Portland is in a heavily populated center. The citizens see great danger in this project. Approval of the citizens could only be accomplished by placing the project somewhere else, i.e., not in my back yard. **45-2**

3. The Port of Portland is controlled by existing labor contracts. All decisions are subject to labor contract inter-meddling. The project would be held hostage to their demands. **45-3**

These three factors are controlling to a proper decision on the matter. It would seem that all of the above objections would apply to not only to the Port of Portland, but also to the other Ports under consideration.

The best alternative and safest solution is a PRIVATE Port.

A Private Port would be away from the population center, able to make decisions by the authority of owner without Public interaction, and would not be under existing contract to the labor unions. Such a Port exists at historic BRADWOOD, OREGON, on the Columbia River. **45-4**

RESPONSE TO COMMENT
COMMENTOR NO. 45:
BRADWOOD, OREGON PRIVATE PORT

Response to Comment No. 45-1

The comment that the Port of Portland is a public port and that its decisionmaking process may be slow as a result, is noted.

Response to Comment No. 45-2

DOE considers that the port selection criteria successfully indicates ports that can safely handle foreign research reactor spent nuclear fuel. The analysis in the EIS indicates that the use of any of the ports indicated by the port selection process, including the Port of Portland, would not pose any significant risk to either the port personnel or the population near the port (Section 4.2.2 of the EIS). The port selection process only identifies ports that are acceptable for the receipt and handling of foreign research reactor spent nuclear fuel, it does not determine which port is best. The decision as to which port or ports would be used in the case that foreign research reactor spent nuclear fuel is accepted into the United States, will be in the Record of Decision. The population in the port, surrounding areas, and along the route to the management site(s) is only one of the many factors that must be considered in determining the best port. All population in the area of the port, including the population in close proximity of the terminal, was considered when the effects of possible accidents were calculated (Appendix D, Section D.5 of the EIS). These calculations demonstrate that the risk from accidents to all individuals is low.

Response to Comment No. 45-3

Although many ports are involved with unionized labor, this was not a consideration in selecting which ports could safely handle foreign research reactor spent nuclear fuel. If the decision is made to accept foreign research reactor spent nuclear fuel into the United States, DOE would work with ports and their labor unions to carry out the policy.

Response to Comment No. 45-4

The port selection process did consider public and privately owned commercial ports.

COMMENTOR NO. 45:
BRADWOOD, OREGON PRIVATE PORT (CONT'D.)

This Private Port's location near the mouth of the Columbia River, away from population centers, with it's zoning status for Marine Industrial, with the absence of existing labor union contracts, makes Bradwood uniquely suited and the best alternative, for a hazardous and nuclear products terminal.

The property has historic use between 1842 and 1965, as the site of a lumber mill and deep river port consisting of approximately 400 acres, 75 acres presently zone for Marine Industrial, with an waste deposit site designation, located on the Columbia River at Bradwood, Oregon, between Columbia River milepost 37 and 39, about 30 miles east of the mouth of the Columbia River and about 70 miles down river from Portland, Oregon.

On the river side, the property line extends to the navigable channel of the Columbia River, affording 7000 of River frontage. The channel is 40 feet deep and is regularly maintained by the U.S. Army Corps of Engineers.

The property is served by the Burlington Northern railway with a direct line to the Portland hub and all states in the continental U.S.A. It is also accessible to and from Oregon State Highway 30, leading to Portland, Oregon, by a two mile county road. Bridge access to the State of Washington canbe had 20 miles northeast and 30 miles west of the property.

The property has a rock quarry with an estimated 11 million tons of high quality rock, suitable for jettyrock.

The owners of Bradwood are ready, and willing to enter into a substantial contract with the Department of Energy. Such a contract would require the construction of proper terminals. Although this would take time and money, any belief that the project can be maintained at a public port, ignores the public interest that would be provoked by such a project, the expensive, inflexible, and controlling interests of the labor unions, and the local political decisions by committee of the port districts.

After due considerations, I believe the best alternative for this project is a Private Port controlled by a reasonable contract.

All inquiries are to be make through my office.

Sincerely,

JESS E. MINIUM, JR.
Attorney at Law

cc: Ken G. Niles
Oregon Dept. of Energy.

Dept. of Energy/Nuclear Port.
Page 2 of 2 pages.

RESPONSE TO COMMENT
COMMENTOR NO. 45:
BRADWOOD, OREGON PRIVATE PORT (CONT'D.)

COMMENTOR NO. 46: HANFORD ACTION OF OREGON

Robin Klein, Hanford Action of Oregon
PO Box 42633
Portland, OR 97242
(503) 235-2924

Spent Fuels Public Hearing
Portland, OR

May 25,1995

I have no new wisdom to offer here. I can only say that what we've said before, we now say even more strongly. Hanford Action of Oregon opposes acceptance of foreign spent nuclear fuels. There are primarily two compelling reasons.

1) Transportation risks are unacceptable. Accidents can never be fully prevented. The potential harm from just one malady is just too terrible to risk. Furthermore, it is almost impossible to completely safeguard against terrorism or theft of the cargo. It is well accepted that, it is during transit that a shipment is most vulnerble to interception or easy attack. If we agree to accept back spent fuels from foreign lands, these shipments will have to travel great distances across the seas. As physician Helen Caldicott, founder of Physicians for Social Responsibility, expressing her concern about shipping spent fuel rods from Japan to Britain and France for reprocessing, said "if the 1.7 tons of plutonium (on a single ship) burned, depending on wind currents, most inhabitants of the globe could be in peril". . . and, "If the ship had to dock in an emergency, any port along the route would be vulnerable." *46-1*

46-2

46-3

Clearly, if Hanford is the destination, and the Port of Portland the port of entry, we here, in the greater Portland/Vancouver area, will be at the greatest risk of all, as shipments sail down our Columbia River, through our cities. Needless to say a catastrophic accident or sabotage could be devastating to our population and environment. We also reject transportation, by rail or highway, of such spent fuels, for safety reasons as well. *46-4*

46-1 (Cont'd.)

The Nuclear Free Port Coalition, a coalition of labor, community, and environmental organizations here in Portland, has said NO shipments of spent nuclear fuel through our port. The longshoremen don't want to handle these dangerous cargos, environmentalists don't want to subject the environment to possible releases of longlived radionuclides, and above all the public doesn't want these threatening cargos on their rivers, passing through their cities. *46-5*

RESPONSE TO COMMENT
COMMENTOR NO. 46: HANFORD ACTION OF OREGON

Response to Comment No. 46-1

The commentor's opposition to transportation of spent nuclear fuel by rail or highway is noted. Nuclear weapon nonproliferation is important, however, and the calculations in Section 4 of the EIS demonstrate that any environmental impacts for both accident and incident-free activities would be low.

Response to Comment No. 46-2

Section D.5.9 has been added to Appendix D of the EIS to address the issue of terrorism and sabotage. One of the attack scenarios postulates hijacking a transportation cask full of spent nuclear fuel.

Appendix H was added to the final EIS in response to public comments to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management sites.

Response to Comment No. 46-3

The probability of an accident at sea is discussed in Appendix C, Section C.5.5 of the EIS, while the port accident probabilities are found in Appendix D, Section D.5.3.1.3. The analysis in the EIS indicates that the risks associated with an accident are low (Sections 4.2.2.3 and 4.5). With respect to accidents involving a fire as mentioned by the commentor, the EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), during which an airborne release of radioactive material results. The results of the analysis of these accidents can be found in Appendix D, Section D.5.4. The analysis indicates that even in the event of a severe ship fire, neither the consequences nor risks are great (Appendix D, Section D.5.5). Although the nonradiological effects of such a catastrophic accident would obviously impact the local environment, no additional impacts are predicted due to the presence of foreign research reactor spent nuclear fuel. If a ship were forced to dock in an emergency, the analysis of the consequences associated with an accident in port involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 and Appendix D, Section D.5 of the EIS).

Response to Comment No. 46-4

The analysis of the consequences and risk associated with an accident in port involving foreign research reactor spent nuclear fuel determined that no decontamination,

COMMENTOR NO. 46: HANFORD ACTION OF OREGON (CONT'D.)

Furthermore, Senator Wyden points out that "DOE's analysis of potential hazards . . . minimizes the risks to US workers and the general public." 46-6

The second reason,

2) The US has yet to establish a national plan for disposition of fissile materials. In other words, we don't know what to do with our own nasty stuff. Safety and transportation issues aside, if that were possible, we have no business considering importation of foreign spent fuels in the absence of an adequate plan for managing them. Not to mention the absence of adequate dollars. Hanford, a prime destination candidate for foreign spent fuels has lost a lion's share of its own cleanup budget. Clean up goals, for the existing mess at Hanford, already threatening our waterways and health -- will be more difficult than ever to meet, if possible at all, given the most recent government cuts. Is the intention here to dump and forget, calling Hanford a national sacrifice zone? Problem is all that waste doesn't stay in one place, it moves, it leaks, and it becomes unstable, and it needs to be dealt with or the "national sacrifice zone" will include our homes and the Columbia River as well. 46-7 46-8

We do not believe reasons given for importation are sound. 46-9

It would be cost effective, and far safer, to aid foreign countries in managing spent fuels on-site, and avoid dangerous shipping. No DOE facility currently accepts domestic spent fuels at this time. Why should we accept foreign spent fuels? Our government is still in the process of establishing a national policy on plutonium and other fissile materials dispositon -- hopefully this year. But this spent fuels EIS is putiing the cart before the horse and makes no sense. 46-10

RESPONSE TO COMMENT
COMMENTOR NO. 46: HANFORD ACTION OF OREGON (CONT'D.)

interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 and Appendix D, Section D.5 of the EIS) and that the risk associated accidents in port for the entire proposed action, was low. Likewise the consequences and risks associated with marine transport were found to be low (Section 4.2.1.3 of the EIS).

DOE is confident that the foreign research reactor spent nuclear fuel can safely be transported to the management site(s), if the foreign research reactor spent nuclear fuel is accepted into the United States. The security measures employed would meet or exceed all the security requirements in the Code of Federal Regulations (10 CFR Part 73). DOE supports these regulations as being adequate to protect the foreign research reactor spent nuclear fuel. If any port did not already provide security to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

See also the second paragraph of the response to Comment 46-2, above.

Response to Comment No. 46-5

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Portland is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Portland, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 46-6

The analysis in the EIS is conservative, which means that it tends to overstate the risks. Since the commentor did not provide any specific examples of minimized risk estimates in the EIS, DOE cannot respond in specific terms.

Response to Comment No. 46-7

The Nuclear Waste Policy Act of 1992, enacted as Public Law 97- 425, specifies that the Federal policy of the United States of America is to dispose of spent nuclear fuel and high-level radioactive wastes in geologic repositories. This Act, as amended, specifies the process whereby such geologic repositories are to be sited and brought into operation. The process of implementing the requirements of Public Law 97-425 is well advanced and is proceeding expeditiously. As noted in Section 4.2.7 of the EIS, DOE has determined that the foreign research reactor spent fuel is authorized for disposal in a geologic repository.

Response to Comment No. 46-8

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho

National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE would be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE would be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 46-9

The commentor's opposition to management in the United States of spent nuclear fuel from foreign research reactors is noted. As discussed in Section 1.2 of the EIS, there are several compelling reasons to manage foreign research reactor spent nuclear fuel. The key reason is to advance U.S. and worldwide interests in nuclear weapons nonproliferation. By managing the foreign research reactor spent nuclear fuel, the United States can continue and expand its widely supported policy of removing HEU from civilian programs worldwide. Management in the United States is one of the management alternatives under consideration and would be technically, politically, and economically more advantageous than management in as many as 41 separate countries. Other policy options include overseas management of some or all of the spent nuclear fuel, and no action. Issues relating to the cleanup at the Hanford site are outside the scope of this EIS.

Response to Comment No. 46-10

The commentor's preference for Management Alternative 2 (overseas management) is noted. Spent nuclear fuel from domestic research reactors is currently accepted for interim storage at the Savannah River Site and Idaho National Engineering Laboratories. As stated in Section 1.2 of the EIS, the intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons grade) uranium in civil programs worldwide.

COMMENTOR NO. 56: HEART OF AMERICA NORTHWEST

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: G. Pollet **Phone:** _____

Title and Organization: Heart of America NW

Address: See other

City: _____ **State** ____ **Zip** ____

*** COMMENTS ***

Does basis of claim regarding less radiation [redacted] to person w. thin 50 miles of "management sites" w. l. right include: 1) dose along Hanford Reach of Columbia River to person exercising Treaty Right to be on Reach 365 days a year or exercising public right to be on State land below bluff / along shore, or 2) credible accident involving loss of coolant or SNF / fuel sludge fire in K-Basins SNF "management sites"? These does must be considered. 56-1

You Must Consider explicitly the impact of diverting resources from K Basin Upgrades or replacement facility from cost of enlarging storage facility, treating FRR SNF or adding FRR SNF to K-Basins. 56-2

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 56: HEART OF AMERICA NORTHWEST

Response to Comment No. 56-1

Receptors evaluated in the EIS for chronic releases included the maximally exposed offsite resident and the population within 50 miles. Individuals who might use the Hanford Reach of the Columbia River for recreational purposes or subsistence fishing were not explicitly evaluated as receptors because their exposure to normal facility emissions would be lower than those of the maximally exposed offsite resident. For all potential management facilities, the offsite residents were located essentially on the far bank of the river, and the dose evaluation of these individuals assumed full time exposure to facility emissions from all pathways. The distance to the source for an individual on the river is essentially the same as that for the offsite resident, the exposure time for use of the river would be lower than that of the offsite resident, and the applicable exposure pathways for the offsite resident include ingestion of locally grown food whereas those for use of the river would not.

A loss of coolant accident was not evaluated in this EIS because the foreign research reactor spent nuclear fuel does not require liquid coolant. It is shipped dry.

The evaluation of fire involving spent nuclear fuel at the K-Basin is outside the scope of this EIS, because the K-Basins were not considered as potential storage sites for foreign research reactor spent nuclear fuel. Accidents involving K-Basin spent nuclear fuel are being considered in a separate EIS for management of that fuel at the Hanford Site.

Response to Comment No. 56-2

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 56:
HEART OF AMERICA NORTHWEST (CONT'D.)

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: G. Pollet Phone: _____

Title and Organization: Heart of America Northwest

Address: _____

City: _____ State ____ Zip ____

*** COMMENTS ***

Address how DoE will select trucking firms to move casks from Port, and Washington State Patrol inspection statistics showing some firms with which DOE has contracted and or which truck waste to Hanford's LLW side have "arrest" records of up to 50% for serious safety defects.

Will USDOE exclude firms from selection, based on bid qualifications, due to poor inspection records?

56-3

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 56:
HEART OF AMERICA NORTHWEST (CONT'D.)

Response to Comment No. 56-3

DOE recognizes its responsibility to assure that its hazardous materials are transported safely. DOE developed and implemented in 1992 a mandatory Motor Carrier Evaluation Program (MCEP). The MCEP is revised every year to keep it up to date with changing regulations. The criteria for evaluating motor carriers in the MCEP are:

- Hazardous Material Transport Experience,
- Equipment Profile,
- Insurance Requirements,
- Financial Stability,
- Carrier Safety Programs,
- Drivers (including:
  - Training Program,
  - Selection Criteria,
  - Turnover Rate, and
  - Incentive Program),
- Carrier Management,
- Equipment Maintenance Program,
- Hazardous Material Routing Policy,
- Security,
- U.S. Department of Transportation OMC Safety Rating, and
- Carrier Interviews.

DOE contacted the Commercial Vehicle Division of the Washington State Highway Patrol in response to this comment, but was not able to ascertain the source of the commentor's statistic about 50 percent of the trucking firms having serious safety defects for low-level waste shipments to the Hanford Site. From January 1 through August 15, 1995, however, out of 301 radioactive shipment inspections performed by the Highway Patrol at Plymouth, WA, only ten vehicles were issued citations. This is a citation rate of only three percent, not fifty percent. Furthermore, none of the ten citations were for serious safety defects. DOE is committed to ensure safe transportation through the implementation of the MCEP.

Trucking firms with poor safety records would be excluded from transporting the foreign research reactor spent nuclear fuel under the mandatory MCEP, which is described above.

COMMENTOR NO. 56:
HEART OF AMERICA NORTHWEST (CONT'D.)

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Gerald Pollet Phone: 206 382 1014
Title and Organization: Heart of America Northwest
Address: 1305 - 4th Ave #205
City: Seattle State WA Zip 98101

*** COMMENTS ***

You were requested to record comments by recording or by court reporter.
Please: identify, & respond in writing via mail to us:
a) Cost of transporting, pay, per diem and all other costs associated w. the 2 SAIC note takers at Seattle and Portland; and,
b) Cost of local court reporter service for 3½ hour hearing and transcript;
c) Cost of hired security or USDOE security for Seattle and for Portland; and
d) Cost for Soda, Coffee, Cookies, cakes for each hearing as broken down on Hotel Order and charge to SAIC or USDOE.

56-4

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 56:
HEART OF AMERICA NORTHWEST (CONT'D.)

Response to Comment No. 56-4

Issues such as the per diem paid under DOE support contracts, costs of security for public hearings, etc., are outside the scope of the EIS review process and do not relate to the purpose. The format adopted by DOE for the public hearings held on the draft EIS are fully in compliance with the requirements of the NEPA implementing regulations and DOE's requirements for conducting such hearings. This public hearing format provides opportunity for an increased interaction between DOE and the public, thus serving to facilitate communication. In the large majority of cases, this public hearing format has been well received by the public. Nevertheless, in addition to the public hearings, several other redundant avenues were also provided through which members of the public could make their comments on the draft EIS known.

COMMENTOR NO. 59: NUCLEAR CONTROL INSTITUTE

NUCLEAR CONTROL
INSTITUTE

1000 CONNECTICUT AVE. NW SUITE 804 WASHINGTON DC 20036 202•822•8444 FAX 202•452•0892

Comments of Alan Kuperman
Senior Policy Analyst
Nuclear Control Institute
at
DOE Public Hearing on Draft Environmental Impact Statement (DOE/EIS-0218D)
on a
Proposed Nuclear Weapons Nonproliferation Policy Concerning
Foreign Research Reactor Spent Nuclear Fuel
Omni Shoreham, Washington, DC
Wednesday, May 31, 1995

Thank you for the opportunity to speak today on behalf of the Nuclear Control Institute, a private, non-profit organization dedicated to stopping the spread of nuclear weapons, with particular emphasis on ending world commerce in weapons-usable nuclear materials -- plutonium and highly enriched uranium.

For some here today, who come to this issue recently, it may seem illogical, unnecessary and even offensive that the U.S. would accept spent nuclear fuel from abroad. I would like to offer some historical perspective, to explain how we got here, where we should go, and why.

First, what is the goal of this U.S. policy? In large measure, it is to ensure that the next terrorist bombing is not nuclear. If the Oklahoma City bombers had used a nuclear weapon instead of conventional explosives, they would have killed many thousands and destroyed not just a building, but a city. If the World Trade Center bombers had used a nuclear weapon, they would have killed even more innocent Americans and possibly triggered a worldwide economic collapse by destroying the world's financial center.

To the credit of U.S. officials, they foresaw such threats 20 years ago. They recognized that the easiest path for terrorists to obtain a nuclear weapon would be to steal bomb-grade uranium -- also known as highly enriched uranium, or HEU -- which was then commonly used as fuel at research reactors around the world. As one U.S. weapons designer, Luis Alvarez, wrote: "With modern weapons-grade uranium . . . even a high school kid could make a bomb in short order." In 1978, the U.S., which was the major exporter of this fuel, set out to eliminate bomb-grade uranium from world commerce by developing substitute, non-weapons-usable reactor fuels of low enriched uranium, or LEU.

Strategies for stopping the spread and reversing the growth of nuclear arms.

Paul L. Leventhal, *President*. Peter A. Bradford, David Cohen, Victor Gilinsky, Denis A. Hayes, Julian Koenig, Sharon Tanzer, Roger Richter, Dr. Theodore B. Taylor
BOARD OF DIRECTORS

RESPONSE TO COMMENT
COMMENTOR NO. 59: NUCLEAR CONTROL INSTITUTE

COMMENTOR NO. 59: NUCLEAR CONTROL INSTITUTE (CONT'D.)

Once the U.S. developed the substitute fuels in the Reduced Enrichment for Research and Test Reactors (RERTR) Program, the question became how to persuade foreign reactor operators to convert to them. Most operators were reluctant because the new fuels caused slight increases in cost and slight decreases in performance. To persuade the foreign operators, the U.S. pursued a two-prong strategy focusing on both supply and demand. To reduce foreign *demand* for HEU, the U.S. offered foreign operators a *quid pro quo* – if you convert, the U.S. will continue to take back your spent fuel – a policy made explicit in the draft EIS. For the foreign operators, sending spent fuel to the U.S. is easier and cheaper than any other alternative, so this conditionality gave them strong incentives to convert to the non-weapons-usable, LEU fuels.

The U.S. also eventually attacked the *supply* side, by refusing to send fresh HEU fuel to reactors capable of converting to the substitute fuels – a policy made explicit in the 1992 Schumer Amendment to the Energy Policy Act. Since the U.S. remains virtually the only producer of HEU for research reactors besides Russia, this supply restriction gave foreign operators yet another strong incentive to convert.

The dual strategy has been very effective. Of the 42 foreign reactors (with power above 1 MW) originally supplied by the U.S., 37 have converted to the substitute fuels, are in the process of doing so, or soon will have shut down. U.S. annual exports of HEU have dropped from 750 kilograms in the mid-1980s (sufficient for several dozen nuclear weapons if stolen or diverted), down to virtually zero over the last few years.

59-1

But all of this progress could be lost if the take-back policy is abandoned or compromised. Of the options identified in the EIS, by far the worst would be to facilitate or allow the reprocessing of the spent fuel overseas (Management Alternative 2/Subalternative 2, alone or as an element of hybrid Management Alternative 3). This alternative would undermine *both* the supply and the demand strategies. Here's how:

First, the demand side. If foreign reactor operators are forced to reprocess their spent fuel overseas, they will suffer two penalties. The price of foreign reprocessing is higher than U.S. take-back, and foreign reprocessors insist that the operators accept the return of recovered radioactive wastes. If foreign operators were forced to absorb these two new penalties, they likely would refuse to use the alternate fuels, given their inherent cost and performance penalties, and once again demand HEU.

Second, the supply side. HEU spent fuel remains highly enriched and usable in weapons. Thus, if spent fuel is reprocessed overseas, foreign reprocessors will recover HEU. Although this uranium originated in the United States, the U.S. would have no control over it so long as it remains in Europe. ***Therefore, foreign reprocessing would not only increase the demand for HEU, it would also create a ready supply.***

With both increased supply of and demand for HEU, it is inevitable that commerce would rise. As the norm against HEU fuel disintegrated, developing countries would demand that their new reactors also use HEU. (Germany is already threatening to exacerbate this

RESPONSE TO COMMENT
COMMENTOR NO. 59: NUCLEAR CONTROL INSTITUTE (CONT'D.)

Response to Comment 59-1

The commentor's support for the RERTR program is noted. DOE agrees that all the progress made over the past two decades could be in jeopardy if a policy concerning foreign research reactor spent nuclear fuel is not adopted soon.

DOE and the Department of State disagree, however, with the commentor's statement that foreign reprocessing would necessarily increase the supply of HEU. If the foreign reprocessors agree to blend down the foreign research reactor HEU to LEU, as discussed in Section 2.3, then the supply of HEU would continue to decline.

DOE and the Department of State also disagree with the commentor's statement that it is unrealistic to expect foreign reprocessors to accept the three conditions in Section 2.3. Diplomatic discussions with the foreign reprocessors are continuing and may be successful. Only if the necessary conditions were in place, however, would foreign reprocessing be consistent with United States nonproliferation policy.

COMMENTOR NO. 59: NUCLEAR CONTROL INSTITUTE (CONT'D.)

problem by proposing to build the first new HEU-fueled research reactor in 20 years). Russia and China, which are now in negotiations with the U.S. to establish their own reduced-enrichment programs, would surely drop out and refuse to convert -- unwilling to relegate their reactors to second-tier status. Russia, which so far has respected U.S. requests to refrain from exporting HEU, might well begin to supply HEU abroad in search of hard currency.

In short, we would move from where we are today -- on the cusp of eliminating world commerce in HEU and blocking the easiest path to the bomb -- to re-legitimating global trade in bomb-grade uranium and making every HEU-fueled reactor a potential source of nuclear weapons for terrorists.

59-1 (Cont'd.)

Incredibly, the EIS' Management Alternative 2 actually proposes to subsidize foreign reprocessing, facilitating this disastrous outcome. The EIS states that the U.S. would insist that three conditions be attached to foreign reprocessing to mitigate these negative effects, but it is unrealistic that these conditions would be accepted. Britain has been telling the United States not to interfere in their policy of reprocessing power-reactor spent fuel to obtain plutonium. Why should they submit to U.S. demands on reprocessing research reactor fuel to obtain HEU. As officials from the UK's Dounreay reprocessing plant have repeatedly said, their job is to serve their customers, who in this case would demand HEU fuel in return.

59-2

Clearly, the overwhelming nonproliferation interest is for the United States to accept the return of research-reactor spent fuel. Indeed, the U.S. has a moral responsibility to do so. We produced this atom-bomb material. We originally sent it overseas without thinking through the proliferation consequences. Refusing to take back the spent fuel now would invite nuclear proliferation and nuclear terrorism just at the moment when we can slam the door shut on the threat posed by bomb-grade uranium. Inevitably, someone would get hold of it and do unthinkable harm.

59-3

As for what the United States should do with the returned spent fuel, the Nuclear Control Institute strongly favors permanent disposal, after interim dry or wet storage and stabilization, if necessary. Reprocessing the spent fuel in the United States is unnecessary and would send the wrong signal to other countries, because U.S. nonproliferation policy states that we do not reprocess civilian spent fuel or encourage others to do so. However, if a decision were made to reprocess any of the HEU spent fuel in the U.S., in conjunction with a program to stabilize U.S. military nuclear residues and wastes, it is imperative that any recovered HEU be blended down to non-weapons-usable LEU -- thereby eliminating the HEU from commerce and serving as a model for any other country that might contemplate such reprocessing.

59-4

Those are NCI's main comments at this time. Our more detailed comments on the EIS will be submitted separately. Thank you.

NCI

RESPONSE TO COMMENT COMMENTOR NO. 59: NUCLEAR CONTROL INSTITUTE (CONT'D.)

Response to Comment 59-2

The commentor's support for United States acceptance of spent nuclear fuel from foreign research reactors is noted. This is Management Alternative 1 or 3, which are discussed in Sections 2.2 and 2.4 of the EIS.

Response to Comment 59-3

The commentor's preference for storage, stabilization, and permanent disposal is noted. These are included in the basic implementation of Management Alternative 1 which is discussed in Sections 2.2.1 and 4.2 of the EIS. It should be noted that the U.S. policy on not chemically separating civilian spent nuclear fuel also covers power reactor fuel.

Response to Comment 59-4

The commentor's opposition to domestic chemical separation is noted. This is Management Alternative 1, Implementation Alternative 6, which is discussed in Sections 2.2.2.6 and 4.3.6 of the EIS. It is also part of Management Alternative 3, which is discussed in Sections 2.4 and 5.5 of the EIS.

DOE agrees with the second part of this comment. As stated in Sections 2.2.2.6 and 4.3.6.2 of the EIS, it would be DOE's preference to blend down any separated HEU to LEU and thus preclude the possibility of it ever being used in a nuclear weapon.

Commentor No. 77: Northern California Psychologists for Social Responsibility

494 Cragmont Ave.
Berkeley, CA. 94708
5/22/95
Phone and Fax: (510) 526-8876

U.S. Department of Energy
1000 Independence Ave. SW.
Washington, DC 29585-0001
Attention Charles R. Head
Office of Spent Fuel Management

Testimony prepared for the U.S. Department of Energy Regarding the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Materials Nuclear Weapons Nonproliferation Policy Concerning Foriegn Research Reactor Spent Nuclear Fuel Draft EIS Hearing. May 22.1995

By Marc Pilisuk, Ph.D.*
Dept. of Applied Behavioral Sciences
University of California, Davis
The Saybrook Institute and Graduate Center
San Francisco, CA.

I am writing on behalf of the Northern California Psychologists for Social Responsibility, an organization dedicated to the application of knowledge of human behavior to the amelioration of larger social problems. We have been concerned with the human costs that have followed the development and testing of nuclear weapons and the radioactive wastes generated by both military and civilian uses of radioactive materials. We are concerned about the plans to send spent fuel rods through the area of Concord California and with absence of satisfactory alternatives for the disposition of weapons grade fissile materials.

As psychologists we are not able to speak to the technical issues of safe designs for radioactive storage. We can, however, speak to the public's concerns about safety. This hearing comes at a time of great suspicion of the Department of Energy. It follows the recently publicized history of involuntary and dangerous medical experiments and numerous examples of

77-1

Response to Comment Commentor No. 77: Northern California Psychologists for Social Responsibility

Response to Comment No. 77-1

Foreign research reactors are not used for the development of nuclear weapons or weapons research. Research, medical, commercial, and educational applications of foreign research reactors are described in Section 1.1 of the EIS. The purpose of this EIS is to evaluate the environmental effects of various alternatives for managing spent nuclear fuel from foreign research reactors and to inform government officials and the public of the results of the evaluation.

COMMENTOR NO. 77: NORTHERN CALIFORNIA PSYCHOLOGISTS FOR SOCIAL RESPONSIBILITY (CONT'D.)

callous disregard for public health and safety. The public image is of a zealous war research machine that will expose people to dangers without informing them. In a recent case of the manufacture of plutonium triggers, the public was informed about the potential risks in the development of plutonium pits only after the fact. 77-1 (Cont'd.)

Environmental Impact Statements are mandated to include a social impact assessment. The absence of appropriate attention to social impacts has contributed to an adversarial stance between the Department of Energy on one hand, and the general public including residents of the communities in which nuclear weapons facilities are found, on the other. As long as the purpose of the EIS is restricted to technical assessments of documented environmental risks of particular programs, the report will prove entirely ineffective in addressing public concerns. Social impacts have been studied in both opinion polls of the general public and in specific case studies of communities affected by the presence, or by the projected presence, of radioactive wastes. The evidence shows that the American public is concerned about such wastes, opposed to their further accumulation, and deeply distrustful of governmental assurances about the level of risk involved. The distrust is born of a long history of secrecy, withholding of information, and callous disregard for consequences to human health and to the environment. 77-2

The public is dubious of studies of the risks to individuals that do not consider all of the dangers. For example, off-site risks involved in the transportation and handling of radioactive wastes lie at the heart of why communities have voted to be nuclear free zones. The risks from attempting to convert these materials for use in commercial reactors poses additional risks not only for safety but of international dangers as nations may acquire materials for commercial use and employ them for development of nuclear weapons. 77-3 77-4

The proposal to ship and store radiactive wastes in heform of spentfuel rods is one that will augment the social and psychological impacts that have already resulted from earlier practices. Studies of citizen concerns regarding nuclear weapons facilities and facilities producing or storing radioactive materials in other communities have been completed. Such studies show 77-5

RESPONSE TO COMMENT
COMMENTOR NO. 77: NORTHERN CALIFORNIA PSYCHOLOGISTS FOR SOCIAL RESPONSIBILITY (CONT'D.)

Response to Comment No. 77-2

Social and economic conditions of potentially affected areas are described in Section 3 of the EIS. Implementation of the proposed action was found to result in no significant social and economic effects (Section 4.2.4.2 of the EIS). Technical assessments are the foundation for evaluations of health and safety impacts. An objective of this EIS is to present technical assessments in an understandable format which includes the EIS and associated public outreach materials. Conservative estimates of radiological and nonradiological effects presented in Section 4 of the EIS indicate that no significant risks are associated with implementation of the proposed action.

Response to Comment No. 77-3

The analysis in the EIS has considered all the important dangers and these have been presented in a straightforward, understandable format. The offsite risks due to transportation and handling of radioactive materials are discussed throughout Section 4 of the EIS.

Response to Comment No. 77-4

DOE interprets the words, convert these materials for use in commercial reactors to refer to chemical separation. The risks posed by chemical separation are discussed in Section 4.3.6 of the EIS.

DOE interprets the international dangers to be the risk of nuclear proliferation and agrees that this is the greatest risk of all. The whole purpose of the proposed policy is to prevent foreign civilian-controlled nuclear material from being diverted into a weapons program.

Response to Comment No. 77-5

The commentor's concern over the social and psychological impacts associated with storage of this spent nuclear fuel is noted. DOE is currently working towards greater involvement from the public into its current and future decision making process. This EIS is one of the forms that DOE is using to get the information back to the public to negate any unrealistic perceptions and present risks to the public in relation to everyday activities. Estimates of radiological exposure in this EIS are based on the conservative assumptions described in Section 4 of the EIS. Radiological risks at candidate ports, along transportation routes, and at interim management sites were found to be low (Sections 4.2.2, 4.2.3, and 4.2.4 of the EIS, respectively).

COMMENTOR NO. 77: NORTHERN CALIFORNIA PSYCHOLOGISTS FOR SOCIAL RESPONSIBILITY (CONT'D.)

rates of 70 to 80% opposition by local citizens to proposals regarding the prospective introduction of radioactive materials in their community. They show widespread belief that the new facilities will increase their health risks (69% of the people), will contaminate groundwater (81%), adversely affect agriculture (65%), and undermine property values (73%). Also 73% in one study saw a high likelihood of accident and 78% did not trust the facility to advise them of changes in operations or types of waste handled. One study in *Science* suggests that the only publicly acceptable form of storage would be on the site where the wastes are produced and above ground where they can be continuously watched for safety. 77-5 (Cont'd.) 77-6

In communities where toxic contamination has already been found, a serious community concern often arises regarding cancer and mutagenic birth defects and a wide array of family mental health consequences reflect the trauma of living with unknown and invisible dangers. Such findings of psychological impacts have been the basis for successful legal actions against the administrative entities responsible for the contamination. The proposal to sell recycled radioactive materials in the United States and to other countries will augment these impacts. 77-7

Radioactie wastes in any quantity pose dangers of leukemia and other cancers, genetic mutation, diabetes, sterilization, and circulatory disorders. The spent fuel poses other risks shipping accidents, of nuclear weapons proliferation, and of acts of terrorism. 77-8

The study of people's reactions to hazardous wastes suggests that they cannot be understood as mirror images of technical measurements of the release of toxic substances. They show that risk perceptions are not effectively changed by showing people comparisons among known levels of excess deaths from a variety of other causes. The reactions are part of deeply rooted concerns about their work, their home and the health of their children. Frequently citizen responses reflect whether they were duly consulted in decisions about levels of acceptable risk before rather than after exposure. People's estimates of risk depend heavily upon whether they perceive the source of information to be a disinterested as well as an expert party. Some are concerned with whether the particular hazard is one that should have been produced in the first place 77-9

RESPONSE TO COMMENT
COMMENTOR NO. 77: NORTHERN CALIFORNIA PSYCHOLOGISTS FOR SOCIAL RESPONSIBILITY (CONT'D.)

Response to Comment No. 77-6

The commentor's reference to documentation suggesting that the only publicly acceptable form of storage would be on the site where the wastes are produced and above ground, is noted. The intent of the proposed action to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate the use of highly enriched (weapons-grade) uranium in civil programs worldwide would not be served by continued storage of the foreign research reactor spent nuclear fuel at the sites where it is generated. The effects of implementing this option (Management Alternative 2, Subalternative 1a, described in Section 2.3), on U.S. nuclear weapons nonproliferation policy are discussed in Section 4.4.1. Also under consideration for implementation of the proposed action, however, is storage above ground under Management Alternatives 1 and 3 (Sections 2.2 and 2.4 of the EIS).

Response to Comment No. 77-7

The commentor's suggestion that the acceptance of spent nuclear fuel into the United States would augment the public's psychological fears associated with toxic (or radiological) contamination, is noted. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor fuel was accepted into the United States in the past. Under NEPA regulations, the environmental effects evaluated for this EIS do not include those associated with psychological fear.

Response to Comment No. 77-8

It is a scientific fact that exposure to radioactive materials poses a risk of developing cancer. As discussed in Section 4.1.3 of the EIS, the risk of developing a genetic mutation is low. Diabetes, sterilization, and circulatory disorders are not caused by low doses of radiation (See also the response to Comment 1125-4).

Section 4.2.3 of the EIS demonstrates that the risks of transporting the foreign research reactor spent nuclear fuel, even if an accident were to occur, would be low. The risk of nuclear weapons proliferation would be reduced by adopting a policy to manage the foreign research reactor spent nuclear fuel (Section 1.2 of the EIS). Section D.5.9 has been added to Appendix D of the EIS to address the issue of attack by disgruntled persons or terrorists.

COMMENTOR NO. 77: NORTHERN CALIFORNIA PSYCHOLOGISTS FOR SOCIAL RESPONSIBILITY (CONT'D.)

and many are affected by whether the purpose of the exposure, however slight, has been for their benefit, as in Xrays, or for some other less justifiable reasons. 77-9 (Cont'd.)

The concern must be understood against a background of larger public concerns. A CBS/New York Times survey of the voting public asked respondents the following question: "Do you agree or disagree with the following statement: Protecting the environment is so important that requirements and standards cannot be too high and continuing environmental improvements must be made regardless of costs." 88% agreed while only 13% disagreed. A National Opinion Research Center poll, that same year, showed 75% of the respondents rating nuclear waste disposal as the top environmental problem. 77-10

At the heart of citizen concern over risks from radioactivity lies a great gulf between the way some experts assess risks and the way the public makes such estimates. Health risk assessments require the investigator to make estimates regarding levels of exposure, duration of exposure, concurrent exposure to other substances and latency of the consequences. The relationship between dosage and latency is often uncertain. Dose response curves for known carcinogens have been shown to differ by six orders of magnitude. Moreover, studies of human consequences are limited by job turnover and geographic mobility and models of risk rarely take into account the synergistic effects of multiple hazards or the generic effects of radiation on immune system impairment or generalized susceptibility. These uncertainties mean that reasonable people have a basis for fear and that social and psychological impacts must be determined. 77-11

The EIS cannot address social and psychological impacts without admitting that it has a history of being unable to prevent accidents and casualties from the handling and transfer of nuclear wastes. The EIS must first acknowledge that the opposition to such wastes is reflected in legislation making Oakland and other cities nuclear free zones . Second, it must include a plan for an independent assessment of the social and psychological, as well as the physical, health impacts that the sites selected for shipping and storage facilities will have upon the communities. 77-12 77-13

RESPONSE TO COMMENT
COMMENTOR NO. 77: NORTHERN CALIFORNIA PSYCHOLOGISTS FOR SOCIAL RESPONSIBILITY (CONT'D.)

Response to Comment No. 77-9

The EIS has addressed all of the pertinent health and safety risks associated with U.S. acceptance of the foreign research reactor spent nuclear fuel and the public has been provided numerous opportunities to express their concern at public meetings and by submitting written comments on the draft EIS. Every comment has been carefully and thoroughly reviewed by technical experts to ensure that the DOE responses contained in the final EIS address the commentor's concerns.

Response to Comment No. 77-10

Although ultimate disposition of spent nuclear fuel from foreign research reactors is outside the scope of this EIS, it is an important concern which is discussed in Section 4.2.7 of the EIS. Isolation in a geologic repository is a candidate method of disposition currently under consideration. Ultimate disposition of spent nuclear fuel will be conducted only after appropriate review under NEPA.

Response to Comment No. 77-11

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with acceptance of foreign research reactor spent nuclear fuel in the United States would be low. See also the response to Comment 77-7, above.

Response to Comment No. 77-12

Spent nuclear fuel has been transported over the highway and rail systems of the United States for over 40 years. During that time, there were twenty-one incidents involving vehicles transporting irradiated spent nuclear fuel elements. None of these incidents resulted in a breach of the spent nuclear fuel transportation cask or release of its contents. Section 4.2.3 of the EIS describes the environmental effects evaluated for ground transport of spent nuclear fuel from foreign research reactors.

Response to Comment No. 77-13

The public's opposition or support for DOE's proposed policy is included in Volume 3 of the EIS which includes all public comments (oral and written) received by DOE in response to the publication of the draft EIS. Physical health impacts associated with the proposed action have been adequately addressed in Section 4 of the EIS, in accordance with NEPA. Under these regulations the environmental effects evaluated for this EIS do not include social and psychological impacts associated with perceived risks.

COMMENTOR NO. 77: NORTHERN CALIFORNIA PSYCHOLOGISTS FOR SOCIAL RESPONSIBILITY (CONT'D.)

Third, the scope of the EIS should include the study of whether people are willing to accept the dangers from increased likelihood of accidents and from exposure. It should assess whether people believe that these risks or worth continuation of a policy of selling nuclear materials to the world even if it means the return to this country of the radioactive wastes. 77-13 (Cont'd.)

Fourth, the report will have to take some step toward assuring the public and the affected communities that plans include consideration of how the DOE may safely change from its major activities--the inherently dangerous development of nuclear weapons and sale of nuclear materials.

The DOE is seriously in need of a process by which citizens, scholars, and public interest groups who fear the dangers of this activity know that their concerns are a direct part of the dialogue about the future direction of nuclear policy. To divorce this issue from the scope of the EIS report would be to ignore a major and continuing social impact of nuclear waste management. 77-14

What some within the DOE appear loathe to hear is that the continued effort to find uses and rationales for work (other than clean-up) on these powerful materials, reflects a commitment to a way of life that is no longer in the national interest. The economic benefits, the research funding, the status, the challenge to mastery of power and danger, and even the masculine identification with immeasurable explosive power, all provide an incentive to keep some within the DOE from envisioning the possibility of an alternative mission. For psychologists, the rigid sticking to an old and unneeded course of action looks very much like an addiction. 77-15

Psychologists understand that the building of public trust requires a willingness to provide full disclosure of the potential as well as the already documented risks. Trust also depends upon a willingness to discuss impacts of the full range of alternatives including the disposition of fissile materials in ways that make reclamation of these deadly products, for any purpose, as difficult as possible. We do need creative work on alternative energy from the DOE. We do not need to find new uses for inherently dangerous technologies or for old bombs.

RESPONSE TO COMMENT
COMMENTOR NO. 77: NORTHERN CALIFORNIA PSYCHOLOGISTS FOR SOCIAL RESPONSIBILITY (CONT'D.)

Response to Comment No. 77-14

NEPA emphasizes public participation and disclosure during evaluations of the environmental effects of federal actions (Section 5.2.1 of the EIS). The public comment process, which includes this comment response document, provides a forum in which individuals and organizations can voice their concerns and positions on the proposed action. In addition, DOE has worked towards greater involvement of the public in its present and future activities. The seventeen public hearings conducted by DOE for the draft EIS reflect DOE's understanding of the importance of meaningful participation by the public in its planning process.

Response to Comment No. 77-15

The commentor's position regarding these matters is noted. Section 4 of the EIS describes the calculational techniques, assumptions and results of the evaluation of radiological and nonradiological health effects. More detailed discussions of the calculations and results are given in Appendices A through F.

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). As discussed in Section 1.1 of the EIS, this is an important component of U.S. nuclear weapons nonproliferation objectives. Ultimate disposition is discussed qualitatively in Section 4.2.7 in the EIS.

COMMENTOR NO. 85:
SEATTLE WOMEN ACT FOR PEACE

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Anci Koppel **Phone:** 206-522-6789

Title and Organization: Co-ordinator Seattle Women Act for Peace

Address: 5411 Ravenna Ave NE

City: Seattle, **State** Washington **Zip** 98105

*** COMMENTS ***

When on Friday May 26 1995, you, Mr. Head, presented the transportation system of radioactive spent fuels from overseas countries, it seemed very harmless, more like a pic-nic. As you said ,'we load the ship(s), then unload at the port of entry unto trucks or rails which take the casks to the depository'. In our case it would b e Hanford. When the question was raised whether special loading rules were followed and whether the casks were isloated on the ships from other freight, you told us that this was not part of your field of expertese. 85-1

The proven facts that 50% of radioactive trucks in Washington State have been cited for major safety deficiencies when inspected at the State border, casks emit 200 millirem per hour at surface. the equivalent of about 10 full body Xrays per hour. Longshoremen, the public and truckers will experience large doses of radio active material. In addition driving thru city streets it multiplies the exposure. We were told that expertise are in Hanford, that is of doubtful help if a truck loaded with this dangerous material has an accident ab out 200 to 300 m miles away . In conlucsion it is my opinion that this material should b e disposed at the country where this material has been used 85-2 85-3 85-4

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

P.S. I hope this and other written statements will be called to the attention of our Secretary of Energy, Hazel O'leary. Anci Koppel 85-5

RESPONSE TO COMMENT
COMMENTOR NO. 85:
SEATTLE WOMEN ACT FOR PEACE

Response to Comment 85-1

No special handling or loading/unloading procedures would be required for the foreign research reactor spent nuclear fuel when it is contained in a spent nuclear fuel transportation cask that is inside of an ISO container. As to isolating the casks from other freight, this is not necessary for radiation or any other reasons. The small amount of radiation coming from the transportation cask is gamma radiation which does not irradiate nor contaminate other materials, so there is no need to isolate it.

Response to Comment 85-2

See the response to Comment 56-3 on the allegation about 50% of radioactive trucks being cited for major safety deficiencies.

The two regulatory limits (200 mrem/hr at the cask surface and 10 mrem/hr at two meters away from the vehicle) would both apply simultaneously. For shipments of certain radioactive materials (e.g., small, intense cobalt-60 sources), the 200 mrem/hr at the cask surface limit is the more stringent limit. For shipments of spent nuclear fuel, however, the 10 mrem/hr at two meters regulatory limit turns out to be more stringent because the source of radiation is large and distributed throughout the internal volume of the cask. Casks loaded with spent nuclear fuel up to the 10 mrem/hr at two meters limit radiate at a level well below the 200 mrem/hr level at the cask surface. (Sections 4.1.5 and Appendix F, Section F.5 of the EIS.)

Response to Comment 85-3

Each port considered in the EIS has developed an Area Contingency Plan. This plan outlines response capabilities, procedures and authorities for responding to and recovering from hazardous material incidents. Additionally, DOE would provide assistance to local authorities to ensure that appropriate measures are taken in the unlikely event of an accident. As part of this assistance, DOE's Radiological Assistance Program teams, from eight offices strategically located throughout the country, would be used to coordinate and to provide remediation assistance. This type of assistance and coordination would be specified in the Transportation Plan that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. The issues would include capabilities and training of first emergency responders.

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive

COMMENTOR NO. 85:
SEATTLE WOMEN ACT FOR PEACE (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 85:
SEATTLE WOMEN ACT FOR PEACE (CONT'D.)

Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Response to Comment 85-4

The commentor's preference for overseas disposition of spent nuclear fuel from foreign research reactors is noted. Due to financial or regulatory constraints, some research reactor operators may not be able to store spent nuclear fuel in their own country. Options such as storage in other foreign countries and overseas reprocessing are described in Section 2.3 of the EIS.

Response to Comment 85-5

While it would be impractical for the Secretary of Energy to personally review and respond to all of the written and oral comments concerning this EIS, this information was reviewed by the Program Manager and his staff. The Program Manager is responsible for relaying public concerns and issues to the Secretary of Energy and her staff. As indicated by this document, all comments received from the public were noted and taken seriously. Under NEPA and DOE's environmental regulations (Section 5 of the EIS), public participation and comments are an integral component of the environmental process.

COMMENTOR NO. 99: EAST BAY PEACE ACTION

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Mrs. Betty Brown **Phone:** (510) 524-6071
Title and Organization: Board Chair for East Bay Peace Action
Address: P.O. Box 6574
City: Albany **State** Ca. **Zip** 94706

*** COMMENTS ***

Although I had driven over 45 minutes and waited until nearly 10 p.m. on 5/22/95, I was unable to present the attached testimony orally. Please consider the attachment as our comment on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 99: EAST BAY PEACE ACTION

COMMENTOR NO. 99: EAST BAY PEACE ACTION (CONT'D.)

East Bay Peace Action
for a sane world

P. O. Box 6574
Albany, CA 94706
Phone (510) 233-0915

EAST BAY PEACE ACTION BOARD
Gary Dobson
Betty Brown
Andrea Turner
Pandi
Peter Roeper
Rita Perry
John Mihalaros
Judy Pollard
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Toshi Seeger
John Simmons
Pam Solo
Dr. Benjamin Spock
Betsy Taylor
Prof. George M. Tenniner
Peter Yarrow

May 22, 1995

My name is Mrs. Betty Brown and I'm speaking on behalf of the Board of East Bay Peace Action, an affiliate of the nation's largest grassroots peace organization, Peace Action, formerly known as SANE/ Freeze.

We wish to protest the Dept. of Energy's proposal to ship nuclear fuel rods through the Concord Naval Weapons Station. We join with others who support the sequestration of spent fuel within the user nation under international supervision until a permanent safe disposal option is realized. This option is particularly relevant in that there exists no permanent U.S. disposal site. Hanford, the Nevada Test Site or other alternatives will only be temporary. Further transportation would be necessary. All of the proposed U.S. sites already have enoumous existing environmental problems.

99-1

99-2

99-3

The Department of Energy should discontinue selling user countries low energy uranium fuel and encourage these nations to decommission plants utilizing such fuel. The dangers inherent to transportation would thus be avoided.

99-4

The safety and health of the citizens of Concord, Contra Costa, and the world should be our first concern.

99-5

RESPONSE TO COMMENT
COMMENTOR NO. 99: EAST BAY PEACE ACTION (CONT'D.)

Response to Comment No. 99-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to Concord NWS, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 99-2

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in (Sections 2.3 and 4.4.1 of the EIS).

Response to Comment No. 99-3

The impacts of ultimate disposition of foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS).

Response to Comment No. 99-4

High density LEU research reactor fuels were developed to allow research reactors to operate with fuels that pose no threat of proliferation of nuclear weapons (Section 1.1 of the EIS). The primary problem to be addressed is to complete the conversion of the foreign research reactors from high enriched (weapons grade) uranium fuels to proliferation proof LEU fuels, thus supporting the United States nuclear weapons nonproliferation policy of reducing and eventually eliminating the use of HEU in civil programs worldwide. LEU is widely available and would be used independent of whether the United States sold it or not. Furthermore, due to the research, medical, commercial and educational benefits that result from operation of the foreign research reactors (Section 1.1 of the EIS), it is unlikely that foreign research reactor operators would be willing to cease operation of their reactors. In addition, the U.S. accrues significant benefits from the operation of foreign research reactors including Moly-99 and other medical isotopes.

Response to Comment No. 99-5

Sections 4.2.2, 4.2.3 and 4.5 of the EIS demonstrate that the risks of receiving and transporting foreign research reactor spent nuclear fuel through Concord NWS would be low. Citizens of the world would be safer if the risk of nuclear weapons proliferation is reduced via implementing the proposed action. The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS).

COMMENTOR NO. 111: HANFORD WATCH

HANFORD WATCH
2285 SE Cypress
Portland, OR 97214
(503) 232-0848

Charles Head
Office of SNF Mngmnt. EM-37
U.S. Dept. of Energy
1000 Independence Ave.
Washington, D.C. 20585

COMMENTS ON DRAFT EIS ON PROPOSED NUCLEAR WEAPONS POLICY
CONCERNING FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL

I will begin my statement with three complaints: I and others in the Portland area received absolutely NO materials on this Draft EIS. What is appalling about this is that we all attended the scoping meeting on this issue in Portland a year ago and all signed up for the documents. 111-1

Second, the format for this meeting was an overt attempt to thwart the intent of the EIS process--our comments were not recorded, only summarized by people not able to keep up with the pace of speakers and humanly erring in capturing the true intent and feeling of our comments. The purported attempt at "dialogue" was a sabotage of true public participation in that the DOE official, Mr. Charles Head, seemed interested in giving a rebuttle to each and every comment, trying to prove our fears ill-founded and assuring us that all is well, when in fact, it was pointed out by citizen after citizen , with expertise in many areas (port handling, policy perspectives, environmental laws and regulations, safety, etc.) that all is NOT well and we are not satisfied with the DOE 's presumptions and conclusions. This meeting harkened back to the DOE I had hoped we were beginning to leave behind--full of secrets, done deals, disregard for human intelligence, health and safety, etc., etc. The 100 plus citizens who attended this meeting were outraged, to say the least. 111-2

My third complaint is that one of the DOE officials was overheard by participants to say, "These people are just a bunch of professional protestors." Who is professional? Certainly not this man. All in all this "hearing" has left a bitter taste in our mouths. You will be receiving a video-taped recording of the proceedings and our REAL comments in the mail before the June 15th deadline. I hope you will give them the full attention and consideration they are due. 111-3

RESPONSE TO COMMENT
COMMENTOR NO. 111: HANFORD WATCH

Response to Comment No. 111-1

DOE apologizes to the commentor for any oversight in providing copies of the draft EIS. Availability of the draft EIS was announced in the Federal Register on April 21, 1995; along with information concerning how to obtain a copy. Hanford Watch is included on the database to receive a full copy of the final EIS once it is issued.

Response to Comment No. 111-2

DOE did request that comments be submitted in writing, however, all oral comments presented at each hearing were summarized and have been addressed along with the written comments in this Volume 3 of the EIS. All comments, written and oral, are part of the public record. The format adopted by DOE for the public hearings held on the draft EIS is fully in compliance with the requirements of NEPA implementing regulations and DOE's requirements for conducting such hearings.

Response to Comment No. 111-3

DOE fully supports the NEPA process and encourages comments made by individuals who attend the public hearing on the proposed action and other activities, as well as any written comments. All comments received were considered during preparation of the final EIS.

COMMENTOR NO. 111: HANFORD WATCH (CONT'D.)

This proposal to manage Foreign Reactor Spent Fuel is based on a faulty presumption, namely, that we can manage our own spent fuel in this country. We have failed to do so thus far. We use the economics of the wealthy (corporations) to corner the market on plutonium and uranium, the new gold of the 21st century, and we use poor science based on short-sited greed to drive the Yucca Mountain project, the MRS on Native Lands Fiasco, and now this. We are certainly aware also, at this time, that congress is considering dumping commercial reactor spent fuel at Hanford so that the nuclear industry can continue to create deadly waste in the name of progress. The question is "Who's progress?" It certainly doesn't feel like progress for us ordinary, honest working citizens. 111-4

I believe that this proposal has been concocted fully for the economic benefits and "ultimate power trip" of the United States government, in particular the Defense Department. There is NO true concern for environmental and human health and safety. The government is only concerned with non-proliferation if it is in the government's economic interests. 111-5

The only acceptable action in this EIS is NO ACTION. Before any of the potential positive plans can be considered any semblance of reason, President Clinton must convene a Blue Ribbon Task Force to establish a comprehensive Nuclear Waste Policy, with full public debate. It is time for us to stop shipping fissile nuclear materials around the country and the world; it is time for us to stop producing all nuclear materials that continue shoving the centuries-long flow of deadly waste into our water, food and air. 111-6 111-7

Science is imperfect. Scientists often play God, taking power into their own hands, determining who is expendable, how many can die from "latent cancers", etc. in order for the corporate powers to have a short life-time of wealth. The DOE has presented us in this 8 inch thick draft document with theoretical "knowledge", while we, the public, have tried to bring to your ears and hearts the practical, and heartfelt side of the equation. 111-8

Re-processing was referred to many times in this document. This is unacceptable to most citizens in this country because of the continued production of more waste. The present congress and DOE officials seem uncommitted to the cleanup mission that was proudly touted a mere two years ago and that is still the subject 111-9

RESPONSE TO COMMENT
COMMENTOR NO. 111: HANFORD WATCH (CONT'D.)

Response to Comment No. 111-4

Spent nuclear fuel from foreign research reactors has been safely managed in the United States for nearly four decades (Section 1.1 of the EIS). Storage technologies and site management options are discussed in Sections 2.6.5.1 and 2.6.5.3 of the EIS, respectively.

Response to Comment No. 111-5

An objective of the proposed action is to aid in safeguarding the citizens of the United States against threats posed by the proliferation of nuclear weapons (Sections 1.1 and 1.2 of the EIS). The Department of Defense has not been and will not be involved in this proposed action, other than through voicing its support for the necessity of action by the United States, and possibly through use of one or more of its ports as ports of entry for the spent nuclear fuel, if accepted into the United States. The financial implications of the proposed action are disclosed in the EIS (Section 4.9 of the EIS). The human health and safety considerations associated with the proposed action are also fully addressed in Section 4 of the EIS.

Response to Comment No. 111-6

The writer's position on the No Action Alternative is noted. Sections 2.5 and 4.6 of the EIS discuss the potential impacts of the No Action Alternative on the U.S. nuclear weapons nonproliferation policy.

Response to Comment No. 111-7

The commentor's position on a comprehensive nuclear waste policy is noted. Environmental effects of transportation and interim management of spent nuclear fuel from foreign research reactors were evaluated and found to have no significant environmental impacts (Section 4 of the EIS).

Response to Comment No. 111-8

The purpose of the EIS is to provide the decisionmakers and the public with the important environmental information needed to make a decision and to identify significant adverse consequences so that they can be avoided or mitigated. The EIS process provides for public input, through scoping, so that all important issues, consequences, and concerns can be addressed in a rational, objective manner. Among the concerns raised during scoping were the need to analyze the potential risks and consequences of accidents involving the foreign research reactor spent nuclear fuel. These risks and consequences are not just theoretical and they are useful information to the public and decisionmakers.

COMMENTOR NO. 111: HANFORD WATCH (CONT'D.)

of slick brochures from the DOE. We seem to be unable to hold DOE and DOD accountable for cleaning the thousands of sites that suffer from the worst toxic damage known to mankind. We have not seen any accountability from the government for the hundreds of thousands of people who have suffered at the hands of the nuclear minds of the atomic age. Thousands of documents have been declassified in the past year about the experimentation on and negligence of the citizens by their government, yet risk assessment based on who will gain the most economically, and denial in the face of these declassified documents still reign supreme. Your representatives use outrageous comparisons of radiation exposure from your programs to a ride in an airplane. In one instance we have informed consent, in the other we are put at risk without our knowledge and consent. 111-9 (Cont'd.) 111-10

We won't take it anymore!!! We do not want nuclear transport of any sort coming through our communities or through anyone else's.

Sincerely,

Paige Knight

Paige Knight
Chairperson, HANFORD WATCH

RESPONSE TO COMMENT
COMMENTOR NO. 111: HANFORD WATCH (CONT'D.)

Response to Comment No. 111-9

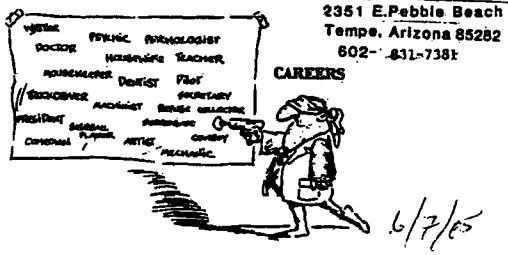
The commentor's opposition to chemical separation is noted. Please note, however, that if chemical separation is used in the context of managing the foreign research reactor spent nuclear fuel, it would be used as a waste management technique that would allow DOE 1) to blend down the HEU in the foreign research reactor spent nuclear fuel to non-weapons grade levels; and 2) to convert the foreign research reactor spent nuclear fuel into a more stable waste form that is more likely to be accepted for ultimate disposal in a geologic repository.

Response to Comment No. 111-10

The comparison of various risks provided in the EIS is valid and the public can use it to put the risks from the proposed action into perspective. For more such risk comparisons, see Section 4.10 of the EIS. DOE considers this information appropriate to share with the public. Those members of the public who do not wish to compare voluntary risks to involuntary risks do not have to do so.

COMMENTOR NO. 135: RECAREERING INSTITUTE

THE RECAREERING INSTITUTE
Dr. Roger W. Axford Ph.D.
2351 E. Pebble Beach
Tempe, Arizona 85282
602-831-7381



6/7/95

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Gerontologist, Counselor

Primary signing citizen concerns were:

135-1 • Additional time to consider the six inch documents outlining the DOE plan which most participants had only received one or two weeks ago, and to conduct independent research and community discussions;

135-2 • Advance notice of all local routes out of CNWS intended for transportation of nuclear materials;

135-3 • Whether closing the Port Chicago Highway through the CNWS in February, new crane installations and dredging currently going on signified a predisposition to using the CNWS port regardless of public opinion;

135-4 • Why only the city planner of Concord was informed of the plan and not other poorer and minority neighborhoods closer to the CNWS,

135-5 • Whether the use of a military port was to preclude citizen's groups from doing independent radiation monitoring and testing;

135-6 • How citizens were to be expected to trust a governmental body that had been operating freely in total secrecy, bombing its Native Nations and experimenting on its own veterans for forty five years;

135-7 • Whether separation of classes of fuel rods for different destinations as stated by Mr. Head indicated plans by the DOE to restart former programs to reprocess spent fuel into weapons-grade material;

135-8 • Why DOE statistics on health hazards differed so greatly from information independently available;

135-9 • Why no concern about earthquake hazards in the Bay Area were included in the DOE assessment;

135-10 • Why the Bay Area was being assessed, when it is one of the most highly populated areas in the US, has numerous bridges and seven oil refineries in the Carquinas Straits alone, with 240 shiploads of petroleum products a year in the Bay;

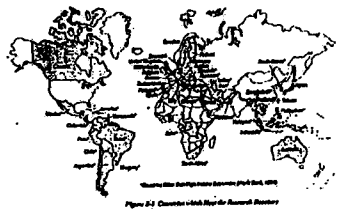
135-11 • The contradiction between the DOE wanting to remove the waste material from such stable and solvent countries as Sweden and Belgium to keep it safe from revolutionaries and terrorists, and scoffing at any concerns over safety from seizure to US communities along the routes;

135-12 • Who would monitor the quality of handling of said materials (one local resident stated that CNWS had "the worst trained and worst paid drivers handling equipment at the piers" anywhere);

135-13 • Why the DOE was apparently ignoring federal law on siting such operations in a way that jeopardized the safety of minority and low-income neighborhoods (not even included in DOE maps or comments) more than others;

135-14 • Whether any federal assistance would be given to improve very degraded roads and railway beds under question; and

135-15 • Whether any special training or funding would be given to local emergency response teams to handle such accidents.



"The Re-careering Institute is a timely and creative response to the demographic and technological revolutions of the 80's which have changed the way we live, learn, work, and communicate" Maggie Kuhn
THE GRAY PANTHERS

RESPONSE TO COMMENT
COMMENTOR NO. 135: RECAREERING INSTITUTE

Response to Comment No. 135-1

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 days total) to be sufficient for public comment.

Response to Comment No. 135-2

As discussed in Section 2.6.4.2 of the EIS, the NRC regulations concerning route notification are set forth in 10 CFR Part 73. Shippers are required to submit proposed routes for spent nuclear fuel shipments to NRC for approval, and NRC publishes a public information circular that lists routes that have been evaluated and approved for specific spent nuclear fuel shipments.

The regulation also requires DOE to inform the Governor of each State and any Tribal chair, or their designee, along a transportation route at least seven days prior to shipment of hazardous cargos, including radioactive materials.

Response to Comment No. 135-3

The closures of Port Chicago Highway and Waterfront Road and the expansion of capabilities at Concord NWS, including the new cranes, were planned before the proposed policy on foreign research reactor spent nuclear fuel was formulated. Dredging of the dock area of Concord NWS is a periodic function, which is also independent of the proposed policy.

Response to Comment No. 135-4

Due to nationwide interest in the draft EIS, it was not feasible to contact potentially interested groups on a neighborhood-by-neighborhood basis. A Notice of Availability for the draft EIS was published in the Federal Register dated April 21, 1995. Copies of the draft EIS were placed in libraries and reading rooms near each candidate port and potential interim management site. More than 2,000 copies of the draft EIS or Summary of the draft EIS were mailed to potentially interested citizens and organizations. Seventeen public hearings, announced in the local news media, were conducted at locations near each candidate port and potential management site.

Environmental justice in potentially affected areas, including those neighborhoods near the Concord NWS, is discussed in Section 4 and Appendix A of the EIS.

Response to Comment No. 135-5

Federal, State, and local governments may (and sometimes do) measure the radiation levels associated with transportation casks carrying nuclear material in their jurisdiction. This is true for any of the commercial and military ports that might receive the foreign research reactor spent nuclear fuel. Allowing citizen's groups into the port to also measure the radiation levels would be the decision of the State and/or the local authorities (and military authorities for military bases). DOE has no objection to citizen groups performing independent measurement of radiation levels.

Response to Comment No. 135-6

Past activities of the United States Government, other than those that pertain to and are described in this EIS, are outside the scope of this EIS (Section 1.3 of the EIS). This EIS deals with a policy that would eliminate many of the nuclear proliferation problems that could concern the citizens of this country, and does not include bombing or experimenting with veterans.

Preparation of this EIS was conducted in an open manner, from the public scoping meetings prior to the implementation plan to the seventeen public hearings held to discuss the draft EIS in locations determined most likely to be directly affected by the EIS alternatives. In addition to accepting oral comments from the public during these meetings and hearings, written comments were also encouraged and accepted, as evidenced by this document.

Response to Comment No. 135-7

DOE is considering the consolidation of all its spent nuclear fuel inventory, such that the aluminum-based fuel would be consolidated at the Savannah River Site and other kinds of fuels would be consolidated at the Idaho National Engineering Laboratory. This action is being considered because the Savannah River Site personnel have the most experience with aluminum-based fuels and the special technologies necessary to manage it safely. Similarly, the Idaho National Engineering Laboratory has more experience with safely managing a variety of other fuels. (Section 2.6.5 of the EIS.)

In the near future, the chemical separation facilities at the Savannah River Site might resume operations for the foreign research reactor spent nuclear fuel or for another purpose. These options are discussed in Section 2.2.2.6 of the EIS. In this situation, the trace amounts of plutonium in the foreign research reactor spent nuclear fuel would not be recovered. The HEU would be recovered, but it would be DOE's preference to blend down the recovered HEU into LEU to prevent its use in a nuclear weapons program.

DOE announced a Record of Decision on May 30, 1995 for the Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental

COMMENTOR NO. 135: RECAREERING INSTITUTE (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 135: RECAREERING INSTITUTE (CONT'D.)

Restoration and Waste Management Programs EIS. Chemical separation at the Idaho National Engineering Laboratory was not included in this Record of Decision, so additional site-specific NEPA documentation would be required to restart the chemical separation facilities at this site.

Response to Comment No. 135-8

General radiological health effects are discussed in Section 4.1.3 and the specific impacts of each alternative are presented throughout Section 4 of the EIS. Since the commentor did not mention specific examples of different statistics on radiological health effects or impacts, DOE cannot perform a comparison.

Response to Comment No. 135-9

Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident and thus effect the probability of such accidents, however, the number of earthquake-induced ship and road accidents is small compared to other causes.

Response to Comment No. 135-10

The port selection process that determined Concord NWS was an acceptable port, considered the population of the port and surrounding areas, (Appendix D, Section D.1.9.5 of the EIS).

The physical constraints of the passage from San Francisco Bay to Concord NWS were considered as part of the port selection process. The passage was determined to meet the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). Also, the port selection criteria do not consider the existence of land-based facilities such as refineries because the addition of some mishap at a land-based facility would not add to the severity of the worst plausible accident, which is considered to be the collision of the ship carrying the foreign research reactor spent nuclear fuel with a petroleum tanker.

The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small

number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (Appendix D, Section D.1.9.2). Appendix D, Section D.5.3.1.3 presents a discussion of the determination of the probability of ship accidents used in the EIS.

Response to Comment No. 135-11

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide. If the United States does not include its stable, developed allies in this program, then many of the research reactors in these countries are likely to switch back to (or continue) the use of HEU as fuel, or would have to shut down.

As stated in the EIS, the U.S. has an obligation under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) to assist nonnuclear weapons states with peaceful applications of nuclear energy. Actions which compel a country to shut down a peaceful nuclear research program, or to seek reprocessing, could cast doubt on U.S. commitment to NPT principles. Any perception that the U.S. does not support the NPT, which is the foundation of the entire international nuclear nonproliferation regime, would make it that much harder to negotiate further nuclear nonproliferation agreements.

If the research reactors are forced to shut down, the United States would likely be accused, rightly or wrongly, of failing to live up to its obligations under the Treaty on the Non-Proliferation of Nuclear Weapons to assist nonnuclear weapons states with peaceful applications of nuclear technology. If the reactors switch back to (or continue) the use of HEU as fuel, the move towards elimination of the civil use of HEU will be severely diminished. While it is true that these countries do not pose a threat of nuclear weapons proliferation themselves, they serve as examples for other countries. If our stable allies continue to use HEU as fuel for their research reactors, then the countries which buy reactors from them would demand reactors fueled in the same manner.

Finally, the United States is currently attempting to persuade Russia and China to implement programs, similar to that of the United States, to convince their client states to switch their research reactors to LEU fuel. If, through action or inaction, the United States is unable to persuade its allies to discontinue the use of HEU as fuel, then we are unlikely to convince Russia and China that they should treat their allies any differently.

Weapons-grade uranium in some of the spent nuclear fuel from foreign research reactors is a nuclear weapons nonproliferation threat because that uranium could conceivably be removed from the spent nuclear fuel and used in production of one or more nuclear weapons. However, to do so would require that the spent nuclear fuel be reprocessed to

COMMENTOR NO. 135: RECAREERING INSTITUTE (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 135: RECAREERING INSTITUTE (CONT'D.)

separate the uranium from the structure of the spent nuclear fuel elements, fission products in the uranium, and other impurities that are integral parts of the spent nuclear fuel. This separation requires a sophisticated chemical processing plant as well as time and money.

Chemical separation of the weapons-grade uranium could conceivably be accomplished if the spent nuclear fuel were left in an irresponsible nation having the required technology, time, and financial resources, or if it were released to a well-funded terrorist organization. However, such actions would not be possible in the relatively short time that the spent nuclear fuel would be in transit. During transit the spent nuclear fuel would be sealed in transportation casks weighing 25 tons or more. The sheer size and weight of these spent nuclear fuel transportation casks, coupled with the radioactive nature of the spent nuclear fuel itself, make movement of spent nuclear fuel a time consuming, difficult task. Conversely, these characteristics make spent nuclear fuel an unattractive target for theft during transit, making it a low proliferation risk during transportation. Furthermore, since spent nuclear fuel shipments would be guarded and their schedules would not be announced, these shipments would be also resistant to terrorism. During the past 40 years, hundreds of shipments have been made in similar casks. To date, there have been no terrorism or proliferation problems with any of these shipments. The physical security provisions used during transit have proven to be effective.

Response to Comment No. 135-12

As the result of public concern born from a September 1993 television report, the Contra Costa County Board of Supervisors initiated an investigation of the safety at Concord NWS. Their report on the subject, Safety at the Concord Naval Weapons Station dated November 2, 1993, concluded in part that, "There were no incidents involving explosions or radiation exposure, and that many of the reported incidents were not accidents caused by Weapons Station employees but, rather, were discoveries by employees that materials being received had been damaged during loading or transit. In some cases the shipments had not been properly blocked, braced or banded."

In fact, the safety record at Concord NWS is significantly better than that of similar activities in ports in the private sector. According to the Department of Labor statistics, for the category of marine cargo handling, the number of lost workday cases per 100 full-time workers for 1993 was 7.1 nationwide (1994 data not available), which is typical. The number of lost workday cases per 100 workers at Concord NWS for the first three quarters of fiscal year 1995 was 5.3, which is also typical for Concord.

Response to Comment No. 135-13

Estimates of radiological and nonradiological impacts at candidate ports, along transportation routes, and at interim management sites show that no disproportionately high and adverse effects are expected for any segment of the population, including minority populations and low-income populations. Figures A-1 through A-10 and A-21 through A-25 of Appendix A show distributions of minority populations surrounding candidate ports and interim management sites, respectively. Figures A-11 through A-20 and A-26 through A-30 of Appendix A show distributions of low-income households surrounding candidate ports and interim management sites, respectively. Environmental justice is discussed in Sections 4.2.2.6, 4.2.3.7, 4.2.4.5, and Appendix A of the EIS.

Response to Comment No. 135-14

The EIS evaluated the potential shipment of foreign research reactor spent nuclear fuel over the existing road and rail line infrastructure and determined that the risks and potential impacts associated with the shipments would be low. No need for upgrades were identified. Other upgrades of these roads and rail lines is outside the scope of the EIS (Section 1.3 of the EIS).

Response to Comment No. 135-15

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Commentor No. 143:
Seattle Women Act for Peace

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Thalia Spyropoulos Phone: (206) 282-0810

Title and Organization: Seattle Women Act for Peace

Address: (home) 1607 Bigelow Avenue, North

City: Seattle State WA Zip 98109

*** COMMENTS ***

Please see attached

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

Response to Comment
Commentor No. 143:
Seattle Women Act for Peace

COMMENTOR NO. 143: SEATTLE WOMEN ACT FOR PEACE (CONT'D.)

Thalia Syracopoulos
1607 Bigelow Avenue, North
Seattle, WA 98109

SUMMARY OF TESTIMONY ON DRAFT ENVIRONMENTAL IMPACT STATEMENT ON A PROPOSED NUCLEAR WEAPONS NONPROLIFERATION POLICY CONCERNING FOREIGN RESEARCH REACOR SPENT NUCLEAR FUEL

Testimony given May 25, 1995 at Raddison Hotel, Seatac, WA.

Prior to beginning my testimony I would like to register my disapproval of the way in which this hearing was organized. I have testified at other EIS hearings and never have I had to listen to a federal apologist lecture myself and numerous others every time testimony was given that he wished to refute. In addition, those who asked questions were not afforded the dignity of having reasoned, written responses provided in the final EIS statement. No person who testified was asked to identify themselves in order to have that information included in the documentation of the hearing. Mr. Beard was officious, testy and rude. Despite the fact that the hearing was scheduled for a specific time period and many persons had travelled there with the expectation of providing important testimony within that time frame, we found that our valuable time was taken with watching movies, listening to lectures and providing Mr. Beard endless opportunities to explain the DOEs position. 143-1

In light of the fact that the DOE had already spent substantial amounts of money publishing not only the Draft EIS, the Summary of the Draft EIS, but also the numerous copies of the 1993 public relations booklet, "Transporting Radioactive Materials" I feel that the DOE had every ample opportunity to state their case and provide information. I will acknowledge that the inadequacy of the information provided in the draft EIS was appalling, but Mr. Beard's comments provided very little substantive elaboration of that inadequate report. The hearing should have been just that, an occasion on which the DOE would HEAR what those who will be most directly affected by the DOE's decision had to say.

I would, in addition, like to protest the use of scribes to take notes on testimony given. For historical and legal purposes, such hearings should have an accurate record of comments made. The purchase of a tape recorder and several blank tapes would have been more efficient, more accurate and less expensive than DOE employees taking notes.

To the best of my recollection from my notes, my testimony on this occasion was as follows:

I am asking that DOE take the "no action" alternative to this 143-2

RESPONSE TO COMMENT COMMENTOR NO. 143: SEATTLE WOMEN ACT FOR PEACE (CONT'D.)

Response to Comment No. 143-1

DOE did request that comments be submitted in writing, however, all oral comments presented at each hearing were summarized and have been addressed along with the written comments in this Volume 3 of the EIS. All comments, written and oral, are part of the public record. The format adopted by DOE for the public hearings held on the draft EIS is fully in compliance with the requirements of NEPA implementing regulations and DOE's requirements for conducting such hearings.

Response to Comment No. 143-2

The commentor's preference for the No Action Alternative which is described in Section 2.5 of the EIS is noted. Environmental effects and policy implications resulting from adoption of the No Action Alternative are discussed in Section 4.6 of the EIS.

COMMENTOR NO. 143: SEATTLE WOMEN ACT FOR PEACE (CONT'D.)

proposal.

143-2 (Cont'd.)

I am completely and unequivocally against the bringing of spent nuclear fuel rods into Puget Sound for transportation, by any means [rail, truck] to Hanford. I have grandchildren and I hope to have great-grandchildren and it is our responsibility to maintain the environment so that they and generations to come will be able to use Puget Sound for their recreation, for their livelihood and for their food and water.

143-3

This country has, for almost exactly 50 years, been creating nuclear waste and we have heretofore neither devised nor implemented a safe method for the disposal or even the storage of this nuclear waste. If, in addition to creating our own nuclear waste, we take on the responsibility of maintaining and storing the spent fuel rods for all of the world's research reactors, none of those countries will ever have any reason to diminish, much less stop, their contribution to the world's ever-growing piles of nuclear waste.

143-4

In addition, to have chosen Hanford for the disposal site while simultaneously denying the serious, health-threatening problems already present at Hanford and, again in addition, to have done this at a time when it appears almost inevitable that funds for clean up at Hanford will be cut, if not eliminated is unconscionable.

143-5

If, despite the above, it is necessary to transport these fuel rods in this country, then the DOE has a responsibility to maximally protect and maximally inform all individuals and communities which would and/or could be impacted by this transportation.

143-6

An accident is, by definition, unexpected and unplanned. Even assuming, as the DOE apparently does, that a serious accident could not happen, they do acknowledge that some very low levels (allegedly) of radiation will be detectable at the surface of these containers. Even if it is true that very little radiation is emitted from these allegedly indestructible shipping containers, it should be remembered that modern medical science has never identified a safe level of radiation exposure. In addition, there are substantial disagreements already about the amount of radiation the stevedores, sailors and truckers will be exposed to when they handle or are in proximity with these containers for greater or lesser periods of time.

143-7

This information is very important because the testing that is described in the brochure, "Transporting Radioactive Materials" (pages 12-14), is inadequate and the results are suspiciously perfect. Even if Type "B" containers are used, who is to guarantee that in the transfer process the container will never drop from the top of a crane down more than 30 feet on to a dock or the sturdy

143-8

RESPONSE TO COMMENT COMMENTOR NO. 143: SEATTLE WOMEN ACT FOR PEACE (CONT'D.)

Response to Comment No. 143-3

The commentor's preference for the No Action Alternative and opposition to the use of the Port of Tacoma is noted. However, on the issue of air and water quality as it pertains to the proposed policy of managing foreign research reactor spent nuclear fuel, the analysis in the EIS indicates that there would be no significant adverse impacts to either the Puget Sound or the Port of Tacoma. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive contents have ever been released from a spent nuclear fuel transportation cask, nor has a spent nuclear fuel transportation cask ever been punctured, even as a result of an accident. Based on this experience, DOE considers that transportation casks passing through Puget Sound, the Port of Tacoma, or any other port, would not release their radioactive contents, or affect either the air or water quality.

Response to Comment No. 143-4

Both wet and dry storage technologies have been used in the past and could be used in the future to safely store spent nuclear fuel from foreign research reactors (Section 2.6.5.1 of the EIS). As noted in Section 1.2 of the EIS (last paragraph), DOE has put the foreign research reactor operators on notice that any policy established after completion of this EIS would be the last instance in which the U.S. would assist them in management of their spent nuclear fuel, and that they would have to use any time provided by the proposed policy to make their own arrangements for spent nuclear fuel disposition.

Response to Comment No. 143-5

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 143-6

Security of the foreign research reactor spent nuclear fuel while in transit is discussed in Sections 2.7.5 and 5.4.2 of the EIS.

COMMENTOR NO. 143:
SEATTLE WOMEN ACT FOR PEACE (CONT'D.)

metal hold of a ship? Who is to guarantee that at no time will such a container drop more than 40 inches on to a steel rod? We already know that a ship fire reaching more than 2000° F burned for more than 24 hours recently in Seattle. Even the DOE cannot say this will never happen, because it already did happen. And yet, somehow, the DOE expects us to be totally reassured by the fact that the package was tested at 1475° F for 30 minutes. We are not reassured. 143-8 (Cont'd.)

Puget Sound is one of the world's deepest natural harbors. Indeed, very little of the water over which these ships will sail is only 50 feet deep and some areas are so deep that it would not only take more than 8 hours to retrieve the package, it is possible that it might never be retrievable. It is impossible to rationally counter the DOEs assumption (Draft EIS, pg. 34) that: "If a cask was to sink in the deep ocean and could not be recovered, seawater would penetrate the cask seals and corrode the spent nuclear fuel. There is no mechanism, however, by which the seawater entering the cask could be forced out of the cask. Thus the radioactive material would escape from the cask at a very low rate and would have a negligible effect on the marine environment." I and many others ask, "where is it written" that seawater will penetrate the cask seals in only one spot thereby blocking egress of the now-contaminated seawater? Again, we are not reassured. 143-9

The dramatic photos of the truck driving full speed into the wall (page 14) is quite impressive. Mr. Beard also told us that even if the truck was broadsided right at the container by a locomotive it would be intact. This seems odd in the context of the information that the simulated truck accident at 84mph succeeded in denting the container although we are reassured that "it did not release its simulated radioactive material". It is hard to give credence to the information about the train when a truck cab which has the container on the bed behind the cab, hitting a surface that yields, still results in denting, if not violating the full structural integrity of the cask. 143-10

The summary of the EIS is 48 pages long. Of that, 47 typed lines are devoted to the impacts of accidents during marine transport, port activities and ground transport. In addition to this obvious short shrift of the issues, the DOE must understand that these reassurances of how "safe" this all is fall on ears that are well tuned to the 50 years of being lied to about nuclear impact, dangers and accidents. 143-11

The assumption that the DOE will do what it wants no matter what we say in opposition, combined with your history of deception, poor decision-making and inadequate preparation for untoward events due to a denial that they could happen, leads me to make the following requests.

RESPONSE TO COMMENT
COMMENTOR NO. 143:
SEATTLE WOMEN ACT FOR PEACE (CONT'D.)

The requirements for physical protection of the foreign research reactor spent nuclear fuel during shipments are specified in 10 CFR Part 73.37. The principal points are (1) cooperation with local law enforcement agencies, (2) armed escorts, and (3) communications with a communications center that is staffed 24 hours per day. (Section 5.4.2 of the EIS.)

For truck shipments in heavily populated areas, one escort vehicle containing an armed guard would lead the truck and another escort vehicle containing another armed guard would follow the truck. In less populated areas, there would be only one escort vehicle instead of two. For rail shipments, the escort would ride on the train in a location that permits observation of the shipment car while the train is in motion.

DOE is required to inform the Governor of each State and any Tribal chair, or their designee, along a transportation route at least seven days in advance of the shipment of hazardous cargos, including radioactive materials.

Response to Comment No. 143-7

The risks of radiation exposure from the proposed action and from common sources are discussed in Section 4.10 of the EIS. The estimated health risks to sailors, port workers, and truck drivers are presented in Sections 4.2.1, 4.2.2, and 4.2.3, respectively. DOE is not familiar with the substantial disagreements cited by the commentor.

Response to Comment No. 143-8

The sequence of testing scenarios (i.e., cask drop onto unyielding surface, cask drop on a steel post puncture, and cask fire) mentioned by the commentor is required by the Nuclear Regulatory Commission as part of the certification of "Type B" spent nuclear fuel transportation casks as given in 10 CFR Part 71.73 and elaborated in the EIS (Section 2.6.2 and Appendix B of the EIS). These tests conservatively represent a wide range of accident conditions that could occur during transport. The test results indicate that if such accidents were to occur, the cask, most likely, would not fail, and would not lead to a loss of containment. The EIS evaluated the consequences of such accidents (Section 4 and Appendix D). Note, the cask drop and puncture tests evaluate the resulting impact on the most vulnerable orientation of the cask, which would be very unlikely to occur while the cask was being transported in an ISO container. In addition, a drop onto a dock or a sturdy metal hold of a ship is not equivalent to a drop onto an unyielding surface.

These certification standards were developed for use of the transportation cask on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. The duration of a ship fire is directly related to the amount of combustibles carried on board. The number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London

COMMENTOR NO. 143: SEATTLE WOMEN ACT FOR PEACE (CONT'D.)

1. Because there is disagreement about the amount of surface radiation emitted by these casks and disagreement about the danger of even low-level radiation exposure I would request that each ship carrying one or more of these casks/containers carry no other cargo other than these casks/containers. In this way clothing, children's toys, furniture or whatever else is shipped would not inadvertantly absorb (and later spread) radiation as a result of being in proximity to that surface radiation for the amount of time that is required for the sea journey to Tacoma. 143-12

2. Every worker, whether a stevedore on the docks, a sailor on the ships or the trucker who drives the container to or from its point of origin/destination, who will handle or be in the vicinity of these casks/containers must sign a fully informed consent which specifies all of the actual and potential hazards of working with such a cargo. This informed consent must span the full spectrum of information from the already-accepted "minimal" unavoidable radiation exposure to the consequences of an absolute worst-case scenario in which the container was violated and those in proximity received the full, unprotected radiation exposure. It must also contain the information, expanded upon in #5 below, that no life-saving activity which might jeopardize the integrity of the cask/container would be undertaken to save that worker's life. 143-13

3. Each and every community through which these shipments must pass must be notified publicly and well in advance of the passage of each shipment. The feasibility of this is apparently relatively easy since, it was explained this evening, the "tracking system" of such cargo is such that it can be specifically located within any 15-minute time period during transit. This would enable impacted communities to prepare for any untoward events and would allow those who wish to absent themselves from proximity to the potential hazard time in which to leave. 143-14

4. Each transport vehicle, truck, ship and each container/cask must be well and visibly marked so that it can be readily identified from all sides on the sea/ground level and from the air. This would facilitate the accuracy and appropriateness of any required emergency or supportive response. 143-15

5. Each dock and each ship/truck should have present, AT ALL TIMES, a team of persons fully and effectively trained in the handling of radioactive material and in the techniques of damage abatement should an accident or "worst case scenario" occur. To rely on local community hazardous material response teams, which most communities do not have, is insufficient. For instance, in a worst case scenario, let us imagine the possibility that an accident occurred in which the integrity of the cask/container was not violated, but an individual (stevedore, sailor, driver, pedestrian, locomotive engineer) was pinned under the cask/container. There has to be someone present with the 143-16

RESPONSE TO COMMENT COMMENTOR NO. 143: SEATTLE WOMEN ACT FOR PEACE (CONT'D.)

indicate that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures. Hence, contrary to the commentor's assertion, long duration fires are not usual.

In respect to the impact a ship fire might have on a spent nuclear fuel transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the transportation cask would not be exposed for the entire duration of the fire. Second, a ship fire's intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it would be almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of research reactor spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).

The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt research reactor nuclear fuel. Appendix D, Sections D.5.3 and D.5.4 of the EIS present a detailed discussion of accident probabilities and radioactive material source terms and the results of the analyses, respectively.

In conclusion, although long duration ship fires are possible, and have occurred, they are uncommon events. Analyses in the EIS indicate that even in the event of a severe ship fire involving a transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5 of the EIS).

Response to Comment No. 143-9

The EIS evaluated the consequences of accident scenarios resulting in the sinking of a transportation cask in the continental shelf (water depth of about 200 meters), and in the deep ocean (water depth of more than 200 meters). DOE acknowledges that some parts of the Puget Sound could be as deep as 305 meters (1000 feet). The analysis in the EIS does not require the cask to be recovered in less than 8 hours. The cask immersion test in 50 feet of water for 8 hours is the last part of a series of tests; i.e., free drop onto an unyielding surface, puncture (drop onto a steel post), fire, and water immersion (Section 2.6.2 and Appendix B, Section B.2 of the EIS). The representative transportation casks identified for marine transport use (Table B-13 of Appendix B of the EIS) would not buckle if one were to sink in Puget Sound. The water could leak into the cask, however, if it were to fall in the deepest part. DOE would recover any cask that might sink in Puget Sound regardless of water depth.

COMMENTOR NO. 143: SEATTLE WOMEN ACT FOR PEACE (CONT'D.)

knowledge, the responsibility and the courage to explain to that inadvertent victim that they will only be freed from the cask/container if that process does not involve violating the integrity of the cask/container. Such techniques as cutting away the container with a torch or the "jaws of life" which might violate the integrity of the cask/container could not be utilized to save the truck driver or the sailor who is pinned and whose life is in danger. Someone who knows this and who has the authority to communicate it must be present at all times to ensure that even greater damage is not done in the process of trying to save one or two lives.

143-16 (Cont'd.)

Once again I firmly state that I oppose the entire plan to transport this material from its reactor-of-origin to Hanford. I urge the DOE to adopt a policy of non-action and to allow each country of origin to deal as effectively and responsibly as they choose with such hazardous waste.

143-17

As a minor addendum, Mr. Beard addressed several of these points after I finished. Prior to my presentation, Mr. Beard had given a detailed and extremely reassuring account of the closeness with which the transport of these casks/containers would be tracked. However, in response to #3 above, he informed me that it was illegal for anyone other than the governor of each state to be informed about the transit of these shipments through any community. In addition, while the governor might be informed, it is apparently illegal for the governor to provide this information to the communities through which such shipments will pass. It is verily this type of deceptively inaccurate "reassuring" manipulation and dishonesty on the part of the DOE that makes it impossible for people to believe that you will act in a responsible manner.

143-18

MAILED TO: Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT COMMENTOR NO. 143: SEATTLE WOMEN ACT FOR PEACE (CONT'D.)

The EIS assumes that if a cask were to sink in the continental shelf it would be recovered. In the deep ocean, if a cask were to sink and could not be recovered, seawater would enter the cask, as noted in the EIS Summary. Since the cask internal pressure is atmospheric, the seawater would be driven into the cask due to the existence of a large pressure differential across the cask seals. Once the cask was filled with seawater and pressurized, the pressure would equalize across the seals, and the water inside the cask would then have a chance to egress. It is only after the pressure equalizes across the cask seals, the contaminants (radioactive materials) would diffuse out of the sunken cask. The EIS evaluated the consequences and risks associated with a nonrecoverable spent nuclear fuel transportation cask in the deep ocean (Section 4 and Appendix C).

Response to Comment No. 143-10

It is important to note that even though the spent nuclear fuel transportation cask dented as expected, in the truck and locomotive crash tests, that does not mean that the cask failed. Cask failure is defined as a rupture of the cask that leads to release of radioactive material in excess of the amount indicated in 10 CFR Parts 71.41, 71.47, and 71.51. The transportation cask denting during a truck crash accident at 84 miles per hour did not violate the full structural integrity of the cask. The cask rammed through the cab and onto the wall. The required test of free fall from 30 feet onto an unyielding surface is comparable to a 52 mile per hour crash onto a hard surface. The final conclusion is that the spent nuclear fuel transportation casks are built to withstand a very high impact energy without losing their containment integrity.

With regards to a test involving a locomotive traveling at 80 miles per hour and broadsiding a cask mounted on a truck trailer, yes it happened. The cask was dented as expected, the locomotive was destroyed, but the cask containment remained intact.

Response to Comment No. 143-11

Sections 4.2.1.3, 4.2.2.3, 4.2.3.3, and 4.2.4.1 of the EIS discuss the risks and consequences of potential accidents involving the foreign research reactor spent nuclear fuel. In addition, Appendix C of the EIS discusses marine transport and associated environmental impacts in detail. These sections demonstrate that the risks and impacts from accepting foreign research reactor spent nuclear fuel into the United States are low.

Response to Comment No. 143-12

Any spent nuclear fuel transportation casks shipped to the United States would be required to emit no more than 10 mrem/hr at 2 m from the cask (Appendix E, Section E.3.1 of the EIS). Any variation in the emitted radiation levels would be below the regulatory maximum limit and would be due to variations in the design, use, and storage history of the foreign research reactor spent nuclear fuel.

COMMENTOR NO. 143: SEATTLE WOMEN ACT FOR PEACE (CONT'D.)

RESPONSE TO COMMENT COMMENTOR NO. 143: SEATTLE WOMEN ACT FOR PEACE (CONT'D.)

There need be no additional requirements to use dedicated ships, nor any adverse consequences to the use of the commercial ships or facilities because the foreign research reactor spent nuclear fuel is shipped in standard ISO containers and because the radiation levels are below the limits that would require special precautions. Although transportation casks carrying foreign research reactor spent nuclear fuel would emit a low level of gamma radiation (Appendix F, Section F.5), this type of radiation cannot contaminate or spread to other cargo. As such, this cargo is compatible with other cargos and can be safely carried on commercial ships.

Response to Comment No. 143-13

The radiation dose that anyone would receive handling or working near a cask is below the limit that is allowed to the public in an unrestricted area by NRC regulations (10 CFR Part 20). As such, no signed consent form is required from anyone associated with the transportation cask carrying foreign research reactor spent nuclear fuel.

Response to Comment No. 143-14

As discussed in Section 2.6.4.2 of the EIS, the NRC regulations concerning route notification are set forth in 10 CFR Part 73. Shippers are required to submit proposed routes for spent nuclear fuel shipments to NRC for approval, and NRC publishes a public information circular that lists routes that have been evaluated and approved for specific spent nuclear fuel shipments.

The regulation also requires DOE to inform the Governor of each State and any Tribal chair, or their designee, along a transportation route at least seven days prior to shipment of hazardous cargos, including radioactive materials.

Response to Comment No. 143-15

The regulations for marking the transport vehicles are published in 49 CFR Part 172. DOE complies with these regulations. The containers holding the spent nuclear fuel transportation casks would be marked while onboard ship, but the ships themselves would not be required to have any special markings. The trucks and/or railroad cars would be visibly marked on all sides, but not on the top.

Response to Comment No. 143-16

Neither NRC, U.S. Department of Transportation, nor DOE regulations require an emergency response team to escort shipments of spent nuclear fuel. DOE considers that if foreign research reactor spent nuclear fuel is managed in the United States, there is adequate regulatory and emergency preparedness infrastructure to ensure its safe acceptance and transportation to the designated management site. As discussed in Section 2.7.1 of the EIS, Federal funding to State, Tribal, and local governments is being provided for maintaining emergency response programs. There are three national emergency

COMMENTOR NO. 143:
SEATTLE WOMEN ACT FOR PEACE (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 143:
SEATTLE WOMEN ACT FOR PEACE (CONT'D.)

response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advice and assistance to the State, Tribal and local agencies involved with a radiological incident. DOE is also required to inform the Governor of a State and any Tribal chair, or their designee, along a ground transportation route at least seven days in advance of the shipment of hazardous cargos, including radioactive materials. It would be the responsibility of the Governor to provide any further notification to State and local officials.

Emergency preparedness, security, and coordination of DOE with local emergency response authorities that would be involved with the acceptance and transportation of foreign research reactor spent nuclear fuel will be discussed in detail in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

If an individual were to be pinned by the transportation cask, cutting the cask with a torch or jaws of life would be an ineffective rescue technique anyway, due to the weight and thickness of the cask. The most appropriate response would be to lift the cask, an action that does not require a special response team.

Response to Comment No. 143-17

The commentor's opposition to the entire plan to transport this material from overseas to the Hanford Site is noted. If the United States adopts a No Action Alternative, our credibility with foreign research reactor operators would likely be so diminished that the United States would have no substantive influence on dispositions of spent nuclear fuel from foreign research reactor or the resulting international commerce in weapons-grade materials (Section 4.6 of the EIS). Assuming the individual countries could safely and securely store and dispose of their spent nuclear fuel (which is unlikely for many countries for both technical and economic reasons), selection of the No Action Alternative would almost certainly lead to a resumption in the use of fresh HEU (i.e., weapons-usable) in civilian programs worldwide. The nonproliferation implications of resumed civilian HEU commerce are greater than the risks associated with marine transport, ground transport in the United States, and management at a U.S. facility. Thus, the proposed action is designed to reduce risks, especially potentially catastrophic ones associated with nuclear weapons proliferation.

Response to Comment No. 143-18

See last two sentences of the first paragraph of the response to Comment 143-16 above.

COMMENTOR NO. 213: WEST COUNTY TOXICS COALITION

WEST COUNTY TOXICS COALITION
1019 MACDONALD AVE., RICHMOND, CA 94801
voice (510) 232-3427 ◦ fax (510) 232-4111

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
100 Independence Avenue, SW
Washinton, DC 2085

May 30, 1995

Dear Mr. Head,

I am responding to the Draft Environmental Impact Statement, On a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

We are disturbed that Executive Order 12898, signed by President Clinton on February 11, 1994, that directs Federal agencies to develop a strategy to address environmental justice concerns in its programs, policies and regulations is not being adhered to in this case.

The Department of Enery plans to transport Nuclear Spent Fuel by ships through the San Francisco Bay , San Pablo Bay to the Concord Naval Weapons Station, Concord, CA.

The Communities near the San Francisco and San Pablo bay are multi-ethnic communities, with a large Afro-American, Latino, Southeast Asian population in the Richmond, San Pablo area, particularly adjacent to the waterways.

213-1

These community people and ethnic populations have not been contacted to alert them of potential risk and possible impact from this proposed policy and project. There should be a series of community meetings in the San Francisco, Richmond, CA, area to make the residents aware of the proposed policy, and to comply with Executive Order 12898.

RESPONSE TO COMMENT
COMMENTOR NO. 213: WEST COUNTY TOXICS COALITION

Response to Comment No. 213-1

Appendix A of the EIS responds to Executive Order 12898 which directs federal agencies to identify and address disproportionately high and adverse environmental effects of their policies and activities on minority populations and low-income populations. Environmental effects of Management Alternatives 1 and 3 were evaluated and found to have no significant beneficial or adverse effects on the general population, including minority populations and low-income populations (Section 4.2 and 4.5 of the EIS). Section 3.2.1 of the EIS identifies low-income households and describes the racial and ethnic composition of resident minority populations surrounding each of the candidate ports. Environmental justice at candidate ports, along ground transportation routes, and at interim management sites is discussed in Sections 4.2.2.6, 4.2.3.7, and 4.2.4.5, respectively, of the EIS.

A public meeting concerning the draft EIS was held in Concord, California on May 22, 1995. Public comments given at the meeting and responses to those comments are included in this document.

COMMENTOR NO. 213: WEST COUNTY TOXICS COALITION (CONT'D.)

WEST COUNTY TOXICS COALITION
1019 MACDONALD AVE., RICHMOND, CA 94801
voice (510) 232-3427 ¤ fax (510) 232-4111

Unfortunately, we cann't confide in the Department of Energy nor the Navy in telling communities of color that there is no risk to our communities and people from the Nuclear Spent Fuel.

This doubt goes back to the disaster at the Concord Naval Weapons Station, July 17, 1944, that killed (377) mostly black sailors while unloading weapons. This national example of institutional racism have not been acknowledged by the Navy and United States government nor completely addressed to the satisfaction of the families of the sailors nor the Afro-American community locally, nationally, nor internationally. 213-1 (Cont'd.)

The West County Toxics Coalition recommends community meetings in the Richmond, CA area and other areas so that all communities that are impacted can attend and voice their concerns. This step would be the beginning of addressing the Environmental Justice issues. 213-2

We are opposed to the development of nuclear weapons by any country that will kill and destroy the environment. 213-3

We also encourage the development of safe solar and wind energy, rather than nuclear energy. Nuclear energy production have not proven to be safe nor have the issues of disposing of the spent fuel been addressed to the safety of people and the environment. 213-4

Sincerely,

Ahmadia Thomas
Board Chairperson

Henry Clark
Executive Director

Lucille Allen
Organizer

RESPONSE TO COMMENT COMMENTOR NO. 213: WEST COUNTY TOXICS COALITION (CONT'D.)

Response to Comment No. 213-2

It would not be feasible, nor does NEPA require, that a hearing be held in every community along a potential transportation route. As such, a total of seventeen public hearings were held on the draft EIS in the locations determined most likely to be directly affected by the EIS alternatives, specifically in the ports of entry and at the potential management sites.

Response to Comment No. 213-3

Management alternatives described in Sections 2.2 through 2.4 of the EIS support efforts by the United States to prevent the spread of nuclear weaponry. As discussed in Section 1.2 of the EIS, elimination of highly enriched (weapons-grade) uranium from civil programs is an essential part of these efforts. Foreign research reactors are not used for weapons production. Research, medical, industrial, and agricultural applications for foreign research reactors are described in Section 1.1 of the EIS.

Response to Comment No. 213-4

Consideration of solar and wind power are outside the scope of this EIS. However, it should be noted that as part of its mission, DOE currently has ongoing programs that are seeking to develop and promote use of these alternative energy sources.

In regard to the commentor's concern about safe disposal of the spent nuclear fuel, DOE is confident that the foreign research reactor spent nuclear fuel could be safely stored at one or more of the candidate management sites pending ultimate disposition (Section 4 and Appendix F of the EIS). The Yucca Mountain Site in Nevada is currently being evaluated as a geologic repository.

COMMENTOR NO. 221: SIERRA CLUB SAN FRANCISCO BAY CHAPTER

SIERRA CLUB San Francisco Bay Chapter
Alameda County • Contra Costa • Marin • San Francisco
Conservation Offices 5237 College Avenue, Oakland, CA 94618 (510) 653-6127
Bookstore 6014 College Avenue, Oakland, CA 94618 (510) 658-7470

Tim Donahue, Chair, DELTA GROUP
2412 Cambridge Drive, Antioch, CA 94509

June 11, 1995

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

Gentlemen:

I am writing on behalf of the Delta Group of the Sierra Club regarding the proposal to receive and transport spent nuclear waste at the Concord Naval Weapons Station, at Concord, California. We have grave concerns about the hazards involved in handling any nuclear material at this site.

The San Francisco Bay Area is one of the largest metropolitan regions in the United States. Use of the Concord Naval Weapons Station facility would involve nuclear-laden ships traveling past six bridges and numerous refinery and chemical plant terminals, along a ship channel that is so hazardous that the channel itself is now in draft EIR study process for improvement work to reduce safety and environmental risks caused by existing ship traffic! Thus the long travel route from the Golden Gate Bridge to Concord via the San Francisco-to-Stockton Ship Channel is subject to risks along every inch of the way. 221-1

Downloading of ships, temporary storage of materials, and loading for rail or truck transport brings additional risks. Rail transport would involve shipment through miles of industrial and urban development in any direction, and from experience, we know that derailment accidents have been all too frequent in the past. These accidents often involve toxic materials from one of our local industries, which require notifying local residents regarding the resultant environmental hazards, and halting rail traffic until the problem has been cleaned up. Transport by highway necessarily involves State Route 4, already grossly inadequate, and operating frequently at Grade Level F in traffic volume--i.e., total gridlock. 221-2 221-3

RESPONSE TO COMMENT COMMENTOR NO. 221: SIERRA CLUB SAN FRANCISCO BAY CHAPTER

Response to Comment No. 221-1

The port selection process that determined that Concord NWS was an acceptable port considered the population of the port and surrounding areas (Appendix D, Section D.1.9.5 of the EIS). Additionally, all population within a fifty mile radius of the Concord NWS was considered when analyzing the potential impact of a range of hypothetical port accidents. Even though all marine transport involves risk, the risks associated with these shipments were found to be low (Appendix D, Section D.5).

The passage from San Francisco Bay to Concord meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). Land-based facilities, such as refineries, have no direct impact on the risk associated with the shipment of foreign research reactor spent nuclear fuel because the addition of some mishap at a land-based facility would not add to the severity of the worst plausible accident, which is considered to be the collision of the ship carrying the foreign research reactor spent nuclear fuel with a petroleum tanker. In this accident the transportation cask is damaged in the collision, then subjected to a fire that resulted from the collision (Appendix D, Section D.5). Section 4.2.2.3 of the EIS discusses the assumptions that went into the port accident analysis and the results of those analyses. Land-based facilities themselves are not a threat to the transportation cask due to the distance from any of the facilities to the ship and the robustness of the cask.

Response to Comment No. 221-2

Radiological health risks and environmental effects of the proposed action were evaluated during preparation of this EIS. As discussed in Section 4 and Appendices B through E of the EIS, the risks associated with the handling and transportation of spent nuclear fuel from foreign research reactors are low. Foreign research reactor spent nuclear fuel has been transported to management sites in the United States for over four decades without a radiological incident. As discussed in Sections 2.6.2, 4.2.3, and Appendix B, Section B.2.1.3 of the EIS, the likelihood that a spent nuclear fuel transportation cask would be breached during an accident is remote.

Response to Comment No. 221-3

Estimates of radiological health effects presented in Section 4.2.3 of the EIS are based on conservative assumptions using representative truck and rail transportation routes from candidate ports to interim management sites. Supporting detail for the calculations is given in Appendix E of the EIS. Radiological and nonradiological health effects were found to be low.

Commentor No. 221: Sierra Club San Francisco Bay Chapter (Cont'd.)

U.S. Department of Energy - 2

An additional factor affecting local environmental problems are prevailing westerly winds. The North Bay corridor forms a natural wind tunnel from the Pacific westward into the Central Valley. The result is that any toxic emissions quickly spread into nearby residential areas, requiring the responsible parties to set in motion an extensive alert system so that safety measures can be taken. Several refineries and chemical plants have had accidents recently, resulting in local residents needing medical attention. A nuclear accident at the Concord Naval Weapon Station would be devasting, affecting not only neighborhoods nearby, but thousands of residents who reside downwind from the Station as well. 221-4

Based on the above listed hazards, we strongly recommend that the Concord Naval Weapons Station not be involved in the handling of spent nuclear rods, or any other nuclear material.

Sincerely,

Tim Donahue

Tim Donahue, Chair, Delta Group
S.F. Bay Chapter, SIERRA CLUB

Phone # (510) 754-8801

Response to Comment Commentor No. 221: Sierra Club San Francisco Bay Chapter (Cont'd.)

Response to Comment No. 221-4

The meteorology and population distribution of the Concord area were taken into account in the calculations in Section 4.2.2.3 and Appendix D of the EIS. In all cases, the risks were found to be low.

COMMENTOR NO. 241:
THE PACIFIC STOCK EXCHANGE INCORPORATED

THE PACIFIC STOCK EXCHANGE INCORPORATED

John C. Katovich
Senior Vice President and
General Counsel

June 12, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management
U.S. Department of Energy
1000 Independence Avenue SW
Washington, D.C. 20585

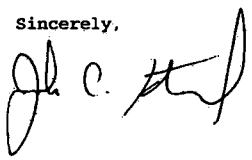
Dear Mr. head:

I am writing to oppose the federal government's plan to ship nuclear waste through the San Francisco Bay Area and store this waste at the Concord Naval Weapons Station. 241-1

Nuclear shipments to the Concord Naval Weapons Station would pass through the heavily populated and seismically active San Francisco Bay Area and be stored near active earthquake faults, six oil refineries, many chemical plants and the Concord High School. The freeways along which the nuclear waste would be carried, 680, I-80 and 5, are major commuter routes which run through the heart of the Bay's dense population. 241-2 241-3

I strongly oppose the Department of Energy's proposal on this matter and urge you to delete the San Francisco Bay Area from your list of proposed sites for the storage of nuclear waste. Thank you. 241-4

Sincerely,



301 Pine Street, San Francisco, CA 94104 (415) 393-4066

RESPONSE TO COMMENT
COMMENTOR NO. 241:
THE PACIFIC STOCK EXCHANGE INCORPORATED

Response to Comment No. 241-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

If the foreign research reactor spent nuclear fuel is accepted into the United States, there would be no storage of this material at Concord NWS, any other port, or anyplace except for management sites. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

Response to Comment No. 241-2

The port selection process that determined that Concord NWS was an acceptable port considered the population of the port and surrounding areas (Appendix D, Section D.1.9.5 of the EIS). Additionally, all population within a fifty mile radius of the Concord NWS was considered when analyzing the potential impact of a range of hypothetical port accidents. The risks were found to be low (Appendix D, Section D.5).

The passage from San Francisco Bay to Concord meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2). The port selection criteria do not consider the existence of land-based facilities such as refineries because the addition of some mishap at a land-based facility would not add to the severity of the worst plausible accident, which is considered to be the collision of the ship carrying the foreign research reactor spent nuclear fuel with a petroleum tanker. While local hazards, such as earthquakes, may slightly increase the probability of an accident, they would not increase the consequences of the accident, which were found to be minor. Therefore, the overall low risk is essentially unchanged in seismic areas.

Response to Comment No. 241-3

Estimates of radiological health effects presented in Section 4.2.3 of the EIS are based on conservative assumptions using representative truck and rail transportation routes from candidate ports to interim storage sites. Supporting detail for the calculations is given in Appendix E of the EIS. Radiological and nonradiological health effects of the proposed action were found to be low.

Response to Comment No. 241-4

San Francisco Bay area is not included in the DOE's list of proposed management sites for the storage of foreign research reactor spent nuclear fuel which is discussed in Appendix F, Section F.1.3 of the EIS.

COMMENTOR NO. 255: UNIVERSITY OF MISSOURI-COLUMBIA

UNIVERSITY OF MISSOURI-COLUMBIA

Research Reactor Center
Research Park
Columbia, Missouri 65211
Telephone (314) 882-4211
FAX (314) 882-3443

June 15, 1995

Public Comments on the
draft FRR SNF EIS
Office of Spent Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave., S.W.
Washington, DC 20585-0001

ATTN: Charles R. Head

This letter presents comments of the University of Missouri Research Reactor (MURR) on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

There are two points:

1. Receipt and storage of approximately 23,000 foreign reactor spent fuel elements must not interfere with continued annual receipt and storage of 26 to 30 MURR elements at Savannah River Site (current receiver) or Idaho National Energy Laboratory (past and possible future receiver). *255-1*

2. Plans for construction of new dry or wet storage facilities must not cause postponement of annual shipments of MURR fuel. *255-2*

Attached is a copy of our comments on an Environmental Impact Statement last year which emphasizes the importance of MURR being able to reliably make annual shipments of spent fuel.

Sincerely yours,

Roland A. Hultsch
Reactor Physicist

enclosure

COLUMBIA KANSAS CITY ROLLA ST. LOUIS

RESPONSE TO COMMENT
COMMENTOR NO. 255: UNIVERSITY OF MISSOURI-COLUMBIA

Response to Comment No. 255-1

If foreign research reactor spent nuclear fuel is accepted into the United States, the receipt and storage activities associated with this decision would not interfere with the existing DOE policy of accepting spent nuclear fuel from U.S. research reactors. In estimating the receipt and storage capabilities of each candidate management site, all previous and current commitments of that site were considered.

Response to Comment No. 255-2

Construction of new wet or dry storage at the candidate management site(s) for storage of the foreign research reactor spent nuclear fuel would not impact other activities or storage requirements.

COMMENTOR NO. 263: CITIZENS OPPOSING POLLUTED ENVIRONMENTS (COPE)

June 11, 1995

COPE
c/o J. Caseber
1908 Tenth St.
Berkeley, CA 94710
510-548-0861
510-845-4001 FAX

Charles Head
U. S. Dept. of Energy (DOE)
Office of Spent Nuclear Fuel Management
1000 Independence Ave. SW
Washington, DC 20585

Mr. Head,

I am offering these comments on behalf of Citizens Opposing Polluted Environment (COPE), a Bay Area grassroots environmental organization on the final draft of the EIS for transportation of spend nuclear fuel rods back into the U.S. from foreign countries

The following are some issues we wish to see addressed in the scope of the final draft EIS:

1. **What would be some worst case scenarios in which radioactive materials from spent fuel rods enroute to temporary storage facilities in the U. S. might be released due to human error, natural disasters, accidents, explosions, fires, sabotage, and/or terrorism?**

Not to include an evaluation of worst case scenarios would be to ignore what we at COPE believe to be unacceptable health and safety risks to the public posed by transportation of spent fuel rods into the U. S. from foreign countries. For instance, because of heavy shipping traffic to and from the Bay Area refineries, transportation by ship through the Golden Gate across the San Francisco Bay could result in an accident involving another ship. In his book, All Things Nuclear., Mr. James Warf, a Group Leader on the Manhattan Project states: "Their (i.e. spent fuel rods') principal vulnerability is from fire. Spent fuel rods on shipboard in a harbor could spew a plume of deadly radioactivity over a city in the case of a severe fire."

If an accident such as an explosion and fire were to occur, it could spread a plume of airborne radioactive materials that could kill or injure thousands of people, not just at the timeof the accident, but continuously for as long as the unimaginable length of time, 500 centuries, that some of

263-1

RESPONSE TO COMMENT COMMENTOR NO. 263: CITIZENS OPPOSING POLLUTED ENVIRONMENTS (COPE)

Response to Comment No. 263-1

A truly worst case scenario is impossible to define because no matter what scenario someone suggests, somebody else could imagine one that is even worse. The EIS does not contain a worst-case scenario, but a broad range of accident scenarios, including severe accidents, is discussed in Section 4.2 of the EIS.

the isotopes involved remain deadly radioactive. We believe that whatever is to be gained economically or for any other reason by taking back these fuel rods, it is not worth this kind of risk.

263-1 (Cont'd.)

2. **How could the DOE assure the general public that one of these scenarios could not happen?**

COPE would be surprised if the DOE could give any such assurances. Just evaluating the potential risk over the next 15 years for each type of occurrence would appear to be impossible.

263-2

3. **If such a catastrophe were to take place, who would be responsible for protecting the citizens against loss of life and health damage and by what means would this be accomplished?**

Officials from other Bay Area cities have already stated in comments that their facilities for emergency response would not only be inadequate, but, for the most part, ineffective in protecting the public from the effects of a catastrophe involving a radioactive fire aboard a ship in the Bay

263-3

4. **Who would be responsible for the possibly astronomical costs involved in payment for injuries and deaths if a terrible accident involving transporting the spent fuel rods were to happen?**

Would liability fall to DOE? the Federal Government? If so it would be the taxpayers who would be ultimately responsible. If the experience of the GI's in Vietnam with regard to their claims for injuries and deaths from Agent Orange is any lesson, how could we be assured that the U. S. Government wouldn't take the same approach to claims associated with a fuel rod explosion? How would the injured be able to prove that their cancer or other injuries were the result of inhalation of radioactive particles emitted from a spent fuel rods accident?

263-4

5. **To what extent would the risk of nuclear weapons proliferation be reduced by implementation of the preferred alternative?**

Given that spent fuel rods made from Low Enriched Uranium (LEU) contains some plutonium, the critical ingredient in the manufacture of nuclear weapons, how would taking back spent fuel rods made from Highly Enriched Uranium (HEU) and supplying foreign agencies with Low Enriched Uranium (LEU) significantly reduce the risk of nuclear weapons proliferation? Isn't it true that as long as nuclear materials are being sold to other nations, risk of proliferation increases?

COPE agrees with many others that the issue of nuclear weapons proliferation should be dealt with within the context of a comprehensive policy which addresses the root causes of proliferation. Key elements of such a policy should include continued significant nuclear arms reductions, the passage of the Comprehensive Test Ban Treaty (CTB), peace time economic conversion of military and nuclear weapons sites, elimination of the United States government's policy regarding threatened "first use" of

263-5

Response to Comment No. 263-2

The accident consequence described by the commentor (kill or injure thousands of people) is not feasible. A fire in the port could not disperse enough radioactive material from these casks to cause such an extreme consequence. Reasonable accident scenarios and their consequences are discussed in Section 4.2.2.3 of the EIS.

Appendix D, Section D.5.4.3.2 presents the risks of a very high temperature fire that engulfs a cask, which was part of a sensitivity study on release fractions. In addition, Section D.5.9 has been added to Appendix D of the EIS to address the issue of attack by disgruntled persons or terrorists.

Response to Comment No. 263-3

Several accident scenarios, including severe accidents, were analyzed during preparation of the EIS. Results of the accident analysis at the ports are given in Section 4.2.2 of the EIS with supporting detail in Appendix D, Section D.5. No catastrophic effects were found to result from severe accidents involving foreign research reactor spent nuclear fuel at any of the ports analyzed.

DOE considers that there is adequate regulatory and emergency preparedness infrastructure to ensure the safe acceptance and transport to designated management sites if the foreign research reactor spent nuclear fuel is managed in the United States. Federal funding to State, Tribal, and local governments for maintaining emergency response programs is discussed in Section 2.7.1. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advise and assistance to the State, Tribal and local agencies involved with a radiological incident. Emergency preparedness, security, and coordination of DOE with local emergency response authorities, and security are discussed in general in Sections 2.7 and 2.8 of the EIS. Details would be contained in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

Response to Comment No. 263-4

Under the Price-Anderson Act, DOE would indemnify contractors for public liability with respect to spent nuclear fuel if there were a "nuclear incident," as defined under the law. In pertinent part, a "nuclear incident" is one that causes, for example, injury or sickness or property damage, resulting from radioactive, toxic, explosive, or other hazardous properties of the material.

Response to Comment No. 263-5

No preferred alternative was selected in the draft EIS on which this comment was submitted (although a preferred alternative is specified in Section 2.9 and 4.7 of this final EIS). On the

COMMENTOR NO. 263: CITIZENS OPPOSING POLLUTED ENVIRONMENTS (COPE) (CONT'D.)

nuclear weapons, and a cessation of promoting nuclear power technologies in foreign countries. 263-5 (Cont'd.)

COPE has formed some strong recommendations concerning the proposed policy. We favor the "no action" alternative as the sanest, the safest, and the least expensive. Leaving the fuel rods right where they are, under international security, eliminates the great potential risks involved in transporting them thousands of miles utilizing several modes of transportation requiring numerous transfers from one mode to another. The costs of potential accidents in terms of human life, human health, and the environment and the expenses associated with each could be astronomical. 263-6

COPE believes that reducing the threat of proliferation of nuclear weapons is a legitimate and extremely important responsibility of DOE. However we disagree that the implementation of the proposed policy will significantly reduce the proliferation risk. We have great fears concerning what we see as terrible health and safety risks to the public associated with the transportation of spend fuel rods, especially through densely populated areas such as the Bay Area. 263-7

5. How could acts of terrorism and theft of materials with which to make nuclear weapons be prevented? 263-8

Don't security risks involving such materials increase dramatically when they are moved over very long distances? Are these shipments to be accompanied by heavily armed convoys?

COPE has a motto: "We have the right to refuse to accept the risk of being poisoned. For the love of ourselves, our families, and our cities, we must not, and will not allow it." We believe this motto is more than applicable in this case. 263-9

Yours truly,
Jami Caseber, Director
Citizens Opposing Polluted Environment (COPE)

cc: President Bill Clinton
U. S. Senator Diane Feinstein
U. S. Senator Barbara Boxer
Vice President Albert Gore
U. S. Congressman Ron Dellums
U. S. Congressman Pete Stark
U. S. Congressman George Brown, Jr.
U. S. Congressman George Miller
U. S. Congressman Richard Gephardt
Governor Pete Wilson
State Senator Nicholas Petris
State Assemblyman Tom Bates

RESPONSE TO COMMENT
COMMENTOR NO. 263: CITIZENS OPPOSING POLLUTED ENVIRONMENTS (COPE) (CONT'D.)

assumption that the commentor meant to refer to the proposed action rather than the preferred alternative, the amount of HEU addressed by the proposed action would be sufficient to produce between 80 and 100 nuclear weapons. Reducing the international availability of this material, therefore would be a major benefit to U.S. nuclear weapons nonproliferation policy.

As shown in Appendix B of the EIS, the amount of plutonium in LEU spent nuclear fuel from foreign research reactors is extremely small and is recognized by nonproliferation experts as not posing a proliferation concern.

The commentor's other comments concerning recommended elements of U.S. nuclear weapons nonproliferation policy are beyond the scope of this EIS.

Response to Comment No. 263-6

The commentor's preference for the No Action Alternative is noted. As discussed in Section 4 of the EIS, potential risks to human health or the environment posed by transportation of spent nuclear fuel from foreign research reactors are low. In the event that such spent nuclear fuel is accepted for disposition into the United States, it would typically be transferred from a container vessel at the port of entry to either rail car, barges, or truck for transport to an interim management site (Section 2.6.3 of the EIS). Numerous transfers from one transportation mode to another would be unnecessary. Furthermore, it is wrong to assume that all of the foreign research reactor spent nuclear fuel would be safe from diversion into a nuclear weapons production program if it were left where it is at this time, as explained in Section 4.4.1 of the EIS.

Response to Comment No. 263-7

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium which could be diverted for the construction of nuclear weapons. Because the amount of HEU needed to construct a nuclear bomb is relatively small, it is prudent to remove as much as possible from international commerce (Section 1.2 of the EIS and the response to Comment number 263-5). As discussed in Section 4 of the EIS, the risks associated with proposed action to human health or the environment are low.

Response to Comment No. 263-8

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security provided for the spent nuclear fuel shipments is required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted.

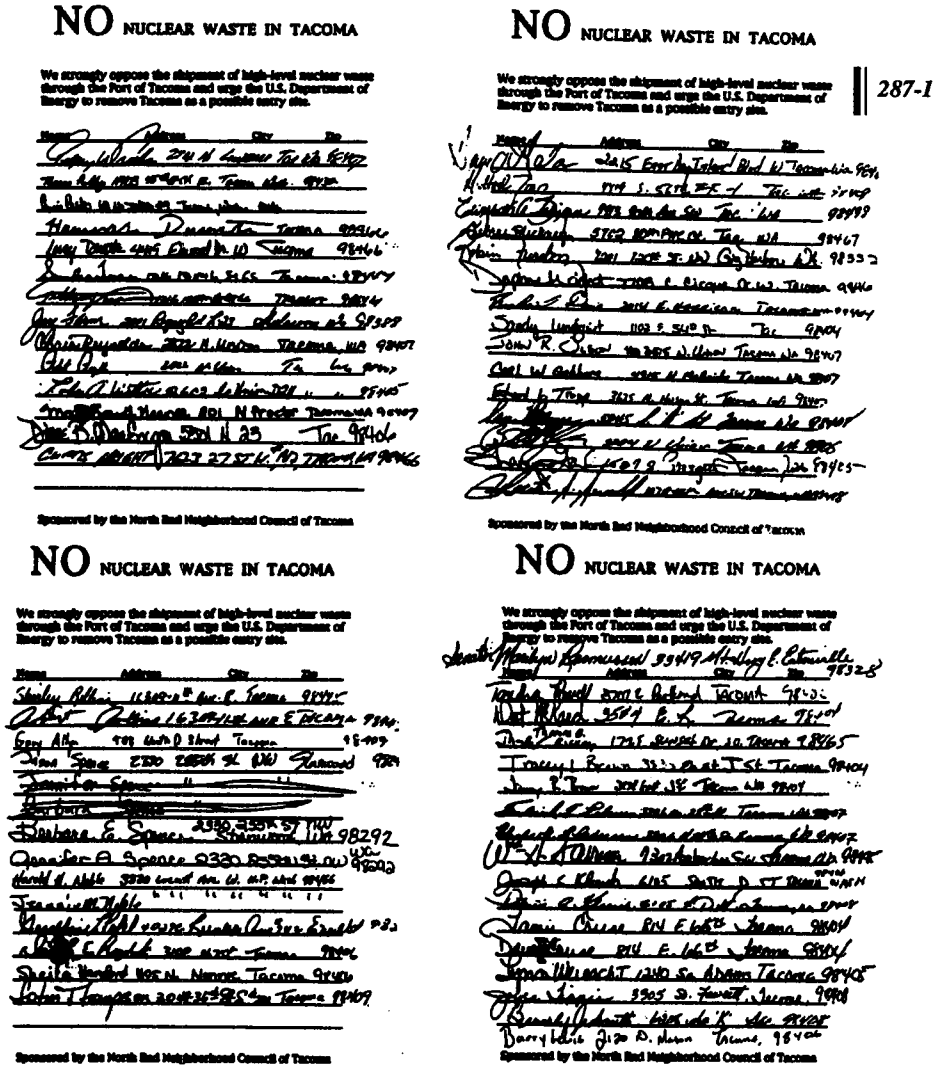
Chemical separation of the weapons-grade uranium could conceivably be accomplished if the spent nuclear fuel were left in an irresponsible nation having the required technology, time, and financial resources, or if it were released to a well-funded terrorist organization. However, such actions are not possible in the relatively short time that the spent nuclear fuel would be in transit. During transit, the spent nuclear fuel would be sealed in transportation casks weighing 25 tons or more. The sheer size and weight of these casks, coupled with the radioactive nature of the spent nuclear fuel itself, make movement of spent nuclear fuel a time consuming, difficult task. Conversely, these characteristics make spent nuclear fuel an unattractive target for theft during transit, thus, a low proliferation risk during transportation. Furthermore, since spent nuclear fuel shipments are guarded and their schedules are not announced, these shipments are also resistant to terrorism. During the past 40 years, hundreds of shipments have been made in similar casks. There have been no terrorism or proliferation problems with any of these shipments. The physical security provisions used during transit have proven to be effective.

Section D.5.9 has been added to Appendix D of the EIS to address the issue of terrorism and sabotage. One of the attack scenarios postulates hijacking a transportation cask full of spent nuclear fuel.

Response to Comment No. 263-9

The analysis in the EIS indicates that the risks of health effects to workers and the general public are low. Furthermore, taking no action would increase the risk of nuclear weapons proliferation, which could have catastrophic consequences.

Commentor No. 287: North End Neighborhood Council of Tacoma Petition



NO NUCLEAR WASTE IN TACOMA

We strongly oppose the shipment of high-level nuclear waste through the Port of Tacoma and urge the U.S. Department of Energy to remove Tacoma as a possible entry site.

Name / Address / City / Zip

Sponsored by the North End Neighborhood Council of Tacoma

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Name / Address / City / Zip

Sponsored by the North End Neighborhood Council of Tacoma

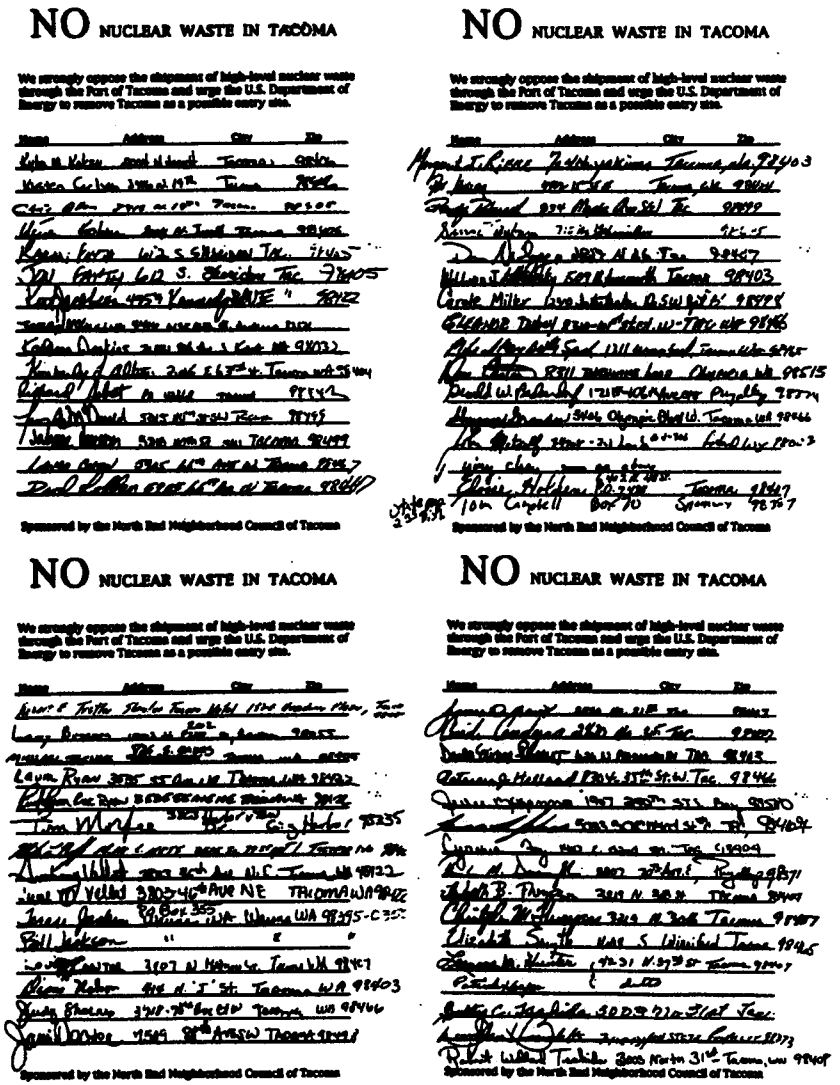
287-1

Response to Comment
Commentor No. 287: North End Neighborhood Council of Tacoma Petition

Response to Comment No. 287-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Commentor No. 287: North End Neighborhood Council of Tacoma Petition (Cont'd.)



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Sponsored by the North End Neighborhood Council of Tacoma

Response to Comment
Commentor No. 287: North End Neighborhood Council of Tacoma Petition (Cont'd.)

COMMENTOR NO. 287: NORTH END NEIGHBORHOOD COUNCIL OF TACOMA PETITION (CONT'D.)

NO NUCLEAR WASTE IN TACOMA

We strongly oppose the shipment of high-level nuclear waste through the Port of Tacoma and urge the U.S. Department of Energy to remove Tacoma as a possible entry site.

Name	Address	City	Zip
[illegible]	2519 N [illegible]	Tacoma	98406
[illegible]	[illegible]	Tacoma	[illegible]
[illegible]	2705 N. [illegible]	Tac.	98407
Wendy S. [illegible]	"	"	"
[illegible]	2501 [illegible]	Tacoma	[illegible]
[illegible]	2501 N [illegible]	Tacoma WA	[illegible]
[illegible]	[illegible] Puget Sound	Tac WA	[illegible]
Diane Novak	2514 N. Puget Sound	Tac WA	98406
[illegible]	"	"	"
[illegible]	[illegible] North 26th	Tacoma	98406
[illegible]	3407 N 24th St	Tacoma	98406
[illegible]	3112 N 22 St	Tacoma	98406
[illegible]	"	"	"
[illegible]	2519 N Junett	Tacoma	98406
[illegible]	2519 N. Junett	Tacoma WA	98406

Sponsored by the North End Neighborhood Council of Tacoma

NO NUCLEAR WASTE IN TACOMA

We strongly oppose the shipment of high-level nuclear waste through the Port of Tacoma and urge the U.S. Department of Energy to remove Tacoma as a possible entry site.

Name	Address	City	Zip
Kathryn [illegible]	3817 No. 29	Tac.	98407
Kim [illegible]	7140 [illegible]	[illegible]	98579
[illegible]	3021 N. [illegible]	Tacoma WA	98403-3213
[illegible]	[illegible]	Tacoma	[illegible]
[illegible]	[illegible]	[illegible]	98409
[illegible]	[illegible]	Tacoma	98498
[illegible]	[illegible]	Tacoma	98418
[illegible]	[illegible]	Tacoma	98444
[illegible]	[illegible]	Tacoma	98422
Craig [illegible]	905 [illegible]	Tacoma	98422
[illegible]	[illegible]	Tacoma	[illegible]
[illegible]	15509 [illegible]	[illegible]	98349
[illegible]	2335 58th Ave E.	Tacoma	98424
[illegible]	[illegible]	Tacoma	98402
Carol [illegible]	9803-[illegible]	Tacoma	98467

Sponsored by the North End Neighborhood Council of Tacoma

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Name	Address	City	Zip
[illegible]	3518 No Junett	Tacoma	98406
[illegible]	3208 N. Alder	Tacoma	98407
[illegible]	[illegible]	Tacoma	98407
[illegible]	[illegible]	Tac.	98402
[illegible]	[illegible]	Tacoma	98422
[illegible]	5021	Everett	98203
[illegible]	2121 S. [illegible] St	Tacoma	98405
[illegible]	2121 S. [illegible] St.	Tacoma	98405
[illegible]	1907 E 36th	Tacoma	[illegible]
[illegible]	1907 E. 36th	Tacoma	[illegible]
[illegible]	637 N [illegible]	Tacoma	98406
[illegible]	[illegible]	[illegible] WA	98391
[illegible]	[illegible] N. 39	Tac WA	98407
[illegible]	4405 N 39	Tac WA	98407
[illegible]	[illegible]	Tac WA	98407

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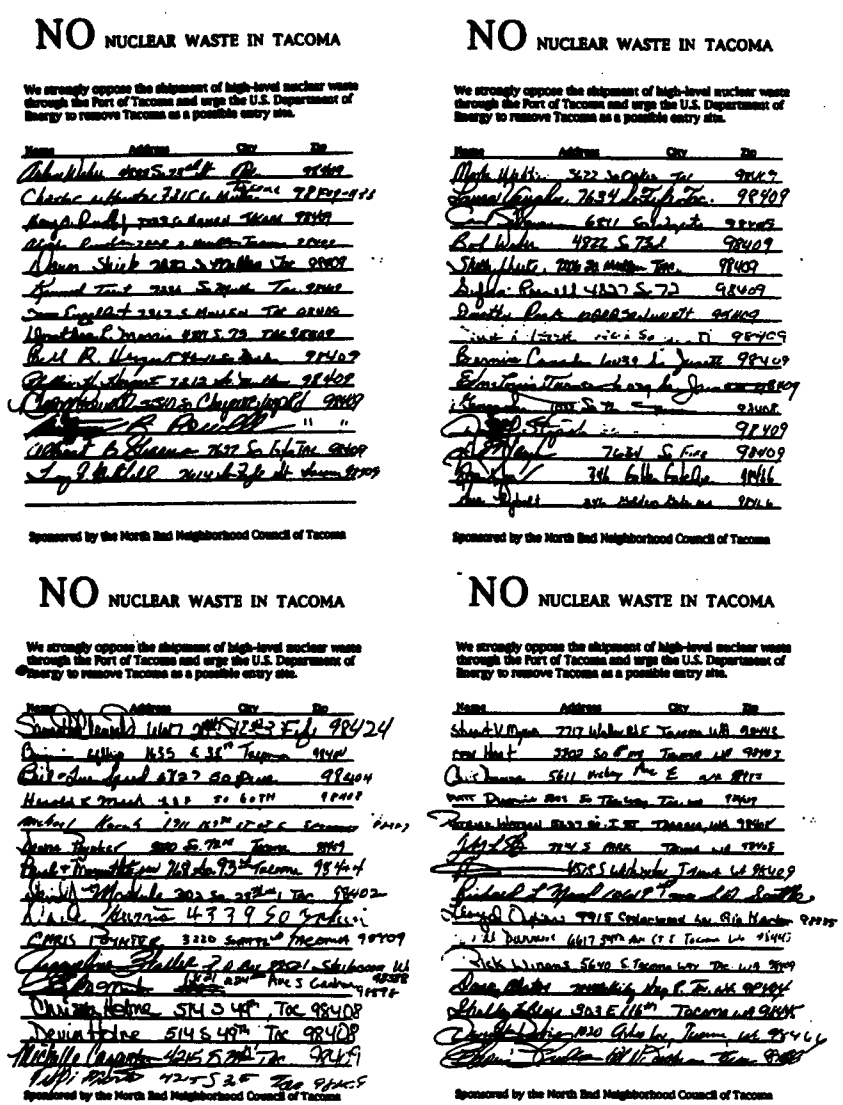
Name	Address	City	Zip
[illegible]	[illegible]	Tacoma	98402
BRENT KEPPLER	613 No. K AP3		98403
[illegible]	[illegible]	TAC	98406
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	3006 N 26th	Tacoma	98407
[illegible]	4121 S. I	Tacoma	98408
[illegible]	[illegible]	Tacoma	98404
[illegible]	13916 S. C St	Tacoma	98444
[illegible]	1506 So. [illegible] St	TAC WA	98407
[illegible]	[illegible]	Tacoma WA	98407
[illegible]	5128 N [illegible]	Tacoma WA	98407
[illegible]	2901 Sunset Dr. W.	TAC WA	98466
[illegible]	2901 Sunset Dr. W.	"	"
[illegible]	2901 Sunset Dr. W.	"	"
[illegible]	4311 N Chapman	Tacoma	98407

Sponsored by the North End Neighborhood Council of Tacoma

RESPONSE TO COMMENT COMMENTOR NO. 287: NORTH END NEIGHBORHOOD COUNCIL OF TACOMA PETITION (CONT'D.)

COMMENTOR NO. 287: NORTH END NEIGHBORHOOD COUNCIL OF TACOMA PETITION (CONT'D.)



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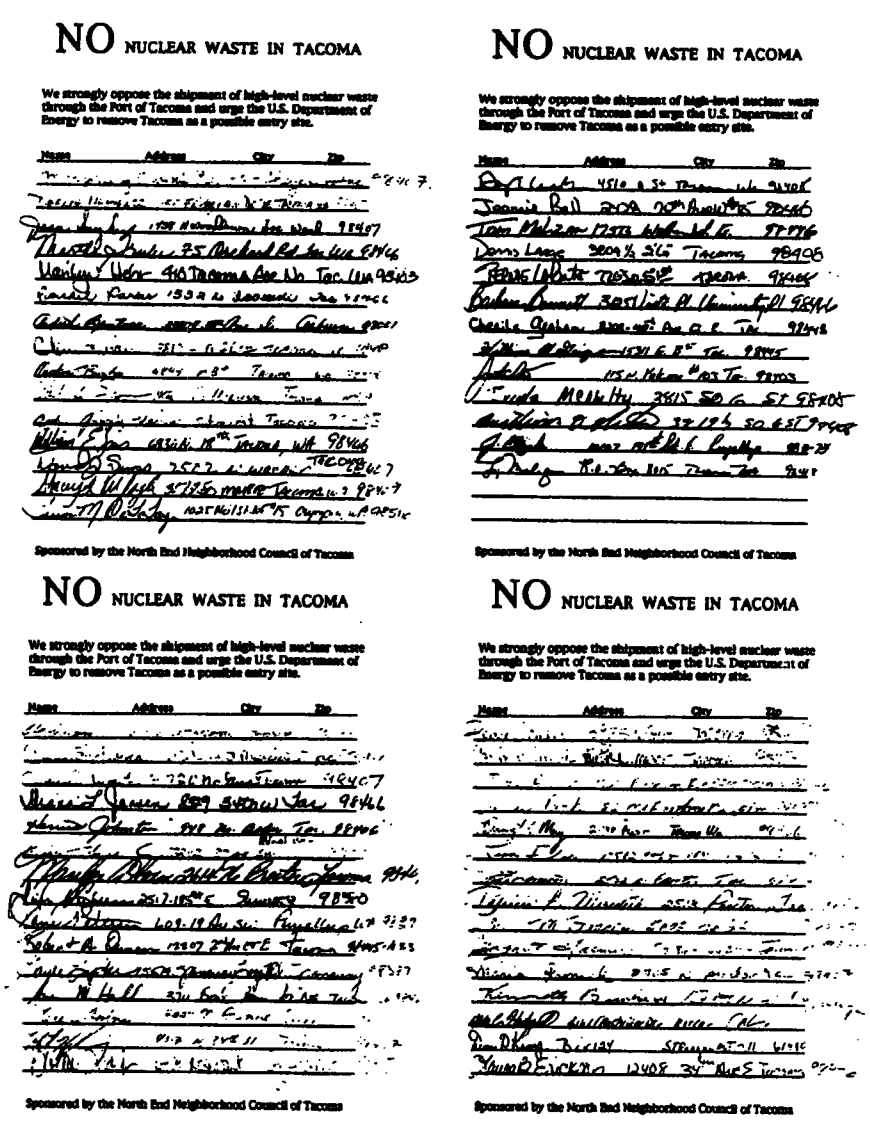
COMMENTOR NO. 287: NORTH END NEIGHBORHOOD COUNCIL OF TACOMA PETITION (CONT'D.)

Commentor No. 287: North End Neighborhood Council of Tacoma Petition (Cont'd.)



NO NUCLEAR WASTE IN TACOMA

We strongly oppose the shipment of high-level nuclear waste through the Port of Tacoma and urge the U.S. Department of Energy to remove Tacoma as a possible entry site.

Name | Address | City | Zip

Sponsored by the North End Neighborhood Council of Tacoma

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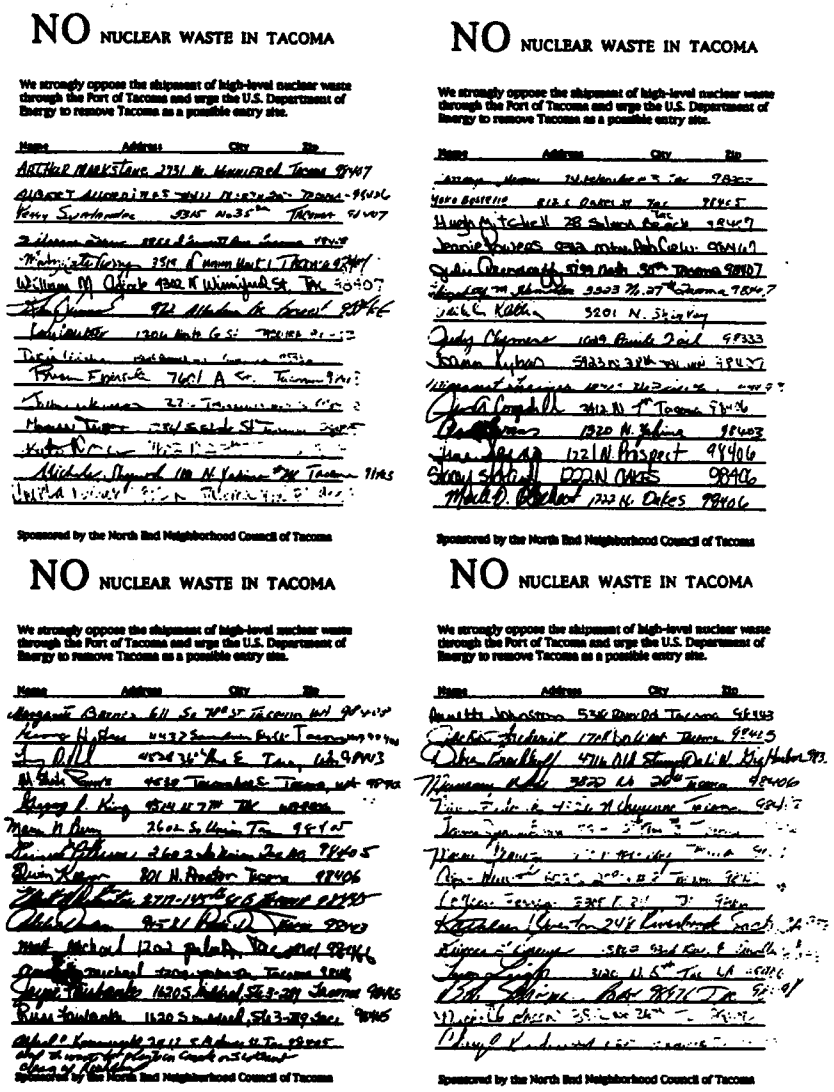
Name | Address | City | Zip

Sponsored by the North End Neighborhood Council of Tacoma

Response to Comment
Commentor No. 287: North End Neighborhood Council of Tacoma Petition (Cont'd.)

* These are the best available copies of the petition signature sheets.

Commentor No. 287: North End Neighborhood Council of Tacoma Petition (Cont'd.)



NO NUCLEAR WASTE IN TACOMA

We strongly oppose the shipment of high-level nuclear waste through the Port of Tacoma and urge the U.S. Department of Energy to remove Tacoma as a possible entry site.

Name	Address	City	Zip
ARTHUR MARKSTEAD	2731 N. WINNIFRED	Tacoma	98407
ALBERT ALLORDING	3611 N. 37th	TACOMA	98406
Penny Symonds	3315 No. 35th	Tacoma	98407
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	3514 N. Cannon Hall	Tacoma	98407
William M. Ostick	1340 N. Washington St.	Tac.	98407
[illegible]	922 Alder St.	[illegible]	[illegible]
[illegible]	1204 North G St.	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Ryan Esposito	7601 A St.	Tacoma	98408
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Michelle Shepard	108 N. Yakima #36	Tacoma	98405
[illegible]	[illegible]	[illegible]	[illegible]

Sponsored by the North End Neighborhood Council of Tacoma

NO NUCLEAR WASTE IN TACOMA

We strongly oppose the shipment of high-level nuclear waste through the Port of Tacoma and urge the U.S. Department of Energy to remove Tacoma as a possible entry site.

Name	Address	City	Zip
[illegible]	[illegible]	[illegible]	[illegible]
Hugh Mitchell	28 Salmon Beach	Tac.	98407
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	5709 North 30th	Tacoma	98407
[illegible]	9303 N. 27th	Tacoma	98407
[illegible]	5201 N. Skyway	[illegible]	[illegible]
Judy Clemens	1049 Pacific Ave	[illegible]	98333
[illegible]	5935 N. 38th	[illegible]	98407
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	3612 N. 1st	Tacoma	98406
[illegible]	1320 N. Yakima	[illegible]	98403
[illegible]	1721 N. Prospect	[illegible]	98406
[illegible]	DOAN OAKES	[illegible]	98406
[illegible]	1733 N. Oakes	[illegible]	98406

Sponsored by the North End Neighborhood Council of Tacoma

NO NUCLEAR WASTE IN TACOMA

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Name	Address	City	Zip
[illegible]	611 So. 7th St.	Tacoma	WA 98405
[illegible]	4432 Sunset Park	Tacoma	98406
[illegible]	4524 W. Ave E.	Tac.	WA 98403
[illegible]	4550 Tacoma Ave S.	Tacoma	WA 98402
[illegible]	4514 N. 7th	Tac.	WA 98406
Mary N. Ann	2602 S. Union	Tac.	98405
[illegible]	2602 S. Union	Tac.	WA 98405
Dawn Kaye	801 N. Proctor	Tacoma	98406
[illegible]	2711-19th St. E.	Tacoma	98421
[illegible]	9511 Portland	Tacoma	98409
[illegible]	1702 [illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	14705 Military Rd. E.	Tacoma	98445
[illegible]	11320 S. Military Rd. E.	Tacoma	98446
[illegible]	[illegible]	[illegible]	[illegible]

Sponsored by the North End Neighborhood Council of Tacoma

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Name	Address	City	Zip
[illegible]	5316 Pioneer	Tacoma	98443
[illegible]	1708 Bay View	Tacoma	98465
[illegible]	4711 Old Stage	Dr. N.W.	Gig Harbor 983
[illegible]	3820 N. 26th	Tacoma	98406
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Sponsored by the North End Neighborhood Council of Tacoma

Response to Comment
Commentor No. 287: North End Neighborhood Council of Tacoma Petition (Cont'd.)

COMMENTOR NO. 287: NORTH END NEIGHBORHOOD COUNCIL OF TACOMA PETITION (CONT'D.)

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Sponsored by the North End Neighborhood Council of Tacoma

RESPONSE TO COMMENT COMMENTOR NO. 287: NORTH END NEIGHBORHOOD COUNCIL OF TACOMA PETITION (CONT'D.)

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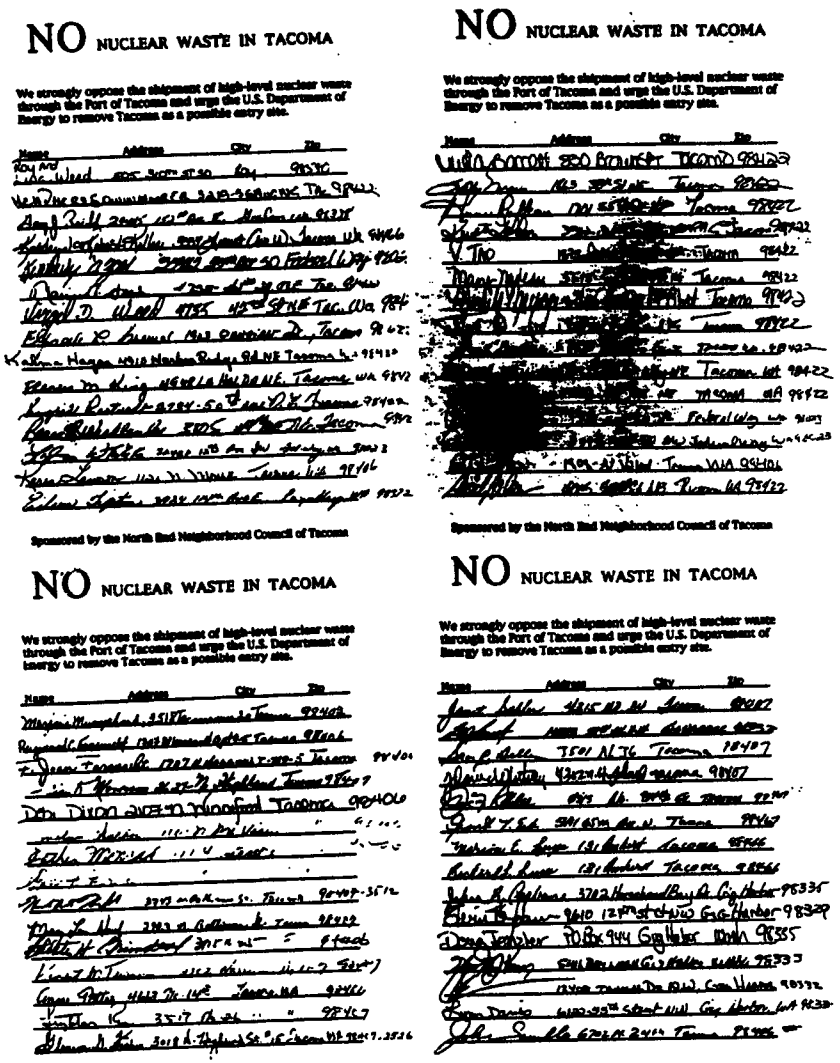

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RESPONSE TO COMMENT
COMMENTOR NO. 287: NORTH END NEIGHBORHOOD COUNCIL OF TACOMA PETITION (CONT'D.)

Commentor No. 287: North End Neighborhood Council of Tacoma Petition (Cont'd.)

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Response to Comment
Commentor No. 287: North End Neighborhood Council of Tacoma Petition (Cont'd.)

COMMENTOR NO. 287: NORTH END
NEIGHBORHOOD COUNCIL OF TACOMA PETITION (CONT'D.)

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Name	Address	City	Zip
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Sponsored by the North End Neighborhood Council of Tacoma

RESPONSE TO COMMENT
COMMENTOR NO. 287: NORTH END
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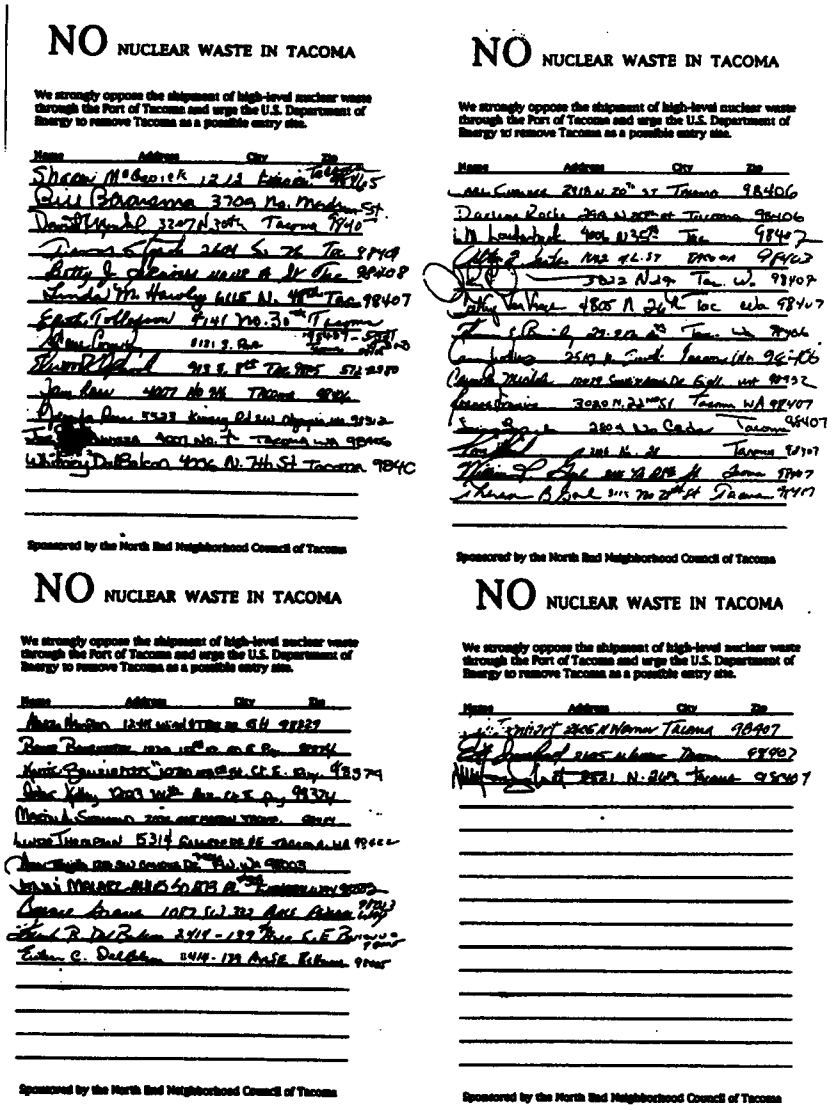

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Commentor No. 287: North End Neighborhood Council of Tacoma Petition (Cont'd.)

COMMENTOR NO. 287: NORTH END
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RESPONSE TO COMMENT
COMMENTOR NO. 287: NORTH END
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COMMENTOR NO. 287: NORTH END NEIGHBORHOOD COUNCIL OF TACOMA PETITION (CONT'D.)

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Name Address City Zip

Janet Koch 2815 53rd St SE Auburn 98092
[illegible] Koch [illegible] 53rd St SE Auburn 98092
Drew Koch 2815-53rd St SE Auburn 98092
[illegible] Koch 2815 53rd St SE Auburn 98092
Valerie [illegible] 14320 200th Ave SE Renton 98059
[illegible] Tinas [illegible] Tacoma [illegible]
John Tinas [illegible] N. [illegible] Tacoma [illegible]
[illegible]

Sponsored by the North End Neighborhood Council of Tacoma

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Name Address City Zip

LOREN WHITNEY 3404 N. 25th TAC. 98406
Carol [illegible] [illegible] 98466
Sharon Rose 3319 N. Adams Tacoma 98407
Carol Briggs 1110 S. [illegible] Tacoma 98405
[illegible] 3306 N. [illegible] Tacoma 98407
[illegible] 814 N [illegible] Tacoma 98406
[illegible] [illegible] Tacoma 98405
[illegible] [illegible] Des Moines, WA [illegible]
[illegible] Tacoma 98406
Bruce R Hammer [illegible] South "A" Tacoma 98408
[illegible] Tacoma 98406
[illegible] 318 HARVARD, FIRCREST 98466
[illegible] Tacoma Av S Tacoma 98408
George [illegible] 110 N. Anderson Tacoma, Wa 98406
Thomas W [illegible] 1325 10th Ave. SE Olympia WA 98501

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Name Address City Zip

Jeanne [illegible] [illegible] Tacoma 98405
[illegible] [illegible] Tacoma 98408
Dean Harris 2916-96th Ave E. [illegible] WA 98387
[illegible] [illegible] Puyallup WA 98373
Sue Linville P.O. Box [illegible] Indianola 98342-0090
[illegible]

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Name Address City Zip

Marilyn [illegible] 13611 [illegible] Ct E. Puyallup 98373
[illegible] 32231-17th Ave SW [illegible] 98023
[illegible] [illegible] Seattle Wa. 98116
[illegible] [illegible] 98349
Lisa L. [illegible] 3651 S. [illegible] Tacoma, WA 98408
Allison A [illegible] 2615 N Street Tacoma 98403
[illegible] Miller 835 S [illegible] Tacoma 98465
[illegible] 1913 N MONROE TAC 98406
[illegible] Olympia [illegible]
Randy Moorehead 3126 N. Mullen Tac 98407
[illegible] E Johnson 6724 So C St 98408
GARY A KOTTMANN [illegible] 98498
PATRICIA A HANSELL 4011 N. 31st 98407
[illegible] Kottmann [illegible] 98498
Kiersta R. Kottmann 15311 Fern St. SW 98498

Sponsored by the North End Neighborhood Council of Tacoma

RESPONSE TO COMMENT COMMENTOR NO. 287: NORTH END NEIGHBORHOOD COUNCIL OF TACOMA PETITION (CONT'D.)

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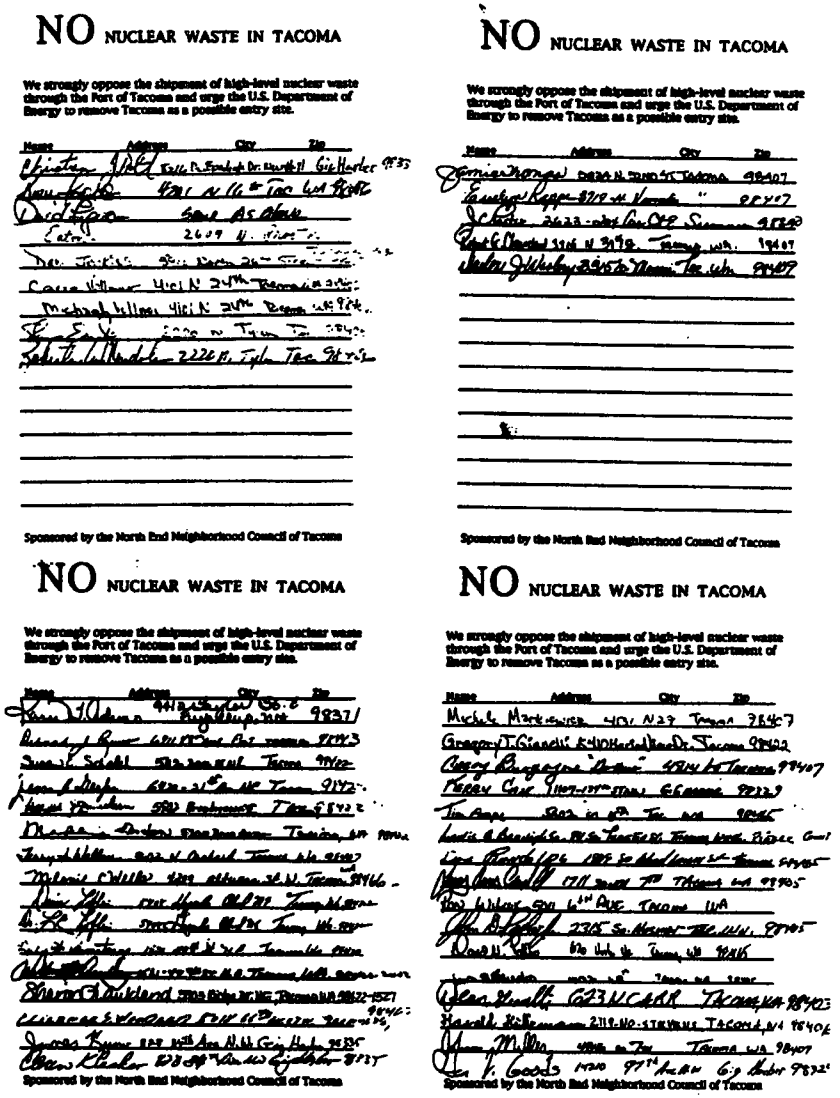

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Name	Address	City	Zip
[illegible]	[illegible]	Tacoma	[illegible]
[illegible]	2821 Garfield Rd	Tac	98403
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	4311 S. 36th St	Tacoma	
Dorothy [illegible]	4311 S 36th St	Tacoma	
[illegible]	1921 [illegible]	Tacoma	
[illegible]	[illegible]	Port Orchard, WA	98366
[illegible]	[illegible]	Tacoma	[illegible]
Ellen Erickson	[illegible]	Tacoma	[illegible]
Debbie [illegible]	9913 184 St. NW	Gig Harbor WA	98329
[illegible]	208 Tacoma [illegible]	Tacoma	98403
[illegible] Miller	2113 SW 318th Pl	Federal Way	[illegible]
[illegible]	[illegible]	Tac.	[illegible]
Joel C [illegible]	[illegible]	Sumner, WA	98390
Mary [illegible]	[illegible]	[illegible]	[illegible]
Nancy Hausman	704 [illegible]	Tacoma WA	98405

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[illegible]	[illegible]	Tacoma	[illegible]
[illegible]	[illegible]	Tacoma	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Richard L. Kerr	1422 N. Highland St.		98406
[illegible]	3316 N 27th St	Tacoma	98407
[illegible]	9157 [illegible]	Olympia WA	98516
[illegible]	9157 [illegible]	[illegible]	98516
[illegible]	[illegible]	Tacoma	[illegible]
[illegible]	806-[illegible]	Tacoma	98445
[illegible]	[illegible]	Tacoma	98405
[illegible]	1510 N. Mullen	Tacoma	98406
[illegible]	1510 North Mullen	Tacoma	98406
[illegible]	5410 S. Steele	Tacoma	98409
Barbara [illegible]	2210 No. 29th	Tacoma	98403

Sponsored by the North End Neighborhood Council of Tacoma

NO NUCLEAR WASTE IN TACOMA

We strongly oppose the shipment of high-level nuclear waste through the Port of Tacoma and urge the U.S. Department of Energy to remove Tacoma as a possible entry site.

Name	Address	City	Zip
[illegible]	[illegible]	Tacoma	[illegible]
[illegible]	[illegible] Olympic Blvd	[illegible]	[illegible]
[illegible]	[illegible]	Tac	[illegible]
[illegible]	[illegible] Ave E	Puy.	[illegible]
[illegible]	[illegible]	Seattle	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	Tacoma	[illegible]
[illegible]	[illegible]	Tac	[illegible]
[illegible]	[illegible]		98444
[illegible]	[illegible]	Tac	[illegible]
[illegible]	[illegible]	Tac	98466
[illegible]	[illegible]	Tac	[illegible]
[illegible]	[illegible]	[illegible]	98295
[illegible]	[illegible]	[illegible]	[illegible]

Sponsored by the North End Neighborhood Council of Tacoma

NO NUCLEAR WASTE IN TACOMA

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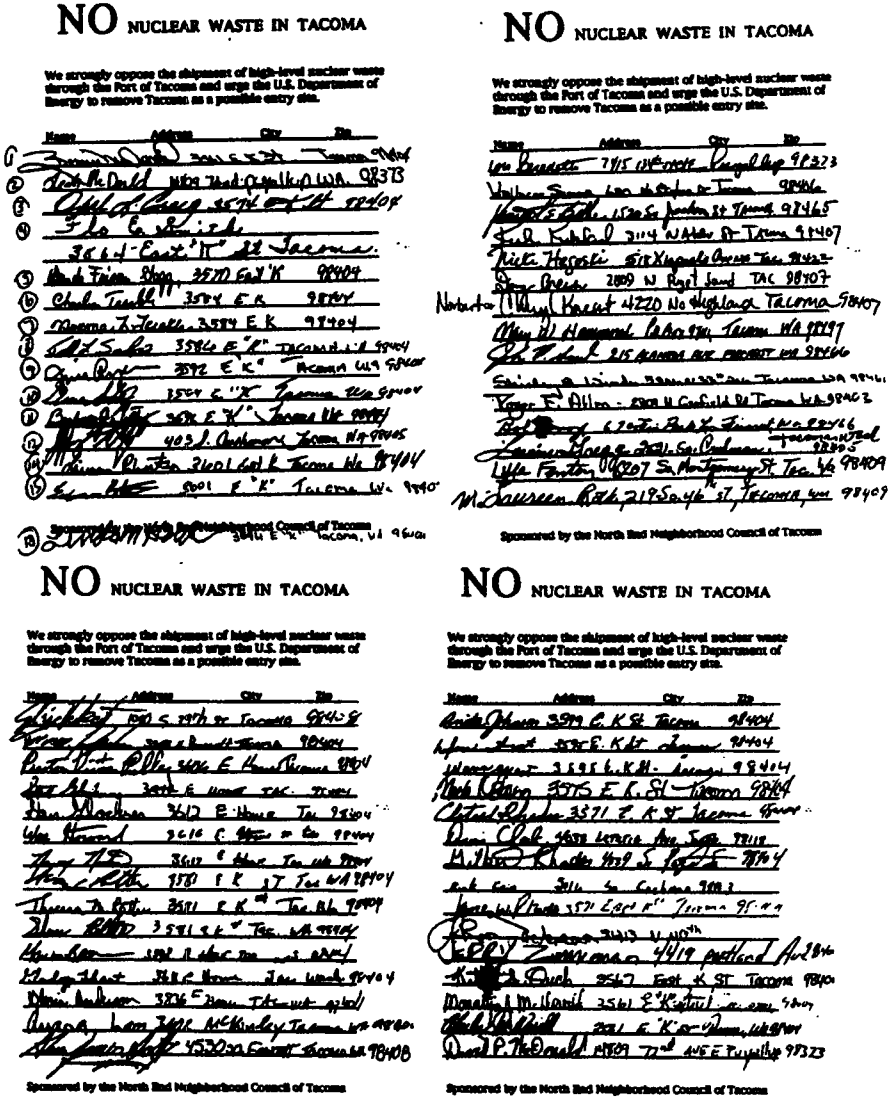
Name	Address	City	Zip
[illegible]	[illegible] Dr NE	Tac	98422
[illegible]	[illegible]	Tac	98422
[illegible]	[illegible]	Tacoma	[illegible]
[illegible]	[illegible]	Tacoma	98499
Robert [illegible]	[illegible] N. [illegible]	Tacoma WA	98407
[illegible]	[illegible]		98446
[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	Tacoma	98403
[illegible]	[illegible]	Tacoma	98406
[illegible]	[illegible]	Tacoma	98406
Carol A. [illegible]	[illegible]	Tacoma	98406
[illegible]	[illegible]	Tacoma	[illegible]
[illegible]	[illegible]	Tacoma	98465
[illegible]	1436 S. Mason	Tacoma	98405
[illegible]	[illegible]	Tacoma	98445

Sponsored by the North End Neighborhood Council of Tacoma

RESPONSE TO COMMENT COMMENTOR NO. 287: NORTH END NEIGHBORHOOD COUNCIL OF TACOMA PETITION (CONT'D.)

COMMENTOR NO. 287: NORTH END NEIGHBORHOOD COUNCIL OF TACOMA PETITION (CONT'D.)



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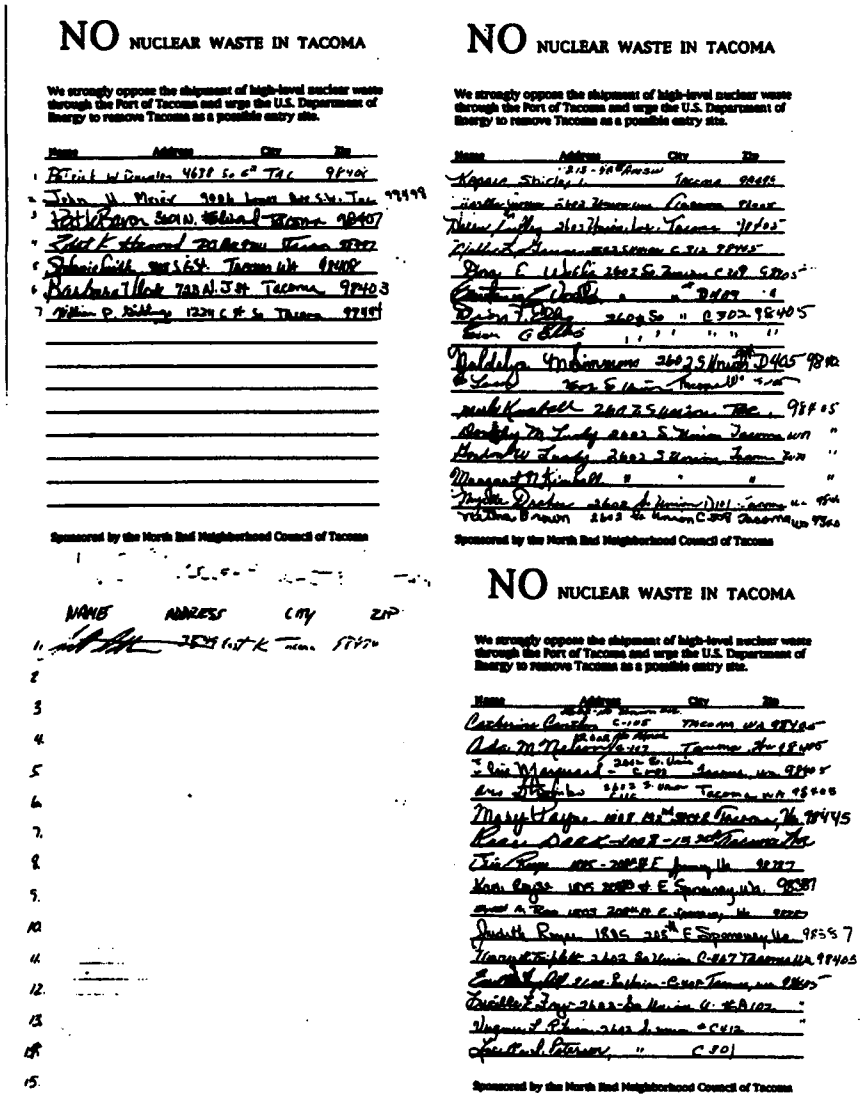
Name | Address | City | Zip

Sponsored by the North End Neighborhood Council of Tacoma

RESPONSE TO COMMENT
COMMENTOR NO. 287: NORTH END NEIGHBORHOOD COUNCIL OF TACOMA PETITION (CONT'D.)

Commentor No. 287: North End Neighborhood Council of Tacoma Petition (Cont'd.)



NO NUCLEAR WASTE IN TACOMA

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	Name	Address	City	Zip
1				
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Sponsored by the North End Neighborhood Council of Tacoma

NO NUCLEAR WASTE IN TACOMA

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	Name	Address	City	Zip

Sponsored by the North End Neighborhood Council of Tacoma

	NAME	ADDRESS	CITY	ZIP
1				
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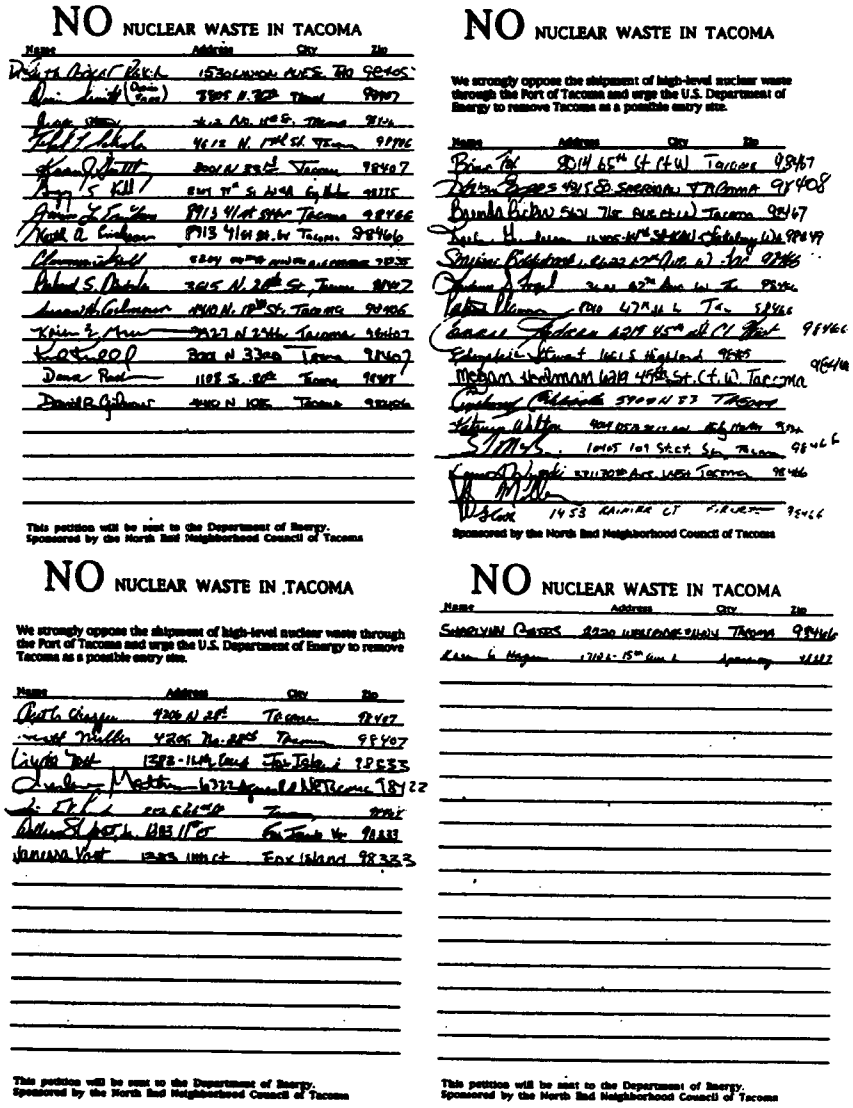
Response to Comment
Commentor No. 287: North End Neighborhood Council of Tacoma Petition (Cont'd.)

Commentor No. 287: North End Neighborhood Council of Tacoma Petition (Cont'd.)



NO NUCLEAR WASTE IN TACOMA

Name	Address	City	Zip
[illegible]	1530 Lawson Ave. S.	Tac	98405
[illegible]	3905 N. 37th	Tacoma	98407
[illegible]	4612 No. 14th St.	Tacoma	98406
[illegible]	4612 N. 14th St.	Tacoma	98406
[illegible]	3004 N 33rd St.	Tacoma	98407
[illegible]	8411 [illegible]	[illegible]	[illegible]
[illegible]	8913 41st St.	Tacoma	98466
[illegible]	8913 41st St. W	Tacoma	98466
[illegible]	[illegible]	[illegible]	[illegible]
Richard S. Patrick	3615 N. 28th St.	Tacoma	98407
[illegible]	4410 N. 19th St.	Tacoma	98406
[illegible]	3927 N 24th	Tacoma	98407
[illegible]	3002 N 33rd	Tacoma	98407
Dana Reed	1108 S. 80th	Tacoma	98498
David A. [illegible]	4410 N 19th	Tacoma	98406

This petition will be sent to the Department of Energy.
Sponsored by the North End Neighborhood Council of Tacoma

NO NUCLEAR WASTE IN TACOMA

We strongly oppose the shipment of high-level nuclear waste through the Port of Tacoma and urge the U.S. Department of Energy to remove Tacoma as a possible entry site.

Name	Address	City	Zip
[illegible]	9014 65th (4 CW)	Tacoma	98467
[illegible]	4915 S. Sheridan	Tacoma	98408
[illegible]	5404 76th Ave (CW)	Tacoma	98467
[illegible]	11405 46th St KPN	Gig Harbor, Wa	98449
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	3401 62nd Ave Ct	Tac	98424
[illegible]	8010 47th St E	Tac	98446
[illegible]	6218 45th St Ct W	Tacoma	98466
[illegible]	1605 S Highland	98465	
[illegible]	6219 45th St. Ct. W.	Tacoma	98466
[illegible]	5900 N 37	Tacoma	
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	10105 Ida Street Ct.	Tacoma	98446
[illegible]	5211 30th Ave. NW	Tacoma	98466
[illegible]	1453 Rainier Ct	Fircrest	98466

Sponsored by the North End Neighborhood Council of Tacoma

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Name	Address	City	Zip
[illegible]	9206 N 28th	Tacoma	98407
[illegible]	4206 No. 28th	Tacoma	98407
[illegible]	1388-114th Court	Fox Island	98333
[illegible]	6222 Agate Ct NW	Tacoma	98422
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1385 115th	Fox Island Wa	98333
[illegible]	1385 115th Ct	Fox Island	98333

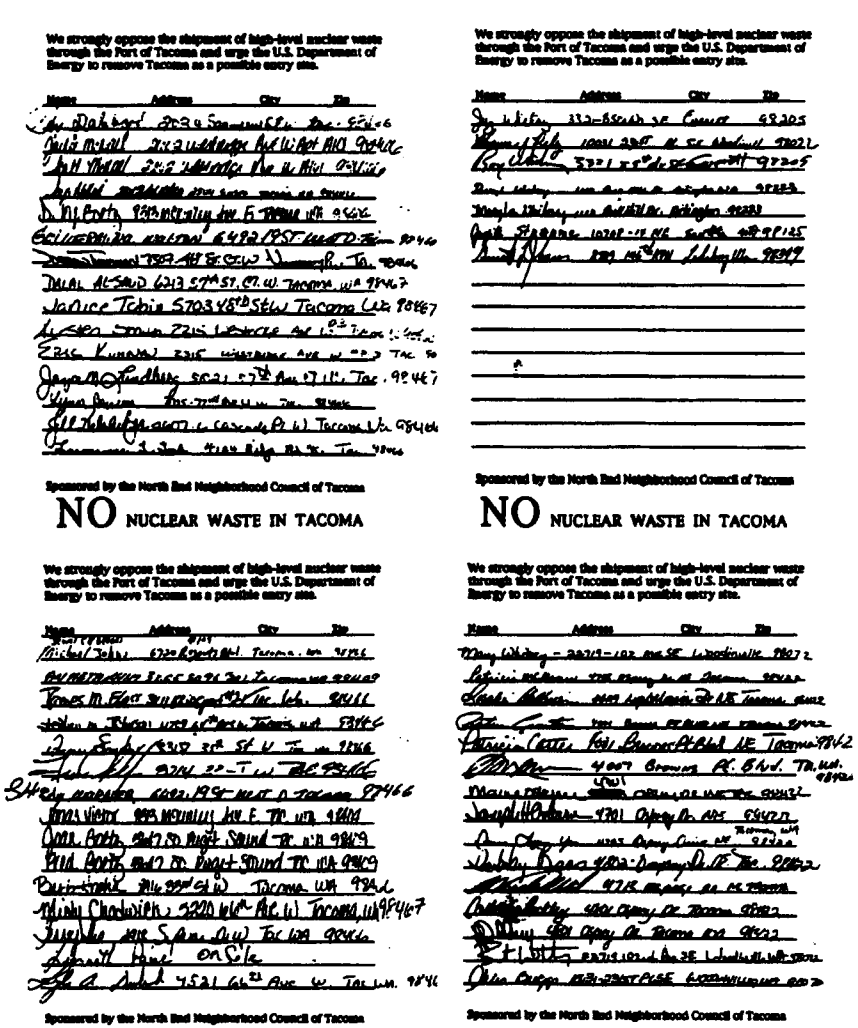
This petition will be sent to the Department of Energy.
Sponsored by the North End Neighborhood Council of Tacoma

NO NUCLEAR WASTE IN TACOMA

Name	Address	City	Zip
[illegible]	9220 [illegible]	Tacoma	98466
[illegible]	17104 15th Ave E	Spanaway	98387

This petition will be sent to the Department of Energy.
Sponsored by the North End Neighborhood Council of Tacoma

Response to Comment
Commentor No. 287: North End Neighborhood Council of Tacoma Petition (Cont'd.)



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Sponsored by the North End Neighborhood Council of Tacoma

Commentor No. 287: North End Neighborhood Council of Tacoma Petition (Cont'd.)

NO NUCLEAR WASTE IN TACOMA

We strongly oppose the shipment of high-level nuclear waste through the Port of Tacoma and urge the U.S. Department of Energy to remove Tacoma as a possible entry site.

Name	Address	City	Zip
Larry Cline	5313 So Oakes	Tacoma	98409
[illegible]	5312 So E St	Tacoma	98409
[illegible]	[illegible]	Tacoma	98409
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1208 S [illegible] St	[illegible]	[illegible]

Sponsored by the North End Neighborhood Council of Tacoma

NO NUCLEAR WASTE IN TACOMA

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Name	Address	City	Zip
[illegible]	[illegible]	Tacoma	[illegible]
Debbie Llewellyn	1519 S 7th	Tac	98405
[illegible]	1032 S Hawthorne	Tac	[illegible]
[illegible]	[illegible]	Tacoma	98465
[illegible]			98406
[illegible]	[illegible]	Tac	98406
Jessica Robinson	[illegible]	Tac	98405
[illegible]	[illegible]	Tac	98407
[illegible]	[illegible]	Puyallup	98372
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	Puyallup	[illegible]
Cindy [illegible]	7104 40th St	Gig Harbor	98335
[illegible]	1001 S [illegible]	Tacoma	98465
[illegible]	[illegible]	Tacoma	[illegible]
[illegible]		Tacoma WA	[illegible]

Sponsored by the North End Neighborhood Council of Tacoma

[illegible] 4310 So 34th Tacoma, WA 98409

[illegible] 5708 S [illegible] Tacoma WA [illegible]

Response to Comment
Commentor No. 287: North End Neighborhood Council of Tacoma Petition (Cont'd.)

COMMENTOR NO. 311: RAY K. ROBINSON, INC. (RKRI)

RKRI RAY K. ROBINSON, INC.
A Management Services Company

200 Hillview Drive-Suite 100
Richland, Washington 99352

Telephone (509) 627-6135
Facsimile (509) 627-6141

June 19, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Reference: Draft EIS on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, March 1995, U. S. DOE

My name is Ray Robinson. I am a management consultant living in Washington State with 20+ years of nuclear fuel experience. Most of my experience involved the supply of uranium, fabricated nuclear fuel, and spent fuel storage services for commercial electric power reactor markets in the United States and abroad. I have been retained by the Port of Tacoma to assist in the assessment of the three alternatives described in the referenced Draft EIS.

The Port, by their unanimous resolution, and many others are supportive of achieving the nuclear nonproliferation objectives of the proposed policy. Specifically its easy to be for eliminating routine commerce in bomb grade uranium -- anywhere in the world, regardless of who enriched the uranium to bomb grade levels. The hard part is answering the question: "What is the best means of achieving nuclear nonproliferation in the foreign research reactor program?" Many issues need to be addressed in resolving the "What is the best means" question. Issues of risk, cost, permanence of the solution, timing of the solution, establishing some responsibility and accountability in those countries pursuing peaceful uses of the atom, the impact of the U.S. as a role model for other nuclear nations, the specific problem of uranium enriched in this country and other issues all need to be addressed.

The purpose of this verbal testimony and accompanying written comments is to clearly state for the record that Alternative 2 appears, by far, to be that "best means". Granted the Departments of Energy and State have more work to do to make any of the alternatives completely viable. The same is true of Alternative 2 -- the "all foreign alternative".

However, some of the Alternative 2 issues that you identify in your Summary as problems appear to be the result of an incomplete effort or a lack of commitment to fully and completely assess the pros and cons of Alternative 2. We ask that you completely and thoroughly engage in detailed discussions with the necessary parties to resolve any impediments, perceived or real, to the implementation of Alternative 2. As examples, I would like to address several apparent impediments that you mention on page 5 of your Summary document. 311-1

1. You state *"Currently, overseas reprocessing results in separated HEU that is placed back into commerce for use as new reactor fuel."*

Nothing is mentioned about potential changes in this current policy to one that is proliferation-proof, i.e., bi-lateral or tri-party agreements (U.S., foreign reprocessor, reactor owner) that requires the High Enriched Uranium to be diluted to Low Enriched Uranium before it is shipped back to the foreign reactor as soon as the foreign country can convert to the LEU reactor mode of operation. 311-2

2. You state *"The overseas reprocessing facilities (e.g., Dounreay in Scotland) currently do not have the capability to reprocess the high-density LEU fuels that the United States is encouraging foreign research reactors to use to replace the HEU fuels."* 311-3

RESPONSE TO COMMENT
COMMENTOR NO. 311: RAY K. ROBINSON, INC. (RKRI)

Response to Comment No. 311-1

The commentor's preference for Management Alternative 2 is noted. This alternative is discussed briefly in the Summary, and more thoroughly in Sections 2.3 and 4.4 of the EIS.

Response to Comment No. 311-2

As discussed in Section 2.3 of the EIS, certain arrangements in support of U.S. nuclear weapons nonproliferation policy would have to be established with the foreign reprocessors and research reactor operators before overseas reprocessing could be implemented with U.S. assistance. These could include steps such as blending the HEU down to LEU, developing the capability to reprocess high-density LEU spent nuclear fuel, and converting the reactors to the use of LEU. There is no guarantee that such arrangements can be worked out, but DOE and the Department of State are discussing these issues with the appropriate parties.

Response to Comment No. 311-3

DOE acknowledges that Dounreay has the capability now to reprocess the bulk of the existing inventory of foreign research reactor spent nuclear fuel. The current lack of

COMMENTOR NO. 311: RAY K. ROBINSON, INC. (RKRI) (CONT'D.)

A phone call to the Dounreay facilities in Scotland indicated that a) the Dounreay facilities can handle **now** the bulk of the HEU fuels and with modifications or added facilities could handle all of the HEU fuels (including the TRIGA fuel rods), and b) with modifications or added facilities could handle the high-density LKU fuels that the U.S. is encouraging foreign research reactors to use to replace the HEU fuels! In essence, Dounreay and perhaps later, facilities in France and/or Japan, could compete for the LEU business from these and additional research reactors providing a long term, stable, proliferation-proof, lower cost solution.

311-3 (Cont'd.)

3. You state *"Thus, any foreign research reactor that wishes to use reprocessing to control its inventory of spent nuclear fuel must continue to use, or convert back to, fuel containing HEU."*

I don't believe that is necessarily true. A short term storage solution needs only to be found to allow Dounreay or any other foreign reprocessor (others in the U.K., France, or Japan) time to make the necessary modifications to their reprocessing facilities. In the interim the storage solutions include, at least, the foreign countries with the research reactors, one or more of the seven countries having major commercial nuclear power programs and existing spent fuel storage areas (Canada, France, Germany, Japan, Sweden, Switzerland, U.K.), and the potential reprocessors (France, Japan, and the U.K.).

311-4

4. You state *"For most foreign research reactor operators, construction of a new storage facility would not be practical due to the very high cost of storing small amounts of spent nuclear fuel and the long time required to design, license, and construct facilities."*

The U.S. commercial reactor operators are facing the same problems. In the U.S., we are fast approaching tough decisions in our own electric power reactor program -- either shut down needed nuclear electrical power generators, construct new storage facilities, or ship each utilities' spent nuclear fuel offsite for storage and ultimate disposal. The best short term and long term solution is for the U.S. to help our foreign friends find a foreign solution while the U.S. is helping the U.S. defense and commercial sectors find a U.S. solution to its own spent fuel problems!

311-5

No response is requested at this public meeting except for two quick questions:

Who is expected to pay the one or several billions of dollars of potential costs estimated for any of the three alternatives that is finally selected? Who is expected to pay the billions of dollars in the future, i.e., beyond this 13-year period in the Draft EIS?

311-6

Thank you for allowing me to speak and submit these written comments. I hope that Alternative 2 is given full, in depth consideration, including the necessary international discussions and negotiations that must take place for it to work effectively and quickly.

Very truly yours,

Ray Robinson

Ray K. Robinson, President

cc: Port of Tacoma

RESPONSE TO COMMENT COMMENTOR NO. 311: RAY K. ROBINSON, INC. (RKRI) (CONT'D.)

capability applies to the new high-density LEU fuel made of a uranium-silicon- aluminum alloy. As stated in Section 1.1 of the EIS, it is not clear whether the modifications necessary to reprocess this new fuel will be installed at Dounreay.

Response to Comment No. 311-4

The sentence cited by the commentor has been revised in response to the comment. Also see the response to Comment 311-2 above.

Response to Comment No. 311-5

The commentor's preference for Management Alternative 2 is noted. The disadvantages of overseas storage are discussed briefly in the Summary, and more thoroughly in Sections 2.3 and 4.4.1 of the EIS.

Furthermore, as discussed in Section 1.2 of the EIS, it is in the self interest of the U.S. to implement the proposed action as a means to reduce, and eventually eliminate, the use of highly enriched (weapon-grade) uranium in civil programs worldwide. No such considerations apply to the storage of spent nuclear fuel from domestic nuclear power plants.

Response to Comment No. 311-6

As discussed in Section 2.2.1.2 and 2.2.2.3 of the EIS, several financing options have been considered, ranging from collection of fees from the research reactor operators that would pay all of the costs of the program to full subsidization of the program by DOE. One of these options would be for developed countries (which represent about 87 percent of the spent nuclear fuel total mass and about 78 percent of the spent nuclear fuel elements) to pay a competitive fee for U.S. management of their spent nuclear fuel. This fee would be based on, among other things, a comparison with the charges these countries would incur for reprocessing at Dounreay. The United States would absorb the full costs of the program for developing countries and absorb the amount above a competitive fee for developed countries.

Fees charged during the period of receipt would be designed to cover the costs for the entire program (including ultimate disposal), less any subsidy the U.S. employs to be competitive, not just the costs during the period of receipt. Charges for management of spent nuclear fuel from developing countries would be covered by Congressional appropriations, as necessary.

COMMENTOR NO. 318: CITIZENS FOR A HEALTHY BAY

Citizens for a Healthy Bay

CITIZENS FOR A HEALTHY BAY
POSITION ON SPENT NUCLEAR FUEL SHIPMENTS THROUGH THE PORT OF TACOMA

Before determining which ports are most appropriate for the shipment of spent nuclear fuel, the costs and risks associated with other options should be more fully explored and the results made available for public review. Options which deserve closer scrutiny include the following:

- The storage of the spent nuclear fuel at the foreign reactor sites, combined with vigilant and comprehensive international monitoring to ensure no diversion of materials — 318-1
- The reprocessing of the spent nuclear fuel to a form, low enriched uranium (LEU) that does not present a international security risk — 318-2

Not enough information was provided in the draft Environmental Impact Statement (dEIS) to consider whether these options, either individually or when taken together, are feasible and could be accomplished at less cost and risk to the United States. — 318-3

At the present time, subsidizing the international use of nuclear materials creates an situation in which foreign countries do not develop their own safe nuclear waste storage technology. Full or partial US taxpayer support of the foreign utilization of nuclear materials does not force other countries to internalize the environmental, health, safety, and financial costs of operating nuclear programs. — 318-4

However, if spent nuclear fuel (nuclear waste) from foreign research reactors is to be returned to the United States, the waste materials should be shipped on military vessels through United States government-owned ports, such as the Naval Weapons Station in Concord, CA and the Military Ocean Terminal at Sunny Point, NC. These military facilities are more properly suited to handle the nuclear waste for the following reasons. — 318-5

- They are secure port situations with personnel trained in handling nuclear materials (dEIS, D6 to D-7).
- They are typically located at much greater distances from population centers (dEIS D-17 to D-33).
- They do not face Commencement Bay's ongoing stigma of Superfund status.
- They have a reduced potential to interfere with regular commercial traffic through commercial ports.

If the nuclear waste is to be shipped through any United States commercial or military port, the United States government must at a minimum provide: — 318-6

- Initial and ongoing training to port employees or military personnel and to local emergency response personnel
- Any potentially necessary response equipment to local communities
- Radiation monitoring of dockside workers and the adjacent environment
- Full funding to carry out public education, training, and response capabilities to the port or ports of entry and surrounding communities

Finally, the US Department of Energy (DOE) must make public the potential harm from a catastrophic fire which results in the full release of radioactive materials from one or more containers of the radioactive materials. — 318-7

771 Broadway
Tacoma, WA 98402
Phone: (206) 383-2429
Fax: (206) 383-2446

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Speaking for a living bay...

Printed on recycled and recycled paper

RESPONSE TO COMMENT
COMMENTOR NO. 318: CITIZENS FOR A HEALTHY BAY

Response to Comment No. 318-1

The option suggested by this comment is covered under Management Alternative 2, Subalternative 1a, as described in Section 2.3 of the EIS. The policy considerations and environmental impacts of this alternative are discussed in Section 4.4.1 of the EIS.

Response to Comment No. 318-2

The option suggested by this comment is covered under Management Alternative 2, Subalternative 1b, as described in Section 2.3 of the EIS. The policy considerations and environmental impacts of this alternative are discussed in Section 4.4.2 of the EIS.

Response to Comment No. 318-3

The EIS provides an evaluation of the environmental effects that would occur under implementation of all reasonable management alternatives (Sections 4.2, 4.3, 4.4 and 4.5 of the EIS). The analysis in the EIS demonstrates that implementation of any of the management alternatives would pose no significant benefits or risks to human health or the environment (other than benefits through support of United States nuclear weapons nonproliferation policy). Decisions regarding the proposed action would thus be based on non-environmental factors such as support for nuclear weapons nonproliferation policies and costs. Costs of the various alternatives are estimated in Section 4.9 of the EIS.

Response to Comment No. 318-4

The draft and final versions of the EIS provide an evaluation of the environmental effects that would occur under implementation of all reasonable management alternatives (Section 4 of the EIS). It was found that the risks associated with implementation of any of the management alternatives to human health or the environment are low.

Many foreign research reactor operators have no immediate means for disposition of their spent nuclear fuel (Section 1 of the EIS). Thus, the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). Past and current nuclear weapons nonproliferation policies of the United States support peaceful applications of nuclear technology for nations who agree not to develop nuclear weaponry.

Response to Comment No. 318-5

The commentor's preference for shipment on military vessels through government-owned ports of entry for foreign research reactor spent nuclear fuel is noted. Candidate ports were chosen from among commercial and military ports along the East Coast, West Coast, and

COMMENTOR NO. 318: CITIZENS FOR A HEALTHY BAY (CONT'D.)

BASIS FOR CHB POSITION

The draft Environmental Impact Statement:

- Does not adequately address the potential for a catastrophic fire or explosion and the impacts if such an event were to occur in Puget Sound or Commencement Bay — 318-7 (Cont'd.)
- Does not address security risks or security measures for civilian ports
- States the Port of Tacoma or the shipper would be required to provide additional security measures.
- Does not address the funding for, training of, and technical assistance to ports and local emergency personnel in communities receiving the spent nuclear fuel — 318-8
- Does not state the potential impacts to the marine environment, threatened or endangered salmon stocks, or the economies that rely on a safe and clean Puget Sound — 318-9

In addition:

- The past record for safe handling, operation, and storage of nuclear materials by the US DOE is less than satisfactory — 318-10
- Millions of dollars have already been spent on remediation of past spills of less hazardous materials in Commencement Bay, and Tacoma does not need the stigma associated with nuclear materials passing through its port — 318-11
- The future funding for the program and US DOE is uncertain, with the US House of Representatives budget eliminating the US DOE — 318-12
- The US DOE has not provided adequate procedural due process. It has failed to make a record of its first formal public hearing. It scheduled no public hearing or repository within 20 miles of a proposed port of entry (Port of Tacoma), and DOE has failed to respond to questions asked at public meetings. — 318-13

FACTS ABOUT THE PROPOSED SHIPMENTS OF SPENT NUCLEAR FUEL

1. The US DOE and State Department have issued a dEIS regarding the management of spent nuclear fuel. A significant option for the management is the return of this material to the US (dEIS 1-1).
2. The Port of Tacoma is considered in the dEIS as one of ten potential ports of entry for spent nuclear fuel (nuclear waste) from 41 different countries, including such countries as Japan, Canada, England, Switzerland, and France (dEIS 1-8, 2-10).
3. Since the 1950's, the US has given nuclear materials to foreign nations for use in research reactors (dEIS, 1-1).
4. Much of these materials are highly enriched uranium, or HEU, which can be converted into nuclear weapons (dEIS, 1-6).
5. The US has used a policy of accepting the spent nuclear fuel back for disposal in the US (dEIS, 1-2, 1-3).
6. Today, the US is attempting to make foreign countries convert to LEU, a less efficient and more expensive fuel, but one that cannot be converted into nuclear weapons (dEIS, 1-2).
7. In order to do this, and to meet the US's nonproliferation goals, the US DOE is working to create an acceptable new policy to facilitate the management of spent nuclear fuel (dEIS, 1-6).
8. The current proposal is based on the assumption that shipment and temporary storage in the US presents the least risk and cost, both to the environment and to the US's national security (Public Hearing, 5/22/95)
9. The proposal is for shipping about 22,800 nuclear fuel elements in 840 shipments from foreign research reactors. Of these shipments, approximately 185 would enter a western port over the next ten years, about one every three weeks (Draft EIS, 2-7 to 2-9, Public Hearing, 5/22/95).
10. At this time, the Cities of Tacoma, Fife, Milton, Federal Way; Pierce County, the Puyallup Tribe, the Port of Tacoma and Port of Seattle, the local longshore union, and other groups and organizations have all expressed opposition to the shipment of nuclear waste through the Port of Tacoma for a variety of reasons (The News Tribune, Port of Tacoma).
11. In 1994, CHB took the position that there was significant environmental and worker safety concerns associated with the shipment of spent nuclear fuel through Puget Sound. CHB urged passage of legislation, sponsored by Rep. Mike Kreidler, which would give local authorities the right to place restrictions on the transport of nuclear materials. CHB stated, "Past shipments of lead and copper ores have lead to the cleanup of the Sitcum Waterway....We do not want to repeat such cleanups..." in Commencement Bay (Statement by Dr. Sheri Tonn, President of CHB Board, January 21, 1994).

Back at last shipment CHB position 6/15/95

RESPONSE TO COMMENT COMMENTOR NO. 318: CITIZENS FOR A HEALTHY BAY (CONT'D.)

the Gulf of Mexico. The selection process is described in Appendix D, Section D.1 of the EIS. No significant human health, safety, or environmental risks were found to exist at any of the candidate commercial or military ports selected (Section 4.2.2 of the EIS). Spent nuclear fuel from foreign research reactors would be shipped in standard containers, and does not require special handling techniques (Section 2.6.3.2.2 of the EIS) or additional security beyond that required by NRC regulation (which can readily be provided in any of the commercial or military ports). No special precautions are required by the U.S. Coast Guard (Section 2.6.3.2.2 of the EIS).

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security measures employed at any port would meet or exceed all the security requirements in the Code of Federal Regulations (10 CFR Part 73). DOE supports these regulations as being adequate to protect the foreign research reactor spent nuclear fuel in any commercial port.

Appendix H has been added to the final EIS in response to public comments to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' status with respect to their clients. Historically, there were no adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

DOE has added a sentence to Appendix D, Section D.2.1.9 of the EIS regarding Commencement Bay being a Superfund Site. The analysis of impacts for Management Alternative 1 in Section 4 of the EIS demonstrates that there would be no significant adverse impacts on the port, people, or natural environment from shipments of foreign research reactor spent nuclear fuel and the overall impacts to Commencement Bay would be unchanged by the various management alternatives.

Response to Comment No. 318-6

Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the transportation casks would be low. No special handling or loading/unloading procedures would be required for the foreign research reactor spent nuclear fuel when it is contained in standard shipping containers; experience with handling containers is sufficient. Therefore, no special training of longshoremen is required.

Commentor No. 318:
Citizens for a Healthy Bay (Cont'd.)

Response to Comment
Commentor No. 318:
Citizens for a Healthy Bay (Cont'd.)

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Emergency preparedness, security, and coordination of DOE with local emergency response authorities that would be involved with the acceptance and transportation of foreign research reactor spent nuclear fuel will be discussed in detail in the Transportation Plan, to be prepared prior to the implementation of the policy, as discussed in revised Section 2.7.5 of the EIS. The general provisions of the Transportation Plan are included in Appendix H of the EIS. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected.

Port inspection activities, including radiation monitoring, are provided for in Appendix D, Section D.4.4 of the EIS. Since no radioactive material is released, monitoring would measure the radiation that comes from the spent nuclear fuel through the transportation cask.

Response to Comment No. 318-7

The transportation casks that would be used for the foreign research reactor spent nuclear fuel are certified if their design meets certain tests, including a fire test, and if the individual casks pass periodic inspections (Section 2.6.2 of the EIS). The probability of an accident at sea is discussed in Appendix C, Section C.5.5 of the EIS, while the port accident probabilities are found in Appendix D, Section D.5.3.1.3. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3). With respect to accidents involving a fire as mentioned by the commentor, the EIS contains the results of an analysis of the effects of an accident that involve a severe fire (severity category 6), during which an airborne release of radioactive material results. Appendix D, Section D.5.4 of the EIS presents the results of the analysis.

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive contents have ever been released from a spent nuclear fuel transportation cask as a result of an accident.

COMMENTOR NO. 318:
CITIZENS FOR A HEALTHY BAY (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 318:
CITIZENS FOR A HEALTHY BAY (CONT'D.)

Response to Comment No. 318-8

Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the transportation casks would be low. No special handling or loading/unloading procedures would be required for the foreign research reactor spent nuclear fuel when it is contained in approved shipping containers; experience with handling containers is sufficient. Therefore, no special training of longshoremen is required. As discussed in Section 2.7 of the EIS, the primary responsibility for emergency response to an incident would reside with State, Tribal, and local authorities. DOE would provide coordination and technical assistance and training to the State, Tribal, and local emergency response personnel. In addition, DOE has Radiological Assistance Program teams that operate from eight strategically located DOE offices around the country. Upon State, Tribal, or local request, these teams can provide technical expertise and assistance to monitor and assess radiological hazards. The teams are activated on an as-needed basis and generally can be ready to deploy from their home station within four hours of notification.

DOE will continue to work with State and local officials to ensure that emergency response capabilities are adequate and that the communications channels between DOE and State and local governments remain open.

Any additional security personnel necessary to secure the port area or any temporary storage area would be paid for by the shipper. No additional responsibilities would be created for city, county, or State law enforcement agencies by DOE or other federal agencies. However, some State and local governments impose additional requirements on shipments of research reactor spent nuclear fuel. These additional requirements may impact State and local law enforcement agencies.

Response to Comment No. 318-9

The potential impacts to human health or the environment as it pertains to the proposed policy of managing foreign research reactor spent nuclear fuel, would not be adverse to any of the ports that might be used to receive the material (Section 4.2 of the EIS). In the unlikely event of a severe accident, the analysis performed for the EIS indicates that some radioactive material could be released from the cask and distributed into the environment. However, the analysis in Section 4.2.2.3 and Appendix D, Section D.5 of the EIS determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident. Close in to the accident, near the cask, would likely require some cleanup, but the overall impact on the water and air quality in the port would be very small. Sections 4.2.2.3 and Appendix D, Section D.5 of the EIS detail the accident analysis and results.

COMMENTOR NO. 318: CITIZENS FOR A HEALTHY BAY (CONT'D.)

RESPONSE TO COMMENT COMMENTOR NO. 318: CITIZENS FOR A HEALTHY BAY (CONT'D.)

Response to Comment No. 318-10

Spent nuclear fuel from foreign research reactors has been safely managed in the U.S. for nearly 30 years (Section 1.1 of the EIS). The EIS describes the precautions and technologies that would be used to ensure safety during handling operations and interim management of this spent nuclear fuel (Section 2 of the EIS).

Response to Comment No. 318-11

Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma as noted by the commentor. Nor should it contribute to any dirty port stigma because as the analysis in the EIS indicates, there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2 of the EIS). See also response to Comment 318-7, above.

Response to Comment No. 318-12

Future funding for this program cannot be determined prior to the completion of the environmental review in this EIS and the issuance a Record of Decision. Resources would be allocated to maintain U.S. national security and the nuclear weapons nonproliferation objectives of the U.S., especially since the Treaty on the Non-Proliferation of Nuclear Weapons was renewed indefinitely this year.

Resolutions concerned with reduction or elimination of DOE fall outside the scope of this EIS (Section 1.3 of the EIS). The EIS is concerned with adoption of a policy to manage spent nuclear fuel from foreign research reactors (Section 2.1 of the EIS). If one of the management alternatives is adopted and the participation of DOE in implementation of the policy is eliminated by Congressional action, the implementation would be carried out by some other appropriate department or agency.

Response to Comment No. 318-13

DOE considers that the provisions made for receipt and consideration of written comments, in addition to the records made of the major points raised during the public hearings, provide a more than satisfactory mechanism for recording the public comment. The steps taken to receive public comment on this EIS fully comply with all procedural process requirements. In particular, there is no requirement under NEPA for a verbatim transcript of a public hearing.

While DOE was in some cases not able to answer every question posed by the public during the public hearings, DOE policy is to follow up and answer such questions. In particular, DOE provided written answers to the questions raised during the public meeting

Commentor No. 318:
Citizens for a Healthy Bay (Cont'd.)

Response to Comment
Commentor No. 318:
Citizens for a Healthy Bay (Cont'd.)

called by the Port of Tacoma, either by FAX directly to the Commissioners, or in these comment responses. DOE is unaware of any questions that arose during the public hearings that have been left unanswered.

In response to public dissatisfaction, DOE held a second public hearing in the City of Tacoma on June 19, 1995, in addition to the public hearing held near the SeaTac airport on May 27, 1995.

COMMENTOR NO. 443: WESTERN GOVERNORS ASSOCIATION

WESTERN GOVERNORS' ASSOCIATION

Michael O. Leavitt
Governor of Utah
Chairman

E. Benjamin Nelson
Governor of Nebraska
Vice Chairman

James M. Souby
Executive Director

Denver:
600 17th Street
Suite 1705 South Tower
Denver, Colorado 80202-5452
(303) 623-9378
Fax (303) 534-7309

Washington, D.C.:
400 N. Capitol Street, N.W.
Suite 370
Washington, D.C. 20001
(202) 624-5402
Fax (202) 624-7707

June 20, 1995

To: Charles Head, Program Manager
U.S. DOE - EM-37

From: Ron Ross
Jon Lawritson

RE: General Comments on the Foreign Spent Nuclear Fuel EIS

Attached are informal comments concerning the Draft EIS on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. Due to the short notice of the comment period deadline, the following comments are general concerns/questions from WGA that may or may not have been addressed in the EIS that are significant and important from our standpoint.

Transportation:

- Regarding inspections of the cask and vehicle: Who will conduct the inspections, e.g. states? Where will the inspections take place, e.g. destination point, port of entry? What standards will be used, e.g. CVSA enhanced? How will states receive this training if they do not already have it? — 443-1
- The states involved from the possible ports to the possible DOE sites have no emergency response training for either truck or rail shipments that are involved in an accident. Also, there are states between sites which have no training. There also needs to be training of the long shoreman at the docks. Training needs to be addressed further due to the new routes and transport being used for these shipments. Will this training be given to the states that do not have it? When will this training be given? — 443-2
- Have the possible western ports mentioned in the EIS handled this kind of material? Have all ports been considered? — 443-3
- What is the state and local gov't involvement process? Will they have a chance to comment on the project? What type of notice will they receive? — 443-4

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RESPONSE TO COMMENT
COMMENTOR NO. 443: WESTERN GOVERNORS ASSOCIATION

Response to Comment No. 443-1

Spent nuclear fuel is required to be transported in "Type B" transportation casks that are certified for transporting radioactive materials. These transportation casks are subject to stringent design, fabrication, and operating requirements imposed by the competent authority for the country of origin (NRC in the United States) to withstand very severe accidents without releasing their contents. Regardless of where a transportation cask is designed, fabricated, or certified for use, if used internationally, it must meet certain minimum performance requirements and regulations established by the International Atomic Energy Agency.

For the subject of vehicle inspections, see the response to Comment 56-3. DOE would not attempt to prevent the State from conducting additional inspections.

Response to Comment No. 443-2

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE-sponsored meetings, informal discussions, and informational materials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Response to Comment No. 443-3

The experience criterion used in the port selection process evaluates the port's experience in handling containerized cargo, not necessarily for dealing with nuclear or radioactive material (Appendix D, Section D.9.1 of the EIS); experience with handling containers is sufficient. Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the transportation casks would be low, so no special handling is required. The ten ports selected all meet the criteria and hence are considered to be able to safely handle the foreign research reactor spent nuclear fuel.

COMMENTOR NO. 443: WESTERN GOVERNORS ASSOCIATION (CONT'D.)

RESPONSE TO COMMENT COMMENTOR NO. 443: WESTERN GOVERNORS ASSOCIATION (CONT'D.)

DOE initially considered 161 ports (153 commercial and eight military ports) as ports of entry for foreign research reactor spent nuclear fuel. These ports were evaluated against the selection criteria (Appendix D, Section D.1.9 of the EIS), resulting in 10 ports that met all of the criteria as being acceptable for the receipt and handling of foreign research reactor spent nuclear fuel. The results of the application of these criteria to the initial 161 ports are set forth in Appendix D, Section D.1.9 of the EIS. The eight military ports were evaluated as candidates given their experience with dry containerized cargoes, as recommended by the Military Traffic Management Command. The 153 commercial ports evaluated represent all reasonable ports in the 48 contiguous states, with the exception of inland ports and those around the Great Lakes due to the long inland transit required.

Response to Comment No. 443-4

State and local governments have the same rights to comment on the project (i.e., proposed action and alternatives) under NEPA as do other interest groups, individuals, foreign governments, etc. Ground transport of foreign research reactor spent nuclear fuel, including any involvement by State and local governments, is discussed in detail in Sections 2.2.1.7, 2.6.4, 3.3 and 4.2.3 of the EIS. Marine transport, including any involvement by local and State governments, is discussed in Sections 2.2.1.5 , 2.6.3, 4.3.6.3 and 4.2.1. As to notice of shipments of spent nuclear fuel, U.S. Department of Transportation regulations (49 CFR Part 397) govern highway routing of spent nuclear fuel and the regulations of NRC (10 CFR Parts 71 and 73) govern physical security and notification. NRC publishes a public information circular that lists routes that have been evaluated and approved for specific spent nuclear fuel shipments (Section 2.6.4 of the EIS).

COMMENTOR NO. 446:
POLLET, GERALD (HEART OF AMERICA, NW)

Charles -

Still waiting to hear from you about who ordered security for the Sea-Tac hearing and why.

Gerald Pollet

446-1

RESPONSE TO COMMENT
COMMENTOR NO. 446:
POLLET, GERALD (HEART OF AMERICA, NW)

Response to Comment No. 446-1

DOE must ensure that meetings are conducted in an orderly and safe manner and, therefore, sometimes security may be necessary due to numerous factors, such as the expected number of participants at a meeting or the controversial nature of a given proposed federal action.

COMMENTOR NO. 458: A.A.R.P.

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Minnie Gaster Phone: 510-827-0553
Title and Organization: A.A.R.P.
Address: 1321 Acacia St.
City: Pittsburg Ca. State Ca Zip 94565

*** COMMENTS ***

An earthquake could cause an accident of Nuclear Waste to contaminate Contra Costa County, I am against your Proposed Nuclear Weapons Nonproliferation Policy that affects my area. I am representing the opinion of the A.A.R.P. against Nuclear Waste Rod's through Port Chicago - Concord Naval Weapon's Station, Ca. We want to live free of this pollution. 458-1

Minnie Gaster
6-15-95

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 458: A.A.R.P.

Response to Comment No. 458-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, Sections 4.2.2 and 4.5 of the EIS demonstrate that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low. Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident and thus effect the probability of such accidents, however, the number of earthquake-induced ship and road accidents is small compared to other causes.

Nuremberg Actions
PO Box 13, Boulder Creek CA 95006
Phone and Fax (408) 338-0147

June 18, 1995

Mr. Charles Head
Office of Spent Fuel Management, EM-37
US Department of Energy
1000 Independence Avenue, SW
Washington DC 20585-0001

Dear Mr. Head:

I am writing to you at this time to express my concerns about what I believe is a hasty and poorly thought out plan to bring spent nuclear fuel rods into the United States through the Concord Naval Weapons Station. As the coordinator for the organization Nuremberg Actions and the editor and publisher of its newsletter, Between the Lines, I believe that I have an unusually thorough knowledge of the Concord Naval Weapons Station. Because of this, I wish to bring your attention to certain things that I think the Department of Energy may have overlooked in the inadequate time frame it has had to examine the base as a potential port. I also ask that my concerns as stated be considered in any further review process you have, and that the Department of Energy respond to me in writing on any relevant findings that you make.

SAFETY ISSUES ON THE PIERS OF CNWS

In your presentation, you stated that one reason for selecting the CNWS is that it has proper equipment, training and experience to handle the transfer of nuclear materials from ships to trucks and trains. Evidence does not support such a statement, Mr. Head.

On September 26, television station KTVU broke a three-part story on over 100 munitions-related incidents, accidents and injuries from 1987 through 1992 at the Concord Naval Weapons Station. Involving everything from dropping guided missiles from cargo cranes to possible radioactive contamination, the information was gleaned from the Navy's own records in research that dates back years.

That accidents take place used to be no secret during Nuremberg Actions' early days of 1987-89. A large movie theater-style marquee was visible at the waterfront gate of the base, listing the number of days since the last accident. As I recall, a period of several months or more was rare. This sign disappeared about the same time all the post guards started sporting Hawaiian shirts, as part of former commander Captain Owens' campaign to give the base a less threatening public image.

Although many weapons involved were blacked out in the documents, guided missiles, anti-tank mines and warheads were specifically named. The over 100 incidents listed involved:

- Derailment and collision of a dozen military trains loaded with weapons, both inside and outside the base;
- Cargoes of bombs dropped from cranes onto ships, piers, and into the Sacramento River;
- Crates or pallets of weapons punctured with forklifts, (the most common kind of accident);

466-1

Response to Comment No. 466-1

As a result of the television report the commentor cites, the Contra Costa County Board of Supervisors initiated an investigation of the allegations. Their report on the subject, Safety at the Concord NWS dated November 2, 1993, concluded in part, "There were no incidents involving explosions or radiation exposure....Many of the reported incidents were not accidents caused by Weapons Station employees but, rather, were discoveries by employees that materials being received had been damaged during loading or transit. In some cases the shipments had not been properly blocked, braced or banded."

In fact, the safety record at Concord NWS is significantly better than that of ports in the private sector for similar activities. According to the Department of Labor statistics, for the category of marine cargo handling, the number of lost workday cases per 100 full-time workers for 1993 was 7.1 nationwide (current data not available), which is typical. The number of lost workday cases per 100 workers at Concord NWS for the first three quarters of fiscal year 1995 was 5.3, which is also typical for Concord.

Overall, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low. DOE understands that Concord's primary mission is to support the military through handling munitions and that no handling of the foreign research reactor spent nuclear fuel could occur concurrently with handling explosives. These facts have been incorporated into Appendix D, Section D.2.1.6 of the EIS.

COMMENTOR NO. 466: NUREMBERG ACTIONS (CONT'D.)

- At least 12 civilian employees treated for possible radiation exposure after weapons accidents, one for as long as four days, and worker injuries in many of the other cases;
- Around six incidents of live ordnance found in crates marked 'empty' that were ready to be either destroyed or dumped.

These are the same trains operators, piers, cranes, and crane operators that you seemed so confident of, Mr. Head. We who know many of them, and live within the circle of death, are not confident, not at all. Many of us were eyewitnesses to Navy train operators running a loaded munitions over three men deliberately and under orders less than eight years ago, at a public crossing only seconds after eleven vehicles had passed, at three times the legal speed limit. An accident involving nuclear materials would affect the lives of thousands, if not millions, of people. It would change the genetic structure of all the unborn to come.

466-1 (Cont'd.)

WHAT COULD HAPPEN?

A conventional weapons accident of major proportions at this time would affect anyone in a twenty-three mile radius, according to one engineer and former Port Chicago resident (town condemned in 1968 to make way for current nuclear weapons bunkers). Within the lethal zone, the first three miles, are numerous bridges, freeways, public schools, residential neighborhoods, chemical factories, oil refineries, and 270 nuclear warheads. The extensive use of glass in Concord's newer buildings and schools would cause enormous injury and blindness. General Chemical, adjacent to the nuclear weapons bunkers, is the same firm whose toxic leaks caused the evacuation or illness of thousands of Richmond residents just months ago. The primary water supply of over 1 million East Bay residents runs through the base in an open canal, just behind the nuclear bunkers. I'm sure others have informed you of the active earthquake fault only one and a half miles from the piers, a fault that shifted up to 18 inches in the 1970's.

U.S. Congressman George Miller, whose district includes CNWS, has called for an outside safety investigation, questioning the need for CNWS in the post Cold-War world. Concerning the KTVU report, Miller said, "If its true, it's unacceptable. There are far too many incidents to say the margin of safety the public expects is being carried out. You're really rolling the dice with public safety."

Nuremberg Actions has been saying that for a long time.

466-2

DIRECT TESTIMONY FROM CNWS EMPLOYEES

One member of Nuremberg Actions, Maylie Scott, interviewed Michael Jones, a former CNWS employee who was deeply concerned about safety at the base. Michael had been working since 1990 at the Concord Naval Weapons Station, loading weapons onto ships, trucks, trains and airplanes. He was employed first as a blocker-bracer, then as a crane operator.

When Michael was hired in October, 1990, activity at the base was peaking in anticipation of the bombing of Iraq in January, 1991. The base was chronically short staffed. Michael was hired as a blocker-bracer. His job was to build structures in transporting vehicles to make sure the weapons would not shift, and would travel safely. Besides his carpentry skills, he had 17 years experience in the use of heavy machinery-- fork-lifting, crane operator and winchman. This experience made him unique and he was rapidly promoted.

The work was dangerous because (as in 1944, when an explosion at the docks killed 344 people and blasted the town of Port Chicago), the priority was on speed rather than safety:

- Training of workers was inadequate; people were given licenses in the use of machinery too quickly by trainers who themselves were not fully qualified.
- Workers loading containers did not have full knowledge of crane hand-signals.
- There was no testing for substance abuse on the job and workers, including fork-lifters loading 1000 pound bombs, were sometimes noticeably intoxicated.

466-3

RESPONSE TO COMMENT
COMMENTOR NO. 466: NUREMBERG ACTIONS (CONT'D.)

Response to Comment No. 466-2

The worst accident analyzed in the EIS involves the foreign research reactor spent nuclear fuel transportation cask being damaged, then engulfed in a long-duration fire. A scenario that includes high explosives was not considered. Rather, administrative controls would be in place to preclude the handling of high explosives while the foreign research reactor spent nuclear fuel was on Concord NWS or in a ship near Concord NWS. Also, the ship carrying the foreign research reactor spent nuclear fuel would not be allowed to dock if there was any other ship currently docked at Concord NWS. While there would be high explosives in Concord NWS's bunkers while the foreign research reactor spent nuclear fuel was being handled, as long as the high explosives were not handled, there would be little danger of explosion. Earthquakes were not analyzed in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident and thus effect the probability of such accidents, however, the number of earthquake-induced ship and road accidents is small compared to other causes. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.3.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel casks are also low (Section 4.2.3.2).

Response to Comment No. 466-3

In regard to the quality of the workforce at Concord NWS, see the response to Comment 466-1, above.

In regard to the allegation that ordnance has been dropped into the water and not recovered, an official at Concord NWS has assured DOE that no ordnance has ever been dropped into the water. The official explained that if ordnance were to be dropped into the water, their policy is to recover it without exception. As a confirmation that no ordnance has fallen into the water and not been reported, periodic dredging of the dock area has never detected or recovered ordnance.

Concord NWS has a no-tolerance policy on alcohol and drug abuse. Individuals suspected of being under the influence of drugs or alcohol are removed from their worksite and escorted to the onsite dispensary for a competence-for-duty examination. If found to be under the influence, they are sent home and action is initiated to rehabilitate and/or discipline the individuals, depending on specific circumstances in each case. A drug testing program for Concord NWS has been approved by the Navy and is expected to begin before the end of the calendar year 1995.

- Containers were not properly labeled and were dangerous to the people opening them. Sometimes Michael did not realize he was lifting a live bomb until he "could feel" the weight difference in his fork-lift. Sometimes weapons were inappropriately packed-- bombs and fuses together in the same car.
- Ships arrived at the port so poorly loaded with weapons that they listed. Not only bumping, but friction can cause bombs to detonate.
- It was not rare for bombs to be dropped into the water during the loading process. An effort would be made to retrieve them, but, given the priority on speed, a number were left. their presence is dangerous because they may contain white phosphorous which burns under water. Or they can detonate at any time, possible setting off a chain reaction in ships above them.

466-3 (Cont'd.)

Any such accident as a bomb falling into the water is supposed to be investigated by a separate administrative body. Disciplinary actions are supposed to result. However, there were times that such investigations did not occur, or were glossed over. They were "to no one's advantage". They were a detriment to prestigious people like dock-foremen, and they slowed down operation. An attitude of informal cover-up was the order of the day.

OTHER CONCERNS OF THE COMMUNITY ABOUT THIS PLAN

We have been told by the Department of Energy, Mr. Head, and the Department of Defense, that there can be no open discussion of safety plans, evacuation plans, medical effects of various scenarios, etc. of nuclear materials in our community, because of "National Security". We have not even been able to get a straight answer about whether there *are* nuclear materials in our community. Since *you* have brought up the subject this time, Mr. Head, we fully anticipate a thorough, well-planned and well-publicized set of plans for ensuring public safety for all the possible scenarios that shipping nuclear materials through overcrowded waterways lined with decomposing bridges and listing oil tankers in one of the most populated and congested areas of the country might encounter.

466-4

Nuremberg Actions members would like written responses indicating the DOE's position on the following questions:

- May we have additional time to consider the six inch documents outlining the DOE plan which most participants had only received one or two weeks before the hearing, and to conduct independent research and community discussions? 466-5
- Will we have advance notice of all local routes out of CNWS intended for transportation of nuclear materials? 466-6
- Whether closing the Port Chicago Highway through the CNWS in February 1995, new crane installation and dredging currently going on signifies a predisposition to using the CNWS port regardless of public opinion? 466-7
- Why only the city planner of Concord was informed of the plan and not other poorer and minority neighborhoods closer to the CNWS? 466-8
- Whether the use of a military port is to preclude citizen's groups from doing independent radiation monitoring and testing? 466-9
- How citizens are to be expected to trust a governmental body that had been bombing its Native Nations and experimenting on its own veterans for forty five years?
- Whether separation of classes of fuel rods for different destinations as stated by you, Mr. Head, indicates plans by the DOE to restart former programs to reprocess spent fuel into weapons-grade material? 466-10
- Why DOE statistics on health hazards differed so greatly from information independently available? 466-11
- Why no concern about earthquake hazards in the Bay Area were included in the DOE assessment?

Response to Comment No. 466-4

DOE considers that there is adequate regulatory and emergency preparedness infrastructure to ensure the safe acceptance and transport to designated management sites if the foreign research reactor spent nuclear fuel is managed in the United States. Federal funding to State, Tribal, and local governments for maintaining emergency response programs is discussed in Section 2.7.1. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advise and assistance to the State, Tribal and local agencies involved with a radiological incident. Emergency preparedness, security, and coordination of DOE with local emergency response authorities, and security are discussed in general in Sections 2.7 and 2.8 of the EIS. Details would be contained in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

Response to Comment No. 466-5

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 days total) to be sufficient for public comment.

Response to Comment No. 466-6

DOE has not yet selected ports, routes, or transport modes for the foreign research reactor spent nuclear fuel. If Concord NWS is selected, then DOE would choose the best route to I-680 in accordance with Department of Transportation regulations (49 CFR 397.101 (a)(2)). That route could use Route 4, Route 24, and/or Waterfront Road. These are the local Concord streets that the trucks would probably use. The State of California routing agency can designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103.

Response to Comment No. 466-7

DOE understands that the expansion of capabilities at Concord NWS will continue as scheduled regardless of the outcome of the proposed action on foreign research reactor

COMMENTOR NO. 466: NUREMBERG ACTIONS (CONT'D.)

- Why the Bay Area is being assessed, when it is one of the most highly populated areas in the U.S., has numerous bridges and seven oil refineries in the Carquinas Straits alone, with 240 shiploads of petroleum products a year in the Bay? 466-12
- Why there is a contradiction in the DOE wanting to remove the waste material from such countries as Sweden and Belgium to keep it safe from revolutionaries and terrorists, but scoffs at any concerns over safety from seizure to U.S. communities along the routes? 466-13
- Who would monitor the quality of handling of said materials (one local resident stated that CNWS had "the worst trained and worst paid drivers handling equipment at the piers" anywhere)? 466-14
- Why the DOE is apparently ignoring federal law on siting such operations in a way that jeopardizes the safety of minority and low-income neighborhoods (not even included in DOE maps or comments) more than others? 466-15
- Whether any federal assistance would be given to improve very degraded roads and railway beds under question? 466-16

Whether an evacuation plan will be funded, drafted, discussed within the affected communities, and tested prior to any waste shipments in the area? 466-17

- Whether any special training or funding would be given by the DOE to local emergency response teams to handle such accidents?

Thank you for your attention to these matters, Mr. Head. I'm sure that we can have every confidence that you will keep the safety of our children and the lands that provide us with food, water and shelter as much a concern and priority as you would your own.

For mutual joy in caring for the Creation we have been blessed with,

Jennifer Viereck

Jennifer Viereck
Coordinator of Nuremberg Actions

Enclosures:
"How Safe Is the Concord naval Weapons Station?" by Roland de Wolk, Express, Feb. 4, 1994

"Report Cites
Accidents at Concord Arms Depot", Contra Costa Times, September 27, 1993

"Miller to Probe Weapons Station Reports", by Donna Hemmila, Contra Costa Times, September 28, 1993.

RESPONSE TO COMMENT
COMMENTOR NO. 466: NUREMBERG ACTIONS (CONT'D.)

spent nuclear fuel. Likewise, the closures of Port Chicago Highway and Waterfront Road were independent of the proposed action. Selection of Concord NWS as one of the ports that might receive foreign research reactor spent nuclear fuel would be based on the selection criteria set out in Appendix D, Section D.1.9 of the EIS.

Response to Comment No. 466-8

A Notice of Availability for the draft EIS was published in the Federal Register dated April 21, 1995. Copies of the draft EIS were placed in libraries and reading rooms near each candidate port and potential interim management site. More than 2,000 copies of the draft EIS or Summary of the draft EIS were mailed to potentially interested citizens and organizations. Seventeen public hearings, announced in the local news media, were conducted at locations near each candidate port and potential management site.

Environmental justice in potentially affected areas, including those neighborhoods near the Concord NWS, is discussed in Section 4 and Appendix A of the EIS.

Response to Comment No. 466-9

Ten ports that are considered to be able to safely receive foreign research reactor spent nuclear fuel were selected using the port selection criteria discussed in Appendix D, Section D.1.9 of the EIS. Examination of the port selection criteria shows that there is no stated preference for military ports, contrary to the comment. Either military or commercial ports, if they are selected by the selection criteria, are equally acceptable. Risk associated with accidents in both military and commercial ports are discussed in Appendix D, Section D.5.5. In either case, the citizen's groups conduct of independent radiological monitoring and testing will not be a factor considered in determining any port selected.

Response to Comment No. 466-10

Whether or not separate classes of spent nuclear fuel rods would be designated for shipment to different management sites is a programmatic decision based on management site experience (Section 2.2.1.8 of the EIS). As stated in Section 2.2.2.6 of the EIS, the United States does not engage in reprocessing (chemical separation) for either nuclear power or nuclear explosives purposes, and seeks to eliminate, where possible, the accumulation of HEU or plutonium.

Response to Comment No. 466-11

General radiological human health effects are discussed in Section 4.1.3 and the specific impacts of each alternative are presented throughout Section 4 of the EIS. This comment mentions no specific examples of different statistics on radiological human health effects or impacts, so DOE cannot perform a comparison. The possibility of earthquakes in the Concord area was taken into account in the calculations in Section 4.2.2.3 and Appendix D of the EIS. See also the response to Comment 466-2, above.

COMMENTOR NO. 466: NUREMBERG ACTIONS (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 466: NUREMBERG ACTIONS (CONT'D.)

Response to Comment No. 466-12

The port selection process that determined that Concord NWS was an acceptable port considered the population of the port and surrounding areas. Appendix D, Section D.1.9.5 of the EIS provides an explanation of the population criterion. The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (port selection Criterion 2; Appendix D, Section D.1.9.2 of the EIS). Appendix D, Section D.5.3.1.3 of the EIS presents a discussion of the determination of the probability of ship accidents used in the EIS.

In regard to the refineries and bridges along the route to Concord NWS, the passage from San Francisco Bay to Concord meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). The population and favorable transit from open ocean are not the only considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel, if it is accepted into the United States. Other items of importance include population along the route to the management site, port experience with handling containers, and port facilities. Appendix D, Section D.1.9 presents details of the port selection process.

Response to Comment No. 466-13

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide. If the United States does not include its stable, developed allies in this program, then many of the research reactors in these countries are likely to switch back to (or continue) the use of HEU as fuel, or will have to shut down.

As stated in the EIS, the U.S. has an obligation under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) to assist nonnuclear weapons states with peaceful applications of nuclear energy. Actions which compel a country to shut down a peaceful nuclear research program, or to seek reprocessing, could cast doubt on U.S. commitment to NPT principles. Any perception that the U.S. does not support the NPT, which is the foundation of the entire international nuclear nonproliferation regime, would make it that much harder to negotiate further nuclear nonproliferation agreements.

If the research reactors are forced to shut down, the United States is likely to be accused, rightly or wrongly, of failing to live up to its obligations under the Treaty on the Non-

COMMENTOR NO. 466: NUREMBERG ACTIONS (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 466: NUREMBERG ACTIONS (CONT'D.)

Proliferation of Nuclear Weapons to assist nonnuclear weapons states with peaceful applications of nuclear technology. If the reactors switch back to (or continue) the use of HEU as fuel, the move towards elimination of the civil use of HEU will be severely diminished. While it is true that these countries do not pose a threat of nuclear weapons proliferation themselves, they serve as examples for other countries. If our stable allies continue to use HEU as fuel for their research reactors, then the countries which buy reactors from them could demand reactors fueled in the same manner.

Further, the United States is currently attempting to persuade Russia and China to implement programs, similar to that of the United States, to convince their client states to switch their research reactors to LEU fuel. If, through action or inaction, the United States is unable to persuade its allies to discontinue the use of HEU as fuel, then we are unlikely to convince Russia and China that their client states should be treated differently.

Weapons grade uranium in some of the spent nuclear fuel from foreign research reactors is a nuclear weapons nonproliferation threat because that uranium could conceivably be removed from the spent nuclear fuel and used in production of one or more nuclear weapons. However, to do so would require that the spent nuclear fuel be reprocessed to chemically separate the uranium from the structure of the spent nuclear fuel elements, fission products in the uranium, and other impurities that are integral parts of the spent fuel. Chemical separation requires a sophisticated chemical processing plant as well as time and money.

Chemical separation of the weapons-grade uranium could conceivably be accomplished if the spent nuclear fuel were left in an irresponsible nation having the required technology, time, and financial resources, or if it were released to a well-funded terrorist organization. However, such actions are not possible in the relatively short time that the spent nuclear fuel would be in transit. During transit the spent nuclear fuel would be sealed in transportation casks weighing 25 tons or more. The sheer size and weight of these casks, coupled with the radioactive nature of the spent nuclear fuel itself, make movement a time consuming, difficult task. Conversely, these characteristics make spent nuclear fuel an unattractive target for theft during transit, making the spent nuclear fuel a low proliferation risk during transportation. Furthermore, since spent nuclear fuel shipments are guarded and their schedules are not announced, these shipments are also resistant to terrorism. During the past 40 years, hundreds of shipments have been made in similar spent nuclear fuel transportation casks. There have been no terrorism or proliferation problems with any of these shipments. The physical security provisions used during transit have proven to be effective.

Response to Comment No. 466-14

Concord NWS is responsible for monitoring the quality of the workforce at the site. Concord NWS's work safety record is good, indicating the quality of the workforce is

high. See response to Comment 466-1 above.

Response to Comment No. 466-15

DOE considers that it is in full compliance with all applicable laws and regulations applicable to the analysis of the proposed action. Safety and health effects were analyzed in detail during preparation of the EIS (See Appendices B through F of the EIS). The proposed action was found to pose no significant radiological health or other risks to the general population, including minority populations and low-income populations (Section 4.2 and Appendix A of the EIS). Descriptions of minority populations and low-income households in potentially affected areas are given in Sections 3.2 and 3.3 of the EIS. Appendix A of the EIS provides maps of minority populations and low-income households in potentially affected areas.

Response to Comment No. 466-16

DOE considers that the current capabilities at Concord NWS are adequate to support the safe receipt and handling of foreign research reactor spent nuclear fuel. The funding and continued maintenance of existing roads and railway beds on Concord NWS would be the responsibility of the Navy. Although facility improvements such as the addition of two container cranes may facilitate the off-loading of the foreign research reactor spent nuclear fuel, if it were to be shipped to Concord NWS, no upgraded facilities would be required.

Response to Comment No. 466-17

Foreign research reactor spent nuclear fuel shipments are subject to the same types of potential hazards as those of other ships carrying nonradiological hazardous materials.

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Spent nuclear fuel has been transported over the highways and rail systems of the United States for over 40 years. During that time, there were twenty-one incidents involving vehicles transporting irradiated spent nuclear fuel elements. None of these incidents resulted in a breach of the spent nuclear fuel transportation cask or release of its contents. In spite of this fact, several accident scenarios, including severe accidents were analyzed during the preparation of the EIS. Results of the accident analysis at the ports are given in

COMMENTOR NO. 466: NUREMBERG ACTIONS (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 466: NUREMBERG ACTIONS (CONT'D.)

Section 4.2.2 of the EIS with supporting detail in Appendix D, Section D.5. No catastrophic effects were found to result from severe accidents involving foreign research reactor spent nuclear fuel, and no events were identified that would require the evacuation of any of the ports analyzed.

Appendix H of the EIS contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

COMMENTOR NO. 484: SIERRA CLUB, VIRGINIA CHAPTER

"When we try to pick out anything by itself, we find it hitched to everything else in the universe."
John Muir

June 16, 1995

Mr. Charles R. Head
Office of Spent Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave., S.W.
Washington, D.C. 20585-0001

Public Comments on the Draft Foreign Research Reactor SNF EIS

Thank you for this opportunity to comment on the Draft Environmental Impact Statement (EIS) on Department of Energy Policy concerning Foreign Research Reactor Spent Nuclear Fuel. We note that these 22,700 reactor fuel elements remain highly radioactive. These comments are submitted on behalf of the Virginia Chapter of the Sierra Club, an environmental organization of about 9000 members with 12 local groups throughout Virginia. A substantial number of our Club members would bear risk if this foreign nuclear waste were to be imported into the United States through Virginia.

The Sierra Club will continue to analyze the environmental issues raised by this Draft EIS in the months ahead. We request within 30 days a copy of all comments made to DOE on this Draft EIS. We want to consider the views of all other commentors in completing our own analysis on this matter. *484-1*

The analysis of potential human health effects mainly in terms of fatalities (latent cancer fatalities plus accident fatalities) is inadequate, understating overall health impacts. Added incidence of nonfatal cancers, added incidence of noncancer diseases, and acoident injuries must also be presented throughout the analysis. *484-2*

The Chapter 5 list of applicable laws must show that the Resource Conservation and Recovery Act, as amended, applies to this nuclear waste. It must also show that Section 3151 of the National Defense Authorization Act for Fiscal Year 1994 applies in the event that any of this spent nuclear fuel were to be shipped into the United States. *484-3*

The Draft EIS does not provide adequate detail on the monetary costs to DOE to carry out each of the management alternatives, subalternatives, hybrid alternatives, and implementation alternatives. The Draft EIS shows that the total cost of this program to DOE could exceed $2 billion in undiscounted 1994 dollars. *484-4*

RESPONSE TO COMMENT
COMMENTOR NO. 484: SIERRA CLUB, VIRGINIA CHAPTER

Response to Comment No. 484-1

DOE complies with NEPA and the DOE regulations of promulgated under NEPA. Such regulations require comments submitted on the draft EIS to be considered in the final EIS. However, the law does not require, nor does time permit, copies of all comments submitted on a particular document to be made available to a particular party within 30 days. The final EIS will contain each comment submitted on the draft EIS during the comment period along with the responses to such comments.

Response to Comment No. 484-2

General radiological human health effects are discussed in Section 4.1.3 of the EIS, including the added incidence of nonfatal cancers. There are no noncancer diseases that are caused by low doses of radiation. Also see the response to Comment 1125-4. The incidence of accidental injuries would be no greater than that associated with the handling and transport of any other heavy standard ISO containers.

Response to Comment No. 484-3

DOE considers that the draft EIS contains a complete list of applicable laws and regulations with respect to the foreign research reactor spent nuclear fuel proposed action and alternatives.

Response to Comment No. 484-4

Appendix F, Section F.7 provides complete details of the monetary costs to carry out each of the management alternatives, subalternatives, hybrid alternatives, and implementation alternatives. At the level of program costs (as opposed to taxpayer costs), the key to understanding total program costs is via a building block approach where you select a transportation component, a site-receiving component, an interim management method, a long-term management method (including disposal), and various risks. The EIS does not enumerate every combination of every set of cost factors for every contingency (e.g., timing, delays, different allocation of spent nuclear fuel rods, etc.) because the policy and decision basis does not require the presentation of essentially infinite combinations. The major cost components, including risks, were clearly outlined.

The total cost of the program and the total cost to the U.S. taxpayers are not the same. Under the basic implementation of Management Alternative 1, if adopted, U.S. taxpayers are asked to bear the costs for developing countries (representing less than 20 percent of the spent nuclear fuel elements and less than 10 percent of spent nuclear fuel by mass) and the costs for developed countries above the level of a competitive fee. The primary basis for a competitive fee, the costs for reprocessing at Dounreay, were clearly laid out. The costs to U.S. taxpayers would depend on all the factors noted in the previous paragraph (especially the long-term disposal method), the precise basis for the competitive fee, the

COMMENTOR NO. 484: SIERRA CLUB, VIRGINIA CHAPTER (CONT'D.)

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In the current austere funding situation for federal departments, whatever funds DOE spends on this program would likely diminish funds available for environmental cleanup of DOE facilities throughout the United States. 484-4 (Cont'd.)

All of the costs of transport and disposal of this reactor nuclear waste must be paid by the reactor operators. For DOE to use U.S. taxpayer funds to pay for any of this program would encourage the continued operation of this large number of foreign reactors, as well as encourage new overseas reactors, with all their adverse environmental effects. Only by facing the full monetary and environmental costs of their own nuclear waste can foreign countries truly understand the disadvantages of operating nuclear reactors.

The Draft EIS analyzes waste fuel rods of U.S.-origin. However, in past years, DOE has also imported into the USA waste reactor fuel not of U.S.-origin. Since the environmental effects are cumulative, the EIS must also assess the possible need for future U.S. involvement in disposal of reactor fuel not of U.S.-origin, from all of these reactors plus any others of interest to the United States. 484-5

Because of the adverse environmental effects at already contaminated DOE sites, we continue our long-held opposition to reprocessing these or any other waste fuel rods in the United States. 484-6

Because of the uniquely hazardous nature of these highly radioactive waste fuel rods, and the possibility of unforeseen accident circumstances, low-population-routing of all shipments is required to the maximum extent feasible. We continue our long-held opposition to transporting these fuel rods through high population centers when reasonable alternative routes exist. 484-7

The problem that this program seeks to address was created by unwise decisions by DOE (and its predecessor agencies) and the Department of State to export high-enriched uranium (HEU) in years past for these research reactors. The Draft EIS does not make clear whether DOE has completely stopped export of HEU from the USA for research reactors; DOE should do so and must clarify this in the EIS. 484-8

In Appendix D of the Draft EIS, the DOE criteria and assumptions for characterizing potential ports-of-entry as experienced, low-population, acceptable, desirable, etc. are arbitrary and illogical. In the event that DOE names a preferred alternative that is related to this, we will address those issues at that time. 484-9

In seeking to justify this program, the Draft EIS implies that the U.S. may have some treaty obligation to take this nuclear waste into the USA. In 1992, then-Secretary of Energy Watkins stated that the United States had no legal obligation to import 484-10

RESPONSE TO COMMENT
COMMENTOR NO. 484: SIERRA CLUB, VIRGINIA CHAPTER (CONT'D.)

timing of the program, the countries that choose to participate, and other factors. As with the combinations of policy options, it would not be possible to detail an essentially infinite combination of taxpayer charges. A cost to DOE (i.e., to the taxpayers) approaching $2 billion would require policy decisions in other programs (primarily high-level waste disposal) that would be highly adverse to all spent nuclear fuel or high-level waste disposal programs, not just the foreign research reactor spent nuclear fuel program. Under most scenarios, the cost of the foreign research reactor spent nuclear fuel program to U.S. taxpayers would be a small fraction (i.e., 1-2 percent) of the cost of the commercial and defense waste programs.

As discussed in Section 2.2.1 of the EIS, if the basic implementation of Management Alternative 1 (management in the United States) is implemented, developed countries would be charged a competitive fee to accept and manage their spent nuclear fuel. United States taxpayers would absorb the full costs of the program for developing countries and absorb the amount above a competitive fee for developed countries. The reasons the United States would pay some of the costs for other countries are: 1) some countries are unable to afford the costs of returning the foreign research reactor spent nuclear fuel and would have no safe alternative means of managing the spent nuclear fuel (i.e., the developing countries); and 2) some countries would continue to use and trade weapons-grade nuclear material indefinitely unless the United States charges a competitive fee and absorbs any costs above that fee (e.g., most of the Western European countries). As discussed in the EIS, the environmental burden and human health risks are low in an absolute sense and very low compared to the risks posed by continued commercial use of HEU, or insecure storage of spent nuclear fuel containing HEU uranium overseas. United States' payment of costs would not encourage new overseas reactors to operate on HEU since the conversion from HEU to LEU is required as part of the U.S. acceptance of their spent nuclear fuel or the U.S. payment for any costs.

The success of the program would, however, encourage the continued use of nuclear research reactors operating on LEU fuel. The adverse environmental effects of these research reactors would have to be weighed against their benefits in many fields, including isotopes for nuclear medicine and materials research.

Response to Comment No. 484-5

Management of spent nuclear fuel from foreign research reactors which does not contain uranium enriched in the United States is outside the scope of this EIS (Section 1.3 of the EIS). DOE is not aware of any non-U.S.-origin HEU spent nuclear fuel that it might accept. Therefore, inclusion of non-U.S.-origin HEU in the cumulative impacts is not relevant.

COMMENTOR NO. 484: SIERRA CLUB, VIRGINIA CHAPTER (CONT'D.)

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this waste, even though he supported doing so. The Draft EIS should include an explicit analysis of any U.S. treaty obligation on this matter. 484-10 (Cont'd.)

The Draft EIS needs to provide much more detailed information on the alternatives for overseas management of some or all of this reactor fuel. While giving much information on the alternatives to import the nuclear waste into the USA, the Draft EIS gives meager information on the alternatives for continued overseas storage (temporary or permanent) at one or many locations. 484-11

The Draft EIS also gives insufficient information on alternatives for secure reprocessing and "blending down" of HEU in Europe, as has been proposed by EURATOM for example. The major environmental damage that DOE sites have already done in the United States should propel DOE to analyse possible overseas options in great detail. The EIS must include this analysis. 484-12

The EIS needs to develop and analyse an alternative that has only HEU rods from unstable countries coming to the USA. Taking nuclear waste from close allies (including Canada, Australia, Japan, NATO allies, etc.) is unnecessary. Accepting LEU rods as a way of getting research reactor operators to do the right thing about safeguarding HEU rods is poor policy; the USA has ample access to governments to gain cooperation from recalcitrant reactor operators. To whatever extent this proposed program is valid, it must be cast in the narrowest scope necessary to acieve our aim: HEU rods only, help with disposal for only unstable countries, and minimizing any nuclear waste imports into the USA. 484-13

Yours repectfully,

Robert D. Deegan

Nuclear Waste Issues Chairman,
Sierra Club Virginia Chapter

Robert F. Deegan
Sierra Club Virginia
340 Rampo Road
Virginia Beach, VA 23451

RESPONSE TO COMMENT
COMMENTOR NO. 484: SIERRA CLUB, VIRGINIA CHAPTER (CONT'D.)

Response to Comment No. 484-6

The commentor's opposition to domestic chemical separation is noted. This is Management Alternative 1, Implementation Alternative 6, which is discussed in Sections 2.2.2.6 and 4.3.6 of the EIS. It is also part of Management Alternative 3, which is discussed in Section 2.4 and 4.5 of the EIS.

Response to Comment No. 484-7

Population density is one of the attributes that DOE considers when selecting ports. See Appendix D, Section D.1.9 and Section 2.3.6.1 of the EIS. Truck routes would be selected in accordance with U.S. Department of Transportation regulations (49 CFR Part 397.101 (a)(2)). A State routing agency can designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103. (Section 2.6.4.2 of the EIS.)

Response to Comment No. 484-8

As discussed in Section 1.1 of the EIS, shortly after the end of the Second World War, the United States recognized that it must take action to prevent the spread of nuclear weapons throughout the world. The United States adopted a policy to assist other nations with peaceful applications of nuclear technology if they would agree to refrain from developing nuclear weapons and place their nuclear activities under international inspection. One of the means of assisting other nations with peaceful applications of nuclear technology was to provide them with research reactors and fuel for the reactors. This approach, far from being a mistake, has worked well, as demonstrated by the small number of countries possessing nuclear weapons capability.

As further discussed in Section 1.1 of the EIS, the Energy Policy Act of 1992 included strict limitations on the further exportation of HEU by the United States. Since enactment of this legislation, no new export licences for HEU have been issued by the United States.

Response to Comment No. 484-9

DOE considers that the port selection criteria indicates ports that can safely handle foreign research reactor spent nuclear fuel. The analysis in the EIS indicates that the use of any of the ports indicated by the port selection process, if foreign research reactor spent nuclear fuel is accepted into the United States would not pose any significant risk to either the port personnel or the population near the port. The decision as to which port(s) would be used in the case that foreign research reactor spent nuclear fuel is accepted by the United States, will be made in the Record of Decision. DOE considers the port selection process and results presented in Appendix D, Sections D.1.8 and D.1.9 of the EIS, to be fair, rational and objective.

COMMENTOR NO. 484: SIERRA CLUB, VIRGINIA CHAPTER (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 484: SIERRA CLUB, VIRGINIA CHAPTER (CONT'D.)

Response to Comment No. 484-10

It is DOE's position that neither DOE nor the United States Government has any legal obligation to receive spent nuclear fuel from foreign research reactors.

Response to Comment No. 484-11

This EIS presents analysis of environmental impacts upon the global commons from the management alternatives. The kind of analyses requested by the commentor is not in accordance with Executive Order 12114, which deals with the Environmental Effects Abroad of Major Federal Actions.

Response to Comment No. 484-13

The commentor's suggestion that the DOE accept only spent nuclear fuel containing HEU, and only from unstable countries to minimize the quantity accepted in the United States, is noted.

As discussed in Section 1.1 of the EIS, the reason for including LEU in the policy is that the United States has offered LEU acceptance as an enticement for foreign research reactor operators to convert from HEU to LEU fuel use. The enticement was necessary because operation with LEU fuel is not as effective as with HEU fuel and many of the reactor operators converted to LEU fuel as a result of the U.S. offer.

The United States has played in the past, and continues to play, a leadership role within the world community in matters of nuclear weapons nonproliferation. In this role, the United States initiated programs such as the Reduced Enrichment for Research and Test Reactors (RERTR) program and encouraged other nations to support it. Some of the nations which have supported it such as Britain, France, Japan, Sweden and others may not currently present the same nuclear weapons proliferation risk as others. The reasons for considering these nations under this policy are included in the Section 1.3 of the EIS.

COMMENTOR NO. 489: GRANDMOTHERS FOR PEACE, SACRAMENTO CHAPTER

Grandmothers for Peace

"Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it's the only thing that ever has." ... Margaret Mead

International Office • 9444 Mainsail Way, Elk Grove, CA 95758 • USA — Phone / Fax (916) 684-0394

June 19, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585
FAX: 202-586-5256

Re: Proposed Nuclear Weapons Nonproliferation Policy
Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

My recommendation is Management Alternative 2 - Overseas Storage. I regret the choices are only France and the United Kingdom, and I hope their citizens actively oppose becoming a dumping ground for the world.

We already have the threat of radioactive waste (high and low-level) criss-crossing the United States to dumps in Nevada, South Carolina, Washington, New Mexico, Texas, California, North Carolina, Nebraska, etc. This is just the radioactive waste produced by U.S. reactors, research and weaponry. Our country will be a coast-to-coast nuclear dump. I do not want additional radioactive material brought in from other nations. Every state and every country should be responsible for its own waste. If you produce it, you store it. No one else should suffer because you choose to flirt with disaster. The financial, physical and environmental cost is too high.

Do not bring this foreign spent fuel into Concord or any other U.S. port. The countries and research facilities using it should store it permanently.

Sincerely,

Bernice Kring

Bernice Kring
Sacramento Chapter
Grandmothers for Peace

Printed on Recycled Paper

489-1

RESPONSE TO COMMENT
COMMENTOR NO. 489: GRANDMOTHERS FOR PEACE, SACRAMENTO CHAPTER

Response to Comment No. 489-1

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

COMMENTOR NO. 493: MT. DIABLO PEACE CENTER

DIABLO VALLEY COLLEGE

321 Golf Club Road Pleasant Hill, California 94523 DVC (510) 685-1230

June 18, 1995

Mr. Charles Head, Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave., S W
Washington, D.C. 20585

Dear Mr. Head:

RE: DEIS on a Proposed Nuclear Non proliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Enclosed is a copy of the Comment I prepared for presentation at the DOE's May 22nd Hearing.

I did not have an opportunity to present it then. However, the organization I represent wants to bring its position to your attention.

Sincerely,

Robert Mannaberg
Member, Executive Board
Mt. Diablo Peace Center

RESPONSE TO COMMENT
COMMENTOR NO. 493: MT. DIABLO PEACE CENTER

COMMENTOR NO. 493: MT. DIABLO PEACE CENTER (CONT'D.)

The U.S. Department of Energy (DOE) plans to return up to 22,700 units of foreign spent nuclear research reactor fuel in 721 cask loads through up to ten U.S. ports, including the Concord Naval Weapons Station. The spent fuel will be transported from the ports to temporary storage sites to await eventual permanent disposal. The DOE states that "the purpose of the proposed policy is to promote nuclear nonproliferation by seeking to reduce the amount of high enriched uranium (HEU) used in civil programs worldwide." (Draft Environmental Impact Statement [EIS].

I have carefully read the Draft EIS and I listened to the DOE's Charles Head at the hearing on May 22nd. However, I am still perplexed by many questions. Until the DOE can provide satisfactory answers to the following questions, they have not earned our trust.

§ If DOE's policy is to remove and secure HEU, then why is the DOE also offering to accept low enriched uranium (LEU) for ten years "from reactors that have already converted. . to use LEU"? (Spent Nuclear Fuels Acceptance Policy, Proposal 3) It seems to make no sense.

§ At the DOE hearing, Charles Head admitted that LEU, when used in nuclear reactors, generates plutonium, prime bomb material. So why, if our goal is nonproliferation, do we continue to promote and sell LEU?

§ Is the purpose of this policy to enable the DOE to sell more nuclear fuel rods to those 26 countries from whom we will

493-1

RESPONSE TO COMMENT
COMMENTOR NO. 493: MT. DIABLO PEACE CENTER (CONT'D.)

Response to Comment No. 493-1

As discussed in Section 1.1 of the EIS, the reason for including LEU in the policy is that the United States has offered LEU acceptance as an enticement for foreign research reactor operators to convert from HEU to LEU fuel use. The enticement was necessary because operation with LEU fuel is not as effective as with HEU fuel. As explained in Section 1.2 of the EIS, the amount of plutonium in the LEU spent nuclear fuel is small, and the difficulty involved in extracting it and using it in a nuclear weapon is so great, that the LEU spent nuclear fuel is not considered to be a nuclear weapons proliferation risk. Also, as explained in Section 2.3 of the EIS, the opportunities for extended spent nuclear fuel storage at foreign research reactor sites would be limited or nonexistent.

COMMENTOR NO. 493: MT. DIABLO PEACE CENTER (CONT'D.)

accept spent nuclear fuel? Does the use of additional nuclear material increase or decrease the chances of nuclear weapon proliferation? 493-1 (Cont'd.)

§ If part of the benefit of this policy is what former Secretary of State Eagleburger, in his letter of 10-26-92, referred to as "nuclear commerce", (DEIS,appendix G) then how much money has been and will be received for the sale of the nuclear fuel rods by the DOE? 493-2

§ Since we here in Contra Costa County are being asked to share the risks of this commerce, is there some plan for us to share the benefits? Can we get some of this money locally? Perhaps the DOE could fund a local cancer treatment facility? 493-2

§ Since all nuclear reactors create fissile materials, wouldn't the goal of nonproliferatioin be best served by conversion to cleaner sources of energy? Can DOE do solar? 493-3

§ Why don't we focus our policy on those countries, e.g. Iran, that pose an actual risk to convert their reactor fuel into bombs? At the hearing Head respondad to this question by speculating about changes in regime, political instability, etc. Why does the DOE want to bring in spent nuclear fuel from Britain, Sweden, and numerous other countries whose rate of domestic terrorism is less than our own? 493-4

§ In the Draft EIS section on Concord, reference is made to some non-existent places: Clydes, Brizzly Bay, and San Suison Bay. The City of Concord is said to be ten miles south of Port Chicago. Do these errors reflect a lack of concern toward us by the DOE? Do they indicate the DOE's level of competence? 493-5

RESPONSE TO COMMENT
COMMENTOR NO. 493: MT. DIABLO PEACE CENTER (CONT'D.)

Response to Comment No. 493-2

DOE is not in the business of selling nuclear fuel rods. In the past, enrichment services were sold at cost using stockpiles of enriched uranium. Future sales of enrichment services would likely be supplied by the United States Enrichment Corporation, a quasi-government agency. No estimate is available of the historic revenues from sales of enrichment services. In any event, sales revenue (both past and future) were relatively small compared with the costs of the proposed action.

DOE considers the risks of the program to the port localities to be low. The benefits are in the form of less risk from the proliferation of nuclear weapons. Secretary Eagleburger's letter would have been more accurate if it had referred to the United States being a reliable partner in nuclear weapons nonproliferation programs. Compensation for affected ports has been discussed but is not proposed.

Response to Comment No. 493-3

Consideration of solar and wind power are beyond the scope of this EIS. Furthermore, research reactors are not involved in power production (Section 1.1 of the EIS). However, it should be noted that as part of its mission, DOE currently has ongoing programs that are seeking to develop and promote use of these alternative energy sources.

Response to Comment No. 493-4

While it is true that some countries such as Britain and Sweden are stable countries, DOE is not in the position to judge their rate of domestic terrorism. The issue, however, is that these countries may serve, themselves, as powerful examples for other countries (including those that have less stable regimes, such as Iran). Several of these countries manufacture and sell research reactors to other countries, including third world countries. If our stable allies continue to use HEU as fuel for their research reactors, then the countries which buy reactors from them would demand reactors fueled in the same manner.

Response to Comment No. 493-5

The errors the commentor points out have been corrected in Section 3.2.1.6 and Appendix D, Section D.2.1.6 of the EIS. These errors do not represent a lack of concern, merely errors in transposing information into the EIS.

Or are they part of DOE's master plan for a massive transformation of our geography? 493-5 (Cont'd.)

§ In the same section, mention is made of "the unlikely event of an explosion" at Port Chicago. True, any accident is, in a way, unlikely - as the DOE's statistics assume throughout the EIS. Yet the Port Chicago catastrophic explosion, unlikely or not, did occur. What would be the consequences if such an explosion were to occur not with just HE (high explosive) but with HE plus HEU? 493-6

§ In the same section the rather truncated map of CNWS includes some of the area occupied by our very busy Buchanan Field. Even though the airfield symbol appears on the map legend, none appears on the map proper. Nor is the airfield mentioned in any of the text. Does this mean the the DOE believes that local air traffic does not increase the risk of a terrible nuclear accident? Or maybe they just failed to consider it? 493-5 (Cont'd.)

§ Likewise, no mention is made of the six oil refineries, fifteen cities, and six bridges that the nuclear casks borne on merchant vessels would encounter on their way to CNWS. Nor of the over nine million tons of petroleum and petroleum products moved through the Carquinez Straits last year. What would happen to the deadly radioactive cargo if a collision occurred with one of the hundreds of loaded gasoline tankers in the narrow channels of the Straits? Why does the Draft EIS contain no worst case scenario? Are they afraid to consider them? Or that we will? 493-7

Response to Comment No. 493-6

Section D.5.9 has been added to Appendix D of the EIS to address the issue of attack by disgruntled persons or terrorists. One of the attack scenarios postulates a large explosion near a transportation cask full of spent nuclear fuel.

Response to Comment No. 493-7

The passage from San Francisco Bay to Concord meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). The port selection criteria do not consider the existence of land-based facilities such as refineries because the addition of some mishap at a land-based facility would not add to the severity of the worst plausible accident, which is considered to be the collision of the ship carrying the foreign research reactor spent nuclear fuel with a petroleum tanker. However, the port selection process that determined that Concord NWS was an acceptable port did consider the population of the port and surrounding areas (Appendix D, Section D.1.9.5). Additionally, all population within a fifty mile radius of the Concord NWS was considered when analyzing the potential impact of a range of hypothetical port accidents. The risks were found to be low (Appendix D, Section D.5).

The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (Appendix D, Section D.1.9.2). Appendix D, Section D.5.3.1.3 of the EIS presents a discussion of the determination of the probability of ship accidents used in the EIS.

The EIS did analyze the severe accident in which a ship carrying a spent nuclear fuel transportation cask is involved in a collision with another ship, severe enough to breach the transportation cask and then subject the cask to a fire resulting from the collision (Section 4.2.2.3). These conditions are the same as the worst conditions that might be expected to result from the collision of a ship carrying a spent nuclear fuel transportation cask with a petroleum tanker. Some radioactive material is released in this hypothetical accident, but because the amount of radioactive material is small, the amount of contamination is so small that no cleanup is required anywhere (except possibly in the immediate vicinity of the cask) to consider land or buildings fit for unconditional use.

COMMENTOR NO. 505: NATIONAL COUNCIL SENIOR CITIZENS

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Mr. Calvin Strickland Phone: 510-432-4895

Title and Organization: National Council Senior Citizens

Address: 1381 Acacia St.

City: Pittsburg, Ca. State Ca Zip 94565

*** COMMENTS ***

We do not want the San Francisco Bay to Port Chicago water contaminated with Nuclear Waste from all over the world. Keep your Nuclear Waste in the foreign countries where it was used! Keep it! Poor condition of railroads and roads is another reason not to transport Nuclear Waste in Contra Costa County, California.

People in this area do not want to die because of the Nuclear Wate.

505-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 505: NATIONAL COUNCIL SENIOR CITIZENS

Response to Comment No. 505-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. As stated in Section 2.6.2 of the EIS, after more than 40 years of spent nuclear fuel shipments, to date no spent nuclear fuel transportation cask has ever released any of its contents (radioactive material), even in actual highway accidents.

COMMENTOR NO. 534: GREEN PARTY

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Edita Hamett Phone: (510) 256-7016
Title and Organization: Member Coordinating Committee Green Party, Contra
Address: 444 Creekside Dr. #3078 / Costa County
City: Walnut Creek State CA Zip 94596

*** COMMENTS ***

Dear Mr. Head:

As a Green Party member and as one of the 300,000 persons who live within a 10-mile radius of the Concord Naval Weapons Station (from you deem to risk expendable), I am absolutely opposed to the DOE's plan to bring the highly radioactive nuclear fuel to this area. It is just too dangerous, as it is too dangerous for any of the sites in the U.S., I suggest that you keep it in the Countries (to whom the U.S. gave it in the 1st place) under international supervision. Most of all I suggest that the U.S. stop manufacturing nuclear weapons and nuclear power, stop testing nuclear devices and stop giving any nuclear material to anybody. Then (s)he will be no more nuclear waste then!

534-1

534-2

534-3

Yours for a nuclear-free future,

Edita Hamett

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 534: GREEN PARTY

Response to Comment No. 534-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 534-2

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

Response to Comment No. 534-3

Foreign research reactors are not used to manufacture or test nuclear weapons or to generate commercial power. Section 1.1 of the EIS describes the research, medical, industrial, and agricultural applications for foreign research reactors. Past and present nuclear weapons nonproliferation policies of the United States support peaceful applications of nuclear technology for nations who agree not to develop nuclear weaponry (Section 1.1 of the EIS).

COMMENTOR NO. 535:
PHYSICIANS FOR SOCIAL RESPONSIBILITY, INC.

PHYSICIANS FOR SOCIAL RESPONSIBILITY, INC.
Greater San Francisco Bay Area Chapter • (510) 845-8393 • FAX (510) 845-8476
2288 Fulton Street, Room 307 • Berkeley, California 94704-1449

SPONSORS

John E. Adams, M.D.
Professor Emeritus of Neurosurgery
School of Medicine
U.C. San Francisco

Harvey Brody, D.D.S.
Clinical Professor of Stomatology
Director of Dental Clinic
U.C. San Francisco

Patricia A. Buffler, Ph.D., M.P.H.
Dean, School of Public Health
U.C. Berkeley

Lawrence Feigenbaum, M.D.
Clinical Professor, School of Medicine
U.C. San Francisco

Charles A. Gooding, M.D.
Professor of Radiology and Pediatrics
Emeritus Vice Chair of Radiology
School of Medicine,
U.C. San Francisco

Ruth Greenwood, M.D.
Author/Lecturer
Asst. Clinical Professor
U.C. San Francisco

Melvin M. Grumbach, M.D.
Edward B. Aleer Professor of
Pediatrics, School of Medicine,
U.C. San Francisco

Stephen B. Hulley, M.D., M.P.H.
Professor of Epidemiology and
Medicine, School of Medicine,
U.C. San Francisco

Joyce Lashof, M.D.
Dean Emerita, School of Public Health,
U.C. Berkeley

Alan S. Leiider, D.D.S., M.A.
Professor of Diagnostic Sciences
Oral Pathology, School of Dentistry
University of the Pacific, San Francisco

Bernard Lo, M.D.
Professor of Medicine, Director of
Program in Medical Ethics
U.C. San Francisco

Allie J. Margolis, M.D.
Professor Emeritus of Obstetrics and
Gynecology, School of Medicine,
U.C. San Francisco

Donald R. Preshaw, D.D.S.
Professor and Chairman, Dept. of
Orthodontics, School of Dentistry,
University of the Pacific, San Francisco

Robert S. Wallerstein, M.D.
Professor Emeritus of Psychiatry,
School of Medicine, U.C. San Francisco

William Ware, D.D.S.
Professor Emeritus of Oral and
Maxillofacial Surgery,
School of Dentistry,
U.C. San Francisco

Raymond Wolfgang, M.D.
Medical Director, Hazel Mary Phillips
Memorial Clinic, St. Mary's Hospital
and Medical Center, San Francisco

Warren Winkelstein, Jr., M.D., M.P.H.
Professor Emeritus of Epidemiology,
School of Public Health, U.C. Berkeley

Affiliation for identification only

June 13, 1995

Mr. Charles Head, Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave., S W
Washington, D.C. 20585

Dear Mr. Head:

RE: DEIS on a Proposed Nuclear Non proliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Enclosed is a copy of the Comment I prepared for presentation at the DOE's May 22nd Hearing.

I did not have an opportunity to present it then. However, I do want to bring to your attention the position of Physicians for Social Responsibility.

Sincerely,

Kathryn Smick, M.D.

Kathryn Smick, M.D.
Vice-President, Steering Committee

PSR is an organization of over 20,000 physicians and health care professionals dedicated to public and professional education on the medical and environmental consequences of the production and use of weapons of mass destruction. PSR is committed to the reduction of violence and its causes. PSR is the U.S. affiliate of the International Physicians for the Prevention of Nuclear War, recipient of the 1985 Nobel Peace Prize.

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RESPONSE TO COMMENT
COMMENTOR NO. 535:
PHYSICIANS FOR SOCIAL RESPONSIBILITY, INC.

COMMENTOR NO. 535:
PHYSICIANS FOR SOCIAL RESPONSIBILITY, INC. (CONT'D.)

I am Dr. Kathryn Smick. I represent the San Francisco Bay Area Chapter of Physicians for Social Responsibility.

PSR believes that the high level nuclear waste of spent fuel rods should remain in the 28 countries where it is now stored, and that it should be under international safeguard. These countries are either industrialized western countries or stable developing countries where the risk of terrorism is probably no greater than in the United States. 535-1

We oppose bringing the spent fuel rods to the Concord Naval Weapons Station for two reasons: 1) The handling and transport of radioactive material create a hazard that, despite all precautions, cannot be reduced to insignificance. An accident with release of radioactivity could contaminate a heavily populated area, with dire consequences. But I will leave it to others to address the dangers of transport. 535-2

2) Accepting the fuel rods of research reactors cannot be justified on grounds of preventing the proliferation of nuclear weapons. Yet this is the rationale given for the Department of Energy's proposal. To be sure, nuclear bombs can be made more readily from highly enriched uranium (HEU), the fuel the DOE proposes to return, than from low enriched uranium (LEU). But the fact is that Pu can be separated from both HEU and LEU for weapons. The DOE will continue to supply LEU as a fuel and, inconsistent with its own policy, will continue to accept the spent fuel from reactors using LEU. 535-3

Inconsistencies abound in U.S. nuclear policies. Article IV of the Non-Proliferation Treaty, which the DOE touts as the

RESPONSE TO COMMENT
COMMENTOR NO. 535:
PHYSICIANS FOR SOCIAL RESPONSIBILITY, INC. (CONT'D.)

Response to Comment No. 535-1

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, is discussed in Sections 2.3 and 4.4.1 of the EIS.

Response to Comment No. 535-2

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 535-3

Weapons-grade uranium in some of the spent nuclear fuel from foreign research reactors is a nuclear weapons proliferation threat because uranium could be removed from the spent nuclear fuel and used in the production of nuclear weapons.

Plutonium is present in foreign research reactor spent nuclear fuel containing LEU in quantities too small to pose a threat. Also, it is much easier to fashion a simple nuclear weapon from HEU than plutonium. An explanation of the relationship between HEU and plutonium in foreign research reactor spent nuclear fuel has been added to Section 1.2 of the EIS.

The commentor's questions regarding the position of the United States on nuclear fuel activities in Japan and the United Kingdom are addressed in Section 1.1 of the EIS.

COMMENTOR NO. 535: PHYSICIANS FOR SOCIAL RESPONSIBILITY, INC. (CONT'D.)

main stay of U.S. non-proliferation policy, mandates that the five nuclear weapons states provide technology for peaceful uses of nuclear energy to the 174 other signatories of the NPT. Thus, by mandating the dissemination of nuclear know-how, the treaty contains the seeds for conversion of the peaceful atom to the very weapons prohibited by the treaty.

If non-proliferation were an over-riding consideration, as the EIS states, why has the United States not objected to our recent enemy Japan's huge stores of Pu, and why has the DOE itself transferred to Japan technical information which can be used to separate weapons-grade Pu from its two fast breeder reactors? Why did the U.S. not object to Great Britain's accepting U.S.-supplied foreign fuel in its new reprocessing plant which, like all reprocessing, produces Pu? Clearly peaceful nuclear energy and nuclear weapons are inseparable, a fact that is selectively applied by the DOE.

535-3 (Cont'd.)

The EIS states that the proposed policy of accepting spent fuel, if adopted, would not continue indefinitely ,only until the host countries had time to make their own arrangements to manage their waste. Why not now? This program with research reactors has been in effect since 1958. More and more waste will accumulate. No nation has a permanent repository for it, nor a prospect for one. All over the world citizens and public officials have resisted efforts to store readioactive waste near their communities. This month four Oregon congressman urged the DOE not to bring the fuel rods from these foreign reactors to Hanford in Washington state. In 1994 S.Carolina

535-4

RESPONSE TO COMMENT COMMENTOR NO. 535: PHYSICIANS FOR SOCIAL RESPONSIBILITY, INC. (CONT'D.)

Response to Comment No. 535-4

Prior to 1989, it was a policy of the United States to accept spent nuclear fuel from foreign research reactors for disposition in the United States (Section 1.1 of the EIS). Thus, many foreign research reactor operators have no immediate means of disposing of their spent nuclear fuel (Section 1.2 of the EIS). The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). Ultimate disposition is a high-priority consideration which is discussed qualitatively in Section 4.2.7 of the EIS.

Commentor No. 535:
Physicians for Social Responsibility, Inc. (Cont'd.)

sued to keep out further shipments of European waste. In 1991 a federal judge stopped the shipment of radioactive waste from Colorado into Idaho on environmental grounds. And in 1993 the port of Oakland successfully resisted the unloading of radioactive fuel, the same fuel the DOE now proposes to bring into the Concord Naval Weapons Station.

In conclusion, the impact of this proposal on non-proliferation is entirely too feeble to warrant the risk of an accident (or the cost of the operation). These highly radioactive fuel rods should remain in storage where they are, under international safeguard.

535-4 (Cont'd.)

Response to Comment
Commentor No. 535:
Physicians for Social Responsibility, Inc. (Cont'd.)

COMMENTOR NO. 552: NUCLEAR ENERGY INSTITUTE (NEI)

NUCLEAR ENERGY INSTITUTE

Theodore J. Garrish
VICE PRESIDENT,
NUCLEAR WASTE MANAGEMENT

June 21, 1995

Mr. Charles R. Head
Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585-0001

Re: Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (60 FR 19899, dated April 21, 1995)

Dear Mr. Head:

This letter provides the comments of the Nuclear Energy Institute (NEI)[1] on behalf of the nuclear industry on the subject draft environmental impact statement (EIS). NEI's purpose is to foster and encourage the continued safe utilization and development of peaceful uses of nuclear energy to meet energy, environmental, and economic goals. These comments have been developed with this purpose in mind.

We are pleased that the Department of Energy (DOE) has completed its draft EIS on the management of foreign research reactor fuel after six years of study on this subject. This study is important to the non-proliferation goals of the U.S. which are wholeheartedly supported by the nuclear energy industry. In fact, NEI has formally taken the position that the:

[1] NEI is the organization responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry. NEI's members include all utilities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, nuclear materials licensees, and other organizations and individuals involved in the nuclear energy industry.

1776 I STREET, NW SUITE 400 WASHINGTON, DC 20006-3708 PHONE 202.739.8064 FAX 202.484.8104

RESPONSE TO COMMENT
COMMENTOR NO. 552: NUCLEAR ENERGY INSTITUTE

> Treaty on the Non-Proliferation of Nuclear Weapons must be extended indefinitely and without condition....It stands as the cornerstone of the international nuclear non-proliferation regime....The NPT provides the world with a stable, predictable non-proliferation regime that is essential for preventing the spread of nuclear weapons while still allowing mankind to receive the many benefits of peaceful nuclear energy.[2]

In general, we think that DOE has done an adequate job of analyzing the environmental issues and alternatives; however, we are concerned with the length of time required to develop this EIS and the preceding environmental assessment (more than six years). Hopefully, DOE will be able to apply the knowledge gained in the development of these documents to reducing the time required to develop future EIS's in the civilian radioactive waste program.

The draft EIS appropriately does not recommend a preferred alternative. However, we strongly encourage DOE to adopt a preferred alternative consistent with the July 13, 1993, submittal by Secretary of Energy Hazel O'Leary to Secretary of State Warren Christopher which recommended the return of the foreign research reactor spent nuclear fuel (SNF) to the U.S. over a ten year period. 552-1

DOE RESPONSIBILITIES

Foreign Research Reactor SNF

DOE has a clear responsibility to accept the SNF from these foreign research reactors. The U.S. obligation to accept the SNF from these reactors began in 1955 pursuant to "Research Bilaterals," or individual bilateral agreements which were approved by the U.S. Congressional Joint Committee on Atomic Energy. Consistent with the Atomic Energy Act (AEA) Amendments of 1954, the earlier agreements provided for the lease of fuel, not for its sale. With respect to return of SNF, the early bilateral agreements provided that:

> When any fuel elements containing U-235 leased by the Commission require replacement, they shall be returned to the

[2] Statement of the Nuclear Energy Institute in support of indefinite extension of the Treaty on the Non-Proliferation of Nuclear Weapons, April 17, 1995.

Response to Comment No. 552-1

The commentor's recommendation of a preferred alternative that supports implementation of Management Alternative 1 as described in Section 2.2 of the EIS, is noted.

The preferred alternative adopted by DOE and the Department of State for the proposed action is presented in Sections 2.9 and 4.7 of the EIS.

COMMENTOR NO. 552: NUCLEAR ENERGY INSTITUTE (CONT'D.)

> Commission[Atomic Energy Commission -- AEC].... [emphasis added][3]

Beginning as early as 1957, DOE's predecessors began what later became known as the "Off-Site Fuels Policy." Under the Policy, SNF from foreign research reactors was shipped without incident to the U.S. In 1964, Congress amended the AEA to allow private ownership of special nuclear materials. These amendments specifically provided that the AEC could repurchase that amount of special nuclear material that was originally provided by the U.S.:

> at a repurchase price not to exceed the Commission's sale price for comparable special nuclear material or uranium in effect at the time of delivery of such material to the Commission.[4]

In the late 1970's, the U.S. developed low enriched uranium (LEU) fuel to replace the high enriched uranium (HEU) fuel then being used by foreign and domestic research reactors. This was pursued in order to minimize the proliferation risks associated with the weapons grade uranium contained in the HEU fuel. Consequently, in 1978, the "Reduced Enrichment for Research and Test Reactors" (RERTR) program was born. Under the RERTR program, foreign research reactor owners were strongly encouraged to convert their facilities to accommodate LEU fuel. Despite the high costs involved, most owners converted or made plans to do so. During this period, the U.S. modified its policy to include receipt of LEU SNF as well as HEU SNF. This provided additional encouragement to reactor owners to join RERTR.

On December 30, 1987, DOE published a notice in the Federal Register, as it and its predecessors had done many times in the past, extending the Off-Site Fuels Policy for only one year.[5] In this notice DOE noted that it was reexamining its adherence to U.S. environmental laws. However, DOE inappropriately did not renew this Policy and it therefore expired on December 31, 1988, for HEU fuels and in 1992 for LEU fuels. With the exception of a limited amount for spent fuel accepted under urgent relief provisions, no foreign research reactor spent fuel has been accepted by this country since.

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[3] Research Bilateral Form Agreement (pre-March 1956) at Article II.C; Research Bilateral Form Agreement (post-march 1956) at Article IV.3.
[4] 42 U.S. Code Section 2074.
[5] 52 Fed. Reg. 49198 (December 30, 1987).

RESPONSE TO COMMENT
COMMENTOR NO. 552: NUCLEAR ENERGY INSTITUTE (CONT'D.)

These and many other points clearly indicate that DOE has a responsibility to these reactor owners. Assurances to this effect have been repeatedly published in the Federal Register. In fact, many of these facilities were developed with this understanding in mind. The Draft EIS's silence in this regard is disappointing. Adopting the Secretary of Energy's July 13, 1993, recommendation, as stated above, will allow DOE to live up to this obligation.

U.S. Civilian Reactor SNF

In a similar fashion, each and every nuclear utility in the United States has an agreement, under 10 CFR Part 961 pursuant to the Nuclear Waste Policy Act of 1982 as amended (NWPA), with DOE to accept their SNF by January 31, 1998. These agreements are also the end result of decades of direct and indirect assurances by the Federal Government that the government would manage and dispose of the utility industry's SNF.

These assurances also began in 1954 when the Atomic Energy Act (AEA) was modified to encourage the development of atomic energy for peaceful purposes. In these amendments, as stated above, the Federal Government agreed to lease "special nuclear materials" including nuclear fuel to licensees; however, the Federal Government retained title to the material. In 1955, the AEC began decades of research on nuclear waste disposal beginning with a National Academy of Sciences report recommending deep geologic disposal of radioactive waste. In addition, in 1974 the AEC's Annual Report to Congress stated that its:

> program for handling radioactive waste encompasses the long-term management of all radioactive waste generated by the AEC operations, commercial high-level and, prospectively, transuranium-contaminated radioactive waste.[9]

Further, the AEC intended that waste disposal facilities would be subject to exclusive Federal control. This is evidenced by the AEC's statement of its "Policy Relating to the Siting of Fuel Reprocessing Plants and Related Waste Management Facilities," adopted in 1970 which states that:

[9] U.S. Atomic Energy Commission 1974 Annual Report to Congress, pg. 155.

COMMENTOR NO. 552: NUCLEAR ENERGY INSTITUTE (CONT'D.)

> Disposal of high-level radioactive fission product waste material will not be permitted on any land other than that owned and controlled by the Federal Government.[7]

In fact, in announcing this policy, the AEC expressly rejected a suggestion that it permit the establishment of HLW repositories on state-owned land under AEC licenses:

> The Commission has considered these suggestions but believes at this time that high-level waste repositories should be under Federal ownership and responsibility.[8]

These examples and others clearly indicate the Federal Government's definitive responsibility for the disposal of HLW and SNF. This agreement with nuclear utilities is embodied in the 1982 Nuclear Waste Policy Act, as amended -- that is, the customers of nuclear electricity pay the cost for management of the spent nuclear fuel in exchange for DOE accepting the waste beginning in 1998. Consequently, in addition to DOE fulfilling its responsibilities to the foreign research reactors, DOE must carry out its responsibilities under the NWPA of 1982, as amended.

We appreciate the opportunity to comment on this very important matter. If you have any questions, please contact Chris Henkel of our staff on (202) 739-8117.

Sincerely,

Theodore J. Garrish

[7] 10 C.F.R. Part 50, Appendix F.
[8] 35 Fed. Reg. 17530, 17532 (1970).

RESPONSE TO COMMENT
COMMENTOR NO. 552: NUCLEAR ENERGY INSTITUTE (CONT'D.)

COMMENTOR NO. 589: CLYDE CIVIC IMPROVEMENT ASSOCIATION, INC.

CLYDE CIVIC IMPROVEMENT ASSOCIATION, INC.
109 Wellington Avenue
Clyde, CA 94520

June 18, 1995

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RE: DEIS ON FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL TRANSSHIPMENTS TO NWS CONCORD

Dear Mr. Head:

The Draft Environmental Impact Statement for the proposed project is not adequate due to the following:

Climate: The DEIS fails to address the damaging rainstorms which occur approximately every three years in the San Francisco Bay region. Most notable recent high rainfall events occurred in January 1982, February 1986 and recently in the current year.

Seismicity: DEIS fails to address the issue that the entire Bay Area is located in a region of active seismicity primarily related to the San Andreas Fault system. It consists of several major faults and zones located in close proximity to the site of the proposed site to be used as a port. The main trace of the Concord Fault to located near the port and has an estimated maximum credible earthquake magnitude of 6.5, with an estimated maximum probable earthquake magnitude of 5.75 (Contra Costa County, 1991). 589-1

Tsunamis: The largest historical tsunami was a measured wave runup of 7.4 feet above the mean sea level (msl) at the Golden Gate. This should be addressed in the DEIS as a reasonable maximum for future events.

Ship Channel Conditions: There are 39 nautical miles of ship channels from the Pacific Ocean and the NWS Concord which are hazardous and encumbered with obstacles. There are a number of narrows and bridges with limited clearance. Visibility especially in the winter months is poor. The DEIS does not adequately address this issue. 589-2

San Francisco Bay-Delta Estuary: DEIR does not adequately address the fact that the port is located in Suisan Bay, a part of the largest estuarian ecosystem in California. The large variety of aquatic species are important to commercial and recreational fisheries. The area also is a major resting,

RESPONSE TO COMMENT
COMMENTOR NO. 589: CLYDE CIVIC IMPROVEMENT ASSOCIATION, INC.

Response to Comment No. 589-1

The EIS evaluates the risk associated with port activities in Section 4.2.2. The risk is evaluated for both incident-free and accident conditions. The seismicity, climate and special meteorological conditions of a particular port do not affect the risk associated with incident-free operations. Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident and thus effect the probability of such accidents, however, the number of earthquake-induced ship and road accidents is small compared to other causes.

Response to Comment No. 589-2

The passage from San Francisco Bay to Concord meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2). The favorable transit from open ocean is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations such as port population, population along the route to the management site, port experience with handling containers, and port facilities have also been considered in making the final selection of ports of entry. Appendix D, Section D.1.9 of the EIS presents details of the port selection process.

The EIS analyses determined that there would be no significant adverse impacts to the ecology of any of the ports that might be used to receive the material (Section 4.2.4.2.8). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of experience shipping spent nuclear fuel, no radioactive contents have ever been released from a spent nuclear fuel transportation cask as a result of an accident (Section 2.6.2 of the EIS). A paragraph has been added to

COMMENTOR NO. 589: CLYDE CIVIC IMPROVEMENT ASSOCIATION, INC. (CONT'D.)

feeding and wintering area for birds on the Pacific Flyway. The DEIS also fails to address the numerous wetlands and marshlands which could be impacted by this proposed project. 589-2 (Cont'd.)

Transportation: DEIS fails to address the local transportation routes in terms of congestion, traffic patterns, overpass and bridge crossings and the risks of transporting hazardous materials. 589-3

Emergency Response: The DEIS fails to provide information and assessment of available emergency response or adequate materials training in the handling of nuclear products in case of accident. 589-4

Temporary Storage: DEIS fails to address or describe what storage facilities are available for hazardous materials. The DEIS needs to describe the exact location proposed for temporary storage. 589-5

Conflicting Uses: The DEIS fails to address the numerous petroleum industries (i.e., Tosco, Shell, Exxon) and chemical plants (Monsanto) which are located in close proximity to the port being proposed. The intense use of the waterways by these potentially conflicting types of transport needs to be adequately addressed in the DEIS. 589-6

In addition, Figure A-6 (Page A-10) and Figure A-16 (Page A-22) in Appendix A (Environmental Justice Analysis) both indicate an incorrect location for the proposed terminal. These figures along with the distribution statistics need to be corrected. 589-7

Sincerely,

Pat Alexander

Pat Alexander
Secretary

RESPONSE TO COMMENT
COMMENTOR NO. 589: CLYDE CIVIC IMPROVEMENT ASSOCIATION, INC. (CONT'D.)

Section 4.2.2.2 of the EIS to make this point and emphasize the no-impact nature of these shipments on air and water quality including on estuaries, flyways, wetlands and marshlands. No significant human health, safety, or environmental risk were found to exist at any of the candidate commercial or military ports selected (Section 4.2.2 of the EIS).

Response to Comment No. 589-3

For the local truck routes near Concord, see the response to Comment 22-11. The addition of up to 186 truck shipments to these routes spread out over a period of 13 years would have a very low impact on traffic congestion because tens of thousands of similar shipments will travel these roads during that time. The trucks would carry standard-size ISO containers, so they would have no trouble with overpasses or bridge crossings. The risks of transporting foreign research reactor spent nuclear fuel overland are presented in Section 4.2.3 and Appendix E of the EIS.

Response to Comment No. 589-4

Each port considered in the EIS has developed an Area Contingency Plan. This plan outlines response capabilities, procedures and authorities for responding to and recovering from hazardous material incidents. Additionally, DOE would provide assistance to local authorities to ensure that appropriate measures would be taken in the unlikely event of an accident. As part of this assistance, DOE's Radiological Assistance Program teams, from eight offices strategically located throughout the country, would be used to coordinate and to provide remediation assistance. This type of assistance and coordination would be specified in the Transportation Plan to be prepared prior to any spent nuclear fuel shipment. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected.

Response to Comment No. 589-5

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternative 1 or 3) there would be no storage of this material in the Port of Concord NWS, any other port, or anyplace except for management sites. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

RESPONSE TO COMMENT
COMMENTOR NO. 589: CLYDE CIVIC IMPROVEMENT ASSOCIATION, INC. (CONT'D.)

Response to Comment No. 589-6

The port selection criteria do not consider the existence of land-based facilities such as refineries because they have no direct impact on the risk associated with the shipment of foreign research reactor spent nuclear fuel. The worst case accident is considered to be the collision of the ship carrying the foreign research reactor spent nuclear fuel with a petroleum tanker. In this accident the transportation cask is damaged in the collision, then subjected to a fire that resulted from the collision (Appendix D, Section D.5). The addition of some mishap at a land-based facility would not add to the severity of this accident, and so was not considered. Section 4.2.2.3 of the EIS discusses the assumptions that went into the port accident analysis and the results of those analyses.

Response to Comment No. 589-7

Latitude and longitude for the pier at Concord NWS were changed from 38 degrees 02' 45' N and 122 degrees 05' 42 W, respectively, to 38 degrees 03' 32 N and 122 degrees 00' 49 W, respectively. Figures A-6 and A-16 of Appendix A show the revised location. Population data changed as follows: Total population residing within 10 miles (16 km) of the port decreased by 18.2 percent. The corresponding minority population decreased by 26.0 percent. Low-income households residing within 16 km of the port decreased by 18.4 percent. Tables A-1 through A-3 of Appendix A include the revised demographic data.

Commentor No. 637: South End Neighborhood Council of Tacoma Petition

SOUTH END NEIGHBORHOOD COUNCIL
c o Sherrill Ware 3719 S M St Tacoma WA 98408

June 22, 1995

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S Department of Energy
1000 Independence Ave
Washington, DC 20585

Dear Mr. Head:

On June 19, 1995 the South End Neighborhood Council of Tacoma voted to oppose the shipment of high-level nuclear waste through the Port of Tacoma. We urge the U.S. Department of Energy to remove Tacoma as a possible entry site. *637-1*

We join the Port of Tacoma and the City of Tacoma in supporting alternative two. *637-2*

It is important that you, as a government representative, listen to the concerns of the citizens who will have to pay for and live with the results of the decisions made regarding the disposal of this nuclear waste.

Enclosed is another page of the petition which was signed by area residents. It was not included with the pages you received Monday, June 19th.

Please consider the concerns you have heard expressed by this community, and recommend the removal of the Port of Tacoma from the list of possible entry sites.

Sincerely,

Sherrill Ware

Sherrill Ware
Chair

encl.

cc: Congressman Norm Dicks
Senator Patti Murray
Senator Slade Gorton

Response to Comment Commentor No. 637: South End Neighborhood Council of Tacoma Petition

Response to Comment No. 637-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 637-2

The commentor's preference for the overseas management alternative is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

NO NUCLEAR WASTE IN TACOMA

We strongly oppose the shipment of high-level nuclear waste through the Port of Tacoma and urge the U.S. Department of Energy to remove Tacoma as a possible entry site.

Name	Address	City	Zip
Wayne A Wells	506 So. 52nd	Tacoma	98408
Penny Sanders	3711 So. N St.	Tacoma	98408
[illegible]	3719 S N St	Tacoma	98408
Jane Ware	3719 S N ST	Tacoma	98408
Tom Williams	3708 S "L" ST	Tacoma	98408
Dennis Dayley	6134 S. Yakima	Tacoma	98408
[illegible]	[illegible]	[illegible]	98445
[illegible]	921 S. 78th	Tacoma	98408
[illegible]	1112 So 64th	Tacoma	98408
Wayne Wells	[illegible] So N St.	Tacoma	98418
[illegible]	4834 So N St	Tacoma	98408
[illegible]	718 So. 57th	Tac.	98408
[illegible]	5004 E D ST	Tacoma	98404

Sponsored by the North End Neighborhood Council of Tacoma

RESPONSE TO COMMENT COMMENTOR NO. 637: SOUTH END NEIGHBORHOOD COUNCIL OF TACOMA PETITION (CONT'D.)

COMMENTOR NO. 778: NORTH END NEIGHBORHOOD COUNCIL

NORTH END NEIGHBORHOOD COUNCIL

Chris Thompson, Chairman
3219 North 30th St.
Tacoma, WA 98407

June 9, 1995

Tacoma City Council
747 Market Street
Tacoma, WA 98402

Honorable council members:

Our Neighborhood Council Board of Directors voted unanimously to oppose the shipment of nuclear material through the Port of Tacoma. The reasons for our adamant opposition to the plan proposed by the U.S. Department of Energy are several.

778-1

Safety is a primary concern. In spite of the 1986 court ruling barring this type of shipment until a plan can be developed for dealing with shipboard fires, no method has yet been devised for dealing with this type of disaster. Shipboard fires have occurred, we understand, aboard ships in Puget Sound in just the last few years which reached 1,600 degrees and lasted 5 to 6 hours. The casks that will transport this highly radioactive nuclear waste are only designed to withstand 1,200 degree heat for 30 minutes. The risk of fire and then release of this highly dangerous material is very real. The safety risks of transporting it off ships at the port and by rail and over the highways are also of concern.

778-2

Our concerns include a focus on our city's image and it's prospects for future economic prosperity as well. Being chosen for this program would be the most dubious distinction we can imagine. It would directly threaten the progress of the Port of Tacoma from 22nd to 6th over the past several years. The Port and all the jobs it generates are vital to our economy. We cannot afford to undermine one of our best sources of family-wage jobs in Tacoma and Pierce County.

778-3

Finally, we question the program's fundamental wisdom. Why should we be forced to handle the world's nuclear waste when we're not even sure what to do with our own? Why should we accept waste from countries (such as Sweden, Japan and Canada) that are no more or less stable than we are, and which are not any more and may be less likely targets of terrorists? The entire program is ill-advised.

We insist that Tacoma not be victimized by being forced to handle, store and transport this radioactive waste. Please help ensure our community is not targeted.

Sincerely,

Christopher M Thompson
CHAIRMAN

cc: Secretary Hazel O'Leary, Sen. Slade Gorton, Sen. Patty Murray, Rep. Norm Dicks, Gov. Mike Lowry, State Sen. Lorraine Wojahn, State Rep. Ruth Fisher, State Rep. Debbie Regala, Port of Tacoma Commission

RESPONSE TO COMMENT
COMMENTOR NO. 778: NORTH END NEIGHBORHOOD COUNCIL

Response to Comment No. 778-1

The transportation casks that would be used for the foreign research reactor spent nuclear fuel are certified if their design meets certain tests, including a fire test, and if the individual casks pass periodic inspections (Section 2.6.2 of the EIS for details). These certification standards were developed for use of the casks on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. The duration of a ship fire is directly related to the amount of combustibles carried on board. The number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicates that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures.

In respect to the impact a ship fire might have on a transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the duration of the fire. Second, a ship's fire intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it would be almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of research reactor spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).

The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt foreign research reactor spent nuclear fuel. Appendix D, Section D.5.3 of the EIS presents a detailed discussion of accident probabilities and radioactive material source terms and Section D.5.4 presents the results of the analysis.

In conclusion, although long duration ship fires are possible, and have occurred, they are uncommon events. Analysis in the EIS indicates that even in the event of a severe ship fire involving a transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5 of the EIS).

COMMENTOR NO. 778:
NORTH END NEIGHBORHOOD COUNCIL (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 778:
NORTH END NEIGHBORHOOD COUNCIL (CONT'D.)

Response to Comment No. 778-2

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipment of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. Under NEPA regulations, the socioeconomic effects evaluated for this EIS do not include those associated with psychological fear of receiving spent nuclear fuel at the Port of Tacoma.

Response to Comment No. 778-3

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide.

Many foreign research reactor operators have no immediate means for disposition of their spent nuclear fuel (Sections 1.1 and 1.2 of the EIS). Management of the foreign research reactor spent nuclear fuel in the United States would provide the research reactor operators in all participating nations, including Sweden, Japan and Canada, with a limited period of time to arrange for disposition of their spent nuclear fuel outside of the United States with minimum disruption of reactor operations, and would encourage continued use of or conversion to LEU fuel (Section 1.2 of the EIS).

Foreign research reactor spent nuclear fuel is not a likely target for theft or destruction by terrorists because it is transported under U.S. Department of Transportation and Nuclear Regulatory Commission regulations (Section 5.4 of the EIS) in heavy, robust containers which are designed to withstand mechanical and thermal stress (Appendix B of the EIS). Spent nuclear fuel is neither flammable nor explosive. Since the spent nuclear fuel is in metallic form, an explosive device capable of destroying the transportation cask would cause damage mainly through the explosion itself with little radiological effect.

Commentor No. 1015: Savannah River Site Citizens Advisory Board

Savannah River Site

CITIZENS ADVISORY BOARD

A U. S. Department of Energy Site-Specific Advisory Board

June 20, 1995

Dr. Mario P. Fiori
U.S. Department of Energy
Savannah River Operations Office
P.O. Box A
Aiken, S.C. 29802

Dear Dr. Fiori:

On behalf of the Savannah River Site Citizens Advisory Board, we are pleased to forward to you the Board's sixth recommendation. The attached recommendation addresses our preferred alternatives for consideration in the evaluation of the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy concerning Foreign Research Reactor Spent Nuclear Fuel.

This recommendation was adopted by majority vote at today's special Board meeting. It reflects the application of suggested screening and performance criteria, forwarded to you in April 1995.

We would appreciate your written response before the Final EIS is issued. We hope the attached advice is of use to DOE in the decision-making process and look forward to any comments you may have.

Sincerely,

Mildred McClain
Co-Chairperson

Bob Slay
Co-Chairperson

cc: Thomas P. Grumbly
Ken Chacey, EM37
Charles Head, EM37
Board Members
Ex-Officio members

1 Attachment

Response to Comment Commentor No. 1015: Savannah River Site Citizens Advisory Board

COMMENTOR NO. 1015: SAVANNAH RIVER SITE CITIZENS ADVISORY BOARD (CONT'D.)

Savannah River Site Advisory Board
Recommendation on Draft EIS on
Foreign Research Reactor Spent Nuclear Fuel
May 23, 1995

The FRR DEIS presents a number of alternative present and future actions for the handling and interim management of the spent nuclear fuel from foreign research reactors. The CAB has reviewed these alternatives and has recommendations on a number of these decisions. In this review, we were guided by the CAB-recommended Screening and Performance Criteria for this EIS that were approved at the March 28, 1995 regular meeting. The CAB strongly supports the nuclear nonproliferation policy of the United States and has the following specific recommendations we believe support that objective and are consistent with the other criteria.

1. We believe that Management Alternative 1, the acceptance and management of the spent fuel in the United States, provides the most support for the nonproliferation policy. It allows: (a) the most certain control of the final disposition of weapons-potential materials, (b) the strongest leadership for bringing other nations into LEU reactor usage, and (c) the least possibility that HEU from the reactors might illicitly or legally fall into a weapons program. 1015-1

2. We support a policy duration of 10 years for LEU or indefinitely, if required, for any HEU not received within this period. As a shorter duration would limit the fraction of foreign HEU that is included, it is less desirable. 1015-2

3. We understand that, under the Programmatic SNF&INEL EIS, shipments of these spent fuels would be limited to SRS and INEL, with SRS receiving only aluminum-clad fuels. We agree with the selection of SRS for its proposed portion of the materials. For the Phase I wet storage period at SRS, our attention has focused on the L-Reactor Disassembly Basin, which would be required early in the program once RBOFF is filled. Although the scheduled upgrade of the L Basin water treatment may well eliminate serious corrosion during the necessary wet storage period, we urge intense scrutiny of corrosion activity in this upgraded basin. 1015-3

4. We consider chemical separation of these fuels at SRS, followed by blending to LEU, to be the preferred alternative during Phase 2 of this program. We recognize that this is probably the most difficult choice to be made. Chemical separation is preferred over the option of dry storage because: (a) dry storage technology for aluminum clad fuel has not yet been demonstrated in the United States; (b) in comparison with stainless steel cladding, aluminum has far greater corrosion susceptibility and therefore is a much greater challenge in achieving safe, stable, long-term dry storage; (c) the dry storage option has a much greater cost uncertainty; and (d) this processing offers much greater assurance of meeting the geologic repository acceptance criteria required for ultimate disposition. 1015-4

Our recommendation is difficult because of the uncertainties implied in the extensive of the chemical separation activities in the SRS canyons. In view of the age and recent inactivity of the canyons, we recognize the potential for problems and delays that could have a major cost impact. We therefore urge that planning for and evaluation of the process activity be given highest priority. Also, as dry storage will 1015-5

RESPONSE TO COMMENT
COMMENTOR NO. 1015: SAVANNAH RIVER SITE CITIZENS ADVISORY BOARD (CONT'D.)

Response to Comment No. 1015-1

The commentor's support for accepting and managing foreign research reactor spent nuclear fuel in the United States (Management Alternative 1 or 3, Sections 2.2 and 2.4 of the EIS, respectively), is noted.

Response to Comment No. 1015-2

The commentor's support for a policy duration of 10 years for LEU fuel, or indefinite acceptance for HEU fuel, if required, is also noted. The 10-year policy duration is considered under the basic implementation of Management Alternative 1, which is discussed in Section 2.2.1 of the EIS.

Response to Comment No. 1015-3

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. A Consent Order, embodying the litigation settlement between the State of Idaho, the Navy, and DOE was issued on October 17, 1995. The commentor's support for a management alternative that would allow the same selection in this EIS is noted.

Response to Comment No. 1015-4

The commentor's support for chemical separation at the Savannah River Site is noted. This is covered under Management Alternative 1, Implementation Alternative 6, which is discussed in Sections 2.2.2.6 and 4.3.6 of the EIS. It is also part of Management Alternative 3, which is discussed in Section 2.4 and 4.5 of the EIS.

Response to Comment No. 1015-5

The commentor's suggestion that DOE give high priority to the evaluation of reprocessing for the management of foreign research reactor spent nuclear fuel is noted. Also noted, is the suggestion to pursue without delay the development of dry storage technology for the portion that could not be reprocessed.

COMMENTOR NO. 1015: SAVANNAH RIVER SITE CITIZENS ADVISORY BOARD (CONT'D.)

eventually be required for some portion of these fuels once processing ceases, it is very important for DOE to pursue development of this technology without delay. 1015-5 (Cont'd.)

We are aware that an argument against chemical separation is that it sets a poor example to other nations whom we discourage from any activity that creates HEU. We believe the blending-down step to LEU could be verified by international observers. This course is a strong demonstration of our nation's commitment to the nonproliferation policy. 1015-4 (Cont'd.)

5. On the question of the program's financing, we recommend that subsidies be provided to nations only to the degree that they are required to assure cooperation in the program's implementation. We understand that this would probably involve underdeveloped nations. It might also lead to less than full cost recovery with a developed nation that is considering a competitive foreign proposal for fuel disposal. 1015-6

6. With the alternatives related to shipment and handling, we consider the risks to workers, the local populace and the environment to be minimal. While all established procedures for safe handling must be followed, cost differences between alternatives should be considered. We recognize that the general population and many of their civic leaders have often opposed local handling of spent fuel casks. These attitudes cannot be overlooked in the decision process. A well-conceived education program in the affected areas would be beneficial. 1015-7

The CAB is well aware that this program cannot be achieved without budgetary support for the very large expenditures involved. In the current environment of reduced spending throughout the DOE nuclear weapons complex, the need for the highest attention to cost minimization is very evident. However, should budget restrictions be seen as undermining your ability to successfully complete this program, CAB will want to participate in whatever steps are then necessary to deal with the problem.

RESPONSE TO COMMENT
COMMENTOR NO. 1015: SAVANNAH RIVER SITE CITIZENS ADVISORY BOARD (CONT'D.)

Response to Comment No. 1015-6

One alternative for implementation of the proposed action is for the United States to charge developed countries a competitive fee to accept and manage their spent nuclear fuel. U.S. taxpayers would absorb the full costs of the program for developing countries and absorb the amount above a competitive fee for developed countries. The reasons the United States is proposing to pay some of the costs for other countries are: 1) some countries are unable to pay and have no safe alternative means of managing the spent nuclear fuel (i.e., the developing countries), and 2) some countries might continue to use and trade weapons-grade nuclear material indefinitely unless the United States charges a competitive fee and absorbs any costs above that fee (e.g., most of the Western European countries). At the policy level of the EIS, it is not possible to provide a country-by-country analysis of financial feasibility, cooperation levels, non-U.S. alternatives, etc. The foreign countries should not be expected to provide any information on these negotiation-type issues nor should the United States expect to estimate the transition point for 41 countries. While some form of negotiated fees might ultimately be implemented, it is impossible to define them, by-country, in advance.

Response to Comment No. 1015-7

The commentor's position that risks to workers, the public, and the environment would be minimal is noted. As evidenced by Section 4.9 of the EIS, cost differences between each of the Management Alternatives for implementation of the proposed action have been provided and will be considered in the preparation of the Record of Decision.

COMMENTOR NO. 1025: HEART OF AMERICA NORTHWEST

Seattle Office
1305 Fourth Avenue
Cobb Building, Suite 208
Seattle, Washington 98101
(206) 382-1014
FAX (206) 382-1148

Washington, D.C. Office
Washington, D.C. Representative:
Honorable Don Bonker
c/o APCO
1155 21st Street NW, Suite 1000
Washington, D.C. 20036
(202) 778-1019
FAX (202) 466-6002

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Mark Blaome, Chairman
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Tom Cleveland
Del Keehn
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Glenn Pascall

Executive Director
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HeartOfAmericaNorthwest
"Advancing our region's quality of life."

June 28, 1995

Pat Wells
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

Dear Mr. Wells,

We are submitting this report to be added to the official record of public comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

Sincerely,

Loretta Ahouse

RESPONSE TO COMMENT
COMMENTOR NO. 1025: HEART OF AMERICA NORTHWEST

COMMENTOR NO. 1025: HEART OF AMERICA NORTHWEST (CONT'D.)

Consequences of a Severe HEU Ship Accident
Page 1

MEMORANDUM

TO: D Moglen, C Zimmer, Greenpeace
FROM: M Resnikoff, RHNA
SUBJECT: Consequences of a Severe HEU Ship Accident
DATE: August 26, 1991

Sorry for the late arrival of our calculations of the consequences of a severe accident involving a ship containing highly enriched uranium fuel (HEU). This involved considerably more number crunching than we anticipated.

HEU contains a large inventory of hazardous radionuclides, much more so than low enriched uranium, such as Taiwan fuel. Many of the details concerning these shipments do not appear in the Environmental Assessment, but in an associated document prepared by Sandia National Laboratory ([1]CA90). In case of a severe ship accident involving a long duration high temperature fire, these radionuclides may escape the shipping cask and be lofted into the air, settling downwind. Persons in the radiation plume would inhale these radionuclides and be exposed to a gamma radiation dose from the radionuclides which settle on the ground.

Calculations by the Department of Energy using RADTRAN mask the consequences of a serious accident by assuming a miniscule percentage of radioactivity could be released and by multiplying the consequences by a small probability. As a result, the risk is vanishingly small.

In this calculation we produce an independent assessment of the consequences of a credible serious accident. This is not a worst case calculation. We use standard computational

[1]CA90 Cashwell, JW and KS Neuhauser, "The Impacts of Transportation within the United States of Spent Reactor Fuel from Domestic and Foreign Reserach Reactors," Sandia National Laboratory, SAND88-0714, 1990.

1025-1

RESPONSE TO COMMENT
COMMENTOR NO. 1025: HEART OF AMERICA NORTHWEST (CONT'D.)

Response to Comment No. 1025-1

Unfortunately, Table 3 of Dr. Resnikoff's report was not included in the submittal by the commentor. DOE asked the commentor verbally and in writing to provide Table 3, but was unsuccessful. Thus, the report does not provide adequate information on the cask inventories, release fractions, and meteorological assumptions that he used in his analyses, nor does he explain any changes he may have made to the code used to predict consequences. Without full disclosure, it is impossible to determine exactly why his estimates are orders of magnitude greater than DOE's well-documented and publicly available estimates. His statements that large economic impacts would be incurred and are ignored in the DOE analyses is untrue. In fact, DOE's economic analyses are presented in the EIS (Section 4.2.2.3) and show that economic impacts are small.

models ([2]NRC77), and computer codes employed by Department of Energy contractors ([3]RAE85).

The results show serious contamination plumes extending over 60 miles downwind from a ship accident, encompassing an area up to 900 square miles. The contamination levels are high enough to require evacuation and decontamination. For areas up to one mile downwind from a ship accident, the gamma radiation dose would be lethal to any person who remained in the contaminated area for a year. The cost of cleanup has not been calculated here and is also not discussed in the Environmental Assessment. The results for HEU fuel are far more serious than for Taiwan fuel. This memo discusses the assumptions, calculational techniques and principal findings.

1025-1 (Cont'd.)

Computer Model and Assumptions

We employ and adapt for our purposes a computer program developed by Department of Energy contractors (PATHRAE-T). This program uses a standard Gaussian puff model dispersion model. As a contamination plume moves downwind, the plume disperses in horizontal and vertical directions. Particulates settle out of the plume as it moves downwind.

Persons living downwind can be exposed to radiation through several pathways. Inhalation of the passing radioactive cloud can cause a radiation dose to the lung and

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[2]NRC77 US Nuclear Regulatory Commission, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light Water Cooled Reactors," Reg Guide 1.111, Rev 1, July 1977.

[3]
RAE85 GM Sandquist, et al, "Exposures and Health Effects from Spent Fuel Transportation," Rogers & Associates Engineering Corp, Salt Lake City, Nov 1985, and
VC Roger et al, "The Pathrae-T Performance Assessment Code for Analyzing Risks from Radioactive Wastes," Rogers & Associates Engineering Corp, Salt Lake City, December 198

COMMENTOR NO. 1025: HEART OF AMERICA NORTHWEST (CONT'D.)

also to the whole body and specific organs by incorporation into the bloodstream. Gamma radiation from the passing cloud can cause a whole body dose. Gamma radiation from material deposited on the ground can also cause a whole body radiation dose (groundshine). Doses can also arise from resuspension of deposited material. Drinking contaminated water and milk, eating contaminated vegetables, beef and meat can also cause a radiation dose. Though we have calculated doses due to all radiation pathways, we report our results here only for groundshine because it is by far the largest dose contributor. The other effects should not be ignored, but time constraints limit a full discussion. In particular, deposition of radioactive material into a reservoir should be investigated. An accident during a rain would cause more radioactive material to be washed out of the plume near the accident scene. This scenario should also be investigated.

A severe accident involving a long duration high temperature fire is assumed to lead to a potential release of radionuclides from one cask. This release could be due to several different causes. Because of operator error, water could remain in the cask. This cask could overpressurize in a fire, blowing the pressure relief valves or cask seals. Operator error could undertorque (loose fitting lid) or overtorque (undue stress) the lid bolts. Or a ship collision could be followed by a fire. Casks are transported in container ships which hold an assortment of flammable materials. The Department of Energy has not factored human error into their probability and consequence calculations.

The cask inventory of radionuclides is shown in Table 3, taken from the Department's supporting document (SAND90). How much of this inventory is released in an accident is a matter of engineering judgment. Casks are not physically tested to destruction under controlled conditions. The Department

1025-1 (Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 1025: HEART OF AMERICA NORTHWEST (CONT'D.)

COMMENTOR NO. 1025: HEART OF AMERICA NORTHWEST (CONT'D.)

Consequences of a Severe HEU Ship Accident.
Page 4

assumes 0.098% of the cesium inventory could be released. On the other hand, an NRC report estimates up to 2.7% of the cesium inventory could be released to the environment (SAI79). The NRC study, however, pertains to PWR fuel which can better withstand high temperature conditions than HEU fuel which is fabricated with an aluminum alloy. We do not assume here that 2.7% of cesium is released. Rather, we assume 2% of cesium and tellurium isotopes, 0.2% of strontium, ruthenium and cerium isotopes, and 0.02% of remaining isotopes will be released in an accident. These values are based on the relative volatility of these isotopes.

It is important to note that iodine-131 has been omitted by Sandia. Release of iodine-131 would cause a very high thyroid dose. Sandia Labs is in error in claiming that the radionuclides in Table 3 represent 99% of the hazard. In addition, it is possible to have a greater inventory of radionuclides by loading HEU fuel before it has cooled. Operator error could cause this situation.

We further assume that these radionuclides are lofted 60 meters in the air due to the fire, the wind speed is 1 meter per second, a slight wind, and the particulate deposition velocity is 0.01 meters per second. We calculate consequences under two meteorological conditions - unstable and neutral. Stable conditions mean there is little mixing or turbulence. Neutral conditions are more nearly representative of average atmospheric conditions.

Results and Conclusions

The major contributors to gamma whole body dose are niobium, zirconium and cerium-144. The daughter product of

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I79 Science Applications Inc., A Scoping Study of Spent Fuel ransportation Accidents, NUREG/CR-0811, Washington, D.C., June 1

1025-1 (Cont'd.)

RESPONSE TO COMMENT COMMENTOR NO. 1025: HEART OF AMERICA NORTHWEST (CONT'D.)

COMMENTOR NO. 1025: HEART OF AMERICA NORTHWEST (CONT'D.)

Consequences of a Severe HEU Ship Accident
Page 5

Cs-144, Pr-144, is a strong gamma emitter.

As seen in Figures 1 and 2, for unstable and neutral meteorology conditions, respectively, the fallout pattern is cigar-shaped. Under neutral conditions, the maximum dose occurs 1 kilometer (km) downwind; under neutral conditions, the maximum dose occurs 300 meters downwind from the accident scene. The figures represent half the radiation plume; the mirror image below the x-axis is missing. As is seen in Figure 1, a person residing for a year within 2 km downwind from the accident scene would receive a radiation dose of 50 rems (R). This is to be contrasted with the average annual background dose of 0.1 R. As seen in Table 1, radiation doses of 5 R/y or greater occur within an area of 1.13 square kilometers (km^2), within which 3500 people reside, using average urban population density figures. A person who resided for a year within 7 km downwind of the accident scene would receive a dose of 5 R. As seen in Table 1, this encompasses an area of 10.96 km^2, within which 34,000 persons reside.

Any area with a groundshine dose greater than 25 millirems a year should have to be decontaminated. As seen in Table 1, this extends to 104 km downwind and encompasses an area of 1968 km^2 or over 750 square miles. This area includes suburban and rural populations. The exact number of persons affected must be determined by placing the plume maps over specific greater port environs — Seattle, Oakland or Hampton Roads. We did not do the analysis in the time available.

A similar discussion would also involve a radiation release under neutral meteorological conditions. Generally, compared to unstable conditions, particulates would be dispersed over a smaller area, but the concentrations and doses would be greater.

A stated earlier, it is credible to have a radioactive

1025-1 (Cont'd.)

RESPONSE TO COMMENT COMMENTOR NO. 1025: HEART OF AMERICA NORTHWEST (CONT'D.)

COMMENTOR NO. 1025: HEART OF AMERICA NORTHWEST (CONT'D.)

release from more than one cask, to have a larger inventory of radionuclides within each cask and to have meteorological conditions, such as rain, which deposit more of the released radioactivity within the port city. Thus, the consequences could be greater than shown above.

We conclude that a severe ship accident involving a high temperature long duration fire could lead to major consequences, the full impact of which depends on a large number of port specific factors, such as the effectiveness of local emergency personnel, the specific demographics and routes and other local conditions. But the consequences in any of the major port cities could involve the long term evacuation of tens of thousands to hundreds of thousands of people. It is not exactly clear how such a large area would be decontaminated. Clearly the economic consequences, which are ignored in the Environmental Assessment, are ignored.

1025-1 (Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 1025: HEART OF AMERICA NORTHWEST (CONT'D.)

COMMENTOR NO. 1027: CITIZENS FOR A HEALTHY BAY

Citizens for a Healthy Bay

771 Broadway
Tacoma, WA 98402
Phone: (206) 383-2429
Fax: (206) 393-2406

Board of Directors
Charlene Blaine
James Dodds
Doug Pierce
H. Lee Rogers
Barbara Ann Sonellos
Sheri Tonn
Allen Zuland

June 19, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

RE: Draft Environmental Impact Statement (dEIS) on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

Citizens for a Healthy Bay (CHB) is writing to express its opposition to the shipment of spent nuclear fuel from foreign research reactors through the waters of Puget Sound and Commencement Bay. The analysis on which this proposal is based is an incomplete assessment of information about the Port of Tacoma and other alternative ports of entry as well as the environmental impacts associated with the shipment of spent nuclear fuel. The proposal also ignores the potential environmental and economic costs of such shipments to the Tacoma community.

Other options exists for the management of the spent nuclear fuel, including the long-term storage of the fuel at the foreign reactor sites (as is currently in practice throughout the Unites States at many nuclear reactor facilities), the reprocessing of the spent nuclear fuel into low enriched uranium (thus ensuring the reuse rather that ongoing and costly storage of the material), or the shipment of the spent fuel through U.S. government owned and operated ports. Each of these options should be analyzed in greater detail than exists in the dEIS and the results released for public review before a final decision is made regarding the management of the spent nuclear fuel.

CHB is a five year old nonprofit organization whose mission is to encourage public involvement in the hazardous waste cleanup, natural resource restoration, and ongoing stewardship of Commencement Bay in Tacoma, Washington.

You will find CHB's complete comments attached. If you have any questions, please do not hesitate to contact Michael Iseaace at Citizens for a Healthy Bay, (206) 383-2429.

Sincerely,

Doug Pierce, President
Citizens for a Healthy Bay

Attachment

Citizens for a Healthy Bay is a non-profit, nonpartisan organization with 500 members.

Speaking for a living bay...

Printed on recycled and recyclable paper

RESPONSE TO COMMENT
COMMENTOR NO. 1027: CITIZENS FOR A HEALTHY BAY

COMMENTOR NO. 1027: CITIZENS FOR A HEALTHY BAY (CONT'D.)

Citizens for a Healthy Bay
Draft EIS on Spent Nuclear Fuel Shipments
Page 2 of 3
June 19, 1995

PREFERRED SHIPMENT ALTERNATIVE
Other options for addressing the management of spent nuclear fuel from foreign research reactors should be more fully addressed. At this time and based on the information included in the draft Environmental Impact Statement (dEIS), Citizens for a Healthy Bay (CHB) supports the shipment of the spent nuclear fuel (nuclear waste) from foreign research reactor only on military vessels through United States government-owned ports, such as the Naval Weapons Station in Concord, CA and the Military Ocean Terminal at Sunny Point, NC. 1027-1

These military facilities are more properly suited to handle the nuclear waste for the following reasons. 1027-2

- They are secure port situations with personnel trained in handling nuclear materials.
- They are typically located at much greater distances from population centers.
- They do not face Commencement Bay's ongoing stigma of Superfund status.
- They have a reduced potential to interfere with regular commerce through commercial ports.

OTHER MANAGEMENT OPTIONS
However, before such shipments occur, the costs and risks associated with other options should be more fully explored and the results made available for public review. These include the following options:

1. The storage of the spent nuclear fuel at the foreign reactor sites, combined with vigilant and comprehensive international monitoring to ensure no diversion of materials 1027-3
2. The reprocessing of the spent nuclear fuel to a form, low enriched uranium (LEU) that does not present a international security risk 1027-4

Not enough information was provided in the draft Environmental Impact Statement (dEIS) to consider whether these options, either individually or when reviewed together, are feasible and could be accomplished at less cost and risk to the United States. At the present time, subsidizing the international use of nuclear materials creates an situation in which foreign countries do not develop their own safe nuclear waste storage technology. Full or partial US taxpayer support of the foreign utilization of nuclear materials does not force other countries to internalize the environmental, health, safety, and financial costs of operating nuclear programs.

MINIMIZING IMPACTS AND INCREASING PUBLIC SAFETY
If the nuclear waste is to be shipped through any United States commercial or military port, the United States government must at a minimum provide: 1027-5

- Initial and ongoing training to port employees or military personnel and to local emergency response personnel
- Any potentially necessary response equipment to local communities
- Radiation monitoring of dockside workers and the adjacent environment
- Full funding to carry out public education, training, and response capabilities to the port or ports of entry and surrounding communities

RELEASES OF NUCLEAR MATERIALS
Finally, the US Department of Energy (DOE) must make public the potential harm from a catastrophic fire or explosion which results in the full release of radioactive materials from one or more containers of the radioactive materials. A 1986 federal court injunction barred DOE from importing spent nuclear fuel through the Ports of Seattle or Tacoma unless all such environmental 1027-6

RESPONSE TO COMMENT
COMMENTOR NO. 1027: CITIZENS FOR A HEALTHY BAY (CONT'D.)

Response to Comment No. 1027-1

The EIS considered the use of various types of ships (Section 2.6.3.2.1) any of which could be chartered. The analyses in the EIS (Sections 4.2.1 and 4.2.2) indicated that there were no significant impacts associated with the use of any of the ships evaluated. Hence, the use of chartered ships is one of the options for transporting the foreign research reactor spent nuclear fuel, if it is accepted into the United States. The use of military ships was not considered in the EIS because of the acceptability of commercial and dedicated ships and because such transport does not fall within the mission of the U.S. Navy.

Response to Comment No. 1027-2

While the proposed policy addresses a national security issue, nonproliferation of nuclear weapons, the implementation of that policy, should it be adopted, need not rely on military ports for the receipt of foreign research reactor spent nuclear fuel. In selecting the proposed ports of entry, carefully developed selection criteria were used to identify those that best fit the requirements of receipt of the foreign research reactor spent nuclear fuel. Appendix D, Section D.1 of the EIS presents a detailed description of the port selection process.

Spent nuclear fuel from foreign research reactors is shipped in standard containers, and does not require special handling techniques (Section 2.6.3.2.2 of the EIS) or additional security beyond that required by NRC regulation (which can readily be provided in any of the commercial or military ports). No special precautions are required by the U.S. Coast Guard (Section 2.6.3.2.2 of the EIS).

Sections 4.2.2 and 4.5 of the EIS demonstrate that the risk associated with bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or any other port, is low. The use of a remote port might slightly reduce the already low consequences of an accident, however there are other considerations that also must be made when making port selection.

Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma as noted by the commentor. Nor should it contribute to any dirty port stigma because the analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Based on over 30 years experience shipping spent nuclear fuel, DOE considers that spent nuclear fuel transportation casks passing through the Port of Tacoma, Commencement Bay, or any other port or waterway would not affect air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

COMMENTOR NO. 1027: CITIZENS FOR A HEALTHY BAY (CONT'D.)

Citizens for a Healthy Bay
Draft EIS on Spent Nuclear Fuel Shipments
Page 3 of 3
June 19, 1995

and human health impacts as well as reasonable alternatives were considered. This would include a shipboard fire which breaches the casks and releases radioactive materials. — 1027-6 (Cont'd.)

BASIS FOR CHB POSITION
The draft Environmental Impact Statement:

- Does not adequately address the potential for catastrophic fire or explosion and impacts if such an event were to occur in Puget Sound or Commencement Bay — 1027-6 (Cont'd.)
- Does not address security risks or security measures for civilian ports — 1027-7
- States the receiving port would be required to provide for additional security measures. — 1027-5 (Cont'd.)
- Does not address the funding for, training of, and technical assistance to the ports of entry and for local emergency personnel in communities receiving the shipments of spent nuclear fuel — 1027-6 (Cont'd.)
- Does not state the potential impacts to the marine environment, threatened or endangered salmon stocks, or the economics that rely on a safe and clean Puget Sound
- Does not address the costs to local, state, and federal governments of implementing any of the options considered — 1027-8

In addition:

- The past record for safe handling, operation, and storage of nuclear materials by the US DOE is less than satisfactory — 1027-9
- Millions of dollars have already been spent on remediation of past spills of less hazardous materials in Commencement Bay, and Tacoma does not need the stigma associated with nuclear materials passing through its port — 1027-6 (Cont'd.)
- The future funding for the program and US DOE is uncertain, with the US House of Representatives budget eliminating the US DOE — 1027-10
- The US DOE has not provided adequate procedural due process. It has failed to make a record of its first formal public hearing. It scheduled no public hearing or repository within 20 miles of a proposed port of entry (Port of Tacoma), and DOE has failed to respond to questions asked at public meetings.
- In 1994, CHB took the position that there was significant environmental and worker safety concerns associated with the shipment of spent nuclear fuel through Puget Sound. CHB urged passage of legislation, sponsored by Rep. Mike Kreidler, which would give local authorities the right to place restrictions on the transport of nuclear materials. CHB stated, "Past shipments of lead and copper ores have led to the cleanup of the Sitcum Waterway.... We do not want to repeat such cleanups..." in Commencement Bay (Statement by Dr. Sheri Tonn, President of CHB Board, January 21, 1994).

RESPONSE TO COMMENT
COMMENTOR NO. 1027: CITIZENS FOR A HEALTHY BAY (CONT'D.)

DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' status with respect to their clients. This consideration is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions. As such, there should be no adverse commercial or economic reaction to the use of the port. Historically, there were no adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

Response to Comment No. 1027-3

The commentor's request for more analysis on the alternative of overseas storage is noted. DOE considers, however, that the information in the EIS is sufficient to make a decision. Overseas storage is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

Response to Comment No. 1027-4

The commentor's request for more analysis on chemical separation is noted. Overseas chemical separation is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS. Domestic chemical separation is Management Alternative 1, Implementation Alternative 6, which is discussed in Sections 2.2.2.6 and 4.3.6 of the EIS. They are both also part of Management Alternative 3, which is discussed in Section 2.4 and 4.5 of the EIS.

Response to Comment No. 1027-5

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Response to Comment No. 1027-6

The analyses that were performed to evaluate the impact of various accidents divided all plausible accidents into six categories (Appendix D, Section D.5.3.1.1 of the EIS). The most severe accident category, release category 6, assumes that the ship carrying the foreign research reactor spent nuclear fuel transportation cask is in a collision with a tanker and that a fire occurs that engulfs the damaged transportation cask. The consequences of accidents, including category six accidents, are discussed in Appendix D, Section D.5.4.2.2.

Appendix D, Section D.5.3.1 of the EIS describes several accident scenarios that involve fire. The results of the analysis of these accidents can be found in Section D.5.4. The analysis shows that even in the event of a severe ship fire, neither the consequences nor risks are great (Section D.5.5).

DOE would like to point out that the foreign research reactor spent nuclear fuel is neither volatile nor unstable. The spent nuclear fuel that the proposed policy deals with is a metal which contains enriched uranium, clad with either aluminum or stainless steel. This type of fuel is very stable. Section 2.6.1 of the EIS presents a detailed description of the foreign research reactor spent nuclear fuel.

Response to Comment No. 1027-7

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that the foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk of such actions. The security provisions are summarized in Appendix H of the EIS. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit.

Response to Comment No. 1027-8

The cost to the Federal government from the proposed action would depend on which Management Alternative is selected for implementation, the total cost of the action, the

COMMENTOR NO. 1027: CITIZENS FOR A HEALTHY BAY (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 1027: CITIZENS FOR A HEALTHY BAY (CONT'D.)

fee charged to the developed countries, the participation of the developed and developing countries, cost overruns or underruns, risks, and numerous other factors. The EIS cannot estimate all of these factors on an integrated basis. The final EIS shows that for fees in the range that the developed countries believe reasonable, total costs to the Federal government are likely to be in the mid hundreds of millions of dollars, plus uncertainties. With higher fees, the costs to the Federal government would decline. Total costs to the Federal government would at a minimum be about one hundred million dollars under every credible scenario.

Excluding costs related to protests, costs to State and local government from implementing the proposed action would be extremely low. Using decades of historical experience in shipping spent nuclear fuel in the United States as a guide, there have been no significant costs to State or local governments. This is true both for shipments from foreign research reactors through U.S. ports and overland to management sites and from shipments from domestic reactors overland to management sites. Japanese experience in shipping spent nuclear fuel to Europe through the Panama Canal shows the same result. On a probabilistic basis, the costs of the program from accidents (i.e., accident event times probability of occurrence) would also be very low. DOE does not consider that local or State governments would incur unusual or significant costs as a result of the program.

Response to Comment No. 1027-9

Spent nuclear fuel has been transported over truck, rail, and water routes in the United States for over four decades. Several thousand of these shipments were by truck or rail. None of the shipments, including shipments involved in accidents, has ever resulted in a release of the radioactive contents of a spent nuclear fuel transportation cask (Section 4.2.3 of the EIS). No significant environmental effects would result from severe transportation accidents involving foreign research reactor spent nuclear fuel (Section 4.2.3 of the EIS).

If management of foreign research reactor spent nuclear fuel in the United States is adopted, interim storage would be provided at one or more of the five management sites described in Section 3.3 of the EIS using mature storage technologies (Section 2.6.5 of the EIS). As discussed in Section 4.2.4 of the EIS, the risks associated with management of the foreign research reactor spent nuclear fuel in the United States are low.

Response to Comment No. 1027-10

If DOE were abolished in response to action by Congress, the current DOE programs for management of spent nuclear fuel would have to be transferred to some other Federal

government agency to protect the health and safety of the public. Since the spent nuclear fuel will not simply go away, these programs cannot simply be abolished.

There is no provision in the NEPA regulations requiring that a verbatim transcript of a public hearing must be taken. DOE considers that the record of the major issues raised in the public hearings, coupled with the multiple provisions made for acceptance and resolution of written comments, provided a more than adequate record of the public's position. In any case, DOE did tape record the June 19, 1995 public hearing in Tacoma and develop a verbatim transcript from it.

When DOE first attempted to arrange for a public hearing in Tacoma, a suitable meeting facility could not be located. When a meeting facility was located at SeaTac airport, DOE erroneously concluded that this would be close enough to allow interested participants to attend the meeting. However, after being informed of the dissatisfaction of Tacoma citizens with the SeaTac meeting location, and in the interests of going the extra mile in securing good public involvement, DOE held a second public hearing in the city of Tacoma on June 19, 1995. Although the applicable regulations only require DOE to hold one public hearing on a draft EIS, the Tacoma public hearings were among 17 public hearings DOE held on the draft of this EIS.

In addition, as announced in the April 21, 1995 Federal Register notice announcing the availability of the draft EIS, a copy of the draft EIS was available in Tacoma in the Tacoma Public Library, 1102 Tacoma Avenue South, Tacoma, Washington. Additional copies were made available in other locations in the State of Washington, and were available by mail by calling a toll free telephone number specified in the April 21 Federal Register notice.

While it is true that the DOE participants were unable to answer every question asked of them during the public hearings, it is DOE's policy to follow up on any such questions in writing. In particular, the questions DOE was unable to answer during the public meeting held by the Port of Tacoma have been answered either by FAX directly to the Port Commissioners, or in this comment response document.

COMMENTOR NO. 1051: TACOMA FIRE FIGHTERS UNION NO. 31

TACOMA FIREFIGHTERS UNION NO. 31
1109 South 50th Street
Tacoma, Washington 98405
472-7802 FAX 473-2593

PAT McELLIGOTT, President
BRUCE BAURICHTER, Vice President
ALONZO HAMPTON, Secretary-Treasurer

Affiliated with
International Association of Fire Fighters - AFL-CIO-CLC
Washington State Council of Fire Fighters
Pierce County Central Labor Council
Washington State Labor Council AFL-CIO

July 6, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 10585

Dear Mr. Head,

We are writing to express our strong opposition to the U.S. Department of Energy's proposal to import spent nuclear fuel from foreign countries through the Port of Tacoma. 1051-1

As members of the Tacoma Fire Department, we feel it is necessary to bring to your attention that we do not have the proper equipment necessary to handle a nuclear emergency. Even if the equipment were available, we have no members who are trained in the area of spent nuclear fuel. In the event of a nuclear catastrophe, we would attempt to do the best job we could, but we would most likely be ineffective. The results would be unthinkable. 1051-2

Tacoma and the surrounding communities would be in grave danger because there would be no way that we could protect them from the radiation. Also, those workers who would be handling the casks--whether it be longshore workers or truck drivers--would be in contact with casks that can legally emit an amount of radiation equivalent to 10 full body x-rays an hour. The effect of this exposure to the workers would be highly detrimental especially since the proposed plan for the Port of Tacoma is to take place over the next 13 years. 1051-3

As citizens of Tacoma, we do not want spent nuclear fuel traveling through our city. There is no reason why nuclear waste from other countries should travel through our port putting American lives in potential jeopardy.

Sincerely,

Pat McElligott, President
Tacoma Fire Fighters
Local #31, IAFF

/lb

RESPONSE TO COMMENT COMMENTOR NO. 1051: TACOMA FIRE FIGHTERS UNION NO. 31

Response to Comment No. 1051-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or Port of Portland is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma or Port of Portland, or to any of the other ports analyzed in the EIS, is low.

Response to Comment No. 1051-2

Foreign research reactor spent fuel shipments are subject to the same types of potential hazards as those of other ships carrying nonradiological hazardous materials.

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Several accident scenarios including a breach of the cask and fire sufficient to oxidize the contents were analyzed during preparation of the EIS. Results of the accident analysis at the ports are given in Section 4.2.2 of the EIS with supporting detail in Appendix D, Section D.5. No catastrophic effects were found to result from severe accidents involving foreign spent nuclear fuel.

Response to Comment No. 1051-3

DOE shares the commentor's concern about limiting radioactive exposures to the lowest levels achievable. Section 4.2.2 of the EIS demonstrates that the risk to Tacoma and the

Commentor No. 1051:
Tacoma Fire Fighters Union No. 31 (Cont'd.)

Response to Comment
Commentor No. 1051:
Tacoma Fire Fighters Union No. 31 (Cont'd.)

surrounding communities would be low.

The spent nuclear fuel transportation casks could emit radiation up to the regulatory limit of 10 mrem per hour at 2 meters from the transport vehicle. This is much lower than the equivalent of 10 full-body x-rays per hour, as suggested by the commentor. Sections 4.2.2.5 and 4.2.3.5 of the EIS discuss the mitigation measures that DOE would employ to keep each port worker's and each truck driver's dose below 100 mrem per year. If one individual worker did receive a full dose of 100 mrem every year for 13 years, their increased chance of incurring cancer sometime later in life would be less than one chance in one thousand.

COMMENTOR NO. 1083: PACIFIC NORTHWEST NEWSPAPER GUILD

Pacific Northwest Newspaper Guild
Local No. 82, The Newspaper Guild, AFL-CIO, CLC

July 5, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (FM-37)
U. S. Department of Energy
100 Independence Avenue SW
Washington, D.C. 20585

Dear Mr. Head:

I have attached a copy of the resolution passed by the Pierce County Central Labor Council opposing the transport of spent Nuclear fuel through the Port of Tacoma.

I oppose this not only in unity with the other Unions of Pierce County, but also as a member of the Tacoma Northend Neighborhood Council. Tacoma is a city that has been the place all of the "Seconds" and trash for the state has been dumped for years. If no one else wants it, give it to Tacoma - this is beginning to turn around but your department's plan will not help us at all.

I sincerely hope the decision will be to ship this material through a more logical and safe spot - not Tacoma!

Sincerely,

William F. Johnston
Administrative Officer

cc: John Thompson
Executive Secretary
Pierce Central Labor Council

2900 Eastlake Avenue East, Suite 220
Seattle, Washington 98102
(206) 328-1190 • FAX 328-1196
Voice Mail 517-7163

RESPONSE TO COMMENT
COMMENTOR NO. 1083: PACIFIC NORTHWEST NEWSPAPER GUILD

COMMENTOR NO. 1083: PACIFIC NORTHWEST NEWSPAPER GUILD (CONT'D.)

PIERCE COUNTY CENTRAL LABOR COUNCIL, AFL-CIO
RESOLUTION
TO OPPOSE THE TRANSPORT OF SPENT NUCLEAR FUEL THROUGH THE PORT OF TACOMA

WHEREAS, the U. S. Department of Energy is going to be shipping from foreign countries spent nuclear fuel to the United States for storage; and

WHEREAS, the Port of Tacoma has been listed as one of ten ports in the Department of Energy's March 1995 Draft Environmental Impact Study (DEIS) on the transport of spent nuclear fuel, and the Port of Tacoma is one of ten ports of entry under consideration for receiving these shipments; and

WHEREAS, the spent nuclear fuel is approximately 22,700 individual fuel rods of enriched uranium from 41 different countries for a total of 721 shipments over 13 years; and

WHEREAS, the Department of Energy cannot guarantee the safety of shipping the containers during transportation; and — *1083-1*

WHEREAS, the local community would be responsible for first response for any accident or fire; and

WHEREAS, the shipping of this spent nuclear fuel will create no additional jobs for this community or region but will only stigmatize our community and the Port of Tacoma, which may cause the loss of additional shipping companies from coming to the Port, or the loss of existing shipping companies which could create a loss of jobs in our economic region; and — *1083-2*

WHEREAS, two local unions, Longshoremen 23 and the United Transportation Union 2845 have publicly expressed concern on handling this type of hazardous waste; and

WHEREAS, June 19, 1995 is the last public hearing by the Department of Energy on this subject at the Tacoma Public Utilities Auditorium, 3628 South 35th Street at 6:00 p.m; therefore be it

RESOLVED, that the Pierce County Central Labor Council, AFL-CIO, go on record to oppose the Department of Energy's consideration of transporting spent nuclear fuel through the Port of Tacoma; and be it further

RESOLVED, that the Pierce County Central Labor Council, AFL-CIO, communicate our position to all local unions in order to solicit their support and letters in opposition to transporting spent nuclear fuel through the Port of Tacoma, and ask them to show their support at the June 19th public hearing at the Tacoma Public Utilities Auditorium and with letters of opposition to the Department of Energy by June 20th, the last date for written comments; and be it finally — *1083-2 (Cont'd.)*

RESOLVED, that the Pierce County Central Labor Council, AFL-CIO, communicate its position to the Washington State Labor Council, AFL-CIO, asking for their support to our congressional delegation and with the news media.

Adopted on the 7 day of June, 1995 by the Pierce County Central Labor Council, AFL-CIO.

John W. Thompson, Secretary-Treasurer

opeiu 23:afl-cio

RESPONSE TO COMMENT
COMMENTOR NO. 1083: PACIFIC NORTHWEST NEWSPAPER GUILD (CONT'D.)

Response to Comment No. 1083-1

Based on the analysis presented in the EIS, DOE considers that foreign research reactor spent nuclear fuel can be received safely at ports identified for the receipt and handling of foreign research reactor spent nuclear fuel. Sections 4.2.2 and 4.5 of the EIS demonstrate that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1083-2

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' economic development. Nor should it contribute to any stigma because the analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Sections 4.2.1.1 and Appendix C, Section C.2 of the EIS). This is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions. As such, there should be no adverse cultural or economic reaction to the use of the port. Historically, there were no adverse economic or cultural impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

COMMENTOR NO. 1094: FREDERICKSON-CLOVER CREEK COMMUNITY COUNCIL

FREDERICKSON-CLOVER CREEK COMMUNITY COUNCIL
A non-profit organization
P.O. Box 715
Spanaway, Washington 98387

June 23, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue SW
Washington DC, 20585

Re: DRAFT ENVIRONMENTAL IMPACT STATEMENT - MARCH 1995
(Regarding Nuclear Fuel Shipments)

Dear Mr. Head:

The Frederickson-Clover Creek Community Council hereby wishes to inform you and the Department of Energy that we are steadfastly opposed to the continued and proposed increase of using the United States as a toxic garbage dump for storage of High-Level Nuclear Waste. Spent radioactive materials should remain in the countries in which they currently are located, and the U.S. should assist in assuring their security with trained personnel at these locations throughout the world. Therefore, we support your Policy Alternative - Management Alternative #2, to Facilitate Management of Foreign Research Reactor Spent Nuclear Fuel Overseas. 1094-1 1094-2

Further, let it be known that we are adamantly opposed to any of D.O.E.'s alternatives (either 1 or 3) which would allow shipping of spent nuclear fuel through the Port of Tacoma, by any means of transportation.

Sadly, it is immediately apparent that the information in the D.O.E.'s Draft Environmental Impact Statement relative to the population of Tacoma and vicinity is terribly outdated. It blatantly ignores the fact that Tacoma and Seattle are essentially a megatropolis. These two cities' centers are within 30 miles of each other. There is no definition or decrease in population/development from one hub to the other. Tacoma and Seattle are, infact, two "spots" in a dense and rapidly growing corridor of development which stretches from approximately 100 miles north of Seattle to approximately 100 miles south of Tacoma. This mass of humanity also ranges 60 or more miles in both east and west directions. 1094-3

All of these people live within and share the same eco system. Puget Sound is the heart of this corridor and its burgeoning population. Our megatropolis corridor is growing tremendously and

RESPONSE TO COMMENT
COMMENTOR NO. 1094: FREDERICKSON-CLOVER CREEK COMMUNITY COUNCIL

Response to Comment No. 1094-1

The commentor's opposition to management in the United States of spent nuclear fuel from foreign research reactors is noted. As discussed in Section 1.2 of the EIS, there are several compelling reasons to manage foreign research reactor spent nuclear fuel. The key reason is to advance U.S. and worldwide interests in nuclear weapons nonproliferation. By managing the foreign research reactor spent nuclear fuel, the United States can continue and expand its widely supported policy of removing highly-enriched (weapons-grade) uranium from civilian programs worldwide. Management in the United States would be technically, politically, and economically more advantageous than management in as many as 41 separate countries.

Storage in the countries of origin would cost more than storage in the United States (and cost U.S. taxpayers more), would be technically difficult, if not impossible, in many countries, and would violate the laws of several of the countries. Finally, many countries participated in the U.S.-led research reactor programs on the belief that the United States would eventually accept the spent nuclear fuel. Failure of the United States to accept the foreign research reactor spent nuclear fuel could endanger the entire program to substantially eliminate civilian use of weapons-grade nuclear material. Health and safety risks associated with all alternatives discussed in the EIS, including shipping to, and management in, the United States, are low. These risks must be weighed against the importance of the program.

Response to Comment No. 1094-2

The commentor's preference for the overseas management alternative is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

Response to Comment No. 1094-3

The population data used for all analyses in the EIS came from the 1990 census, the most up-to-date available. The port selection process considered port population, and Tacoma was found to meet Criterion 5 Human Population (Appendix D, Section D.1.9.5 of the EIS). Port population growth was also considered, and Tacoma's growth factor was one of the higher at 1.35, but not high enough to disqualify the port.

COMMENTOR NO. 1094: FREDERICKSON-CLOVER CREEK COMMUNITY COUNCIL (CONT'D.)

the particular area in which we are located (approximately 20 miles south of Tacoma) is expected to increase by at least 250,000 people in the next 15 years! Therefore, it is imperative that more current information be secured and evaluated by the D.O.E. before any intelligent decisions are made, decisions which would effect and possibly endanger the health and lives of so many people. We Washingtonians have simply not been provided with enough information in regard to what the D.O.E. plans to do and what the true risks are. And, it is painfully obvious that the D.O.E. has no current information on us. Therefore, at this point, an intelligent, logical and correct decision is certainly impossible.

1094-3 (Cont'd.)

We join an influential and sizable list of people opposed to the D.O.E.'s plan to use the Port of Tacoma. A few of our cohorts are the Port of and City of Tacoma, the Port of and City of Seattle, the Cities of Sea-Tac and Kenton, a multitude of politicians (including local, state, legislative, and congressional) the organizations of Citizens for a Healthy Bay, Heart of America Northwest, the local Teamster's and Longshoremen's unions, and the four to five hundred citizens who appeared at the presentation on Monday, June 19th. We'd also like to speak on behalf of the hundreds of thousands who are yet unaware of what our own government has in mind for us, and therefore are as of yet, unspoken.

In conclusion, we earnestly request that the Department of Energy leave the 19.2 short tons of fuel elements where they are, secured, but out of this country. These "user" countries made use of the fuel, they must also be responsible for its safe-keeping under our watchful eye.

The Frederickson-Clover Creek Community Council is emphatically against risking the health and safety of the citizens of the Pacific Northwest and the entire United States by transporting nuclear waste all over the face of the earth.

Sincerely,

Laura Roberts

Laura Roberts
President

cc: Hazel O'Leary, Secretary of Energy, D.O.E., Washington DC
Washington State Congressional Delegation
Governor Mike Lowry, State of Washington

RESPONSE TO COMMENT
COMMENTOR NO. 1094: FREDERICKSON-CLOVER CREEK COMMUNITY COUNCIL (CONT'D.)

COMMENTOR NO. 1113: SAN FRANCISCO BAY KEEPER

San Francisco BayKeeper

July 11, 1995

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Administrative Assistant

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Re: Comments regarding the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head,

On behalf of San Francisco BayKeeper, I am writing to express concerns regarding the threat posed to the water quality of San Francisco Bay should the Department of Energy select the Concord Naval Weapons Station as a port of entry for spent nuclear fuel from various countries. 1113-1

Because of the inherently extreme danger posed by the transportation, handling and temporary storage of spent uranium fuel, and the sensitive health of an already impaired San Francisco Bay and the aquatic life it supports, BayKeeper believes the additional risks of shipping such materials through the Bay is not warranted. BayKeeper believes that the Draft EIS's Management Alternative No. 2 best accommodates the nuclear non-proliferation concerns of the United States and concerns for the environmental and economic health and well-being of sensitive and highly populated estuaries, such as San Francisco Bay. 1113-2

In addition, any proposal to ship spent nuclear fuel through San Francisco Bay must address at least two water quality issues that are not mentioned in the draft EIS. First, DOE must consider the need to obtain waste discharge requirements from the California Regional Water Quality Control Board, San Francisco Bay Region. WDRs are issued pursuant to the State of California Porter-Cologne Water Quality Control Act, Water Code § 13000 et seq. A WDR permit must be obtained for any activity that threatens to pollute waters of the State. A process for obtaining such a permit is initiated by the filing of a notice of discharge to the Board. In this instance, the focus of such WDRs would be on potential releases from operations at the proposed off-loading facility at the Naval Weapons Station and potential releases from any temporary storage facility sited there to place the spent fuel while awaiting shipment to any of the management sites described in the EIS. Neither of those elements of the proposed project are discussed in the draft EIS. As a result, the draft EIS does not adequately address the threats posed to San Francisco Bay and the millions of people who depend on it for their recreation and livelihood. 1113-3

Building A Fort Mason
San Francisco
CA 94123 1362

Printed on recycled paper

Telephone: 415 567 4401
Facsimile: 415 567 9715
Hotline: 1 800 KEEPBAY

RESPONSE TO COMMENT COMMENTOR NO. 1113: SAN FRANCISCO BAY KEEPER

Response to Comment No. 1113-1

On the issue of air and water quality as it pertains to the proposed policy of managing foreign research reactor spent nuclear fuel, DOE considers that there would be no significant adverse impacts to any of the ports that might be used to receive the material. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality. In the unlikely event of a severe accident, the analysis performed for the EIS indicates that some radioactive material could be released from the cask and distributed into the environment. However, the analysis in Section 4.2.2.3 and Appendix D, Section D.5 of the EIS determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident. Close in to the accident, near the cask would likely require some cleanup, but the overall impact on the water and air quality in the port would be very small. Section 4.2.2.3 and Appendix D, Section D.5 of the EIS detail the accident analysis and results.

Response to Comment No. 1113-2

The commentor's preference for the overseas management alternative is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

Response to Comment No. 1113-3

Any shipments of foreign research reactor spent nuclear fuel would be made in compliance with all regulations, including waste discharge requirements. However, DOE does not agree that such a waste discharge permit is required for shipments of foreign research reactor spent nuclear fuel because there would be no discharges associated with incident-free transportation of the foreign research reactor spent nuclear fuel. Foreign research reactor spent nuclear fuel is a solid metal fuel that is shipped in dry transportation casks; no liquid is involved. As such, the potential for any discharge or leak to pollute the water is zero, hence there is no need for a waste discharge permit.

Analysis in Sections 4.2.2 and 4.5 indicates that even in the event of the worst plausible accident, the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low. Based on this low risk, DOE considers that no special response action plan or contingency plan is necessary.

COMMENTOR NO. 1113:
SAN FRANCISCO BAY KEEPER (CONT'D.)

Mr. Charles Head
July 11, 1995
Page 2

Second, any reasonable analysis of the wisdom of shipping spent fuel through San Francisco Bay or any other port in the country should examine the response and remediation system established for risks posed by the transportation of petroleum products. Transporting spent nuclear fuel, including deadly radioactive isotopes, is by far a more risky proposition with by far potentially more devastating impacts on the Bay area than the transportation of oil, despite that daily activity's significant risks. Although the number of shipments proposed for spent fuel, although substantial, is small compared to the number of oil tankers and barges moving through San Francisco Bay, the menace posed by deadly radioactive isotopes should be subjected to higher prevention and response actions that are developed or are being developed for oil shipments. For example, in San Francisco Bay, oil tankers are required to be accompanied by a tug escort vessel in case the vessel should lose control of its steering or lose power. Likewise, the transportation of oil through the Bay is accompanied by a 3 inch thick Contingency Plan that outlines in great detail how agencies and response organizations will respond to an oil spill in the Bay. Any reasonable EIS should consider analogous prevention and response systems, as well as other components of the oil spill prevention and response system, in order to assure that DOE's risk projections will prove to have any basis in the real world.

1113-3 (Cont'd.)

1113-4

San Francisco BayKeeper thanks DOE for this opportunity to comment on the draft EIS. If you have any questions, feel free to call Michael R. Lozeau, San Francisco BayKeeper, at (415) 567-4401.

Sincerely,

Michael R. Lozeau
San Francisco BayKeeper

cc: Steven Ritchie, Executive Director, RWQCB
Craig Johns, Board member, RWQCB

RESPONSE TO COMMENT
COMMENTOR NO. 1113:
SAN FRANCISCO BAY KEEPER (CONT'D.)

Response to Comment No. 1113-4

Each port considered in the EIS has developed an Area Contingency Plan. This plan outlines response capabilities, procedures and authorities for responding to and recovering from hazardous material incidents. Additionally, DOE would provide assistance to local authorities to ensure that appropriate measures would be taken in the unlikely event of an accident. As part of this assistance, DOE's Radiological Assistance Program teams, from eight offices strategically located throughout the country, would be used to coordinate and to provide remediation assistance. This type of assistance and coordination would be specified in the Transportation Plan that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected.

Commentor No. 1121: Western Governors' Association

WESTERN GOVERNORS' ASSOCIATION

E. Benjamin Nelson
Governor of Nebraska
Chairman

Edward T. Schafer
Governor of North Dakota
Vice Chairman

James M. Souby
Executive Director

Headquarters:
600 17th Street
Suite 1705 South Tower
Denver, Colorado 80202-5452
(303) 623-9378
Fax (303) 534-7309

Washington, D.C. Office:
400 N. Capitol Street, N.W.
Suite 370
Washington, D.C. 20001
(202) 624-5402
Fax (202) 624-7707

July 18, 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Mr. Head,

This letter serves as a supplemental letter to WGA's June 20, 1995 comments regarding the Draft EIS on Foreign Research Reactor Spent Nuclear Fuel. The Western Governors met last month for their annual meeting and passed several resolutions which pertain to this shipping campaign. The resolutions present the Governors collective policy on nuclear waste and safe transportation issues. The Governors believe the safety standards contained in these resolutions must be met for the safe and uneventful transport of nuclear waste either by land or sea. Since western ports and sites are being considered for shipping purposes, the Western Governors believe the following resolutions address this shipping campaign:

- 95-020 - Transportation of Spent Nuclear Fuel and High-Level Radioactive Waste
- 95-021 - High-Level Nuclear Waste
- 92-004 - U.S. Department of Energy Transport of Nuclear Waste
- 92-005 - Emergency Preparedness for the Shipments of Radioactive Materials by Sea
- 89-024 - Storage of Spent Nuclear Reactor Fuel

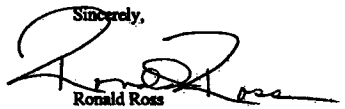
The safety and transportation standards presented in these resolutions should be addressed in the final EIS. The Western Governors' Association stands ready to work with DOE on this shipping campaign.

Response to Comment Commentor No. 1121: Western Governors' Association

COMMENTOR NO. 1121:
WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

If you have any questions, please call Jon Lawritson or myself at (303) 623-9378.

Sincerely,



Ronald Ross
Program Manager

Enclosures

RESPONSE TO COMMENT
COMMENTOR NO. 1121:
WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

Western Governors' Association
Resolution 95-020

June 26, 1995
Park City, Utah

SPONSORS: Governors Leavitt, Nelson, and Miller
SUBJECT: Transportation of Spent Nuclear Fuel and High-Level Radioactive Waste

A. BACKGROUND

1. This nation must dispose of significant amounts of spent nuclear fuel and high-level radioactive waste.

2. The federal government is responsible for the disposal of these wastes under the Nuclear Waste Policy Act (NWPA).

3. Plans of the federal government place a disproportionate share of the national burden of nuclear waste transportation on western states.

4. The governors recognize that a transportation program developed and implemented cooperatively with western states, such as that used for recent cesium shipments and that being planned for shipments to the Waste Isolation Pilot Plant, can be developed with proper planning and commitment by the federal government. *1121-1*

5. Pending litigation and proposed federal legislation have increased pressure on the federal government to accept private reactor spent nuclear fuel under the NWPA beginning in 1998, well before the Department of Energy's (DOE) plans to accept waste in 2010.

6. The analysis by and experience of western states show that adequate preparations cannot be in place to accommodate large scale shipments beginning in 1998.

7. For many years, western governors have consistently urged the federal government to develop a comprehensive transportation plan, including the preparation of contingency plans for events such as the early shipment of waste. *1121-1 (Cont'd.)*

8. DOE has not prepared a comprehensive transportation plan and has no effective contingency plans to accommodate shipments beginning in 1998.

RESPONSE TO COMMENT COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

Response to Comment 1121-1

Transportation aspects, including marine and ground transport modes, route selection, security, and communication, for the alternative approaches are analyzed in Sections 2 and 4 and Appendix E of the EIS. In addition, to further address this issue, individual Transportation Plans would be prepared for any shipments actually scheduled for acceptance through any port of entry. These Transportation Plans would be prepared in consultation with appropriate State, Tribal, and/or local officials to ensure that details of the transportation process are understood, that the individuals or organizations who would perform all required activities are specified, and that these individuals and parties know what is expected of them (Section 2.7.5 and Appendix H of the EIS).

Response to Comment 1121-2

A national transportation system for foreign research reactor spent nuclear fuel is not consistent with the strategy discussed in the EIS. Individual Transportation Plans will be developed for specific shipments of foreign research reactor spent nuclear fuel if the Record of Decision states that foreign research reactor spent nuclear fuel will be accepted into the United States.

COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

B. GOVERNORS' POLICY STATEMENT

1. The Western Governors' Association finds that as a result of federal government inaction and delays, and inadequate strategic planning involving stakeholders, a national transportation system cannot be in place in time to begin accepting spent nuclear fuel in 1998. *1121-2*

2. The objective of the Western Governors' Association — the safe and uneventful transport of nuclear waste — must be paramount in all federal policies affecting nuclear waste transportation. *1121-3*

3. Critical steps need to be taken to prepare for shipments, including but not limited to:

   a. The preparation of a comprehensive transportation plan that includes the analysis of all needed transport safety activities in a single document; *1121-1 (Cont'd.)*
   b. The development of responsible criteria for selecting shipping routes; *1121-4*
   c. The development of a sound methodology for evaluating optional mixes of routes and transportation modes; *1121-5*
   d. The expeditious amendment of the Nuclear Waste Policy Act to provide states and tribes with technical assistance and training funds prior to any large-scale shipment of spent fuel to a repository and/or centralized storage facilities, whether such facilities are publicly or privately owned;
   e. The prohibition on any major shipping campaign to interim storage facilities until such technical assistance and training funds have been provided at least three years prior to the commencement of any such shipping campaign; *1121-6*
   f. Adoption of regulations to implement a mutually acceptable program of technical assistance and training funds, such as those recommended by the Western Governors' Association;
   g. Appropriations to fund technical assistance and training monies to states and tribes through whose jurisdiction spent fuel and high-level radioactive waste are to be transported; and
   h. The full-scale testing of casks to be used to transport spent nuclear fuel and high-level radioactive waste. *1121-7*

RESPONSE TO COMMENT COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

Response to Comment 1121-3

Safe and uneventful transportation in accordance with international and national regulations are paramount to the successful implementation of the joint DOE and Department of State proposed action to manage foreign research reactor spent nuclear fuel.

Response to Comment 1121-4

Criteria for selection of ground transportation routes are set forth in U.S. Department of Transportation Regulations (49 CFR Part 397.101 (a) (2)). A state routing agency can designate a preferred route in compliance with 49 CFR Part 397.103.

There are no regulations or route selection criteria for transportation of radioactive materials by rail. Rail routes are fixed by the location of rail lines, and populated areas cannot be readily avoided. Rail transport impacts, including distances, populations, and accident rates, are evaluated in Appendix E of the EIS.

Response to Comment 1121-5

The methodology for evaluating and comparing transportation routes and modes is discussed in Appendix E and Section 4.2.3 of the EIS. Specific mixes of transportation routes and modes would be described in the individual Transportation Plans (Appendix H of the EIS) for each shipment of foreign research reactor spent nuclear fuel and evaluated by the reviewing government organizations, to ensure compliance with applicable regulations and criteria.

Response to Comment 1121-6

DOE considers that there is adequate regulatory and emergency preparedness infrastructure to ensure the safe acceptance and transport to designated management sites if the foreign research reactor spent nuclear fuel is managed in the United States. Federal funding to State, Tribal, and local governments for maintaining emergency response programs is discussed in Section 2.7.1. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advise and assistance to the State, Tribal and local agencies involved with a radiological incident. Emergency preparedness, security, and coordination of DOE with local emergency response authorities, and security are discussed in general in Sections 2.7 and 2.8 of the EIS. Details would be contained in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

C. GOVERNORS' MANAGEMENT DIRECTIVE

1. This resolution shall be conveyed to the President, the Secretaries of Energy and Transportation, the chairman of the Nuclear Regulatory Commission, and appropriate members and committees of Congress.

2. The Western Governors' Association staff, in cooperation with the Western Interstate Energy Board, shall monitor implementation of this resolution and provide the federal government with assistance in the development and implementation of a transportation plan for spent nuclear fuel and high-level radioactive waste.

RESPONSE TO COMMENT COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

Response to Comment 1121-7

Full-scale demonstration testing of spent nuclear fuel transportation casks were conducted in the United States in the 1970s to confirm that "Type B" casks that were built to Federal standards (10 CFR Part 71) could protect and retain its contents in the most severe of accidents. Similar tests have been conducted in the United Kingdom, Germany and Japan. In each of these tests, the cask prototype was deformed as predicted by analysis, but no simulated radioactive material was released.

COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

Western Governors' Association
Resolution 95 -021

June 26, 1995
Park City, Utah

SPONSOR: Governor Batt
SUBJECT: High-Level Nuclear Waste

A. BACKGROUND

1. The United States entered the nuclear age a half century ago with a woeful lack of planning for the storage and ultimate disposal of nuclear by-products.

2. In 1982, Congress attempted to come to terms with this situation by passing the Nuclear Waste Policy Act. That Act called for nuclear utility ratepayers to contribute financially to the establishment of a geologic repository. Since the passage of that legislation, nuclear utility ratepayers have contributed, with interest and other obligations, over $11 billion.

3. However, current efforts to open the high-level radioactive waste repository at Yucca Mountain now stand in great question. Originally that facility was to have been ready by 1998. Billions of dollars have already been spent. Billions more will be spent before that facility opens in 2010, if it opens at all. Others place the opening date of Yucca Mountain as late as 2030, again, if it opens at all.

4. Currently there are competing efforts in Congress to expedite the opening of Yucca Mountain. Some call for siting a Monitored Retrievable (also called an interim) Storage facility near the Yucca Mountain site. Still other members of Congress are attempting to defund the Yucca Mountain effort.

5. The President has stated that he cannot support any legislation currently before Congress regarding the Yucca Mountain facility.

6. The State of Idaho is presently in litigation with the U.S. Department of Energy to block shipments of federal and foreign spent nuclear fuel from entering its state, primarily because this Nation has not yet come to terms with what to do with its high level nuclear waste.

7. This year, the Mescalaro Apache Tribe in New Mexico voted to accept interim storage of commercial high-level spent nuclear fuel from commercial reactors. Initially tribal members voted to reject the proposal, but then reconsidered and voted to accept the proposition. That private disposal site effort is still in negotiation with the State of New Mexico.

RESPONSE TO COMMENT
COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

8. The Office of the Nuclear Waste Negotiator has been closed for both budgetary concerns and for a failure to come to a resolution on finding a community willing to become a nuclear waste disposal site.

9. However, thirteen years after the passage of the Nuclear Waste Policy Act, it continues to be apparent that despite the billions of dollars that have been spent and the billions of dollars that will yet be spent on opening Yucca Mountain, the current federal program to store this Nation's high-level spent nuclear fuel is in serious jeopardy due to cost, schedule, political, environmental and management difficulties.

B. GOVERNORS' POLICY STATEMENT

1. The Western Governors, consistent with previous WGA Resolutions (89-006, 92-009 and 93-007), continue to support geologic disposal as an appropriate means of managing and finally disposing of spent nuclear fuel and high-level radioactive waste.

2. The Western Governors call upon the President and Congress to work with the states in developing a fair, honest and scientifically sound course of action for the permanent disposal of the Nation's high-level radioactive waste.

1121-8

C. GOVERNORS' MANAGEMENT DIRECTIVE

1. The Western Governors' Association staff shall notify the President and all members of Congress of the passage of this resolution.

RESPONSE TO COMMENT COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

Response to Comment 1121-8

The commentor's preference for geologic disposal of spent nuclear fuel is noted. The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS).

COMMENTOR NO. 1121:
WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

Western Governors' Association
Resolution 92-004 (Revision 1)

Originally Adopted June 23, 1992
Jackson, Wyoming
Readopted June 26, 1995
Park City, Utah

SPONSORS: Governors Johnson and Geringer
SUBJECT: U.S. Department of Energy Transport of Nuclear Waste

A. BACKGROUND

1. This Nation must dispose of significant amounts of high-level and transuranic nuclear waste which continues to be held in temporary storage. The need for final disposal of this waste has become an issue of national concern.

2. The U.S. Department of Energy (DOE) is responsible for the management and permanent disposal of these wastes. Management and disposal will require transporting unprecedented quantities of high-level and transuranic nuclear waste.

3. Western states will bear most of the national burden of nuclear waste transport.

   a. The Waste Isolation Pilot Plant (WIPP) in New Mexico is DOE's planned disposal site for transuranic waste.

   b. The Yucca Mountain site in Nevada is being studied as the site for permanent disposal of commercial spent nuclear fuel and defense high-level waste.

   c. DOE has temporarily stored defense nuclear waste at six sites located in western states: Hanford (Washington), Rocky Flats (Colorado), Idaho National Engineering Laboratory, Nevada Test Site, Lawrence Livermore National Laboratory (California), and Los Alamos (New Mexico).

   d. DOE has proposed to bring spent fuel from foreign research reactors back to the United States for management as part of the national nuclear non-proliferation program.

RESPONSE TO COMMENT
COMMENTOR NO. 1121:
WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

e. DOE ships unclassified high-level and transuranic nuclear material among its facilities and other users. High-level cesium capsules are shipped in and out of the Hanford Washington facility.

4. Establishing public confidence that nuclear waste can be transported safely will require an extraordinary safety program, information to the public about that safety program and a continuing record of safe transportation.

5. The governors recognize the success of the transportation safety program developed under cooperative agreement among western states and DOE to prepare for transuranic radioactive waste shipments to WIPP. This safety program focuses on the states' prominent role in the areas of accident prevention, emergency response preparedness, and public awareness and participation. Components of the state/DOE WIPP program include:

   a. selecting routes
   b. inspecting shipments
   c. ensuring high-quality drivers
   d. safety audits of the carrier
   e. restrictions for travel when weather and road conditions are unsafe
   f. coordinated shipment scheduling and notification
   g. computer and satellite tracking of each shipment
   h. designating safe parking areas
   i. radiation detection and safety equipment
   j. emergency response planning, training and guidance
   k. informing and involving the public

6. The WIPP Transportation Safety Program was successfully adapted for application to DOE's recently concluded Cesium-137 Capsule Return shipping campaign between a commercial facility in Colorado and the Hanford site. This shipping campaign experienced no accidents and was completed almost one year ahead of schedule and under budget.

7. The DOE has identified important actions that could be taken to improve its transport safety program. Its Transportation Assessment and Integration (TRAIN) planning process has identified areas for safety

RESPONSE TO COMMENT COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

improvements and set useful program goals. The DOE has also taken important steps to improve communication and coordination with state, tribal, local, and professional associations through the Transportation External Coordination (TEC) Working Group.

B. GOVERNORS' POLICY STATEMENT

1. The objective of the Western Governors' Association is the safe and uneventful transport of nuclear waste from current temporary storage facilities to more suitable permanent repositories. The western governors are committed to working with Congress and DOE to achieve this objective. *1121-9*

2. Early coordination and effective communications with state, tribal, and local governments is essential to the ultimate success of any nuclear waste transportation safety program. *1121-1 (Cont'd.)*

3. DOE should proceed expeditiously with the implementation of the initiatives identified in TRAIN to provide uniform safety procedures and coordination with state, tribal, and local governments for route-controlled DOE shipping campaigns and shipments to DOE facilities. *1121-10*

4. A safety and information program similar to that developed with western states for shipments of transuranic waste to WIPP should be utilized for all route-controlled DOE shipping campaigns. Safety programs should be evaluated and improved as needed. *1121-11*

5. DOE should work to identify flexible funding resources and cooperative agreements between their civilian, power and defense agencies as a means for supporting WGA and DOE application of lessons learned through the WIPP safety program to other DOE shipping campaigns. *1121-12*

C. GOVERNORS' MANAGEMENT DIRECTIVE

1. The Western Governors' Association shall convey this resolution to the Secretary of Energy, appropriate congressional committees and the western delegation.

RESPONSE TO COMMENT COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

Response to Comment 1121-9

The commentor's support for safe transportation of spent nuclear fuel from foreign research reactors is noted. Spent nuclear fuel has been transported for nearly four decades along highways, rail routes, and waterways of the United States (Section 1.1 of the EIS). Several thousand of these shipments were by truck or rail. None of the shipments, including shipments involved in accidents, has ever resulted in a release of the radioactive contents of a spent nuclear fuel transportation cask (Section 4.2.3 of the EIS). No significant environmental effects would result from severe transportation accidents involving foreign research reactor spent nuclear fuel (Section 4.2.3 of the EIS).

Response to Comment 1121-10

If foreign research reactor spent nuclear fuel is managed in the United States, there is adequate regulatory and emergency preparedness infrastructure to ensure its safe acceptance and transportation to the designated management site. DOE is required to inform the Governor of each State and any Tribal chair, or their designee, along a transportation route at least seven days prior to shipment of hazardous cargos, including radioactive materials. It would be the responsibility of the Governor to provide any further notification to State and local authorities. A state routing agency can designate a preferred route, which shipments would be required to follow, in accordance with 49 CFR Part 397.103.

Emergency preparedness, security, and coordination of DOE with local emergency response authorities that would be involved with the acceptance and transportation of foreign research reactor spent nuclear fuel will be discussed in detail in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H of the EIS.

The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

Response to Comment 1121-11

Safety has been and remains a primary objective in the transportation of spent nuclear fuel from foreign research reactors. As discussed in Section 4 of the EIS, spent nuclear fuel, both foreign and domestic, has been transported in the United States for nearly four decades without a single radiological incident. Safety and security regulations are described in Section 5 of the EIS. In view of the routine nature of shipments of spent nuclear fuel, existing regulations, and the evaluation of environmental risks reported in Section 4 of the EIS, no special safety program is planned if a policy to accept foreign research reactor spent nuclear fuel is adopted.

COMMENTOR No. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

2. The WGA Technical Advisory Group for WIPP Transport is directed to continue working cooperatively with DOE to establish and implement an exemplary safety program necessary to reach a high level of public confidence that nuclear waste can be transported in a safe and uneventful manner. The Advisory Group is also to continue working with DOE to adapt and apply the safety programs developed for WIPP shipments to other rout-controlled DOE shipping campaigns and shipments to DOE facilities.

RESPONSE TO COMMENT COMMENTOR No. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

Response to Comment 1121-12

See response to comment 1121-11 immediately above.

COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

Western Governors' Association
Resolution 92-005 (Revision 1)

Originally Adopted June 23, 1992
Jackson, Wyoming
Readopted June 26, 1995
Park City, Utah

SPONSOR: Governor Gutierrez
SUBJECT: Emergency Preparedness For The Shipment of Radioactive Materials By Sea

A. BACKGROUND

1. Foreign shipments of radioactive materials, such as the plutonium oxide powder shipped from France to Japan in 1992, are expected to increase with the continued globalization of nuclear power and the wastes it produces.

2. In March 1995, the U.S. Department of Energy published a Draft Environmental Impact Statement on a *Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.* One of the strong options is to return the 22,700 spent nuclear fuel elements to the United States beginning in 1995. The return program is planned to take ten years.

3. The foreign research reactor spent fuel would originate from 40 nations, and would be shipped by sea to one or more of nine ports. Four of these ports are in western states – California, Texas, Oregon and Washington. In addition to the ports, those shipments which use Pacific shipping routes will pass near or through the territorial waters of the three Pacific Flag islands, and the states of Alaska and Hawaii.

4. These substances are classified as some of the most toxic and hazardous known to man, having half-lives in excess of 25,000 - 300,000 years. These same substances have been demonstrated to migrate up the food chain, of particular concern to the Pacific Flag islands which are dependant on commercial and subsistence fisheries, including many migratory species. Shipment of radioactive material by sea has unique environmental conditions and risks. *1121-13*

5. Under international law, any ship with an emergency can declare "*force majeure*, 7," which allows that vessel to enter a port or move through the

RESPONSE TO COMMENT COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

Response to Comment 1121-13

DOE agrees with the commentor on the hazardous nature of the foreign research reactor spent nuclear fuel and, to that end, would ship and receive such fuel only in compliance with all standards for safety, security, and minimal environmental impact. The environmental impacts of marine transport are discussed in Appendix C and Section 4.2.1 of the EIS.

COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

waters of a foreign state, and is excused from complying with the domestic law. The U.S. Coast Guard may block such entrance only if there is a threat to life or property, or the vessel poses an imminent threat to the safety of the port.

6. The Lead Federal Agency for an accident involving a transient shipment of nuclear material is the U.S. Environmental Protection Agency. Based on the National Contingency Plan, state, territorial and local governments have the primary responsibility for protecting the public and for emergency actions on land. The U.S. Coast Guard is responsible for radioactive releases in U.S. waters. The Department of Energy (DOE), Nuclear Regulatory Commission (NRC) and the Federal Emergency Management Administration (FEMA) will provide assistance if requested.

   FEMA has the responsibility to assist states, territories and local jurisdictions in radiological emergency planning and preparedness. Additionally, FEMA is charged with reviewing state, territorial and local radiological emergency response plans upon request.

7. The standards for shipment of radioactive materials by sea are set by the International Atomic Energy Agency (IAEA), and national regulations of the countries of origin and destination. The Department of Transportation sets the standards for the U.S. and for coordinating with IAEA and DOE (the U.S. representative to the IAEA). Both agencies depend on a package centered philosophy for protection in the event of an accident. The second barrier to radiation exposure is operational controls for handling and securing the package (container).

   Under IAEA standards the packages are designed and tested (in most cases a computer simulation can be used to demonstrate the performance) to meet normal transport accident conditions. The conditions under which these shipment will be made are much more extreme than those used for testing, e.g. the depths of the Pacific Ocean can exceed 12,000 feet, and ship board fires have been recorded at 1675 °F.

RESPONSE TO COMMENT COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

Commentor No. 1121: Western Governors' Association (Cont'd.)

B. GOVERNORS' POLICY STATEMENT

1. It is the objective of the western governors to ensure the safe and proper handling, storage, transportation, emergency response and cleanup of hazardous and radioactive materials. Materials that cannot be transported safely and protected against a "credable accident" scenario should not be transported.

2. Protocols which have been prepared and used by the Western Governors' Association for land transportation for radioactive materials are to be applied to ocean transportation, with special consideration given to marine conditions and risks. *1121-14*

3. The Governors urge the Federal Emergency Management Administration, Departments of Energy and Transportation and the Environmental Protection Agency to assist the western coastal states and Pacific Flag islands to plan and prepare to respond to potential incidences involving the return of foreign spent fuel. *1121-15*

4. The transport vessels and shipment packages (containers) must meet independently verifiable standards to withstand maritime accidents including collision, fire and sinking under the maximum credible accident scenario. *1121-16*

C. GOVERNORS' MANAGEMENT DIRECTIVE

1. The WGA staff shall convey this policy resolution to the President, appropriate Congressional members and committees, the Secretaries of Energy, State and Transportation, the Chairman of the Nuclear Regulatory Commission and the Administrator of the Environmental Protection Agency.

2. In accordance with the policy established by this resolution, the WGA staff is directed to work with federal agencies, Congress, and individual states and territories to address safety and environmental issues related to the return of foreign research reactor spent nuclear fuel.

Response to Comment Commentor No. 1121: Western Governors' Association (Cont'd.)

Response to Comment 1121-14

DOE will work closely with the commentors in developing plans and protocols for safe transportation of foreign research reactor spent nuclear fuel for both marine and ground transport.

Response to Comment 1121-15

DOE accepts the commentors' recommendation and has established a Transportation External Coordination/Working Group, including the WGA, to address cross-cutting transportation and emergency response issues. Section 2.7.3.3 of the EIS lists the organizations that are part of this Working Group.

Response to Comment 1121-16

Ships and casks that would be used to transport the foreign research reactor spent nuclear fuel under Management Alternatives 1 and 3 of the proposed action would be required to meet all applicable regulations and standards for safety, including IAEA regulations for package integrity, and U.S. Department of Transportation Regulations (49 CFR Parts 171-178) governing packaging and shipment of radioactive materials. Appendix B, Sections B.2.1.1 - B.2.1.3 of the EIS present a discussion of cask and transportation standards.

COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

Western Governors' Association
Resolution 89-024 (Revision 2)

Originally Adopted December 1, 1989
Las Vegas, Nevada
Readopted June 26, 1995
Park City, Utah

SPONSOR: Governor Miller
SUBJECT: Storage of Spent Commercial Nuclear Reactor Fuel

A. BACKGROUND

1. Through the Nuclear Waste Policy Act of 1982 the Federal Government has the responsibility to provide for the permanent disposal of spent nuclear fuel.

2. Through the Nuclear Waste Policy Act, Congress found that the owners and operators of nuclear power reactors have primary responsibility for providing interim storage of spent nuclear fuel. The Act requires that federal officials expedite the effective use of existing reactor storage facilities and the addition of needed new storage capacity, consistent with:

   a. the protection of public health and safety, and the environment;
   b. economic considerations;
   c. continued operation of such reactor;
   d. any applicable provisions of law; and
   e. the views of the population surrounding such reactor.

3. The U.S. Department of Energy (DOE) originally projected that a geologic repository would be available for acceptance of spent nuclear fuel in 2003. Recently DOE revised their schedule to project that the repository will not be available until at least 2010.

4. Since the repository will not be available for spent fuel disposal in 2003, commercial nuclear reactors in the nation will require additional spent fuel storage capacity beyond that which is, or can be made, available in existing spent fuel storage pools at the individual reactor sites.

5. Both DOE and the Nuclear Regulatory Commission (NRC) have determined that technology for safe, cost effective, dry cask, at-reactor storage exists, and some designs are currently licensed and in use in this country and abroad.

RESPONSE TO COMMENT COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

6. The Monitored Retrievable Storage Review Commission has concluded that a Monitored Retrievable Storage System (Interim Storage Facility) is not justified as conceived under current law. They further concluded that spent fuel storage should be available away from the reactor site for health and safety emergencies. For circumstances which threaten the continued operation of reactors, a User-Funded Interim Storage facility (UFIS) should be built. The costs of such a facility should be incurred by the rate payers.

B. GOVERNORS' POLICY STATEMENT

1. It is the objective of the Western Governors' Association to support the national policy for permanent, safe, geologic disposal of spent nuclear reactor fuel. Congress and the Federal Government must anticipate that, if the permanent geologic repository does not open on schedule, most reactors will need interim storage. It must be assured that any interim storage is safe, cost effective and fiscally equitable to the rate payers.

2. The Western Governors' Association acknowledges the adoption by NRC of the statement of confidence for at-reactor passive storage. With the statement of confidence, and the permanent geologic repository not being available, the Western Governors' Association endorse at-reactor dry storage, where such storage is permissible under state law, as an acceptable means of interim storage until a permanent geologic repository becomes available.

1121-17

3. An Interim Storage Facility shall not be located within the geographic boundaries of a state without that state's Governor's written consent.

4. The West is getting stuck with disposing of the nations nuclear and radioactive waste.

5. The West should be given assurances by DOE that disposal in the West is safe and acceptable.

6. Consequently, spent nuclear fuel waste should remain at commercial facilities until the following issues are resolved to the satisfaction of the western states:

RESPONSE TO COMMENT COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

Response to Comment 1121-17

The commentor's support for geologic disposal of spent nuclear fuel is noted. If a policy to accept spent nuclear fuel from foreign research reactors is adopted, the management techniques, facilities, and sites discussed in Sections 2.2.1.8, 2.6.5 and 3.3 of the EIS would be implemented. Estimated costs of the various policy alternatives evaluated in this EIS are described in Section 4.9 of the EIS.

As discussed in Section 1.2 of the EIS, many of the foreign research reactor operators have no immediate means for disposing of their spent nuclear fuel due to financial or regulatory constraints. Overseas management of foreign research reactor spent nuclear fuel is discussed in Section 2.3 of the EIS.

If a policy of acceptance were adopted for foreign research reactor spent nuclear fuel, the United States Government would cooperate to the fullest extent possible with governors representing states where interim management sites are located.

Ultimate disposition of foreign research reactor spent nuclear fuel is outside the scope of this EIS (Section 1.3 of the EIS). However, a qualitative discussion of ultimate disposition is provided in Section 4.2.7 of the EIS.

Candidate management sites for foreign research reactor spent nuclear fuel are described in Section 3.3 of the EIS. As discussed in Section 4.2.4 and Appendix F of the EIS, foreign research reactor spent nuclear fuel could be safely managed at one or more of these management sites pending final disposition.

COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

a. That the DOE has an acceptable transportation plan for shipping this waste to western disposal sites.

b. That the DOE has adequate infrastructure capacity to handle and dispose of this waste.

c. That the DOE has ensured adequate responder training in case of an accident of mishap while shipping this waste to a western disposal facility.

1121-17 (Cont'd.)

C. GOVERNORS' MANAGEMENT DIRECTIVE

1. The Western Governors' Association shall convey this resolution to the appropriate members and committees of Congress, the Secretary of the Department of Energy, and the Nuclear Regulatory Commission.

2. The Western Governors' Association and the Waste Task Force are to work with Congress, the Nuclear Regulatory Commission, the U.S. Department of Energy and the National Association of Utility Regulators to develop the appropriate elements of policy to anticipate the need for interim storage.

RESPONSE TO COMMENT COMMENTOR NO. 1121: WESTERN GOVERNORS' ASSOCIATION (CONT'D.)

EGAN & ASSOCIATES, P.C.
Counselors at Law

2300 N Street, N.W.
Washington, D.C. 20037
Telephone (202) 663-9200
Fax (202) 663-9066

July 18, 1995

VIA COURIER

Mr. Charles Head
Program Manager
Office of Spent Nuclear
Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585

RE: COMMENTS OF THE "EDLOW GROUP" ON DOE's DRAFT ENVIRONMENTAL IMPACT STATEMENT ON A PROPOSED NONPROLIFERATION POLICY CONCERNING FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL (DOE/EIS-0218D)

Dear Mr. Head:

The Edlow Group, an association of fifteen of the world's largest and most important research reactors from twelve countries, commends DOE on its completion of the subject Draft Environmental Impact Statement. For reasons that are articulated in our detailed comments attached, the Edlow Group strongly supports the adoption by DOE of Management Alternative No. 1 in its basic implementation approach, but with no time limit on receipts other than that of the life of each respective facility which has participated in the RERTR program.

Attached to our detailed comments are copies of many individual comments prepared by several of our research reactor operators and their governments, as well as copies of comments submitted to DOE by the Euratom Supply Agency and the International Atomic Energy Agency.

COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

EGAN & ASSOCIATES, P. C.
Counselors at Law

We hope that DOE will move expeditiously to complete the draft EIS and will issue a ROD within 30 days thereafter.

Please call if you have any questions concerning our comments.

Sincerely,

Joseph R. Egan
Attorney for the Edlow Group

cc: Assistant Secretary Thomas P. Grumbly
Ms. Ellie Busick, Department of State
Ms. Jeanine Sweeney, Esq.
Mr. Abe Zeitung (SAIC)

RESPONSE TO COMMENT
COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

COMMENTS OF THE "EDLOW GROUP" ON DOE's DRAFT ENVIRONMENTAL IMPACT STATEMENT (DOE/EIS-0218D) ON A PROPOSED NUCLEAR NONPROLIFERATION POLICY FOR FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL

July 1995

The Edlow Group thanks the Department of Energy ("DOE") for the opportunity to provide comments on DOE's Draft Environment Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, DOE/EIS-0218D, dated March 1995. Moreover, the Edlow Group is pleased to have participated in DOE's public meeting on May 31, 1995 in Washington D.C. to discuss issues raised in the draft EIS with members of the public, the environmental and nonproliferation communities, and other interested persons.

I. THE "EDLOW GROUP"

Edlow International Company (an international nuclear fuel shipping and traffic management company) and Egan & Associates, P.C. (a Washington D.C. law firm) currently represent fifteen of the world's largest and most important foreign research reactors from twelve countries on four continents in their collective efforts to foster a solution to the crisis in spent fuel management that arose from expiration of DOE's Off-Site Fuels Policy for the receipt of U.S.-origin foreign research reactor spent nuclear fuel. Our group of reactor facilities has been referred to collectively as the "Edlow Group" or the "Foreign Research Reactor Spent Fuel Project." The vast majority of our reactor facilities are foreign-government owned. The Edlow Group has received the strong support and active participation of senior embassy representatives and government officials from most of the foreign nations whose facilities participate in the group. Moreover, the Euratom Supply Agency and the International Atomic Energy Agency ("IAEA") have served as participating observers of the activities of the Edlow Group, and both have separately filed comments on the draft EIS.

Members of the Edlow Group currently include the following foreign participants, some of which operate more than one reactor facility:

1. Studiecentrum Voor Kernenergie SCK/SEN (BR-2/Mol, Belgium)
2. Risoe National Laboratory (DR-3/Denmark)

COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

3. Austrian Research Center Seibersdorf (ASTRA)
4. Swedish Nuclear Fuel & Waste Management Company (R-2/Studsvik)
5. Paul Scherrer Institute (SAPHIR/Switzerland)
6. Hahn-Meiter-Institute (BER-II/Berlin)
7. Delft University of Technology (HOR/the Netherlands)
8. National Centre for Scientific Research "Demokritos" (GRR-1/Greece)
9. Atomic Energy of Canada Limited/McMaster University
10. Australian Nuclear Science & Technology Organization (HIFAR/ANSTO)
11. Forschungszentrum Geesthacht GmbH (FRG-1/GKSS, Germany)
12. Physikalisch-Technische Bundesanstalt (PTB/Germany)
13. Technical University of Munich (Germany)
14. Japan Atomic Energy Research Institute (JAERI)
15. L'Energia e l'Ambiente (ENEA/Italy)

Many members and participating observers of the Edlow Group have separately filed individual comments on the draft EIS with DOE. The Edlow Group urges DOE to pay particular attention to those comments, many of which contain additional details on the situation facing individual facilities. No attempt will be made here to duplicate all such comments. However, Attachment No. 1 does contain a compilation of copies of individual comments obtained by the Edlow Group. This compilation may or may not be complete.

II. OVERALL ASSESSMENT OF THE DRAFT EIS

The Edlow Group commends DOE on its completion and release of the Draft EIS. Although we remain dismayed that it took DOE more than seven years to arrive at this point in its environmental studies -- during which time our spent fuel problems were compounded to crisis proportions -- we believe, subject to certain reservations

RESPONSE TO COMMENT
COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

expressed below, that the Draft EIS represents a comprehensive and competent analysis by DOE, for which we are grateful. Moreover, we had a representative present at most of the public meetings DOE held on the Draft EIS across the United States, and we believe the public raised very few substantive criticisms of DOE's analysis.

Given the thoroughness of the draft EIS, coupled with the paucity of substantive (as opposed to political) criticisms by the public, we see no justifiable reason why DOE should fail to meet (or indeed, better) its scheduled release date for the final EIS of September 30, 1995. We urge DOE, in the strongest possible terms, to release its Record of Decision on the final EIS no later than the required 30 days following release of the Final EIS. We would note for the record that, since 1988, DOE has missed every deadline announced or established for its environmental review process, often for gratuitous reasons. Nevertheless, we sincerely hope and expect that DOE's repeated commitments that the environmental review process will be completed prior to the end of 1995 will be honored. 1130-1

For reasons articulated below, the Edlow Group strongly supports the adoption by DOE of Management Alternative No. 1 in its basic implementation approach, but with no time limit on receipts other than the that of the life of each respective facility which has participated in the RERTR program. 1130-2

On environmental as well as policy grounds, the draft EIS clearly supports the issuance by DOE of a Record of Decision to proceed with the return of U.S.-origin foreign research reactor spent fuel to the United States. We see no evidence in the draft EIS, and have seen none offered by any other agency or member of the public, that receipt of such spent fuel would pose a significant threat to the environment, or a risk to the public health and safety of U.S. citizens. On the other hand, the draft EIS extensively documents the fact, which is supported by a plethora of other U.S. and foreign agencies and environmental/nonproliferation experts, that failure by the U.S. to proceed with receipts of U.S.-origin foreign research reactor spent fuel would unravel a heretofore successful nonproliferation program of the United States, would compromise U.S. relations with friendly foreign partners, and would harm U.S. efforts to build similar nonproliferation regimes in China and Russia. 1130-3

We believe the draft EIS, coupled with the strong endorsements of President Clinton, two Energy Secretaries, two Secretaries of State, the Deputy Secretary of Defense, the National Security Council, the Arms Control & Disarmament Agency, the Nuclear Regulatory Commission, the General Accounting Office, the International Atomic Energy Agency, the Commission of the European Communities, the Euratom Supply Agency, over a dozen Ambassadors, the Carnegie Endowment for International Peace, the Natural Resources Defense Council, and the Nuclear Control

Response to Comment No. 1130-1

DOE is committed to completion of the final EIS and issuance of the Record of Decision as quickly as practicable.

Response to Comment No. 1130-2

The commentor's support for the basic implementation of Management Alternative 1, as described in Section 2.2.1 of the EIS is noted. Also noted is the suggestion that the policy period should have no time limit other than the life of each respective facility which has participated in the RERTR program. The basic implementation of Management Alternative 1 analyzed in the EIS is for a 10-year policy period.

DOE and the Department of State consider that the 10 year duration of the proposed action would be long enough to allow the United States to accept essentially all of the foreign research reactor spent nuclear fuel containing HEU enriched in the United States (or to arrange for the reprocessing of spent nuclear fuel and blending down of the HEU). Furthermore, by accepting spent nuclear fuel from foreign research reactors under the limitations specified in the proposed action, the reactor operators will have been given a powerful incentive to convert to operation on LEU fuels during the effective period of the policy. In parallel with these actions to drastically reduce the amount of U.S.-origin HEU in international commerce and convert research reactors to LEU fuel, the United States is separately working to eliminate other current or potential sources of HEU, such as from Russia or China, by encouraging these nations to establish foreign research reactor spent nuclear fuel management policies similar to that of the United States. Thus, by the end of any policy period that might be established, DOE and the Department of State hope to have reduced the availability of HEU for use in civil programs to the point where it is no longer a viable option for use as research reactor fuel, and to have enabled almost all of the research reactors to switch to LEU operations. In the absence of further sources of HEU, the reactors would have no option to switch back to HEU, the reactors would have no option to switch back to HEU fuel after expiration of any new policy that might be established.

A substantially longer period of acceptance might result in more material ultimately being accepted, but would also lessen the near term incentives for conversion.

Response to Comment No. 1130-3

All participating U.S. agencies and authorities are well aware of the effect of a failure of the program. The issue is one of balancing numerous competing interests, including nuclear weapons nonproliferation, taxpayer concerns, and cleanup at DOE sites. As discussed in Section 4 of the EIS, risks associated with implementation of the proposed action to human health or the environment are low.

COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

Institute, provides DOE with overwhelming U.S. bipartisan and global support to make a decision based on sound policy rationale rather than on narrow political or economic interests or in reaction to challengers whose principal complaint, notwithstanding reaping decades of direct economic benefit from DOE's Off-Site Fuels Policy, is now one of "Not-In-My-Backyard." Likewise, we do not believe DOE should be deterred from making the right decision by threats of litigation from those whose substantive challenges -- due to DOE's sound analytical work -- are likely to be unsuccessful in court on environmental grounds.

As a result of South Carolina's litigation against DOE concerning receipts of shipments under DOE's April 1994 Environmental Assessment of Urgent Relief Shipments, DOE now has a useful and compelling precedent in the Fourth Circuit which should make it easier to defend successfully any litigation brought by South Carolina challenging DOE's final EIS.

III. IMPORTANT OMISSIONS FROM THE DRAFT EIS

A. Background Documents

Several important background documents were omitted from Appendix G of the draft EIS and are unfortunately not discussed in the text of the draft EIS. Those are:

- The October 25, 1994 letter to DOE from Jack Saunders, Deputy Director, Access Management, the National Security Council, declassifying a portion of President Clinton's Presidential Policy Directive PDD-13 as it applies to accelerating efforts to return the U.S. foreign research reactor spent nuclear fuel. (See Attachment No. 1.)

- Three sworn affidavits by Secretary of State Warren Christopher, Acting Secretary of State Strobe Talbot, and Under Secretary of State Lynn Davis, all of which were filed in 1994 and 1995 in DOE's litigation concerning its April 1994 Environmental Assessment, and all of which attest to the compelling foreign policy and nonproliferation rationale underlying the return of U.S-origin foreign research reactor spent fuel. Copies of these affidavits are attached as Attachments Nos. 2 to 4.

- The April 4, 1994 letter to Hazel O'Leary by Deputy Secretary of Defense John Deutsch, which underscores the national security importance of receipt of U.S.-origin foreign research reactor spent fuel, and which sets forth the Defense Department's position on the price to

1130-4

RESPONSE TO COMMENT
COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

Response to Comment No. 1130-4

Documents listed in this comment have been added to Appendix G of the EIS and are cited in Section 1.1 of the EIS.

be charged for such receipts (no more than $2000 per kilogram). A copy of the letter, which was also filed in the EA litigation, is attached as Attachment No. 5.

- A joint letter to Secretary of State Christopher, dated February 15, 1995, signed by seven Ambassadors, the Head of the Delegation of the European Commission, and three other senior foreign government representatives, urging the prompt completion of DOE's environmental reviews and asking DOE to renew its previous policy of receiving U.S.-origin foreign research reactor spent fuel. (Copy attached as Attachment No. 6.)

- Letters received by DOE from the U.S. Nuclear Regulatory Commission (which were attached in DOE's EA) urging that DOE reinstate its policy of receiving U.S.-origin spent research reactor fuel.

- The September 1992 letter to DOE from the Secretariat of the RERTR Annual Conference in Roskilde, Denmark (also in the EA), which notes that research reactors will no longer support the RERTR program unless DOE moves quickly to complete its environmental reviews and begin accepting returns of U.S. origin spent fuel.

1130-4 (Cont'd.)

B. Legal Considerations

The draft EIS is inexplicably silent on the legal obligations of the United States to accept the return of U.S. origin foreign research reactor spent fuel. Yet, this is obviously a relevant consideration both to DOE and to the public generally. At the public meeting on the draft EIS in North Augusta, South Carolina, questions from the public made it obvious that peoples' views on the viability of DOE's proposals are influenced in part by whether DOE has an obligation to accept return of the spent fuel. Legal considerations are relevant as well to U.S. taxpayers, who may one day be tasked with paying damages for breach of U.S. obligations. Legal obligations are also clearly relevant to U.S. diplomatic relations with any countries with which it made commitments.

1130-5

In implementation of its Environmental Assessment last year, DOE executed contracts with eight foreign research reactor facilities for the return of specified elements of spent fuel, not all of which have yet been returned. DOE has a legal obligation to receive those elements which have not yet been returned.

Response to Comment No. 1130-5

With the exception of cases in which DOE has executed contracts and all necessary supporting documents for acceptance of spent nuclear fuel from specific foreign research reactors, DOE considers that neither DOE nor the United States Government has any legal obligation to receive spent nuclear fuel from foreign research reactors.

In the specific case of the shipments covered by the Urgent-Relief Environmental Assessment (DOE/EA-0912), all spent nuclear fuel eligible for acceptance under that environmental assessment has been safely transported to the United States.

Notwithstanding the absence of any legal requirements, the proposed action would support long-standing U.S. nuclear weapons nonproliferation policy. Failure to implement the proposed policy would subject the United States and its allies to the risk that some of the HEU intended for use in research reactors might be diverted into the production of nuclear weapons, or otherwise harm U.S. nuclear weapons nonproliferation programs.

COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

DOE also has a signed agreement with ANSTO for the return of Australian spent research reactor fuel.

For those research reactor facilities which converted their facilities under the RERTR program, DOE's agent Argonne National Laboratory executed contracts for the return of specific RERTR fuel elements when spent.

As is abundantly clear in the attached affidavit by Under Secretary of State Lynn Davis (Attachment No. 3), the RERTR program and the Off-Site Fuels Policy were always "essential complements" of each other. Foreign reactors and their governments agreed, at substantial cost, to participate in RERTR with the understanding that the U.S. would continue to receive their spent fuel. As the arrangement is described in Ms. Davis' affidavit, it has all the elements of a contract, with a clear *quid pro quo*.

Various of the research reactor operators in the Edlow Group have other documents, including commitment letters or written assurances from DOE or the Atomic Energy Commission, that their spent fuel would be returned. The reactor operators relied, to their detriment, on these commitments and assurances. These assurances, in fact, forestalled development of a European solution for spent research reactor fuel in Europe, as might have occurred in the absence of such assurances. The legal doctrine of promissory estoppel, or justifiable reliance, is likely to apply in such circumstances.

1130-5 (Cont'd.)

Moreover, many of the foreign research reactors were sold by the United States with the understanding that spent fuel would be returned to the U.S. This fact is evidenced in written documents in some cases, in the fact that many of the facilities were sold and constructed without spent fuel storage facilities, and by the fact that, prior to 1964, U.S. fuel could only be leased from the U.S. and could not be sold. DOE's course of conduct over three decades of receiving this fuel ratifies any such initial understandings.

Thus, the foreign community believes that DOE's legal obligations are indeed an important, if not superseding, consideration which should be explained to the public, or at least discussed. If DOE believes such an obligation does not exist, it should explain in the final EIS why it believes this is the case, providing appropriate responses to and analysis of the points raised here. In that case, however, DOE should explain that many members of the Edlow Group, and perhaps other reactors and their governments, hold a different view, and that such differences may pose certain costs or adverse impacts for the U.S., particularly in the event DOE chooses the "no action" alternative.

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RESPONSE TO COMMENT
COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

Finally, in the view of the reactor operators in the Edlow Group, the *quid pro quo* established with the RERTR program requires DOE, as a matter of law, to accept return of all U.S.-origin spent foreign research reactor fuel for RERTR participants, without any time limit, and for the life of the facilities which have agreed to convert to LEU fuel. DOE's proposed limitation of such receipts to a specific time period is inconsistent with DOE's RERTR commitment, and departs from traditional contract principles, even if, as discussed below, some reactor facilities are prepared voluntarily to accept time restrictions on receipts. 1130-5 (Cont'd.) 1130-6

C. **Presidential Policy Directive**

The EIS fails to explain the obvious discrepancies between DOE's proposed policy simply to "manage" foreign research reactor spent fuel (perhaps overseas) and the declassified portion of President Clinton's nonproliferation policy directive PDD-13 as it relates to the return of foreign research reactor spent nuclear fuel. As illustrated in Attachment No. 1, the declassified portion of PDD-13 calls for the U.S. "to accelerate steps towards implementing a policy of taking back U.S-origin spent fuel from foreign research reactors." (Emphasis added.) In our view, therefore, the only alternative under exploration by DOE that is consistent with the President's nonproliferation policy is Management Alternative No. 1. DOE provides no explanation for its deviation from the President's policy in its exploration of the other alternatives analyzed. (See also, p. 1-1 of Volume 1 of the draft EIS.) 1130-7

The Edlow Group is disappointed that DOE has chosen to retreat from Secretary O'Leary's proposed policy to take back U.S.-origin spent research reactor fuel as announced in her July 13, 1993 letter to Secretary of State Christopher. Secretary O'Leary's original proposal was fully consistent with President Clinton's nonproliferation policy and, indeed, formed part of the framework for that policy.

D. **Price Considerations**

While the draft EIS includes a discussion (addressed below) of cost issues, price issues are not addressed in any significant detail. Foreign research reactor operators agree that DOE's decisions with respect to selection of a management alternative should not be predicated on price issues. However, at the same time, they want to make certain that DOE understands that at some price level (both for shipping and for storage/disposal), any alternative can be rendered illusory. 1130-8

RESPONSE TO COMMENT
COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

Response to Comment No. 1130-6

The reason for the limitation of managing foreign research reactor spent nuclear fuel to a specific time period is explained in the response to comment 1130-2 above.

Response to Comment No. 1130-7

The commentor's opposition to managing foreign research reactor spent nuclear fuel overseas is noted. As discussed in Section 1.2 of the EIS, the proposed action is one action among many pursued by the United States to reduce the potential for the proliferation of nuclear weapons. More specifically, the intent of the proposed action is to support the U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, highly enriched (weapons-grade) uranium from civil programs worldwide. The management and implementation alternatives considered in the EIS satisfy Presidential Policy Directive 13, and U.S. environmental laws that require the evaluation of reasonable alternatives to satisfy the purpose and need for the proposed action.

Response to Comment No. 1130-8

With respect to cost and price considerations, the following points are noted:

- DOE would have to balance the interests of taxpayers, foreign research reactor operators, and U.S. nuclear weapons nonproliferation goals. Many taxpayers urge no U.S. subsidization. Representatives of the foreign research reactors urge a return to the 1988 fees. Organizations interested in nonproliferation favor a balance. In attempting to design a fee structure that is reasonable and fair, DOE must look to the cost of alternative approaches to managing the spent nuclear fuel. In the case of reprocessing, Dounreay provides the most obvious market-based comparison.
- DOE is aware of the repercussions from setting a fee far in excess of the level considered reasonable by the foreign research reactor operators. DOE is also aware of the repercussions from setting a fee far below the cost to the United States for providing the spent nuclear fuel management services.

COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

As underscored by the Department of Defense in April 1994:

> The return of research reactor spent fuel is an important part of the Administration's nonproliferation efforts and its goal of minimizing the civil use of highly enriched uranium. The price charged to research reactor operators is critical to the success of this endeavor. We share the Department of State's view that the price should not be so high as to discourage foreign reactor operators from returning this HEU to the United States. Too high a price would seriously damage the Administration's nonproliferation efforts.
>
> ... The Department of Defense joins the Department of State to urge strongly that the Department of Energy charge no more than $2000 per kilogram. The expenses are small compared to the national security benefits.

1130-8 (Cont'd.)

Letter from Deputy Secretary John Deutsch to Energy Secretary Hazel O'Leary, April 8, 1994 (Attachment No. 5).

The magnitude of the price selected by DOE for implementation of any alternative may well determine whether research reactors move ahead in partnership with DOE or abandon any DOE management option in pursuit of heretofore less palatable business and nonproliferation alternatives.

We would note for the record that, prior to DOE's sudden cessation of receipt of foreign research reactor fuel in 1988, DOE had been charging what was asserted to be a "full cost recovery" rate of roughly $1000 per kilogram of heavy metal (excluding shipping). This fee included the cost of ultimate disposal in the United States of the wastes from reprocessing. Furthermore, the reactor operators were given a credit for retention by DOE of the valuable high-enriched uranium contained in the fuel. Thus, the net "full cost recovery" figure prior to 1988 was well under $1000 per kilogram.

1130-9

Foreign research reactor operators understand that times have indeed changed, and that the costs of environmental management of radioactive wastes and spent fuel are now projected to be significantly higher than was previously estimated. They understand, as well, that inflation has likely produced a readily calculable, although modest, price escalation from previous times. Nevertheless, the Edlow Group believes (particularly insofar as ultimate disposal costs are discounted from a point well into the future so that they are relatively modest now on a discounted present

RESPONSE TO COMMENT
COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

- Costs have been estimated on a stand-alone basis where they would be truly stand-alone (e.g., shipping), on a shared basis when they would be shared (e.g., waste disposal), on a marginal basis where they would be marginal (e.g., concurrent operations at the Savannah River Site), and so forth.

Response to Comment No. 1130-9

DOE is aware that at some price level, any alternative could be rendered illusory. DOE is also aware that taxpayers would be extremely sensitive to subsidizing developed countries. The idea of a competitive fee for spent nuclear fuel management (independent of transportation costs) is DOE's attempt to balance these interests.

Costs for all phases of nuclear materials and nuclear waste handling, storage, shipping, disposal, reprocessing, etc. have escalated far in excess of the general price level since DOE last charged what was then-termed a full cost recovery fee. No effort was made to baseline the current estimates to the 1988 estimates. Rather, current estimates were based on quotes or estimates from the DOE management sites, Edlow International, shipping journals, and various DOE offices.

Ultimate disposal costs make up by far the largest component of program costs on an undiscounted basis. The very high undiscounted costs and the low discount rate in the draft EIS generate a high net present value, rather than a modest one. In the final EIS, the most recent (February 1995) Office of Management and Budget discount rate is used. This newer rate is higher than the previous rate (4.9 percent vs. 2.8 percent) and thus the net present value is much lower. This also creates a risk that fees based on the lower net present value would be too low over time.

DOE considers that Dounreay provides a realistic basis for assessing the competitive market. It is an option for owners of a substantial portion of the foreign research reactor spent nuclear fuel. DOE estimates that on the basis of a country's ability to accept the reprocessing waste from Dounreay, about 25 percent of the total spent nuclear fuel (by element count) could be reprocessed at Dounreay. Thus, the price charged by Dounreay is of significance.

value basis) that any large departure from the previous price number will constitute an unaffordable and unjustified burden on the foreign reactors at a time when their operating costs have already been driven to excessive levels due to delays by DOE in completing its environmental reviews.

In short, we think "price" is a material consideration in evaluating EIS options, shipping arrangements and modes of transport, insofar as prices alone can undermine the objectives to be accomplished by the planned action. We agree with the Department of Defense that any DOE management price in excess of $2000 per kilogram would have important adverse repercussions among the reactor owners, and would seriously undermine the Administration's nonproliferation objectives. We believe the draft EIS's notion that a "competitive" price can be set simply in reference to Dounreay's current charges is groundless on any economic, business, or policy basis.

1130-9 (Cont'd.)

In determining the appropriate prices to be charged, DOE should give recognition to the value and importance of the RERTR participants' voluntary contributions, both past and future, toward the accomplishment of U.S. nonproliferation goals. Any charges by DOE should also reflect the fact that DOE must manage a large inventory of domestic research reactor spent fuel and other similar DOE spent fuel whether foreign fuel is received or not. Thus, in many respects, costs attributable to management of foreign fuel reflect only incremental costs, and not, as the draft EIS appears to imply, stand-alone costs. While foreign research reactor operators have affirmed their commitment not to ask the U.S. taxpayer for a subsidy, neither do they wish to subsidize the U.S. taxpayer for costs DOE must incur in any event.

1130-10

The Edlow Group agrees with the U.S. General Accounting Office, which has recommended, in GAO/RECD-94-119 (p. 4)), that DOE should assess charges that balance the need to minimize the cost burden on the U.S. with the reactor operators' need for a reasonable affordable charge. We note that the fundamental purpose of DOE's proposed policy is not simply to provide a commercial service, but to accomplish vital U.S. nonproliferation goals.

E. NRC Consultation

According to Table 5-1 of the draft EIS, DOE has apparently failed to consult with the U.S. Nuclear Regulatory Commission. Given NRC's previously expressed interest in the foreign research reactor spent fuel crisis, coupled with NRC's cognizance over various aspects of nuclear materials transportation and storage, we believe DOE should solicit the views of NRC. We think this is especially true in the

1130-11

DOE is aware of the support for a fee of $2,000/kgTM, (excluding shipping). DOE will, nevertheless, attempt to balance numerous competing interests in establishing the fee. The draft EIS does not explicitly suggest a fee structure since this is considered out of scope. The final EIS shows the effect of various fees on the cost of the program to the U.S. taxpayer.

Response to Comment No. 1130-10

The analysis in the EIS recognizes the costs of managing DOE's existing inventory of spent nuclear fuel. Costs for the foreign research reactor program are allocated appropriately. For example, costs for chemical separation would be allocated incrementally based on an assumption that chemical separation operations for foreign research reactor spent nuclear fuel would either be carried out concurrently with other program proposals (i.e., the Interim Management of Nuclear Materials EIS) or would not be conducted at all. Costs for geologic disposal would be based on an allocation of average costs for the entire civilian radioactive waste program. Staging and storage costs would be based on facilities large enough to cover all the foreign research reactor spent nuclear fuel as well as other similar costs arriving at or being managed at a management site (e.g., domestic research reactor spent nuclear fuel at the Savannah River Site).

DOE agrees with the GAO and with Edlow on the need to balance the cost burden.

Response to Comment No. 1130-11

The commentor's suggestion that DOE consult with the NRC on the spent nuclear fuel proposed action and alternatives is noted. A copy of the draft EIS was provided to the NRC for that purpose. To the extent that NRC regulations would be germane to issues concerning the proposed action, consultation with NRC or reference to regulations has been made. Appropriate regulations are referenced in the EIS and are also summarized in Section 5.

COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

area of transport arrangements. Based on public discussions with NRC officials concerning the September 1994 shipment of 153 spent fuel elements to the U.S., we believe NRC would not support any policy by DOE to pre-determine either a port or a specific transport mode.

1130-11 (Cont'd.)

F. Fresh and Non-Self-Protecting Fuel

The draft EIS does not address the return of U.S.-origin fresh HEU fuel. Since such fuel is arguably the greatest proliferation risk, the draft EIS should address it and provide a proposed means to deal with it quickly.

Similarly, the draft EIS does not address the fact that, as some U.S.-origin HEU spent fuel has aged, it has become "non-self-protecting" as defined in international security regulations, making it riskier material. This fuel, too, should be given a very high priority by DOE.

1130-12

In both cases described, the U.S. would appear to have an extremely high obligation and duty to return or otherwise manage such fuel.

IV. TIMING AND TRANSITION CONSIDERATIONS

The draft EIS does not address in any significant detail the timing and transition considerations that may complicate DOE's adoption of any management alternative unless the ROD on the final EIS is promptly issued as early as possible in 1995 and substantial shipping can begin immediately in early 1996.

If DOE chooses adoption of a management alternative permitting shipment to the U.S., prioritization of many urgent shipments will be required. The Edlow Group has previously provided to DOE a list of foreign research reactors which must ship, collectively, over a thousand spent fuel elements commencing early in 1996. DOE has in many cases confirmed these numbers through its own surveys, as well as in on-site inspections in Europe. We understand that, in separate comments, the International Atomic Energy Agency will be submitting to DOE a proposed prioritization for receipts by DOE which is based on a nonproliferation/safety rationale. Our understanding is that the IAEA will call for receipt first of fresh HEU fuel, then non-self-protected spent HEU fuel, then HEU spent fuel from facilities where physical security is lax, followed by HEU spent fuel receipts from facilities which are in poor physical condition, followed by spent fuel from facilities which will experience the most urgent operational problems.

1130-13

RESPONSE TO COMMENT
COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

Response to Comment No. 1130-12

Fresh HEU fuel is addressed in Section 2.1 of the EIS under "Qualifying Fuel Types and Policy Stipulations," fifth bullet. DOE considers that it is not necessary to address the order in which the spent nuclear fuel might be accepted in the EIS, and plans to address these issues separately (including the very good points raised by the commentor).

Response to Comment No. 1130-13

Section 1.2 of the EIS describes the need for immediate action to avoid disruptions in foreign research reactor operations.

If foreign research reactor spent nuclear fuel is accepted into the United States, prioritization efforts will begin. Current plans are to issue a Record of Decision regarding the proposed action no sooner than 30 days after publication of the final EIS. The commentor's position that high priority should be given to management of foreign research reactor spent nuclear fuel from reactors faced with urgent disposition requirements is noted.

Although the Edlow Group is generally supportive of the IAEA's prioritization, we wish to underscore the fact that failure to ship fuel promptly from reactors which will experience severe operational difficulties due to lack of storage space could undermine the objectives of the management alternative selected by DOE by forcing the largest participants in RERTR either to shut down their facilities or to seek alternative arrangements which depart from U.S. nonproliferation goals.

In anticipation of the fact that a substantial number of elements may have to be shipped in 1996, the Edlow Group is exploring with suppliers the joint development of one or more new high capacity shipping casks which could be used to supplement the casks now available. The Edlow Group expects that manufacture of the new cask(s) would proceed apace in the event DOE selects a management alternative which calls for return of fuel elements to the U.S., and plans are now under development for such casks.

V. TRANSPORT REQUIREMENTS

DOE does not regulate, and has no legal authority to regulate, the transportation of spent fuel or other radioactive materials. Spent fuel transportation is governed under international and domestic law by the International Atomic Energy Agency, the Department of Transportation, and the Nuclear Regulatory Commission. In some cases, U.S. Coast Guard requirements and International Maritime Organization requirements also apply. These regulations currently permit the transoceanic shipment on commercial vessels of spent nuclear fuel, the entry into a wide variety of U.S. ports of such fuel, and the transport by either train or truck of shipping casks containing the fuel to any site under consideration by DOE. These regulations have consistently been upheld in litigation.

1130-14

The Edlow Group would be extremely concerned with any attempt by DOE to mandate transport requirements which putatively supersede or augment those requirements now applicable under the law. We would view such attempts by DOE as a very harmful precedent for the entire nuclear industry, including DOE itself, which must move vastly more nuclear materials than simply foreign research reactor spent fuel. Moreover, we would view such attempts as readily subject to legal challenge on preemption grounds.

Accordingly, the Edlow Group requests that DOE not attempt to impose costly transport requirements over and above those now documented by the cognizant regulatory agencies to be safe and adequate for nuclear materials transport, all of which were authorized by statute or regulation after massive public input. This same principle should also govern DOE's contractual arrangements with the reactor

Response to Comment No. 1130-14

If a decision is made to accept foreign research reactor spent nuclear fuel into the United States to implement the proposed action, DOE would not impose any requirements in the acceptance contract beyond those it deems necessary or appropriate under the circumstances.

COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

operators. Moreover, it should (but does not now) govern discussion of the analyses in the final EIS. For example, it should be clear in the final EIS that a ten-percent difference in the person-rem exposure between commercial vessels and charter vessels is no basis whatsoever for preferring one vessel over the other if both exposures are, on an absolute basis, inconsequential and within regulatory requirements. (Cf., p. 4-9 of the draft EIS). *1130-14 (Cont'd.)* *1130-15*

VI. THE NO ACTION ALTERNATIVE

The draft EIS's consideration of the "no action" alternative is starkly inadequate. Notwithstanding the paramount policy objectives sought to be achieved by the draft EIS in the first place, the document asserts that there will be no U.S. environmental impacts if the no action alternative is selected. This is incorrect.

First, selection of the no action alternative will decimate the RERTR program, undercutting 17 years of successful and costly bipartisan U.S. efforts to remove HEU from civil commerce. Clearly, the U.S. would not have undertaken the RERTR program if its objectives and benefits were only foreign. The loss of RERTR would mean an increase in civil commerce in HEU worldwide, increasing the risk of nuclear proliferation and nuclear terrorism, each of which can have a dramatic environmental impact for U.S. citizens. As the Oklahoma City and World Trade Center bombings have demonstrated, terrorism is not confined to foreign nations, and there is nothing to suggest that nuclear weapons would not be used if they could be more easily obtained.

Second, since the U.S. currently purchases virtually all radioisotopes used in medicine and hospitals in the U.S. from foreign research reactors, the no action alternative, which would precipitate a widespread shutdown of reactor facilities across the globe, should analyze the impact on the $800 billion U.S. healthcare industry of a precipitous decline in the availability of medical radioisotopes. Indeed, it is likely, if not certain, that selection of the no action alternative would demand that the U.S. build a sizable new reactor in the U.S. simply to make up the shortfall, or that it significantly augment existing reactors. *1130-16*

Third, Executive Order 12114 requires consideration of the impact of any government action on the global commons. In this case, such consideration should include an assessment of the impacts of a wide-scale shutdown of research reactor facilities worldwide, a proliferation of HEU dry storage around the world, and facilitation of global shipping and commerce in HEU and high-level wastes from British reprocessing. (Likewise, Executive Order 12114 would require assessment of

RESPONSE TO COMMENT
COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

Response to Comment No. 1130-15

Section 4.2.1.3 of the EIS analyzes the impacts of using either commercial or chartered shipping and demonstrates that, although there are differences between them, both would have low environmental effects.

Response to Comment No. 1130-16

Negative impacts on nuclear weapons nonproliferation efforts of the United States that could result if the No Action Alternative were adopted are described in Section 4.6 of the EIS. Impacts on the global commons are discussed in Section 4.2.1 of the EIS. Apart from safety and security issues relating to uncertain storage and disposal of spent nuclear fuel, the key impacts include an expansion of civilian commerce in HEU, a shutdown of reactor operations in many countries allied with the United States, reductions in the production of medical pharmaceuticals and commercial and industrial radioisotopes, and elimination of many materials testing programs.

As stated in the EIS, the U.S. has an obligation under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) to assist nonnuclear weapons states with peaceful applications of nuclear energy. Actions which compel a country to shut down a peaceful nuclear research program, or to seek reprocessing, could cast doubt on U.S. commitment to NPT principles. Any perception that the U.S. does not support the NPT, which is the foundation of the entire international nuclear nonproliferation regime, would make it that much harder to negotiate further nuclear nonproliferation agreements.

In the event that foreign research reactors that supply medical isotopes to the United States were forced to shut down, it would be necessary to find alternative foreign suppliers or augment capabilities for domestic production of medical radioisotopes. Construction of a new reactor, if these shutdowns occur and if a new reactor in the United States were required, would have to be addressed under a separate environmental document. In addition, the U.S. accrues significant benefits from the operation of foreign research reactors - including Moly-99 and other medical isotopes.

A discussion has been added to Section 1.1 of the EIS that describes potential impacts of management policies for foreign research reactor spent nuclear fuel on efforts of the United States to persuade Russia and China to adopt programs similar to the RERTR program.

the impacts on the global commons of shipping to and from Dounreay under a DOE-sponsored plan.)

Fourth, the No Action alternative does not evaluate what impact no action would have on current U.S. efforts to initiate RERTR-like programs in Russia and China. (Indeed, U.S. efforts in Russia and China are not mentioned in the draft EIS.)

1130-16 (Cont'd.)

VII. MANAGEMENT ALTERNATIVES 2 AND 3

Although many of the members of the Edlow Group continue to sustain close business relationships with AEA Technology in Dounreay, the Edlow Group generally opposes the selection by DOE of Management Alternatives 2 and 3.

Management Alternatives 2 and 3 presume that all or a substantial portion of the foreign research reactor spent fuel would be sent to Dounreay, Scotland, for reprocessing and possible blend-down to LEU fuel. For the following reasons, the reactor operators in the Edlow Group are dubious of the prospects for success with these alternatives:

1) Adoption of these alternatives would conflict with the Administration's nonproliferation policy as expressed in PDD-13. The repercussions of this conflict should not be underestimated.

2) There is no guarantee that Dounreay will continue to operate even if Management Alternative 2 or 3 is selected. Dounreay is subject to many domestic environmental and political considerations, many of which could be impacted if Alternative 2 or 3 is selected. Although selection of Management Alternative 2 or 3 could be perceived as a prerequisite for sustaining Dounreay, such selection may not be the only prerequisite. Thus, to a large degree, selection by DOE of Alternative 2 or 3 relinquishes both U.S. responsibility and U.S. control over the program to an unpredictable third party.

1130-17

3) Management Alternatives 2 and 3 effectively export U.S. environmental impacts to Britain and the North Sea area, a fact which could have unpredictable political and programmatic consequences. For example, one of the principal reasons that Greenpeace's European constituency has not opposed the return of U.S.-origin spent fuel to the U.S. is that group's perceived view (in addition to its support for nonproliferation) that environmental consequences in Britain and the North Sea area would be minimized if the fuel is returned to the U.S. instead of

Response to Comment No. 1130-17

The commentor's opposition to Management Alternatives 2 and 3, as described in Sections 2.3 and 2.4 of the EIS, is noted. The reasons for this opposition are also noted and have been considered during the process of selecting the preferred alternative as described in Sections 2.9 and 4.7 of the EIS.

COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

reprocessed in Britain. Greenpeace has proved to be a formidable political force in Europe.

4) Management Alternatives 2 and 3 effectively establish a U.S.-led monopoly on alternatives for those reactors who may now avail themselves of the Dounreay option without any interference by DOE. The U.S.-led alliance would essentially remove Dounreay from the marketplace, placing all pricing and programmatic decisions into DOE's hands. Thus, DOE could mandate a blend-down process, could change the price indiscriminately over time, and could manipulate the schedule of receipts and other key aspects of what is now controlled by the private sector. Rather than avail themselves of any such U.S.-led alliance, most of the reactors which can now use Dounreay would likely consolidate their resources to maintain the Dounreay option as it now exists and, thus, the selection of Alternatives 2 and 3 could prove to be ineffective or even counterproductive in accomplishing DOE's policy goals. Indeed, negotiations have been underway between Dounreay and five nations which could form the basis for sustaining Dounreay without DOE interference. Given DOE's recent history as an unreliable partner in the RERTR program, it is understandable that the reactors would desire an extraordinarily low price and extremely firm commitments before availing themselves of any DOE-Dounreay alternative. *1130-17 (Cont'd.)*

5) As far as the Edlow Group is aware, the State of South Carolina desires to receive foreign research reactor spent fuel so long as that fuel can be reprocessed at Savannah River Site. If DOE has crossed the political threshold of deciding to permit (or even mandate) reprocessing with associated blend-down of HEU, it makes no sense for DOE to compel that this be done in Europe instead of (or in addition to) in the U.S. From a political and an environmental point of view, this posture would appear to "maximize the damages" for both DOE and the global environment.

VIII. IMPLEMENTATION ALTERNATIVES

The Edlow Group strongly encourages DOE to reject any alternative implementation strategies discussed in the draft EIS that reduce the duration of the proposed policy, or that reduce the amounts of spent fuel to be received. As noted in our discussion of legal obligations, the Edlow Group believes DOE has a legal obligation receive all spent fuel generated following a reactor's commitment to *1130-18*

RESPONSE TO COMMENT
COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

Response to Comment No. 1130-18

The commentor's opposition to implementation alternatives of Management Alternative 1 that reduce the duration of the proposed policy (Section 2.2.2.2 of the EIS) or reduce the amounts of spent nuclear fuel to be received (Section 2.2.2.1 of the EIS) is noted. As discussed in Section 1.2, the intent of the proposed action is to support the U.S. nuclear weapons nonproliferation policy seeking to reduce, and ultimately eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide. DOE does not acknowledge any other legal obligations. See also responses to Comments 1130-2, 1130-5, and 1130-6.

convert its facility under the RERTR program, through the life of the facility, and without time constraint.

As reactors in the Edlow Group have noted, over the long term, it will be necessary to develop non-U.S.-based solutions to foreign research reactor spent fuel management. Recognizing this, some of the reactors in the Edlow Group are prepared voluntarily to accept reasonable restrictions on the duration of the proposed policy. In that context, however, DOE should not apply an arbitrary 10-year or 15-year criterion. In the view of the Edlow Group, DOE has a legal obligation to receive spent fuel from the participants in RERTR as long as those reactors continue to operate. Some reactors (such as PTB) have already announced that they are shutting down prior to what would be the expiration date of DOE's proposed new policy. Others know now that they will operate for another 11 years, or 16 years, or perhaps 19 years. It would be unreasonable, particularly in light of the legal situation facing DOE, for DOE to demand that a reactor close its doors prematurely to satisfy an arbitrary cut-off date, particularly if the host nation for that reactor does not have a waste disposal program at all. Thus, at a minimum, the Edlow Group encourages DOE to take a more case-by-case approach to the issue of policy duration, extending its overall policy for a duration long enough to permit it to accomplish the fundamental objectives of the RERTR program without imposing extreme penalties on the reactor operators which have voluntarily participated in that program.

1130-18 (Cont'd.)

Likewise, the Edlow Group encourages DOE to stay the course on its nonproliferation policy and to seek return of all U.S.-origin HEU spent fuel (and associated LEU spent fuel from converted facilities) which would accomplish the removal from civil commerce of all HEU worldwide. In this regard, the Edlow Group believes that DOE should describe, in the introductory section of the EIS and in the summary, its programs with Russia and China to develop parallel RERTR programs.

1130-19

IX. U.S. REPROCESSING ALTERNATIVE

Members of the Edlow Group and their governments believe it would not be appropriate to attempt to recommend to the United States what to do with U.S.-origin foreign research reactor spent once it has arrived safely in the United States. That is a matter of U.S. domestic policy. The Edlow Group is not ideologically opposed to reprocessing of the material in the United States. Obviously, this material was reprocessed in the U.S. for many years.

However, on a practical level, the Edlow Group is concerned that selection by DOE now of a U.S. reprocessing option could derail the EIS process and spawn

1130-20

Response to Comment No. 1130-19

The commentor's support for Management Alternative 1 (Section 2.2 of the EIS) is noted. Statements have been added to Section 1.1 of the EIS which describe efforts of the United States to persuade Russia and China to adopt programs similar to the RERTR program.

Response to Comment No. 1130-20

The commentor's ideological neutrality on the subject of chemical separation is noted. The commentor's concern about potential litigation is also noted. NEPA, however, requires that the environmental impacts of all reasonable alternatives be evaluated. Concerns over potential litigation do not justify the omission of a reasonable alternative.

COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

needless litigation, thereby slowing implementation of the recommended alternative, which would only augment the crisis for reactors and governments abroad. There appears to be no legal restriction on DOE receiving the material now and slating it for dry and/or wet storage, and then deciding, based on a subsequent analysis at a later time, that it will recommence reprocessing for this and perhaps other material in inventory in the U.S. Such an approach would permit implementation of Management Alternative 1, while providing a basis for continued negotiations with South Carolina on reprocessing.

1130-20 (Cont'd.)

The Edlow Group is also concerned that DOE's environmental analysis of reprocessing alternatives, insofar as it calls for reinstituting a previously abandoned U.S. policy, engaging in substantial new activities at Savannah River, and perhaps constructing new facilities, may be inadequate to sustain a legal challenge on NEPA grounds. Conversely, the Edlow Group is confident that, based on the analysis in the EIS, selection by DOE of Management Alternative 1 with a dry storage option (using Savannah River for interim temporary wet storage) could survive legal challenge on NEPA grounds. This is all the more likely given the highly favorable precedent obtained by DOE in the Fourth Circuit Court of Appeals in June 1995. Accordingly, although the Edlow Group has no preference for or against reprocessing in the U.S., we regard dry storage in the U.S. as the substantially less risky implementation alternative, at least until further studies of reprocessing can be completed.

1130-21

X. PROGRAMMATIC EIS ON DOE SPENT FUEL

DOE's Final EIS on foreign research reactor fuel should take ample credit for the analyses now completed in DOE's Programmatic Environmental Impact Statement and ROD on all of DOE's spent nuclear fuel, DOE/EIS-0203-F. Analyses and decisions in the latter EIS and ROD, to the extent applicable, should be expressly incorporated by reference into the foreign research reactor EIS to aid the public in understanding the thoroughness of DOE's entire program, and to serve as a broader analytical foundation in responding to any possible litigation challenging the EIS. The PEIS is likely to be particularly important in the event of any challenge to the safety and capacity of storage at Savannah River or INEL, to domestic overland transport, and to questions concerning dry storage technology or the ultimate disposition of the fuel. Thus, the PEIS should be explicitly referenced or incorporated in sections of the foreign research reactor EIS dealing with these issues.

1130-22

RESPONSE TO COMMENT
COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

Response to Comment No. 1130-21

The commentor's observation that the selection by DOE of Management Alternative 1 (Section 2.2 of the EIS) with dry storage option, using the Savannah River Site for interim wet storage, would more likely survive legal challenge on NEPA grounds than the chemical separation option, is noted.

Response to Comment No. 1130-22

The Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement (Programmatic SNF&INEL EIS) is cited at appropriate places throughout this document. At the time that the draft version of this document received final edit, the final Programmatic SNF&INEL EIS was not yet available. Inputs from the final Programmatic SNF&INEL EIS are reflected in the final version of this EIS.

XI. JOINT SPONSORSHIP OF EIS

Since the EIS is jointly sponsored by DOE and the State Department, we believe it would be appropriate and useful to include the State Department on the cover of the Final EIS as a co-sponsoring agency.

1130-23

XII. COST PROJECTIONS

In large part, DOE's cost estimates are completely opaque, either because they are not supported by data and analyses made available to the public, or because DOE has claimed that cost information is proprietary. In any event, DOE's cost estimates for each of the alternatives it has considered appear to be wildly inflated in every component, particularly relative to previous cost-based (as a matter of law) charges levied by DOE and to charges recently imposed by DOE for the EA reactor fuel, as well as relative to documented experience with other countries. On a cost per kilogram basis, DOE's projected costs, if charged entirely to foreign research reactors in the developed countries, would be extraordinarily high and would altogether vitiate any option selected by DOE, undercutting the rationale of DOE's and the State Department's proposed nonproliferation policy. DOE does not explain how legally-cost-based charges of less than $1000 per kilogram in 1988 could have risen by a factor of more than 10 (with no credit for HEU) when standard escalation indices during that same period averaged well under six percent per year. Even in today's environmental context, such a result is unjustified.

1130-24

As noted above in discussion of price issues, DOE must manage a very substantial inventory of U.S. research reactor fuel and other domestic aluminum-clad and TRIGA fuel already under DOE's auspices. Thus, further receipts of foreign research reactor fuel will impose only incremental costs on activities that must be undertaken by DOE in any event. This fact, although lost in DOE's cost analysis for the foreign research reactor fuel EIS, is prevalent throughout DOE's Final Programmatic EIS on the management of all of DOE's spent fuel, DOE/EIS-0203-F, and should substantially deflate DOE's cost projections.

Although DOE has stated that its assumptions (for example, the number of FTEs required) are "extremely conservative," such extreme conservatism may have a prejudicial impact on the public and on the actual pricing mechanisms employed by DOE policy makers and is thus inappropriate and unfortunate. Indeed, based on experience worldwide, the members of the Edlow Group believe it would be possible to contract on a fixed-price basis with the private sector to manage the spent fuel at a small fraction of the cost projections listed in the draft EIS, particularly in the case of dry storage options.

Response to Comment No. 1130-23

In compliance with the National Environmental Policy Act and Council on Environmental Quality Regulations (Section 5 of the EIS), DOE is the lead agency for the proposed action, and the Department of State is a cooperating agency. While DOE assumes primary responsibility for preparation of this EIS, the document was developed under consultation with the Department of State. It is customary to include the names of the lead agencies on the cover of the EIS and acknowledge the cooperative agencies in the text of the EIS. Omission of the cooperating agency's status on the cover is not intended to diminish the Department of State's significant contributions to this EIS.

Response to Comment No. 1130-24

With respect to cost projections, the following points are noted:

- DOE considers that it has documented the sources for the major cost components and provided these to the public. The only major cost components not documented relate to shipping costs, most of which were provided by or concurred in by the Edlow Group.
- Among the major cost components (shipping, storage/separation, and spent nuclear fuel/high-level waste disposal), DOE is not aware of items that have been artificially or arbitrarily inflated. DOE does not dispute that these costs have risen sharply in recent years. Shipping costs under the EA and geologic disposal costs are two prime examples. The final EIS shows shipping costs to and from developed countries as an element of the program that is not subject to U.S. subsidization.
- Standard escalation indices do not reflect the change in costs for nuclear materials handling and disposal over the past 6 years. The extremely high cost growth in the research reactor area mirrors that in the power reactor area (e.g., low-level waste disposal charges).
- Costs to manage the increment of foreign research reactor spent nuclear fuel at the DOE complex are charged incrementally where appropriate and on an average basis where appropriate. In particular, TRIGA storage is charged as an incremental cost at the Irradiated Fuel Storage Facility (IFSF) or the Fluorinel Dissolution and Fuel Storage facility (FAST) at Idaho National Engineering Laboratory, not a total cost for new facilities. The final EIS shows that staging and storage of aluminum-based spent nuclear fuel at the Savannah River Site is charged to a new facility (or a refurbished facility) using allocated average costs for the entirety of the aluminum-based spent nuclear fuel at the Savannah River Site.

COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

XIII. OTHER COMMENTS

- **Eligibility Criteria. The Draft EIS's statement at the bottom of p. 2-7 (Volume 1) that some "other foreign research reactor operators have notified DOE and the Department of State that they are interested in participating in the proposed spent nuclear fuel management program" is an unfortunate statement that should be removed or recharacterized. This statement makes it appear as if DOE's program is simply a gratuitous offering to reactors which may or may not want to participate. The draft should make clear that, in fact, there are strict eligibility criteria for the program and that, furthermore, the U.S. will actively seek to manage any fuel covered by the eligibility criteria. The eligibility criteria should be keyed to U.S. origin HEU and to LEU associated with conversion under the RERTR program.**

- **PTB Eligibility. We wish to point out that the eligibility criteria listed on page 2-5 of Volume 1 of the draft EIS should be supplemented to include spent fuel from Physikalisch-Technische-Bundesanstalt (PTB), as described in a separately-filed comment from PTB and attached hereto.**

1130-25

RESPONSE TO COMMENT
COMMENTOR NO. 1130: EGAN & ASSOCIATES (CONT'D.)

Response to Comment No. 1130-25

Statements have been added to Section 2.2.1.3 of the EIS which clarify the active efforts of DOE and the Department of State to develop a policy to manage eligible spent nuclear fuel from foreign research reactors.

Eligibility criteria described in Section 2.1 of the EIS address spent nuclear fuel from reactors such as the FMRB reactor operator operated by Physikalisch-Technische Bundesanstalt (Table B-3 of Appendix B).

COMMENTOR NO. 1136:
ENERGY RESEARCH FOUNDATION

Following are comments of the Energy Research Foundation on the Department of Energy's (DOE) Draft Environmental Impact Statement (EIS) on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor (FRR) Spent Nuclear Fuel (SNF). Our focus is primarily on nonproliferation aspects of the proposal and possible reprocessing activities at the Savannah River Site (SRS).

Nonproliferation Policy

Despite the integral nature of nonproliferation policy to the Draft EIS, the document does a surprisingly poor job articulating how alternatives could affect this policy. To begin, the Draft EIS focuses attention on an overly narrow component of U.S. nonproliferation policy: "The purpose of the proposed policy would be to promote nuclear weapons nonproliferation objectives of the United States, ***specifically by seeking to reduce, and ultimately to eliminate, highly-enriched uranium [HEU] from civilian commerce.***" (p. v, emphasis added)

Reprocessing

Within these narrow confines, the Draft EIS partially recognizes the complication of reprocessing. According to the draft, "The use of chemical separation by the United States as a spent nuclear fuel management technology could increase the accumulation of stockpiles of HEU." (p. 2-16) This is, of course, counter to the stated policy objective.

The Draft EIS then offers, several pages later, a proposed solution to this dilemma. If the HEU were to be blended down to low-enriched uranium (LEU) after reprocessing, the Draft EIS contends, "the nuclear weapons nonproliferation goal would be satisfied because the material would not be usable in weapons after it was blended down....If the HEU were not blended down, DOE and the Department of State might be accused of accepting the foreign research reactor spent nuclear fuel in order to stockpile HEU for future weapons use. To address this concern, DOE and the Department of State would, over time, place the separated HEU under International Atomic Energy Agency [IAEA] safeguards." (p. 2-21)

There are at least three problems with this response. First, there are no apparent plans to allow international inspection of the reprocessing and blending operations. Consequently, there are no guarantees to the world community that DOE will in fact carry out its stated intention. This is especially ironic since European reprocessing facilities are operated under Euratom and IAEA safeguards. (p. 2-24) Moreover, the U.S. would rightly insist that operations in other countries be subject to international control sufficient to guarantee that recovered HEU is not diverted to a weapons program.

1136-1

RESPONSE TO COMMENT
COMMENTOR NO. 1136:
ENERGY RESEARCH FOUNDATION

Response to Comment No. 1136-1

DOE and the Department of State do not agree with the commentor's statement that the EIS focuses on an overly narrow component of United States nuclear weapons nonproliferation policy, as embodied in Presidential Decision Directive 13 (PDD-13). The September 27, 1993 White House press release that explains PDD-13 lists a wide range of activities that are designed to address the accumulation of fissile materials. The reduction and eventual elimination of the use of HEU in civilian programs is a separable component of United States nuclear weapons nonproliferation policy that can be analyzed, and upon which decisions can be made independently.

Reducing and eventually eliminating the use of highly enriched (weapons grade) uranium in civilian programs worldwide is an important objective because a relatively small amount of HEU could be used to construct a nuclear weapon. Furthermore, the technology required for an HEU weapon would be more easily developed than that for construction of a nuclear weapon using plutonium (Section 1.2 of the EIS).

If any separated HEU were blended down, there would be no increase in the stockpile of this material in the United States. The EIS specifically states that this would be the preferred alternative were any of the foreign research reactor spent fuel to be processed in the United States (Section 2.2.2.6 of the EIS).

Given the fact that the United States is one of the world's major nuclear weapons states, and ceased production of HEU for nuclear weapons purposes, DOE considers that lack of confidence in DOE's stated preference to blend down any HEU that might be separated should not be a significant issue. This expectation is borne out by the absence of other comments on this issue.

COMMENTOR NO. 1136: ENERGY RESEARCH FOUNDATION (CONT'D.)

ERF Comments on Draft FRR EIS, July 20, 1995, page 2

Second, a vague promise to place recovered HEU under IAEA safeguards "over time" is not assured either to be implemented or effective. Like the proposed blending operation, this promise can be easily undone by DOE, others in the executive branch, or Congress. In addition, the promise does not cover plutonium which could be extracted during reprocessing. The Draft EIS has a single statement that "the limited amount of plutonium in the spent fuel would not be separated. Rather it would be left in, and disposed of with, the high-level radioactive wastes produced during the chemical separation operation." (p. 4-84) The EIS does not, however, either demonstrate that reprocessing facilities can be operated to ensure that this happens or provide a mechanism that some future decision will not reverse this plan. Again, the U.S. would not accept such vague promises from other nations.

1136-1 (Cont'd.)

1136-2

Third, the response ignores other potential nonproliferation impacts of reprocessing. The most significant of these other impacts is touched on two chapters later, but even then the discussion is incomplete.

> Chemical separation of foreign research reactor spent nuclear fuel, with blending down of the separated uranium, would, in fact, result in a reduction in the amount of HEU - a major goal of the U.S. Nuclear Weapons Nonproliferation Policy announced in September 1993. Despite this fact, there is a concern that other states may perceive only that the U.S. has restarted reprocessing.
>
> For example, the potential exists that other states (e.g., Iran), might use the restart of reprocessing in the United States as an excuse to continue current programs or begin new ones - activities that would run counter to U.S. nuclear weapons nonproliferation interests. The implication in North Korea, where the United States has been actively working to create a nonreprocessing zone, as well as in other states, could complicate current U.S. nonproliferation activities. (p. 4-84)

1136-3

In fact, the message to the world would be that the U.S. accepts reprocessing as a waste management technology. This would put us in no position to discourage others from reprocessing and thereby accumulate stockpiles of nuclear weapons-usable fissile materials. Indeed, the impact of a U.S. decision to reprocess might well off-set any potential benefit to nonproliferation objectives gained by receiving foreign research reactor spent nuclear fuel.

Long-term Implications

The Draft EIS further fails to demonstrate that any of the policy proposals will satisfy long-term nonproliferation interests. At most, the proposed policy would involve bringing back LEU SNF generated during the next decade, accepting HEU SNF for an indefinite period, and receiving some target material containing HEU and LEU. (pp. 2-6,11,13) The Draft EIS points out that:

1136-4

RESPONSE TO COMMENT
COMMENTOR NO. 1136: ENERGY RESEARCH FOUNDATION (CONT'D.)

Response to Comment No. 1136-2

The amount of plutonium in the spent nuclear fuel is very small. Research reactors use a fuel and fuel cycle that does not generate much plutonium. This is even true for the LEU reactors since the LEU fuel is typically around 20 percent enriched, rather than the much lower enrichments used for plutonium generation. While it is true that plutonium could be separated from foreign research reactor spent fuel, DOE has not proposed to do so, and would instead dispose of the plutonium with the high-level waste would not create a critically or diversion issue.

Response to Comment No. 1136-3

Both France and the United Kingdom currently conduct reprocessing as part of their nuclear power fuel cycles. There have been numerous opportunities in the past for such reprocessing activities to be used as excuses for reprocessing by nonnuclear weapons states. In the opinion of the Department of State, nations intent on creating new reprocessing capabilities would do so without regard to whether the United States chemically separates spent nuclear fuel.

Response to Comment No. 1136-4

The definition of the policy duration alternative that includes indefinite acceptance of HEU spent nuclear fuel specifies that any such HEU spent nuclear fuel (except for the small amount in lifetime cores) would either have to have been discharged already, or would have to be generated (i.e. discharged) within 5 years of the date on which any new policy becomes effective. Thus, this alternative would not allow unlimited acceptance of newly discharged HEU spent nuclear fuel into the indefinite future. Rather, it covers a finite amount of HEU spent nuclear fuel that has already been discharged or might be discharged in the rivalry near future, but allows time to resolve any difficulties that might exist in securing the shipment of such spent nuclear fuel. DOE considers that this does provide an incentive for conversion to LEU fuel since the only spent nuclear fuel eligible for acceptance (if the spent nuclear fuel is discharged more than 5 years after implementation of the policy) would be LEU spent nuclear fuel (other than the limited amount in lifetime cores).

COMMENTOR NO. 1136: ENERGY RESEARCH FOUNDATION (CONT'D.)

ERF Comments on Draft FRR EIS, July 20, 1995, page 3

> By proposing a policy for management of certain foreign research reactor spent nuclear fuel, DOE and the Department of State have no intention of establishing a commitment to continue accepting or otherwise managing the disposition of such spent nuclear fuel indefinitely. Rather, the intent of the proposed new policy is to remove as much U.S.-origin HEU as possible from international commerce while giving the foreign research reactors and their host countries time to convert to operation with LEU fuel and make their own arrangements for disposition of their subsequent LEU spent nuclear fuel. (pp. 1-7,8)

1136-4 (Cont'd.)

The only long-term policy component considered in the EIS - ongoing acceptance of HEU SNF for an indefinite period - is counter to the above stated intention of DOE and the Department of State. Moreover, adoption of this option without significant caveats might discourage research reactor operators from using LEU fuels since the U.S. would no longer assist with their disposition.

If the U.S. abandons its policy altogether, though, the incentives appear to be in favor of reactor operators using HEU fuels as well. According to the Draft EIS, conversions to LEU fuel "were expensive and generally resulted in reductions in the capabilities of the reactors and increased operating costs." (p. 1-2) "From the beginning of the RERTR program, foreign research reactor operators made it clear that their willingness to convert their research reactors to LEU fuel was contingent upon the continued acceptance by DOE of their spent fuel for disposition in the United States." (p. 1-3)

In addition, no "available [European reprocessing] facility is currently accepting or has the capability of reprocessing the high density LEU fuels that the United States is encouraging foreign research reactors to use to replace the HEU fuels. Hence, if the research reactors decide to use reprocessing as it has been managed up to this point to prevent backlogs of spent nuclear fuel from building up, they would have to continue to use HEU fuels...If some foreign research reactor operators were to withdraw from the RERTR program and rely instead on HEU fuels, with attendant lower costs and enhanced performance, other research reactor operators would be under pressure to convert to the use of HEU for competitive reasons." (p. 1-4) "[I]f foreign research reactor operators begin delaying or canceling plans to convert to LEU, and thereby continue to use HEU, foreign research reactor purchasers would demand HEU-fueled reactors. This could lead to renewed international commerce in weapons-usable HEU, and would be antithetical to the policy goal of seeking to minimize and eventually eliminate the civil use of HEU." (p. 1-5)

1136-5

The Draft EIS does not, in fact, explain why DOE contends that foreign research reactor operators would continue their switch to LEU fuels in the absence of U.S. involvement. Based an the considerations above, it seems more likely that they will revert back to the use of HEU fuels, and international trade in HEU will develop between reactor operators, reprocessors, and HEU suppliers early in the 21st Century.

RESPONSE TO COMMENT
COMMENTOR NO. 1136: ENERGY RESEARCH FOUNDATION (CONT'D.)

Response to Comment No. 1136-5

The DOE and the Department of State consider that the proposed 10 year duration of the proposed action would be long enough to allow the United States to accept essentially all of the foreign research reactor spent nuclear fuel containing HEU enriched in the United States (or to arrange for the reprocessing of the spent nuclear fuel and blending down of the HEU). Furthermore, by accepting spent nuclear fuel from foreign research reactors under the limitations specified in the proposed action, the reactor operators will have been given a powerful incentive to convert to operation on LEU fuels during the effective period of the policy. In parallel with these actions to drastically reduce the amount of U.S.-origin HEU in international commerce and convert research reactors to LEU fuel, the United States is separately working to eliminate other current or potential sources of HEU, such as from Russia or China by encouraging these nations to establish foreign research reactor spent nuclear fuel management policies similar to that of the United States. Thus, by the end of any policy period that might be established. DOE and the Department of State hope to have reduced the availability of HEU for use in civil programs to the point where it is no longer a viable option for use as research reactor fuel, and to have enabled almost all of the research reactors to switch to LEU operations. In the absence of further sources of HEU, the reactors would have no options to switch back to HEU fuel after expiration of any new policy that might be established.

A substantially longer period of acceptance might result in more material ultimately being accepted, but would also lessen the near term incentives for conversion.

COMMENTOR NO. 1136: ENERGY RESEARCH FOUNDATION (CONT'D.)

ERF Comments on Draft FRR EIS, July 20, 1995, page 4

Reprocessing at SRS

The technical discussion of reprocessing foreign research reactor spent nuclear fuel at the Savannah River Site is inadequate, especially in regard to safety and cost considerations.

The "advantages" touted for reprocessing at SRS are misleading. For example, the Draft EIS claims that:

> The conventional chemical separation facilities already exist, as well as the waste treatment facilities required to put the high-level radioactive and other wastestreams [sic] in forms suitable for disposal. In contrast, there are large technical, cost, and regulatory uncertainties associated with direct disposal of intact foreign research reactor spent nuclear fuel (much of it containing HEU). (p. 2-15)

The reprocessing facilities do indeed already exist, but they are forty years old and subject to substantial technical, cost, and regulatory uncertainties never discussed in the EIS. Indeed, in the last few years, several significant and never before reviewed safety questions have come to light. The full importance of these safety concerns cannot be thoroughly known and discussed until up-to-date Safety Analysis Reports are complete.

Reprocessing involves the highest population risk estimates of any alternative considered for SRS - 16 percent chance of a fatal cancel during incident free operations and a 30 percent chance of a fatal cancer if an accident occurs. (pp. 4-90,91) These estimates may be understated since they are not based on a completed safety review of the reprocessing facilities and because DOE uses a dose conversion factor which is only about two-thirds that currently accepted by the National Research Council.

Regulatory compliance issues regarding the Resource Conservation and Recovery Act's (RCRA) applicability to SNF and other materials which might be reprocessed remain unresolved. It is also a significant concern that there is no current opportunity for external regulation of reprocessing other than through RCRA. There is substantial uncertainty whether DOE should begin any waste management operation as a self-regulated entity - especially an operation as potentially dangerous as reprocessing. Reprocessing is externally regulated in Europe, for example. (p. 4-99) Also, DOE would likely use licensed cask designs for dry storage of SNF. (p. F-68)

Regulatory compliance is also complicated by the fact that the reprocessing facilities at SRS are not in compliance with DOE Orders. Order compliance is not even addressed in the Draft EIS. An example of the potential significance is in the area of

1136-6

RESPONSE TO COMMENT COMMENTOR NO. 1136: ENERGY RESEARCH FOUNDATION (CONT'D.)

Response to Comment No. 1136-6

The commentor's position on the adequacy of the EIS discussion on chemical separation facilities is noted. This EIS, however, is not the only document that would be required to support the restart of chemical separation at the Savannah River Site. The chemical separation facilities would not be restarted without approved safety documentation and a start-up evaluation, including an Order Compliance Review as required by DOE Order 5480.31.

The risk estimates for cancer under the chemical separation alternative (Section 4.3.6.6 of the EIS) are conservative. That is, the real risk probably would be lower. The dose conversion factors used in this EIS to estimate risks of cancer due to radiation exposure (Section 4.1.3 of the EIS) are endorsed and accepted by the NRC and the International Commission on Radiological Protection.

DOE is engaged in discussions with the Environmental Protection Agency and the South Carolina Department of Health & Environmental Control regarding the applicability of RCRA to spent nuclear fuel.

DOE considers that treatment facilities do exist at the Savannah River Site for all the wastes that would be generated by chemically separating the aluminum-based foreign research reactor spent nuclear fuel. The types of waste and estimates of the volumes that would be generated are presented in Section 4.3.6.6.5 of the EIS. The comment does not mention any specific untreatable waste, so DOE is unable to respond in more specific terms.

DOE's cost estimates are realistic and based on the best available information. The life-cycle costs, which include geologic disposal costs, would increase dramatically if the disposal volume for intact spent nuclear fuel increases due to criticality concerns. Chemical separation offers the only proven way to eliminate criticality concerns and thus avoid this volume increase. The projections for a delayed need for dry storage are based on expectations that the available wet storage can accommodate the spent nuclear fuel receipts over an extended period, not on the use of chemical separation.

COMMENTOR NO. 1136: ENERGY RESEARCH FOUNDATION (CONT'D.)

ERF Comments on Draft FRR EIS, July 20, 1995, page 5

nuclear criticality control. Discussing dry cask storage, the Draft EIS explains:

> In nuclear criticality safety, the principle of double contingency is used to protect against criticality. Double contingency requires that the design of any system containing fissile material use two of the aforementioned factors to prevent the onset of criticality. (p. F-69)

The Draft EIS does not mention, though, that the H-Canyon Safety Analysis Report does not comply with DOE Order 5480.24 which requires addressing the principle of double contingency.

While waste tanks and the Defense Waste Processing Facility exist for managing high-level waste, the tanks are also decades old, and the DWPF is more than six years behind schedule. It is not true that treatment facilities exist for preparing all other reprocessing wastes for disposal.

For another example, the Draft EIS contends that:

> If disposal of intact spent nuclear fuel is shown to be technically infeasible, or if the waste acceptance criteria for a geologic repository require significant dilution of the HEU due to criticality concerns, DOE estimates that the life-cycle costs of chemical separation may be substantially lower than the cost of storage and geologic disposal of intact spent nuclear fuel. (p. 2-15)

The cost estimates in the Draft EIS, however, are so uncertain that they cannot credibly support a decision. The Draft EIS acknowledges that the cost figures are only "rough-order-of-magnitude values." (p. 4-127) It is impossible, based on information included in the Draft EIS, to independently verify the values which add up to the totals. Several of these values appear to be estimates by SRS personnel who are strongly biased in favor of reprocessing. (see e.g., F-293) As an example of their bias, an assumption in their recently completed Fiscal Year 1997 budget request is that dry storage will not be needed before 2005.

1136-6 (Cont'd.)

Reprocessing Costs

Further, the estimates understate reprocessing costs while overstating the uncertainty associated with dry storage. In regard to reprocessing, the Draft EIS essentially ignores costs to upgrade facilities. A rare mention of these costs is a footnote alleging that $210 million could be needed to upgrade the H-Canyon at SRS but excluding those costs from consideration in the EIS "since they would, presumably, be borne by other programs requiring use of the facilities." (p. 4-130)

1136-7

H-Canyon is forty years old, and this EIS is the only decision making process underway which addresses the possibility of running the facility another ten years or

RESPONSE TO COMMENT COMMENTOR NO. 1136: ENERGY RESEARCH FOUNDATION (CONT'D.)

Response to Comment No. 1136-7

With respect to the comments on cost, the following points are noted:

Chemical separation of foreign research reactor spent nuclear fuel at the Savannah River Site would take place only if a Canyon (H or F) were in operation (at least during the 1997 to 2003 period) pursuant to other requirements. Restarting one or more canyons under the Interim Management of Nuclear Materials (IMNM) EIS is considered realistic. In this case, the foreign research reactor spent nuclear fuel program would bear only the marginal costs of additional chemical separation during the period of concurrent operations and the full cost excluding surveillance and maintenance associated with de-inventoried status. Using the IMNM EIS as a reference, the period of concurrent operations would be 1997 through 2002 to 2005. Chemical separation on a stand-alone basis without a period of concurrent operations would be economically infeasible. Chemical separation on a stand-alone basis after concurrent operations would be possible depending on how fixed costs for the facilities are allocated. Under no circumstance would the foreign research

COMMENTOR NO. 1136: ENERGY RESEARCH FOUNDATION (CONT'D.)

ERF Comments on Draft FRR EIS, July 20, 1995, page 6

longer. Upgrade costs should be fully documented in the EIS - not just an unsubstantiated, and probably low, estimate of $210 million but the full costs of bringing the facilities into compliance with current environmental, safety, and health standards. Moreover, foreign research reactor spent fuel activities should be assumed to bear their full and fair share of these costs for purposes of analysis in the EIS. In determining the appropriate percentage of costs to charge to this program, DOE should consider that research reactor fuel is the driver for extended, and potentially ongoing, canyon operations.

The operating costs charged to reprocessing foreign research reactor spent nuclear fuel are significantly underestimated. A mere $1 million per year is charged to the program through 1999. After that, the attributed costs are only $11 million per year through 2003, then $84 million per year for ongoing operations. (p. F-285) As with upgrade costs, the EIS should better ensure that the foreign research reactor spent fuel program is charged a full and fair percentage of operating costs and overhead. It is completely inappropriate to understate these costs in order to make reprocessing appear as an attractive alternative.

Also, reprocessing costs assume operation of only one SRS wet storage basin and essentially uninterrupted reprocessing (~1,800-2,000 elements per year for 12 years). (pp. F-284,285) Both these assumptions are unrealistic, especially in light of recent operating history which shows that the SRS canyons current throughput is lower than historical rates and that work stoppage to address safety concerns is not uncommon. Other reprocessing costs which may not be fully considered are the treatment and disposal of all generated wastes, including transuranics, and the implementation of international inspection and safeguards. In addition, the costs of reprocessing are off-set by a credit for the recovered HEU of $60 million, but this assumes the produced LEU can be sold and does not appear to consider storage costs until the sale takes place. (p. F-286)

Finally, there appears to be no calculation of the costs of dry storage or other activities to manage spent nuclear fuel after reprocessing ceases. There would likely be aluminum-clad SNF - some of which would contain HEU - received at SRS after reprocessing stops. Thus, many of the costs of dry storage, as well as decisions about repository criteria, would still be faced by DOE.

One option not evaluated in the Draft EIS which could affect long-term management of research reactor spent fuel is the development of alternative fuel types, including non-aluminum clad research reactor fuels. According to the Draft EIS, President Clinton's September 27, 1993, directive included a call for the Energy Secretary to "review the need for programs to develop alternative fuels for research reactors." (p. 1-1) There is no further discussion of this review in the Draft EIS, though.

1136-7 (Cont'd.)

RESPONSE TO COMMENT COMMENTOR NO. 1136: ENERGY RESEARCH FOUNDATION (CONT'D.)

reactor spent nuclear fuel program be the cost driver for upgrades. Only in the pure stand-alone mode would foreign research reactor spent nuclear fuel be the cost driver for operations. All costs in the EIS are based on the marginal effect of the foreign research reactor spent nuclear fuel, not the average effect. Appendix F, Section F.7.1.4 of the final EIS shows a cost sequence of $1 million per year, $11 million per year, and $84 million per year. The final EIS shows a different cost sequence, including lower costs in the canyons as a result of revisions in the IMNM program. The basic concept of marginal costing is retained however.

A processing rate of 1,800 to 2,000 foreign research reactor spent nuclear fuel elements per year would be realistic. The limiting constraint would be transportation cask receiving capacity, not canyon throughput. Total processing is assumed to reach 2,880 elements per year in the IMNM EIS.

All chemical separation costs in the EIS are either marginal operations, or are stand-alone operations as noted in the EIS. Disposal costs of high-level waste and low-level waste are included. Overall costs are lower in the final EIS due to changes in the IMNM EIS.

The Savannah River Site has received expressions of interest from at least one nuclear utility about buying the recovered HEU, blended down to about 5 percent enrichment level. The value assigned to the recovered uranium and separative work is conservative. The cost to dry store aluminum-based foreign research reactor spent nuclear fuel and target material after 2002 is included where chemical separation at the Savannah River Site would take place during the period of processing under the IMNM EIS (1998 through 2002). In the cases where all the aluminum-based foreign research reactor spent nuclear fuel and target materials would be chemically separated (1998 through 2008), no foreign research reactor spent nuclear fuel would be dry-stored at the Savannah River Site and no interim dry storage facilities are charged to the foreign research reactor spent nuclear fuel program.

DOE agrees that, in any case where all of the foreign research reactor spent nuclear fuel is not processed, there would still be costs and uncertainties associated with storage and ultimate disposition of the spent nuclear fuel. Nevertheless, the amount of spent nuclear fuel which would be subject to these costs and uncertainties would be reduced. The development of alternative fuel types does not affect the costs of managing the existing spent nuclear fuels.

COMMENTOR NO. 1136: ENERGY RESEARCH FOUNDATION (CONT'D.)

ERF Comments on Draft FRR EIS, July 26, 1995, page 7

Dry Storage Costs and Uncertainties

Dry storage costs and uncertainties appear overestimated. The number of casks assumed to implement dry storage, for example, is "very conservative and correspond[s] to a maximum of around 40 percent of the NRC-licensed heat loads per cask." (p. F-91)

As described in the Draft EIS, the large uncertainty for dry storage costs is driven by an "as-yet-unknown criteria for acceptance into a geologic repository and the cost of processing (not chemically separating) the spent nuclear fuel for geologic disposal." (p. 4-130) The Draft EIS, though, does not make a clear case for whether processing will be required. It also fails to indicate whether DOE considered that most of the spent fuel contains LEU, rather than HEU, and therefore poses a lower criticality concern. 1136-8

In addition, the uncertainty estimate includes $500 million for "Adequacy of Limited Spent Nuclear Fuel Characterization" with no explanation of why DOE thinks the characterization will be inadequate. (p. F-293) It also includes $500 million for vault design criteria despite numerous statements in the Draft EIS that, for example, "Redesign engineering should be limited to changes in the design of the basket that encapsulates the fuel...Outside the basket, all remaining components should be identical to those already licensed for commercial nuclear fuel by the NRC." (pp. F-77,293) There is no explanation of the vault design uncertainty which could add $500 million to the total costs.

L-Reactor Disassembly Basin

The Draft EIS ignores significant safety issues associated with use of the L-Reactor Disassembly Basin at SRS. There is no analysis which directly considers facility-specific seismic, monitoring, leak detection, water quality, and other conditions. Instead, the risks are presumably addressed as part of a "bounding analysis."

"The wet pool accidents are assumed to be cutting into the fuel region or mechanical damage due to operator error, an accidental criticality, and an aircraft crash into the water pool facility." (p. 4-42) None of these accidents involve corrosion of the spent fuel - the most serious concern publicly raised in recent years about storage in the basin. There is also no analysis in the Draft EIS to demonstrate that the accidents considered do in fact "bound" facility-specific hazards. 1136-9

The Draft EIS also fails to adequately address activities necessary to prepare the basin for possible use. As the EIS acknowledges, the disassembly basin is "not currently configured for storage of MTR type foreign research reactor spent nuclear fuel,

RESPONSE TO COMMENT
COMMENTOR NO. 1136: ENERGY RESEARCH FOUNDATION (CONT'D.)

Response to Comment No. 1136-8

With respect to dry storage costs and uncertainties, the following comments are noted:

- The dry storage design and costs are conservative. These cost estimates are more conservative and costly than an equivalent commercial design because of uncertain requirements for characterization and canning (due both to uncertain DOE and any NRC requirements and uncertain spent nuclear fuel conditions) and higher costs for DOE projects as compared to commercial projects. If the dry storage component of the dry storage option (e.g., shipping, receiving, storage, disposal) were reduced to a DOE-equivalent for power reactor fuel, costs for the storage component of the program might be reduced by several tens of millions of dollars. If the costs were based on commercial utility experience, costs would reduced by an additional tens of millions of dollars. There is , however, no basis for assuming that either the requirements or the implementation will follow commercial power reactor experience. Thus, the conservatism in design and costs is warranted.

- Enrichments in the spent nuclear fuel range from the low teens to around 60 to 70 percent. The LEU is fuel that was originally enriched to as much as 19.9 percent, not the 4 to 5 percent typical of power reactor fuel. The spent nuclear fuel enrichments are on the order of 1/2 to 2/3 of the original enrichments.

- DOE does not consider that the characterization would be inadequate. That is why the characterization item is discussed as an uncertainty instead of being part of the base cost estimate. It is possible that there might be unforeseen conditions discovered during acceptance of spent nuclear fuel from such a large number of sources, or at that the geologic repository acceptance requirements might require more detailed information concerning the spent nuclear fuel than DOE currently considers to be reasonable. An uncertainty figure related to the degree of characterization has been included to account for such developments.

- The vault design criterion relates to characterization facilities that could be required for the extensive testing (e.g., full calorimetry, full isotopic analysis, etc.) that is not currently costed either in the basic vault design or the uncertainty over characterization requirements and operations. It is not related to the storage function, per se, but to the facilities associated with the vault. The issue of double-counting between the facilities and the operations is under review and could result in a reduced estimate for the weighted cost of the two components.

Response to Comment No. 1136-9

Appendix F, Section F.1.3.1.1 of the EIS has been revised to address the concerns expressed in the comment related to the use of the L-reactor Disassembly basin for interim storage of foreign research reactor spent nuclear fuel.

COMMENTOR NO. 1136: ENERGY RESEARCH FOUNDATION (CONT'D.)

ERF Comments on Draft FRR EIS, July 20, 1995, page 8

however, minor modifications which would provide new storage racks, new handling equipment, safety documentation, etc., along with upgrades in progress to address vulnerabilities associated with water chemistry control, would permit receipt and management of foreign research reactor spent nuclear fuel. Installation of racks equivalent to those in RBOF would provide storage for approximately 20,000 foreign research reactor spent nuclear fuel elements per reactor basin." (p. 2-60) The Draft EIS also explains that, "Ongoing facility upgrades with epoxy coatings and purification equipment are intended to correct the conditions at the L-Reactor basin." (p. F-38)

In contradiction to the above statement, DOE is not upgrading the basin with new epoxy coatings. It is, however, working to improve water chemistry, installing new racks, and modifying the transfer bay. Efforts to improve water chemistry by reducing conductivity are perhaps the most important factor in determining whether the basin can be safely used for extended storage of SNF. It will be at least October 1995, though, before DOE has actual data to demonstrate whether the deionization efforts are successful. Consequently, the EIS cannot adequately consider the environmental, safety, and health consequences of using L-Reactor basin before then. Given the recent history of the basin, DOE should not decide to put any additional SNF into the basin until these data is gathered and thoroughly evaluated to determine whether storage would be safe for at least the ten years comprising Phase I of the proposal.

The Draft EIS also fails to discuss the status of compliance with DOE Orders, the adequacy of current safety documentation, and similar factors in regard to the L-Reactor Disassembly Basin.

1136-9 (Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 1136: ENERGY RESEARCH FOUNDATION (CONT'D.)

A Basis for Interim Operation (BIO) document for L-Reactor Disassembly basin in cold standby was prepared in accordance with DOE standards for BIO preparation. The document has been added to the reference list of Appendix F. Technical specifications were developed and approved by DOE, and safety analyses were performed to evaluate the hazards associated with storage of irradiated reactor fuel and components in the basin. These analyses determined the effects of process events on the facility worker and the effects of process and Natural Phenomena Hazards events on the public and environment. The document concluded that the L-Reactor Disassembly basin can continue to operate within the safety envelope identified in the document without undue risk to the public or the environment. The BIO addresses the status of compliance with DOE Orders, and current safety documentation.

The impacts of radiological emissions from failed fuel due to corrosion at the L-Reactor Disassembly basin have been evaluated as part of the normal operation emissions in Appendix F, Sections F.6.5 and F.6.6.3.

With respect to the accident analysis at existing facilities, the selected scenarios along with conservative accident progression assumptions (Appendix F, Section F.6.4 of the EIS) are considered to provide a bounding measure of consequences and risks associated with foreign research reactor spent nuclear fuel storage accidents. As indicated in Appendix F, Section F.6.2, the accident scenarios were selected based on the review of previously analyzed site- and/or facility-specific spent nuclear fuel storage accidents as documented in each facility's safety analysis documentation. Specifically for the L-Reactor basin the safety documentation considered is the BIO document discussed above.

The reference to epoxy coatings as an ongoing activity for the L-Reactor Disassembly basin in Section F.1.3.1.1 of the draft EIS is not entirely correct. Epoxy coatings have been applied in the past. Appendix F, Section F.1.3.1.1 has been revised accordingly.

COMMENTOR NO. 1137: GREENPEACE

GREENPEACE

July 20, 1995 34 pages

Following are comments on the DEIS on foreign research reactor fuel return.

Tom Clements
202-319-2506

1436 U Street, NW • Washington, DC 20009 • Tel (202) 462-1177 • Fax (202) 462-4507 • Tlx 89-2359

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RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

GREENPEACE

COMMENTS OF GREENPEACE USA AND GREENPEACE INTERNATIONAL

TO THE U.S. DEPARTMENT OF ENERGY

"DRAFT ENVIRONMENTAL IMPACT STATEMENT ON A PROPOSED NUCLEAR WEAPONS NONPROLIFERATION POLICY CONCERNING FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL", MARCH 1995 (DOE/EIS-0218D)

SUBMITTED ON JULY 20, 1995

1436 U Street, NW • Washington, DC 20009 • Tel (202) 462-1177 • Fax (202) 462-4507 • Tlx 89-2359

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RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

I. INTRODUCTION

The following comments are submitted by Greenpeace USA and Greenpeace International to the US Department of Energy (DOE) and US Department of State (DOS)(also referred to as the "Agencies") regarding their Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, DOE/EIS-0218D (the DEIS).

Greenpeace is an international environmental organization with offices in 31 countries and some 5.3 million Supporters around the world. In the United States, Greenpeace has some 1.6 million Supporters and operates 3 regional offices.
Greenpeace has international campaigns directly dealing with the issues of nuclear power, reprocessing, transports and proliferation--all issues which are involved in the DEIS.
Since the expiry of the "Off-Sites Fuels Policy" (OSF) at the end of 1988, Greenpeace has submitted hundreds of pages of comments to the DOE in the course of its meandering policy development on this issue.

Greenpeace would like to congratulate the DOE on its decision to conduct an EIS regarding the OSF. For a number of years we have argued that this decision was required by law and made this demand a central point in our comments (GP91, GP93) to the DOE's indefensible OSF EA and FONSI (EA91 and FO91 respectively) released in February 1991 and the Agency's Predecisional Draft Environmental Assessment of Urgent-Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel, DOE/EA-0912 (the PDD) of 1993 (PDD 93). It should be noted that if the DOE had chosen to conform with the law and conduct an EIS in 1987, when the Agency apparently recognized this requirement (PDD, p1-7), the process could have been completed in the late '80s. Accordingly, any nuclear proliferation threats which exist, due to the expiry of OSF returns, are the responsibility of the DOE and past US Administrations. 1137-1

Greenpeace would also like to record its strong support for the DOE's apparent recognition that the future handling of the OSF program must be regarded as a matter of great significance in "Reducing the threat of the proliferation of nuclear weapons." and "promot[ing] U.S. nuclear weapons nonproliferation policy (p.1 and cover-sheet of DEIS Summary). 1137-2
While these concerns may well have been recorded in the DEIS's title, certain management options under consideration would instead amount to a direct threat to the cause of nuclear nonproliferation.

We are very disturbed that the reprocessing of highly enriched uranium (HEU) spent nuclear fuel (SNF) is considered an option in all three of the Management Alternatives under consideration. The "foreign" reprocessing of HEU SNF at either Dounreay (UK) or Marcoule (France) is unacceptable on the bases of nonproliferation, health and safety concerns and amounts to a serious denial of US policy objectives in each of these areas. On the same bases, consideration of reprocessing at US DOE facilities is equally unacceptable and in conflict with national and international policy objectives. While we fully understand that a comprehensive DEIS should consider all possible alternatives, we are convinced that inclusion of 1137-3 1137-4

Response to Comment No. 1137-1

This Environmental Impact Statement, has been prepared in accordance with the requirements of NEPA to insure that reasonable alternatives were considered in the decisionmaking process.

Response to Comment No. 1137-2

The commentor's support for the objectives of nuclear weapons nonproliferation and the proposed policy is noted. The degree to which the various alternatives analyzed in the EIS do or do not support United States nuclear weapons nonproliferation policy are discussed in Sections 2 and 4 of the EIS.

Response to Comment No. 1137-3

The commentor's opposition to the overseas reprocessing alternative is noted. Specifically, this is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS. Management Alternative 3 is a combination of Management Alternatives 1 and 2, so it also contains some overseas reprocessing, as discussed in Sections 2.4 and 4.5 of the EIS. NEPA requires that the environmental impacts of all reasonable alternatives be evaluated.

Response to Comment No. 1137-4

The commentor's opposition to consideration of domestic chemical separation is noted. The advantages and disadvantages of chemical separation are discussed in Sections 2.2.2.6 and 4.3.6.1 of the EIS.

The degree to which the various alternatives analyzed in the EIS do or do not support United States nuclear weapons nonproliferation policy are discussed in Sections 2 and 4 of the EIS.

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

reprocessing options in the final EIS and resultant program would provoke significant public and political opposition which will once again delay, if not halt this important program.

1137-4 (Cont'd.)

We are also concerned that the current plans for the transport of HEU SNF have not progressed beyond those which have caused public and political censure in the past. The options for these transports appear to place environmental health and safety as well as nonproliferation concerns as a secondary matter to cost and ease of shipping. Inadequate attention to safety and security issues has made such nuclear transports into a matter of international concern and attention. Bad transport planning will guarantee that this program will sail directly into a storm of controversy and further delays.

1137-5

While these comments focus on concerns relating to the reprocessing options and transport plans, Greenpeace has considerable concerns regarding other aspects of this DEIS and the program itself. Given the short space of time provided for review, and given the fact that crucial cited documents are neither completed nor available to the public in draft form, Greenpeace wishes to reserve its right to make additional comments regarding this DEIS and the OSF--we simply have not had time to complete our review of certain new technical and legal issues. In addition, we wish to call the DOE's attention to our submitted comments (GP91, GP93) to their 1991 and 1993 OSF assessments and request that those comments be considered in addition to these provided below.
Relevant legal and technical comments/analysis were provided in our 1991 and 1993 comments which will be referred to below but will not be recopied in their entirety given time and space constraints.

1137-6

II. Overseas Reprocessing Is An Unacceptable Option

The DEIS' consideration of overseas reprocessing is unacceptable as it:

*runs counter to US nonproliferation policy
*runs counter to developed US policy regarding OSF
*is technically and legally flawed
*will engender direct public and political opposition leading to continued delays in the OSF program

1137-7

Any one of these shortcomings is adequate to disqualify the foreign reprocessing option from consideration--taken together, these problems require that this option should not only be eliminated but should be rejected as a matter of public, proactive policy setting for domestic and international purposes.

II.a. Overseas Reprocessing of HEU SNF would constitute an Unjustifiable Reversal of US Nonproliferation Policy

1137-8

As is stated in the DEIS, "...the United States does not encourage the development of reprocessing capabilities overseas...." (4-99). This policy is linked to the recognition, also stated

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Response to Comment No. 1137-5

DOE disagrees with the commentor's allegation that, in transporting foreign research reactor spent nuclear fuel, human health, safety, environmental concerns, and nonproliferation are made secondary to cost and ease of shipment. DOE's plans would ensure that foreign research reactor spent nuclear fuel, as well as all radioactive materials, are transported in a manner that would minimize human health risks, safety risks, environmental impacts, and nonproliferation concerns. Spent nuclear fuel shipments within the United States have been conducted for over 40 years. In all that time, there has never been an incident in which the spent nuclear fuel transportation cask has released any of its radioactive contents, nor has a spent nuclear fuel transportation cask ever been punctured, even as a result of an accident.

Response to Comment No. 1137-6

The 90 day comment period for the draft EIS ended on July 20, 1995. Comments received after July 20, 1995, were incorporated in this Comment Response Document to the maximum extent practicable. No further Greenpeace comments had been received by the time this document was finalized.

The commentor references previous testimony given during the scoping process. The testimony given during scoping meetings was solicited in order to help DOE determine the scope of the EIS and was responded to in the development of the Implementation Plan on the proposed policy on spent nuclear fuel (DOE/EIS-0218, October 1994). However, to the extent that the earlier comments have been individually referred to in the current Greenpeace comments, responses are provided in the following material.

Response to Comment No. 1137-7

The commentor's opposition to the overseas reprocessing alternative is noted. DOE responds below to the commentor's assertions that 1) overseas reprocessing would run counter to U.S. nuclear weapons nonproliferation policy, 2) it would run counter to U.S. policy regarding offsite fuels, 3) it would be technically and legally flawed, and 4) it would engender opposition leading to delays.

Response to Comment No. 1137-8

The phrases and sentences cited by the commentor came from several different sections of the EIS and do not present a coherent picture of U.S. policy on overseas reprocessing. As discussed in Section 2.3 of the EIS, overseas reprocessing could support U.S. nuclear weapons nonproliferation policy if, and only if, arrangements are worked out with the foreign reprocessors and foreign research reactor operators to minimize the use of HEU. Nevertheless, the text cited by the commentor from page 1-4 of the draft EIS has been revised to clarify the need for some changes from the way overseas reprocessing was done in the past. Also see the response to Comment 311-4.

in the DEIS, that "...HEU in civilian commerce might be diverted into a nuclear weapons program.
Removal of HEU from international civilian commerce will greatly enhance the goals of the U.S. nuclear weapons nonproliferation policy." (4-118) These recognitions lead to the clear and definitive statement: "While the U.S. Government has full confidence in the physical protection and safeguards systems in place at the British and French reprocessing facilities, reprocessing of spent nuclear fuel containing HEU would sustain international commerce in HEU, in direct contradiction to the U.S. position on nuclear weapons nonproliferation."(1-4)

Despite the apparently clear position staked out in the DEIS against foreign reprocessing, the Authors not only consider this option among those considered in Management Alternatives 2 and 3 but suggests several forms of active encouragement for and participation in overseas reprocessing:

1. The US would "Encourage and provide nontechnical (financial and/or logistical) assistance to foreign research reactors and reprocessors to facilitate reprocessing spent nuclear fuel overseas...."(2-23)

2. The US would actively seek to negotiate new "bilateral agreements" allowing overseas reprocessing (2-25)

3. In the course of facilitating these contracts, the US would in fact be encouraging countries to enter into new reprocessing contracts which had not existed before and in a number of cases, this would involve countries which had never before been interested in and/or allowed to negotiate such contracts.

4. Such contracts with Dounreay or Marcoule would have the effect of further developing/enlarging the reprocessing industry. In the case of Dounreay, the DOE would be supporting the UK in reopening a closed plant and in the case of Marcoule, the US government would be supporting France in adopting a new program of reprocessing foreign HEU SNF.

It is quite clear that these proposed actions amount to active encouragement for reprocessing. It is certainly clear that given the other options provided in the DEIS, the overseas reprocessing option can not be defended as part of current or past commitments to clients or allies and therefore required by US policy or contract. Accordingly, these offers are an unjustifiable encouragement to foreign reprocessing and should remain precluded by US nonproliferation policy as stated.

1137-8 (Cont'd.)

II.b. Overseas Reprocessing Runs Counter to Developed Policy Around the OSF.

As is noted in the DEIS "Under the "Off-Site Fuel Policy," the United States accepted, temporarily stored, and reprocessed spent nuclear fuel containing HEU enriched in the United States." (1-2) This remained US "operative policy" for over two decades until the HEU SNF

1137-9

Response to Comment No. 1137-9

Under the expired Off-Site Fuels Policy, overseas reprocessing was not precluded, as suggested by the commentor. Sometimes the foreign research reactor operators leased the nuclear fuel from DOE, so title never left the U.S. Sometimes the foreign research reactor operators purchased the fuel and took title to it, but in these cases the foreign research reactor operators usually chose to send it to the United States after it was irradiated (used).

Overseas reprocessing, per se, would not undercut U.S. nuclear weapons nonproliferation policy. Only overseas reprocessing as it has been done in the past without new arrangements, such as those discussed in Section 2.3 may do so.

The Off-Site Fuels Policy sought to minimize international commerce in HEU, not to preclude overseas reprocessing as suggested by the commentor. This fundamental policy has not changed over the years. In fact, minimizing and eventually eliminating HEU in civil commerce is the primary goal of the proposed action in this EIS.

Reprocessing was considered unacceptable in the context of the Urgent-Relief EA since, in the time available for that action, it was not possible to make arrangements to prevent the separated HEU from being placed back into international commerce.

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

returns program under the OSF expired at the end of 1988. It should be noted that during this period, overseas reprocessing was apparently precluded for HEU of US origin.

Building on the earlier "operative policy", the DOE in 1993 and 1994 issued its Draft and Final EA of Urgent Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel, DOE/EA-0912 (hereafter the EA). In the EA, which clearly provides a basis for the current DEIS, it is categorically stated that "offsite" or overseas reprocessing would not "serve the nonproliferation interests of the United States." (EA, S-2). In numerous instances, these documents suggested that reprocessing at Dounreay "would engender a number of consequences adverse to United States nonproliferation interests."(EA, 1-3). Among the serious consequences threatened by such a development could be "renewed international commerce in weapons-usable HEU and would be directly antithetical to the policy goal of seeking to minimize and eventually eliminate the civil use of HEU."(EA, 1-4)

1137-9 (Cont'd.)

The proposed "Urgent Relief" program was therefore, at least in part, urgent due to the risk of a non-returns policy leading to a resurgence and/or increase in reprocessing. As a further indication of the risk perceived by the US government, it should be noted that it reportedly sought to pay Belgian authorities as much as half a million dollars to discourage them from proceeding with their negotiations with Dounreay.

It is quite clear that in its past incarnations the OSF program has sought to preclude overseas reprocessing as part of US nonproliferation policy. It is inexplicable that fundamental policy positions of this kind should be changed from year to year. As has been true in the past, overseas reprocessing should be precluded.

II.c. The DEIS' Consideration of Overseas Reprocessing Options is Inaccurate, Incomplete and Inconsequential

Put bluntly, the review of overseas reprocessing options in the DEIS is indefensible and pathetic. The analysis contains serious factual errors, gaping deficiencies, and significant contradictions. These discussions do not provide the basis for informed policy making and seriously undermine the legal, political and technical credibility of the DEIS and the EIS process as carried out by DOE/DOS.

II.c.1. The DEIS fails to Consider or Adequately Address the Following Points regarding potential reprocessing at Dounreay:

1137-10

II.c.1.a. The DEIS erroneously states that "The British facilities at Dounreay are currently reprocessing foreign research reactor spent nuclear fuel."(2-24) This is incorrect. The so-called Materials Testing Reactor Reprocessing Plant (MTRRP), at which reprocessing of domestic and foreign HEU fuel has occurred, was in fact mothballed in 1994. On the other hand, the Prototype Fast Reactor Reprocessing Plant (PFRRP), which has been and will be used until as late as 1999 for the reprocessing of fuel arising from the Dounreay Prototype Fast

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Response to Comment No. 1137-10

The MTR reprocessing plant has not been mothballed as suggested by the commentor. It is not currently operating, but is quite capable of operating. Nevertheless, the text of the EIS has been revised to indicate that the facilities are currently capable of reprocessing foreign research reactor spent nuclear fuel. Also see the response to Comment 490-1.

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Reactor, is still operating but not for foreign research reactor (FRR) HEU SNF. It should be noted that the PFRRP is not designed to reprocess FRR HEU SNF. *1137-10 (Cont'd.)*

II.c.1.b. The Agencies Seem Confused and Unclear about the Nature of Reprocessing Facilities at Dounreay. As the DEIS does not go into detail about the facilities at Dounreay, it is impossible to guess what the Authors know about defunct and operational facilities. But, they appear to think that the mothballed MTRRP is not only open but operating on FRR HEU SNF--all of which is wrong. It is also possible that they think that the PFRRP is working with FRR HEU SNF. This is also wrong. In any case, the Agencies have neglected to state which plant(s) they are talking about and which plant(s) they would consider using. They have neglected to assess the nature and capacities of the reprocessing facilities, etc. *1137-11*

The bottom line is that the MTRRP which is extremely old and decrepit would need to be reopened, and presumably overhauled, in order to reprocess HEU SNF considered under the OSF. Such a decision would entail considerable economic, environmental and political assessments and costs--none of which have been considered let alone assessed in the DEIS.

II.c.1.c. Dounreay Reprocessing Is Precluded by the Criteria Set Out in the DEIS. The DEIS states that the DOE and DOS "would only consider the subalternative in France or the United Kingdom where the capability already exists." (4-99) *1137-12*
As the HEU SNF would need to be handled in the MTRRP, and given the fact that this plant was mothballed in 1994, this plant does not constitute an 'already existing capability'.
In fact, causing the MTR to reopen would be to encourage new reprocessing capacity and commerce in HEU.

II.c.1.d. The DEIS Inaccurately Characterizes the Nature of Radioactive Discharges from Dounreay. Although the DEIS provides very, very little data about Dounreay and its discharges it states that it, along with the other controversial reprocessing plants in Europe: "... routinely release small quantities of radionuclides into the environment and produce radioactive wastes." (4-99) Noting that these releases "would cause a small, unmeasurable increase in world-wide natural background radiation levels" the DEIS nonchalantly sweeps the discharge issue aside by stating that such discharges would only "produce impacts on FOREIGN TERRITORY AND POSSIBLY IN INTERNATIONAL WATERS."(4-99, emphasis added)

In seeking to justify this blase attitude, the DEIS supplies release figures from Dounreay to the North Sea in 1993. The authors neglect to mention that 1993 was a record year at Dounreay for research reactor reprocessing--the MTR reprocessing plant operated near its maximum design specifications in reprocessing some 1,000 spent fuel elements. *1137-13*
During this year, "routine" discharges of plutonium to the atmosphere increased by 600% and to the sea by 450% over the average discharges for the period 1989-92. The only reason that the discharges represented a fraction of the "applicable regulatory limits" is because these limits have been set at an unjustifiably high and dangerous level. It should be noted that this practice is now prohibited by the latest UK/EC environmental regulations. Limits are now regulated based on the necessity to discharge rather than on a high theoretical figure.

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Response to Comment No. 1137-11

See the responses to Comments 490-1 and 1137-10, above. Any maintenance or refurbishment work necessary for the reprocessing plants at the Dounreay Site would be regulated by authorities in the United Kingdom, so they would be outside the scope of this EIS. Any economic, environmental and political assessments and costs at the Dounreay Site would also be outside the scope of this EIS.

Response to Comment No. 1137-12

The Dounreay Site has the capability necessary to reprocess foreign research reactor spent nuclear fuel. Furthermore, reprocessing does not inevitably lead to increased commerce in HEU. It could, but if Management Alternative 2 is selected then new arrangements would be put in place to minimize commerce in HEU. (Section 2.3 of the EIS.)

Response to Comment No. 1137-13

DOE cannot respond to the commentor's allegation that the United Kingdom regulatory authorities have set their regulatory limits for discharges at an unjustifiably high and dangerous level because this is a matter for the United Kingdom regulatory authorities. The kind of analyses requested by the commentor are not in accordance with Executive Order 12114, which deals with the Environmental Effects Abroad of Major Federal Actions.

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Although Washington may be a distance from Dounreay, DOE and DOS officials would do well to get their facts straight nonetheless. The issue of Dounreay's discharges has been a matter of intense domestic and international concern. Most recently, in 1995, the UKAEA has requested permission to increase actual radioactive discharges to the environment by up to 1,000%. While these discharges are partially based on FFR reprocessing, it is clear that the increased discharge levels are being requested in the hope that the MTRRP will be reopened due to winning new contracts under or outside of the OSF program. This outrageous request has capped a rash of domestic and international protest (discussed below) which all the more assures that Dounreay's reprocessing future is doubtful at best.

1137-13 (Cont'd.)

II.c.1.e. Dounreay Does Not Comply with US Criteria for HEU disposition. The DEIS sets out two criteria which would need to be met by foreign reprocessors in their handling of reprocessed HEU: 1. the capacity and commitment to downblending reprocessed HEU to LEU, and, 2. the capacity and commitment to reprocess research reactor (RR) LEU SNF as well as HEU SNF in order to encourage clients to remain within the RERTR program.(2-34) Dounreay does not have the capacity to comply with either of these criteria.

While the DEIS sets out the first criteria, ie., downblending capacity, it does not discuss Dounreay's current or future capacity to conduct such activities. This is an inexplicable and fatal omission. We believe that Dounreay has little if any downblending experience or capacity. It is quite clear that facilities for downblending would need to be constructed in order to undertake the handling of reproHEU of the amounts under consideration. Accordingly, Dounreay does not comply with this criteria nor that of being a facility where the "capability already exists."(see II.c.3.)

1137-14

While the DEIS sets out the additional criteria of RR LEU SNF reprocessing it does not discuss Dounreay's current or future capacity to conduct such activities. This is an inexplicable and fatal omission. Dounreay does not have the capacity to reprocess RR LEU SNF. New facilities would need to be constructed. Therefore, Dounreay does not comply with this criteria, nor with the criteria of choosing only facilities where the "capability already exists," and finally, the construction of a new RR LEU SNF reprocessing line at Dounreay would clearly put the US in the position of directly encouraging increased reprocessing activity and capacity.

Finally, both these criteria assume that uranium fuel containing contaminated uranium arising from reprocessing (reproU) will prove commercially useful. The DEIS does not provide any assessment of the issues relating to the reuse of contaminated reproU despite the fact that it is fully aware that use of this uranium has considerable economic, environmental, technical, and worker/public health implications. This omission is inexplicable as it calls into question the practicality and support for this option.

II.c.1.f. The DEIS Neglects to Address the Question of Plutonium Disposition Arising from Dounreay Reprocessing. The DEIS admirably points out the significance of plutonium content in FRR HEU SNF from a transport standpoint (S-11), but it does not address this same matter from a reprocessing and disposition standpoint with regard to the Dounreay reprocessing option. As the US government has stated that such plutonium is usable in nuclear

1137-15

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Response to Comment No. 1137-14

The Dounreay Site has the capability to blend down all the HEU that would be involved in this program. See the figure attached to the UKAEA comment letter included in this volume as Comment Document 442 for information on Dounreay's downblending experience and plans.

New facilities would not need to be constructed at the Dounreay Site to reprocess the new high-density LEU nuclear fuel, as stated by the commentor. Actually, only minor modifications to the existing facilities would be necessary.

The intent of the proposed action is support for U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate the use of, highly enriched weapons-grade uranium in civil programs worldwide (Section 1.2 of the EIS). The commercial usefulness of the uranium is a secondary consideration. Nevertheless, the HEU could be blended down with appropriate stocks of natural or depleted uranium to make a commercial product.

Response to Comment No. 1137-15

The plutonium content of foreign research reactor spent nuclear fuel is presented in Table B-8 in Appendix B. If the foreign research reactor spent nuclear fuel were to be reprocessed at the Dounreay Site, the trace amounts of plutonium in the fuel would not be separated from the bulk of the fission products. The plutonium would be treated along with the fission products in the high-level waste.

weapons, it is clear that the DEIS, given its concern with nonproliferation, must address the plutonium disposition question with regard to overseas reprocessing. 1137-15 (Cont'd.)

II.c.1.g. The DEIS' Assessment of Nuclear Waste Disposition from Dounreay Reprocessing is Inaccurate, Incomplete and Naive. In discussing possible FRR HEU SNF reprocessing in the US, the DEIS correctly states "Chemical separation would increase the total volume of waste (including liquid high-level waste raffinates,transuranic wastes, various solid and liquid low-level wastestreams, acidic wastes, chelating and complexing agents, and solvents)...."(2-16) Inexplicably, there is no equivalent discussion of the nature and disposition methods for the handling of Dounreay's waste streams.

In a piece of indefensible political alchemy, the DEIS neglects to discuss the nature and disposition of waste save that which is classified as "high level" (HLW) in the US. This of course means that issues relating to the handling, transport and disposition of the overwhelming volume of waste is simply neglected. This is a fatal flaw rendering the DEIS legally and technically indefensible.

In assessing the treatment of HLW at Dounreay, the DEIS documents the fact that the UK inexplicably conducts its own political alchemy in that "the wastes from reprocessing of research reactor spent nuclear fuel are classified as intermediate-level radioactive wastes," and notes "(in the United States, these same materials would be classified as high-level radioactive wastes." (4-101). A number of points must be made:

-obviously, the characterization of "the wastes from reprocessing" as all being intermediate level in the UK or high level in the US is foolish and inaccurate-as noted above there are a mixture of different wastes, the overwhelming proportion of which is not even mentioned 1137-16

-Dounreay's waste processing and storage practices do not comply with US standards. Not only does this mean that the US will not accept such wastes as part of the OSF but it should also mean that the US prohibits any support/encouragement for such inadequate and faulty waste practices.

Additionally, the DEIS states that "French and British regulatory agencies require the customer to take back the wastes as a condition of reprocessing spent nuclear fuel." (4-100) As this statement receives no further discussion nor clarification, we are left to understand that British authorities require that all wastes arising from reprocessing at Dounreay would have to be received by the RR operators and/or by the US. Yet quantities, transport measures, ultimate disposition for this tremendous quantity of waste is not discussed. In any further analysis the Agencies must make it clear that either all wastes will be returned to clients and/or the US and analyze the implications of this or they must explain and justify the retention of foreign wastes in the UK.

The DEIS states that "The government of the United Kingdom might allow an exchange of vitrified commercial waste from Sellafield for cemented waste from Dounreay...." It is quite clear that policy-making, and environmental analyses should not be based on policies which

Response to Comment No. 1137-16

The United Kingdom and the U.S. government have different definitions of high-level waste and intermediate level-waste. This is a simple difference of regulatory practice among governments.

Dounreay's waste processing and storage practices comply with United Kingdom standards, not with U.S. standards. The U.S. government does not have the authority to impose its standards on another sovereign nation.

The text of the EIS has been revised in response to this comment to indicate that all of the waste (including low-level waste) would have to be exported from the United Kingdom. This is another of the arrangements that would have to be established before the overseas reprocessing alternative could be implemented in the United Kingdom with U.S. assistance. In Dounreay's experience, however, insignificant amounts of low-level waste have been produced during reprocessing of research reactor spent nuclear fuel.

DOE considers that it is beneficial to examine a wide range of options, including some that are uncertain at this time. The exchange of vitrified waste from the Sellafield Site for cemented waste from Dounreay is one example of such an uncertain option.

The vitrified waste being produced at the Sellafield Site today is similar to the vitrified waste that is expected to be produced at the Defense Waste Processing Facility at the Savannah River Site. Therefore, the Sellafield vitrified waste form is likely to be acceptable for disposal in a geologic repository in the United States. The impacts of ultimate disposition of spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. A detailed, quantitative discussion of these impacts would have to be the subject of future NEPA documentation when further information and analysis are available.

U.S. based storage of vitrified waste from the Sellafield Site would not be the same as stockpiling weapons-usable plutonium. Vitrified waste would contain only trace amounts of plutonium trapped in a chemically inert glass.

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

"might" do one thing or another. It is clear that Dounreay is not an acceptable option under this program as it does not conduct waste practices in compliance with US regulations; most specifically it treats HLW in a way which could not be accepted for radisposition in the US as this program would apparently require. It is also quite clear that a waste swap would also not comply with US policy as the waste to be brought to the US or foreign customers would not in any way be connected to the reprocessing of the material brought to and reprocessed at Dounreay.

Finally, in considering the storage of vitrified HLW from Sellafield, the DEIS fails to provide data about the nature, content and quality control of this material. This omission is a fatal flaw which precludes the necessary analyses legally required in an EIS. Of even greater importance, US-based storage of waste arising from Sellafield would make a mockery of the US position that it will not encourage the separation and stockpiling of weapons-usable plutonium. Acceptance of vitrified high level "plutonium waste" arising at Sellafield would clearly make the US an accessory to activities which it has vowed not to encourage.

1137-16 (Cont'd.)

II.c.2. The DEIS fails to Consider or Adequately Address the Following Points Regarding Potential Reprocessing at Marcoule:

II.c.2.a. The DEIS fails to describe and analyze facilities at Marcoule which are apparently under consideration under Management Alternatives 2 and 3. While the DEIS notes "French facilities at Marcoule are planning reprocessing of French research reactor spent nuclear fuel in the near future..."(2-25) no further discussion occurs on the timing, nature and content of these activities. As there is no description or analysis of the facilities or their activities it is clear that this option has not been assessed as is required.

1137-17

II.c.2.b. Marcoule Reprocessing is Precluded by the Criteria Set Out in the DEIS. The DEIS seems to suggest that the Marcoule facilities are not now reprocessing research reactor fuel and are certainly not reprocessing foreign research reactor fuel. This would appear to place the use of Marcoule in clear conflict with the criteria that a plant must "currently" operate for the purpose of HEU reprocessing. In addition, this option would be at conflict with US commitment to not encourage further development of new reprocessing activity as it would bring Marcoule into the market of reprocessing FRR HEU SNF.

1137-18

II.c.2.c. Reprocessing at Marcoule is in Conflict with Safeguards Requirements Laid Out by the DEIS. It is stated that the "candidate" reprocessing facilities located in Europe "are operated under EURATOM and IAEA safeguards"(2-24). Marcoule is a military production facility which is only under partial safeguards. The DEIS does not list the facilities under consideration and therefore does not show that the Marcoule facilities which might be used are only those under safeguard. For example, while head-end activities would involved the CEA/COGEMA TOR facility, additional separation activities would take place in UP1 which has been and continues to be operated for military production purposes under the control of the CEA. As the French mix their "civilian" and "military" fuel cycles, it is quite clear that the issue of facility safeguarding and materials accountancy are far from clear. For example, in their latest report on physical protection and safeguards of nuclear materials in France (covering year 1993), the

1137-19

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Response to Comment No. 1137-17

The discussions of the reprocessing facilities and activities in France are adequate for determining the feasibility of this alternative. The additional analyses suggested by the comment are outside the scope of this EIS since the activities involved would occur within a sovereign nation and outside the United States.

Response to Comment No. 1137-18

There is no criteria in the draft EIS that a plant must be currently operating to consider it for reprocessing the foreign research reactor spent nuclear fuel. As discussed in Section 4.4.2.1, the United States does not encourage the development of reprocessing capabilities overseas, but the capability already exists in France.

Response to Comment No. 1137-19

Before any decision to reprocess the foreign research reactor spent nuclear fuel at the Marcoule Site in France would be implemented with U.S. assistance, arrangements in support of U.S. nuclear weapons nonproliferation policy would have to be established. These arrangements could include a requirement that the separated uranium remain under safeguards. However there is no guarantee that such arrangements could be worked out.

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Ministry of Industry states:

"In any case, France keeps the control of the materials which are free to use [for any purpose including military] and can transfer them at any moment, by a simple act of accountancy, from the sector under safeguards to the sector outside EURATOM safeguards and the other way round."

1137-19 (Cont'd.)

Given France's policy, and given the lack of information provided in the DEIS, it is not defensible to say that Marcoule activities would be conducted under safeguards.

II.c.2.d. The DEIS Provides No Data to Support The Claim of Minimal Radioactive Discharges. As was noted above with regard to Dounreay, the DEIS contends that only "small quantities" of radionuclides are discharged into the environment from European reprocessing plants including Marcoule. As in the case of other reprocessing plants in Europe, considerable concern exists about discharges from such plants in France. If the DEIS is to suggest that such discharges from a controversial, militarily secret plant like Marcoule are insignificant, then it will need to provide the factual discharge data to support that claim.

1137-20

II.c.2.e. The DEIS does not Indicate that Marcoule Complies with US Criteria for HEU disposition. While the DEIS states that downblending of reproHEU and reprocessing of RR LEU SNF are necessary criteria for the choice of a foreign reprocessing plant under this program, the Authors provide no data whatsoever about either such capacity at Marcoule. Such capacity would need to be demonstrated and its potential impacts analyzed before the Agencies could be deemed in compliance with their own criteria let alone those of NEPA. In addition, given Marcoule's military status, and the nature of France's 'mixed fuel cycle', the DEIS must demonstrate how US nonproliferation goals would be assured at Marcoule.

1137-21

II.c.2.f. The DEIS Neglects to Address the Question of Plutonium Disposition Arising from Marcoule Reprocessing. The DEIS admirably points out the significance of plutonium content in FRR HEU SNF from a transport standpoint (5-11), but it does not address this same matter from a reprocessing and disposition standpoint with regard to the Marcoule reprocessing option. As the US government has stated that such plutonium is usable in nuclear weapons, it is clear that the DEIS, given its concern with nonproliferation, must address the plutonium disposition question with regard to overseas reprocessing at Marcoule.

1137-22

II.c.2.g. The DEIS' Assessment of Nuclear Waste Disposition from Marcoule Reprocessing is Incomplete and Naive. In discussing possible FRR HEU SNF reprocessing in the US, the DEIS correctly states "Chemical separation would increase the total volume of waste (including liquid high-level waste raffinates,transuranic wastes, various solid and liquid low-level wastestreams, acidic wastes, chelating and complexing agents, and solvents)...."(2-16) Inexplicably, there is no equivalent discussion of the nature and disposition methods for the handling of Marcoule's waste streams.

1137-23

At the same time, the DEIS correctly states that "...French regulatory agencies require the

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Response to Comment No. 1137-20

As mentioned in the response to Comment 1137-13 above, the statements in the EIS are accurate on this subject. The radioactive releases from the Marcoule Site are regulated by the French government and DOE does not have the authority to impose any change in those regulations. The kind of analyses requested by the commentor are not required by Executive Order 12114, which deals with the Environmental Effects Abroad of Major Federal Actions.

Response to Comment No. 1137-21

The Marcoule Site has the capability to blend down all the HEU that would be involved in this program. Before a decision to reprocess the foreign research reactor spent nuclear fuel at the Marcoule Site could be implemented, COGEMA would make any necessary facility modifications or improvements.

New facilities would not need to be constructed at the Marcoule Site to reprocess the new high-density LEU spent nuclear fuel. Actually, only minor modifications to the existing facilities would be necessary.

For a discussion of how U.S. nonproliferation goals would be assured at the Marcoule Site, see the responses to Comments 311-2 and 1137-19.

Response to Comment No. 1137-22

The plutonium content of foreign research reactor spent nuclear fuel is presented in Table B-8 in Appendix B, not on page 5-11 as stated by the commentor. If the foreign research reactor spent nuclear fuel were to be reprocessed at the Marcoule Site, it would be DOE's preference that the plutonium not be separated from the bulk of the fission products. DOE would prefer that the plutonium be vitrified along with the fission products in the high-level waste. This is one of the arrangements in support of U.S. nuclear weapons nonproliferation policy that would have to be established before the overseas reprocessing alternative could be implemented with U.S. assistance.

Response to Comment No. 1137-23

The text of the EIS has been revised in response to this comment to indicate that all of the waste (including low-level waste) would have to be exported from France. This is another of the arrangements that would have to be established before the overseas reprocessing alternative could be implemented in France with U.S. assistance.

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

customer to take back the wastes as a condition of the reprocessing of spent nuclear fuel...."(4-100) Oddly though, the DEIS suggests that only vitrified HLW is and would be involved in waste returns. In fact, according to the French Nuclear Waste Law of 30 December 1991, the storage in France of any waste arising from foreign sources is prohibited. In addition, Ministerial level officials from the last three French governments have pledged that all reprocessing wastes will be returned to the clients.
Accordingly, in considering the return of nuclear waste from Marcoule, the DEIS must address the handling, packaging, transport and eventual disposition of all wastes generated by Marcoule reprocessing. The omission of this data and analysis precludes this option and renders the DEIS fatally flawed.

1137-23 (Cont'd.)

II.d. Reprocessing of Foreign RR HEU SNF at Dounreay or Marcoule Would Occasion Tremendous Opposition which would Delay if not Preclude this aspect of the OSF.

II.d.1. Public and Political Opposition to Dounreay Reprocessing Precludes this Option for the OSF.

It is quite clear that Dounreay reprocessing of FRR HEU SNF would fan the flames of domestic and international opposition which have all but ended such activity at the plant otherwise.

On the domestic front, it must be understood that Dounreay faces massive opposition in Scotland. As reprocessing at the plant is all but finished--the MTRRP closed as of last year and the PFRRP will be finished within the next few years--the threat of new foreign contracts has created considerable opposition and anger. The Scottish National, Labour and Liberal Democratic parties have all gone on record against such contracts and the required restart of reprocessing activities at the plant. As these parties represent the overwhelming majority of Scottish voters their will is already important in the political balance of UK politics and will be all the more important and powerful in the next national government. Should the next government be Labour or a mixed Labour/Lib Dem government, Dounreay is finished. Dounreay is simply not a reliable 'management' option for the OSF.

1137-24

Local opposition has also grown to the point where the local Highland Regional Council has also made it clear that it does not support the signing of new foreign reprocessing contracts. This is crucially important as reopening and rehabilitation of the MTRRP, and construction of downblending and LEU reprocessing facilities will all require permission from the Highland Council. This local opposition therefore all but guarantees extended delay if not an outright block to new reprocessing operations at Dounreay.

Finally, there has been intense regional opposition to Dounreay from countries around the North Sea region. When the OSF program lapsed and Dounreay began negotiations for new contracts with foreign clients in the early 90's, countries throughout the region wrote letters of protest to the UK government. Letters came from numerous Nordic and Northwestern European nations as well as from the Nordic Council, and the European Parliament. Direct protests occurred including the decision of the Dutch government to stop a German RR HEU SNF

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Response to Comment No. 1137-24

NEPA requires that the environmental impacts of all reasonable alternatives be evaluated. Reprocessing abroad is considered a reasonable alternative under the conditions set forth in the EIS.

transport to be sent via the port of Rotterdam.

More recently, when notified about Dounreay's request to increase its radioactive discharges into the North Sea (see above at 2.c.1.a), assuming the signing of foreign HEU SNF reprocessing contracts and the reopening of the MTR, 8 nations represented at the Joint Meeting of the Oslo and Paris Commissions on June 26-30, 1995, concurred on a statement of concern and condemnation (see Appendix). With the opposition of these countries: Denmark, Iceland, Ireland, Netherlands, Norway, Portugal, Spain and Sweden, it is clear that fierce and powerful opposition must be expected to a resumption of FRR HEU SNF reprocessing at Dounreay.

Ultimately, DOE and DOS must recognize that the Dounreay option is far from an "easy way out". It will be a political nightmare involving guaranteed delay and obstruction. After 7 years of delay and miscalculation, this is a fight the US government simply does not need.

1137-24 (Cont'd.)

II.d.2. The Marcoule Option will Meet with Considerable Political and Public Opposition which will Further Delay and Jeopardize the OSF.

On the domestic level, reprocessing has come under increasing attack in France itself. Of particular concern to the public is the fear that reprocessing contracts will allow massive quantities of nuclear waste to remain in France. Accordingly, plans to sign new contracts with foreign RR customers will be met with great suspicion and concern. Given the lack of commitment expressed in the DEIS to returning all nuclear wastes to either the RR clients and/or the US, French law and public opposition would clearly be mobilized to block such agreements on the French side.

At the same time, given recent international consternation and condemnation of France's decision to resume nuclear testing, the US should not expect public or political support for reprocessing contracts with Marcoule. Given France's dismissal for the concerns of other nations and its arrogant disregard for the disarmament process and its NPT responsibilities, it is quite unlikely that countries will be prepared to sign reprocessing contracts with a French military facility in the name of nuclear nonproliferation.

In sum, the Agencies would do well to concentrate on options which can support nuclear nonproliferation and the RERTR program in the most rapid, effective and least controversial fashion.

1137-25

III. US Reprocessing of FRR HEU SNF is not an Acceptable Option

Greenpeace is extremely concerned that domestic US reprocessing is put forward as an option in Management Alternatives 1 and 3. We strongly endorse the DOE's statement as contained in the DEIS: "...chemical separation of spent nuclear fuel in existing facilities is not preferred by DOE as a technology for management of spent nuclear fuel in the

1137-26

Response to Comment No. 1137-25

See response to comment 1137-24, above.

Response to Comment No. 1137-26

The commentor's opposition to domestic chemical separation is noted. The advantages and disadvantages of chemical separation are discussed in Sections 2.2.2.6 and 4.3.6.1 of the EIS. NEPA requires that the environmental impacts of all reasonable alternatives be evaluated.

DOE responded to the referenced comments (GP91 and GP93) when they were submitted. Since the commentor did not mention any specific comments from those references that apply directly to this proposed action DOE is unable to respond in specific terms.

DOE has not rejected the chemical separation option, nor has DOE suggested that special circumstances would nonetheless justify chemical separation, as suggested by the commentor. DOE is simply considering overseas reprocessing as one of the alternatives for managing the foreign research reactor spent nuclear fuel.

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

United States because of the necessity of handling additional wastestreams and because it could increase the accumulation of stockpiles of HEU." We are therefore surprised and dismayed that the reprocessing option is nonetheless considered as it is clear that reprocessing should be precluded in compliance with the environmental and nonproliferation policies the Agencies are promoting through the OSF and RERTR programs. We do not accept the defacto presumption that worker and/or public safety will be served by reprocessing nor do we accept that reprocessing will assist in the safe storage and or disposition of nuclear waste.(2-16) Reprocessing unnecessarily endangers workers and the public and it exacerbates and complicates the nuclear waste problem.

Greenpeace has commented extensively on the risks, dangers and contradictions posed by reprocessing in the US as part of our comments to prior documents analyzing the OSF program (see GP91 and GP93). For the sake of space and time, we ask that our comments from these earlier papers be reconsidered at this time with reference to the DEIS.

At the same time, we wish to make brief comments amplifying on the "disadvantages" stemming from reprocessing which are contained in the DEIS as justification for rejecting the reprocessing option. We also wish to provide additional policy arguments which we feel preclude any consideration of the reprocessing of RR HEU SNF.

1137-26 (Cont'd.)

Finally, commitment to non-reprocessing options can respond to the worker/public health and safety and disposition concerns raised in the DEIS at 2.2.2.6. and therefore any resultant documents to this DEIS can and should categorically preclude the reprocessing option. If the Agencies do not agree, they are required to definitively and clearly state the nature and rationale for reprocessing and analyze all potential impacts of such activities undertaken under the auspices of the OSF program. The EIS for this program can not at once reject the reprocessing option and suggest that special circumstances would nonetheless justify reprocessing under the program.
Contradiction of this type would fatally flaw any future EIS and would open the Agencies to legal challenges which would further delay this program.

III.a. Reprocessing Would Increase the Nuclear Waste Problem

As is stated in the DEIS: "Chemical separation would increase the total volume of the waste" generated in the course of the OSF program.(2-16). In order to press this issue home, the DOE should publicly state the colossal volumetric increase occasioned by reprocessing. In a recent study commissioned by Greenpeace of reprocessing in the UK, the volumetric increase occasioned by reprocessing at Sellafield was shown to be as much as 189 times the volume contained in the original SNF.(LA92)

1137-27

While defenders of reprocessing suggest that "volume reduction" will bring these figures down it is widely recognized that "volume reduction" is a cynical 1984ism for discharging waste into the environment by changing its form or changing regulations in order to render once dangerous waste miraculously "below regulatory concern".

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Response to Comment No. 1137-27

The volumes of wastes that would be generated during chemical separation and the management of those wastes are discussed in Section 4.3.6 of the EIS. The reasons why chemical separation was not dismissed from consideration on the basis of waste minimization and management are discussed in Section 2.2.2.6 of the EIS.

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Given the existence of viable storage options for HEU SNF, it is clear that reprocessing should be precluded on the basis of nuclear waste minimization and management alone. 1137-27 (Cont'd.)

III.b. Reprocessing Produces a Range of Chemical, Mixed and Nuclear Wastes.

As is noted in the DEIS, beyond the increased volume of nuclear waste produced, reprocessing also produces wastes "...which are complex, involving corrosive, flammable and toxic liquids."(2-16). Spent fuel is itself a dangerous and difficult material to handle and store, but it is quite clear that reprocessing complicates and exacerbates the nature of the waste problem in a qualitative and unjustifiable manner. 1137-28

III.c. Resumption of Reprocessing under the OSF would Overturn key Domestic Policy.

The DEIS notes that reprocessing under the OSF "could increase the accumulation of HEU stockpiles" and would overturn US policy which "does not engage in reprocessing (chemical separation) for either nuclear power or nuclear explosive purposes, and seeks to eliminate, where possible, the accumulation of stockpiles of HEU or plutonium." This policy has developed over a number of years and constitutes the realization of a key step in the disarmament and nuclear nonproliferation process. Withdrawal from this policy would not only reintroduce new environmental and public health dangers but it could also endanger US national security through encouraging other nations to act without nonproliferation restraints. Given the existence of other options for the handling of HEU SNF, these key domestic policies should not be overturned. 1137-29

III.d. The Resumption of Reprocessing Could have Significant Negative Effects on the International Level

III.d.1. The Reprocessing of Foreign HEU SNF Could Discourage Countries from Participating in the OSF.

During the years when the OSF returns program was operating, considerable international concern was voiced about the US' diversion of reproHEU, arising from civilian RRs, into its nuclear weapons production program; ie, its use as driver fuel in the SRP production reactors. Such concerns are likely to resurface should reprocessing resume under the OSF as it is quite clear that resumed reprocessing of FRR HEU SNF would occur in facilities which still remain "closed" for military reasons and remain outside of international safeguards. In addition, the DEIS makes it clear that separated HEU would remain at least temporarily within the US military establishment; the DOE and DOS "would, OVER TIME, place the separated HEU under International Atomic Energy safeguards."(my emphasis added) (2-21). Countries with strongly anti-nuclear public opinion and/or aggressive nonproliferation policies are unlikely to "do business" with the US nuclear weapons production complex. 1137-30

In addition, RR HEU SNF exists in some countries which might well use the resumption of RR HEU SNF reprocessing in US DOE facilities as a justification for retaining material which they could otherwise not justify keeping under the OSF. They could of course additionally argue

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Response to Comment No. 1137-28

The variety of wastes that would be generated during chemical separation and the management of those wastes are discussed in Section 4.3.6.6.5 of the EIS.

Response to Comment No. 1137-29

The commentor's concerns regarding chemical separation are noted. As stated in Section 2.2.2.6 of the EIS, if a policy to use chemical separation were to be adopted, it would be DOE's preference to blend down the HEU to preclude its use in nuclear weapons.

Response to Comment No. 1137-30

As discussed in response to Comment 1137-29, above, if reprocessing is implemented, DOE would prefer to blend HEU down to LEU (Section 2.2.2.6 of the EIS).

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

that they will keep their HEU SNF under international safeguard and therefore render the material more proliferation resistant than it would be in the US where the material would not be handled under safeguard.

In either case, the resumption of HEU SNF could have serious implications for the effectiveness of the OSF program at the international level. In turn, non-compliance with OSF could well lead to significant withdrawals from the RERTR program and a resultant increase in the use of and commerce in weapons-usable HEU. These concerns should preclude the resumption of HEU SNF reprocessing in the US.

1137-30 (Cont'd.)

III.d.2. The Resumption of HEU SNF Reprocessing Will Encourages International Reprocessing and Marketing of Weapons-Usable Fissile Materials.

While current US policy may not encourage reprocessing, this position would clearly be undercut by the resumption of HEU SNF in the US. The resumption of reprocessing of "civilian" materials., ie. ER HEU SNF, would clearly provide the large commercial reprocessors with an excuse, even a justification by example for their own activities. This could have the effect of further encouraging the traditional reprocessing countries like France and Britain and undercut the trend among traditional reprocessing clients to break old contracts and terminate negotiations for new contracts. The vested economic and political supporters in reprocessing states and their client nations will clearly argue that the US policy shows that reprocessing is both good for nonproliferation and nuclear waste management.

In addition, countries considering the construction of new reprocessing plants (Russia, China and Japan) or the offering of new commercial reprocessing contracts (Russia or India) will no doubt find encouragement in the resumption of "civilian" reprocessing in the US. In addition, states which have sought but been discouraged in gaining access to foreign reprocessing (Iran, South Korea, Taiwan) will clearly be strengthened in their justification, if not resolve to gain equal access to commercial reprocessing. US pressure on these countries is crucial in stopping the dangerous separation, stockpiling and marketing of weapons-usable fissile materials yet a resumption of reprocessing in the US will clearly undermine this position.

1137-31

Finally, it is quite obvious that states that might be deemed of particular proliferation risk may choose to use US resumption as justification for their own dangerous maneuvers to ascertain reprocessing capacity and/or nuclear weapons materials. As the DEIS states:

"... there is concern that other states may perceive only that the U.S. has restarted reprocessing. For example, the potential exists that other states (e.g., Iran), might use the restart of reprocessing in the United States as an excuse to continue current programs or begin new ones activities that would run counter to U.S. nuclear weapons nonproliferation interests. The implications in North Korea, where the United States has been actively working to create a nonreprocessing zone, as well as in other states, could complicate current U.S. nonproliferation activities."

Given the fact that viable non-reprocessing options exist for the OSF, it is inconceivable why the US would chose to disregard and undermine its own nonproliferation goals and interests by

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Response to Comment No. 1137-31

Chemical separation has been included as one of the alternatives considered in the EIS in response to public input during the scoping process, and it is considered a reasonable alternative under NEPA. Furthermore, both France and the United Kingdom currently reprocess spent nuclear fuel. Reprocessing by these countries has not led to a spread of reprocessing to other countries. The Department of State considers that other countries would not need the excuse of U.S. reprocessing to justify reprocessing, if they wished to undertake such an activity.

resuming reprocessing.

1137-31 (Cont'd.)

III.d.3. US Resumption of Reprocessing Seriously Jeopardizes Future Negotiations Towards a Fissile Materials Ban

As a significant element in its nonproliferation and disarmament agenda, the Clinton Administration has committed itself to pressing for a Ban on Fissile Materials Production (FMB). It has discussed the matter in bi and multilateral negotiations and has played a lead role in having the UNGA place the issue on the UNCD negotiations agenda from 1995 onwards. It is quite clear that this historical initiative will be seriously undermined by a resumption of HEU SNF reprocessing in the US. Beyond allowing other weapons states to use this as a justification for not negotiating a FMB, non-nuclear weapons states could have their own interest in a more comprehensive FMB shattered. At a time when non-nuclear weapons state signatories to the NPT are looking to the weapons states to realize their disarmament commitments, the resumption of reprocessing in the US could prove a decisive and devastating blow to the international nonproliferation regime. This significant threat to the FMB alone should preclude OSF initiated resumption of reprocessing in the US.

1137-32

IV. The DEIS' Analysis of and Proposal for Transport Options is Flawed and Technically and Legally Indefensible

Greenpeace finds that significant elements of the current DEIS' evaluation of transport options and risks are shockingly inadequate and indefensible. We are disturbed that cavalier attitudes about transport safety and security have been all but carried over from earlier, deficient DOE assessments of the OSF (see EA91, FO91, FDD93, EA94). We believe that serious deficiencies in the scope, content and conclusions of the DEIS render it fatally flawed and technically and legally indefensible.

Greenpeace has submitted tens of pages of comments specifically on transport issues discussed in this document's predecessor analyses. As foolish inadequacies and discrepancies have been carried over from these earlier DOE documents, we formally request that transport analyses contained in our prior papers and their appendices be considered as commentary on this one. (see GP 91 and 93)
Given requirements of space and time, we will not repeat these analyses but refer the Agencies to comments made in our earlier comments regarding: the inadequacy of RADTRAN analysis, the requirement of analyzing the nature and effects of low-probability/high consequence accidents, shipping container inadequacy, ship choice for enhanced safety, route planning, requirement for non-stop voyages, global commons issues, issues/risks relating to terrestrial transports, and security issues.

1137-33

At the same time, we will also contribute below a few specific, additional comments on glaring problems in the DEIS pertaining to inadequate evaluation of the shipping containers, vessels and route planning, and accident and security analyses and recommendations.

Response to Comment No. 1137-32

The United States is a leading country in the effort to achieve a ban on the production of fissile materials for use in nuclear weapons. The United States does not currently engage in chemical separation for use in weapons or power production. If the United States were to choose reprocessing as a management technology, it would be conducted in a way that would be compliant with a fissile material cutoff agreement and current U.S. policies on reprocessing as identified in the EIS. As stated in Section 2.2.2.6 of the EIS, it would be DOE's preference that any separated HEU be blended down to LEU, probably for use in power reactors. At least one U.S. utility has expressed an interest in obtaining such LEU. The small amounts of plutonium in the spent nuclear fuel would be left in the waste product and disposed of geologically.

If reprocessing were to be selected as an approach, a consideration would be increased certainty associated with geologic disposal of high-level waste compared with the aluminum based spent nuclear fuel.

Response to Comment No. 1137-33

Human health and safety were the primary considerations during the evaluation of the proposed action. Great effort was expended to honestly and fairly assess the risks associated with the proposed action, all of its alternatives, and all of its ramifications. All practical options were evaluated, even those that would be more expensive, such as chartered versus regular commercial shipping.

DOE has responded, as appropriate, to Greenpeace comments submitted in other matters, either through formal responses or as part of DOE's decision making process. Thus, DOE will respond here only to specific points raised in this matter.

RADTRAN is a peer-reviewed, widely used and accepted risk evaluation code.

All reasonably foreseeable consequences associated with this proposed action have been evaluated and the results are presented in Section 4 of the EIS, as well as selected, plausible low-probability, high-consequence accidents.

In regard to shipping container inadequacy, see the response to Comment 1134-34, below. Appendix C, Section C.3.1.2 of the EIS describes all of the types of ships that might be used; Sections 4.2.1.2 and 4.2.2.2 evaluate the incident-free risk using various types of ships and the risks for all ships were found to be low. Route planning would be a function of the shipper; however, only established shipping routes would be used. Nonstop voyages were found to be unnecessary, due to the low risk associated with shipping of the foreign research reactor spent nuclear fuel. The risks associated with terrestrial transportation are evaluated in Section 4.2.3 of the EIS, and found also to be low.

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Finally, for the historical record, we wish to state that the DEIS' transport analysis and recommendations appear to have been greatly and tragically affected by an understandable but dangerous desire to cut costs. In turn, diminished safety and security caused by this "cost-effective" approach have been justified by benalizing the risks and effects of nuclear transport accidents. Given the fact that this program will launch a massive number of highly dangerous transports, these deficiencies are not just inadequate from a policy standpoint, they are morally and politically reprehensible. Unless the Agencies are prepared to require safe and secure transports they can rest assured that they will be faced with considerable legal, public and political opposition.

1137-33 (Cont'd.)

IV.a. The DEIS Fails to Address Recognized Inadequacies in the Current Generation of Nuclear Transport Containers

A crucial element in the safety system described by the DEIS is the so-called "Type B" transport container or cask.
Despite the fact that there is an increasing body of technical analysis which shows that these containers are not sufficiently designed and tested to withstand severe transport accidents which have occurred, the DEIS simply neglects these concerns by stating that "regulatory tests are structured to place an upper bound on the kinds of damage seen in actual severe transportation accidents."(5-11)

This statement simply places the DEIS out of step with regulatory reality. While the DEIS bases the adequacy of its containers on IAEA analysis, it is not noted that this analysis has fallen apart under the weight of technical criticism. For decades, the IAEA has maintained that the integrity of Type B casks was assured regardless of the mode of transport. This mode independent philosophy should have been rejected at the time of its inception as it was/is quite clear that different transport modes involve different forces and therefore should require different designs and testing.
Common sense has finally won out and the IAEA, with US participation, is in the process of developing regulations for a new air transport container (Type C) due to the recognition that air transport involves forces beyond those involved in the design and testing of Type B containers.(See IAEA40)

1137-34

This development should amount to a sea change in the regulation of nuclear transports--a change which must be urgently applied to sea transport as well which is widely acknowledged as involving potential factors far beyond those taken into account in the design and testing of Type B containers. Despite the fact that we have brought these factors to the attention of the DOE in numerous past submissions we do so again as they have not in any way been addressed let alone mentioned in the DEIS. The following discussion outlines our concern that the current design and testing parameters for Type B containers does not provide adequate guarantee of integrity during serious accidents.

Drop Test

These tests, like the DOE's risk assessment calculations, are based on hypothetical scenarios.

1137-35

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Appendix H has been added to the final EIS in response to public comments to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix includes the general provisions of the overall Transportation Plan, which in turn, provides for the preparation of individual transportation plans for each shipment. The individual transportation plans would cover the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

Response to Comment No. 1137-34

The spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive contents have ever been released from a spent nuclear fuel transportation cask, nor has a spent nuclear fuel transportation cask ever been punctured, even as a result of an accident. "Type B" casks would be used for marine and ground transport. No air transport of foreign research reactor spent nuclear fuel has been proposed as part of the implementation of the proposed action. The new air transport regulation changes do not apply to the existing "Type B" casks, and neither NRC nor the International Atomic Energy Agency has any plan to change regulations that would affect the current required test simulations for "Type B" casks.

Response to Comment No. 1137-35

The drop test required by the regulation (10 CFR Part 71.73) is part of a series of tests that are performed sequentially to determine the cumulative effect of a simulated severe accident scenario. It is important to note that these tests are designed to provide a cumulative effect, rather than the individual test results. In addition, a cask that is certified against breach if dropped from 30 feet onto an unyielding surface does not mean it would be breached if it drops from 31 feet. The unyielding surface criterion requires that the result of the impact be borne completely by the cask. For the test, the cask is oriented such that its weakest point would strike the surface. Drops from heights 2.5 to 3 times greater onto normal hard surfaces, such as dock pier or ship hull, would be comparable. That is equivalent to a drop from a height of 75 to 90 feet. Real-life crash tests of the prototype spent nuclear fuel transportation casks indicate that the casks can protect their content in crashes up to 130 kilometers per hour.

Common sense alone shows that the test parameters do not effectively address the real world possibilities. For instance, drop tests involve falls from 40 inches onto a steel bar and 30 feet onto an unyielding surface: however, cranes regularly lift cargoes into and out of ship holds to heights orders of magnitude greater than those involved in the drop tests. At the same time, truck transports travel over bridges or embankments which involve heights far greater than those the tests envision.

1137-35 (Cont'd.)

Fire Test

Despite the drop tests shortcomings, of even greater concern is the inadequacy of the fire and immersion tests for guaranteeing the integrity of casks in real accidents.
According to a report produced by the DOE contractor Battelle and published by the IAEA, the following observations are made:

1) "A cask will survive a minor fire of the order of 30 minutes, without loss of integrity."
2) "A fire lasting an hour or more would cause the pressure relief devices to vent. This intermediate fire would release the contaminated cooling water but would not fail any of the fuel elements."
3) "After approximately four hours some fuel elements will begin to fail."
4) "An extended fire of nine hours or more might be required to fail all the fuel pins." (HA76)

These results show that in a fire of as little as one hour, spent fuel casks will expel their radioactive coolant water, and that after as little as 4 hours, the fuel rods in the casks will begin to fail with the result that in as little as nine hours all the fuel pins in a cask will have melted. With the resultant failure of casks' seals or structural integrity, cask and fuel failure of this kind could therefore lead to a massive release of radioactivity carried by virtue of air currents fed by the fire and/or by the entry of water into the ship itself.[see GP91)

1137-36

Fires of the ferocity and duration sufficient to cause cask failure are a documented fact in the world of shipping.
According to records of the International Maritime Organization, the mean duration of shipping fires at sea is some 23 hours, while the mean duration of fires in port is 20 hours. (See LA90) These statistics, compiled for fires over a two decade period, include a standard deviation of 68 and 44 hours respectively. At the same time, the DOE itself confirms that shipping fires involving hydrocarbon fuels can reach temperatures in excess of 1000 C. (See US86; LA90 (example of Taiwan EA using example of fire in NYC). Fires of this intensity have now been adopted as a standard when looking at the risks of serious shipping fires. (See LO79; DA87)

An accident of this kind would be adequate (as can be seen from the plume diagram in GP91, Appendix B) to cause a massive nuclear contamination accident with devastating, long-term effects on the environment and human populations--in a port population of 1 million inhabitants, there could be thousands of latent cancer fatalities from a relatively severe but hardly worst-case accident. (See GP91, Appendix B)

Response to Comment No. 1137-36

The observations that the commentor is referring to are from a study of the effects of a long duration fire on an old model of spent nuclear fuel transportation cask which used water as a cooling medium and was equipped with a pressure relief valve. The current casks do not contain water as a cooling medium. If a transportation cask is heated in a high intensity fire (flame temperature in the order of 1500 to 2000 degrees F) for a long period, as suggested by the commentor, it would eventually fail. However, there would not be any contaminated water release, because the spent nuclear fuel elements are shipped in dry casks. Examinations of real-life fires on land and at sea, and fire tests, have demonstrated that high intensity fires would not likely be sustained for lengthy periods, and even then, not in a single location. Section 4.2.1.3 and Appendix D, Section D.5.4.3.2 of the EIS present an evaluation of a wide range of fire scenarios, including a high intensity prolonged fire involving spent nuclear fuel. The results indicate a very low overall risk to the public and the environment.

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Serious accident scenarios have simply been defined out of possibility and removed from this EA's scope for no defensible reason.

It is quite clear that the DOE's complacent attitude about the capacity of type B casks to withstand serious maritime fires is simply not borne out by the facts. Rather than using an example of a shipping fire that lasted for one hour at a duration of one hour (US 86 referred to in US 91), DOE should use the example of the ferry Moby Prince which collided with an oil petroleum tanker, the Agip Abruzzo off the Italian port of Livorno on April 10, 1991. The fire onboard the Moby Prince raged for 45 hours at temperatures in excess of 1000 C. Clearly, such a ship fire calls into question the adequacy of the IAEA fire test of 30 minutes at a temperature of 800 C.

US policy makers indicated their own concern about the adequacy of IAEA cask test criteria. In 1987, after Congressional concerns were raised about air transports of plutonium which were slated to land for refuelling in Alaska on their way from Europe to Japan, the Congress amended the Nuclear Waste Policy Act of 1982 in order to require that casks be tested under circumstances modelling a real worst case scenario. In 1987, in a clear rejection of the IAEA's own standards adopted here by DOE, the U.S. Congress required that casks developed for these transports would:

A) Require an actual drop test from maximum cruising altitude of a full-scale sample of such container loaded with test materials...

B) Require an actual crash test of a cargo aircraft full loaded with full-scale samples of such container loaded with test material.... (CR87)

As noted above, this concern has forced the IAEA to undertake policy review and an overhaul of its air transport requirements.

Similar tests of this kind, ones which identify realistic, worst-case scenarios, should be used to guarantee cask integrity. Without reference to such tests and with reference to actual maritime fire data it is quite clear that there is an inadequate guarantee of security provided by the casks to be used in this program.

1137-37

Immersion Test

Similarly, the cask tests for immersion are also inadequate.
The IAEA immersion tests involve submersion under a head of water of at least 3 feet for not less than 8 hr and all packages must also be subjected to a separate test in which an undamaged cask is submerged under a head of water of at least 50ft for not less than 8 hr. The shipments involved in this program will not only sail over waters of continental shelf depth (200m) but also across high sea areas the depth of which may be thousands rather than hundreds of meters. Clearly, accidents involving casks could occur over depths greater than 200m and involve immersion under tremendous pressure for a sustained period. Submergence at depths of less than 200m could occur for far greater periods than eight hours.
Accordingly, immersion incidents beyond cask design parameters are a distinct possibility.

1137-38

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Response to Comment No. 1137-37

See the responses to comments 1137-36 and 1137-34, above.

Response to Comment No. 1137-38

Section 4.2.1.3 of the EIS presents an evaluation of the consequences of accident scenarios that would result in the sinking of a spent nuclear fuel transportation cask on the continental shelf (water depth of about 200 meters), and in deep ocean (water depth of more than 200 meters). Should a loaded spent nuclear fuel transportation cask sink anywhere in the U.S. coastal waters, it would be recovered, regardless of water depth. In the deep ocean, if a cask were to sink and could not be recovered, seawater would enter the cask. Since the cask internal pressure is atmospheric, the seawater would be driven into the cask due to the existence of a large pressure differential across the cask seals. Once the cask was filled with seawater and pressurized, the pressure would equalize across the seals, and the water inside the cask would then have a chance to egress. It is only after the pressure equalizes across the cask seals that the contaminants (radioactive materials) would be able to diffuse out of the sunken cask. The EIS evaluated the consequences and risks associated with a nonrecoverable transportation cask in the deep ocean (Section 4.2.1.3 and Appendix C, Section C.5 of the EIS).

Clearly DoE cannot realistically suggest that salvage operations will occur in these depths within the time periods identified by the IAEA tests (one and eight hours respectively).

In addition, according to the DOE itself "A cask submerged in waters deeper than 200 meters is considered unrecoverable."
This effectively suggests that casks lost at depth will simply be left alone thus allowing the possibility that deep sea pressures and corrosion will finally take their toll and casks will loose their integrity and radiation will be released to the environment.

In sum, it is widely held that the current generation of Type B containers has simply been inadequately designed and tested to withstand the considerable strains of serious maritime accidents. For example, in the conclusion to an independent study, prepared by ECO Engineering of Annapolis, submitted by Greenpeace International to the International Maritime Organization it is concluded that: "there is no substantive evidence to support any claim relative to the integrity of a cask exposed to the consequences of a maximum credible marine accident. Without such supporting evidence, one cannot accept the premise that any cask or container is impervious to the kinetic energy of ship collisions, to the time-temperature domains of shipboard fires, or to the hydrostatic pressures associated with immersion in deep water." (See MSC92) 1137-38

A number of potential accident scenarios beyond cask design parameters are clearly possible. Any one of these scenarios could cause the integrity of casks to be breached and radioactive material could be released to the environment with significant impacts. [1]

An additional factor that must be taken into account is the possibility that FRR operators may not have adequate experience with nuclear casks to guarantee that correct procedures are followed for the loading and sealing of Type B containers. As the DOE will not oversee this element of the program, it is possible that contamination accidents could occur even without additional accident eventualities. 1137-39

In sum, the safety of nuclear transports at sea is not adequately guaranteed by the inadequately designed and tested casks currently in use. Rejection of these claims will not make transports safer nor will they rid the US government of the protest and opposition it will face by use of inadequate transport packages.

IV.b. The DEIS Fails to Evaluate the Safety Benefits of Different Ship Types

The DEIS takes a very strange approach to analyzing the transport ship options available for bringing HEU SNF to the US. While the ship types are presented in Appendix C, there is no analysis of the respective virtues or shortcomings of the different vessel-types. This may be the kind of window-dressing which gives the impression of the job getting done but it is clearly not the technical analysis required by good policy-making or the law. 1137-40

This superficial attitude is unfortunately carried over in the DEIS' recommendation:

Response to Comment No. 1137-39

Prior to use of a specific transportation cask, the shipper would have to comply with the specifications, limitations, and maintenance requirements of the cask as required by the cask's certificate of compliance. Further, a Transportation Plan detailing inspection procedures for the loading of the spent nuclear fuel at the foreign research reactor site would be provided by DOE prior to any individual spent nuclear fuel shipment. General provisions of the transportation plan are provided in Appendix H of the EIS.

Response to Comment No. 1137-40

Management Alternative 1 makes no recommendations about the mode or type of shipping and clearly states that chartered ships include purpose-built ships, as well as commercial ships, that might be used.

Section 4.2.1.3 of the EIS analyzes the impacts of using either commercial or chartered shipping and demonstrates that, although there are differences between them, both would have low risks and impacts.

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

"Under the basic implementation of Management Alternative 1, the foreign research reactor spent nuclear fuel would be shipped by chartered and/or regularly scheduled commercials ships from foreign ports to the United States. Chartered shipments would be on purpose-built ships or general purpose commercial cargo ships. Regularly scheduled commercial shipments would be on general purpose commercial ships carrying other cargo at the same time."(2-9)

Why are different vessels to be used? What makes a transport 'regular' and therefore safe on a general cargo vessel loaded with mixed goods, meandering among different ports, and when is it 'irregular' and therefore requiring of the enhanced protection of a dedicated, purpose-built vessel? None of this is explained; the different options are not analyzed on the basis of safety or security. Clearly, this is neither a real recommendation nor is it a real analysis.

1137-40 (Cont'd.)

Stemming from these deficiencies, the following issues need to be addressed in preparing the final EIS:

IV.b.1. Failure to Address the Exclusive Use of Purpose-Built Ships.

The DEIS fails to consider the exclusive use of ships constructed specifically for transporting irradiated nuclear fuels, known as "purpose-built" ships. Purpose-built ships are equipped with numerous safety features not found on cargo ships: these include hull stability and strengthening additions, duplication of all major systems, 24 hour radiation monitoring of personnel and casks. (See I.A.90) Purpose-built ships are currently available. For example, British Nuclear Fuels, Ltd. (BNFL) owns six purpose-built ships that cross tens of thousands of miles of sea a year while carrying cargoes of up to 24 LWR casks.[2] BNFL is actively pursuing additional contracts and clients.[3] Despite the obvious benefits and readily available information, DOE did not compare the risks of shipping via standard cargo ships versus purpose-built ships.

1137-41

The use of standard general freight vessels for these shipments is a clear indication that cost of the shipments has been made a greater concern than has the safety and security provided by the vessels engaged. It is quite clear that a general cargo vessel can not be expected to have special features, and/or trained personnel who could deal with accidents involving a nuclear cargo. At the same time, the maintenance and standards on-board such freighters are notoriously poor--thus the image of rusted out tramp freighters.

1137-42

Unfortunately, the DOE has allowed such shipments to be made by this type of vessel in the past with quite frightening results.

In a DOE document outlining a small part of the Agency's past SNF returns history, we have found the names of five standard cargo vessels each of which was used at one time to carry a freight of research reactor spent fuel during the Phase 1 segment of the program to carry Taiwan research reactor fuel back to the U.S.[4] These shipments occurred between August of 1986 and July of 1988. During its transport of research reactor fuel, the general dry good

1137-43

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Response to Comment No. 1137-41

Appendix C, Section C.3.1.2 of the EIS discusses types of ships that could be used, including purpose-built ships. While the specific risks of using purpose-built ships were not analyzed, Section 4.2.1.3 of the EIS analyzes and compares the impacts of using either commercial or chartered (which includes purpose-built ships) shipping. This section demonstrates that, although there are differences between them, both would have low environmental effects and low risks.

Response to Comment No. 1137-42

The safety record of commercial freighters is actually quite good. As shown in Appendix C, Section C.5.5 of the EIS, the accident rate is 0.00032 per port call and 0.000046 per deep ocean voyage. Put another way, of every commercial ship that enters a port, only one in 3,125 ships will have an accident. Likewise, only one in over 21,000 deep ocean voyages result in accidents at sea. An accident in this context covers anything that is large enough to involve insurers.

DOE considers that using a reputable shipping line is a safe way to transport foreign research reactor spent nuclear fuel. Historically, foreign research reactor spent nuclear fuel has been shipped on commercial carriers without major accidents and with no release of radioactive materials.

Response to Comment No. 1137-43

DOE agrees with the commentor that shippers with poor safety and reliability records should not be used, and if DOE does contract for foreign research reactor spent nuclear fuel shipments, it would only do so with reputable shippers. DOE invites the commentor to submit, for DOE's consideration, a list of shippers who should not be used for the proposed action. It should be noted that shipping is the responsibility of the owner of the spent nuclear fuel, so DOE expects not to be the shipper of record, except in extraordinary circumstances.

The commentor's statements about national and trade union concerns relating to the transport of irradiated fuel are noted. Please see Appendix B, Section B.1.8 of the EIS which lists the geographical distribution of foreign research reactor spent nuclear fuel, and estimated number of shipments by country.

The majority of foreign research reactor spent nuclear fuel shipments would originate from those countries mentioned by the commentor as concerned with the transport of irradiated fuel, i.e., Germany, Netherlands, France, Japan, and Belgium. Since those countries would be responsible for shipping their foreign research reactor spent nuclear

cargo vessel "Swallow" suffered serious mechanical problems. Whether under tow or under her own power, the Swallow came into the Mexican port of Manzanillo where the ship remained for over a month's time between May and July, to undergo repairs before sailing to Hampton Roads, VA. We have not been able to ascertain additional information about this accident, nor about the measures taken to protect and secure the shipment of spent fuel which was on board. We have also been unable to obtain additional information as to what investigations of the program were undertaken at that time to analyze changes required in the shipping program. Additionally, what safety and security provisions were exercised to protect this cargo during its unscheduled and prohibited stop?

Another one of the vessels, the "Sanko Harvest", ran aground on a reef, after having made its transport of research reactor spent fuel. The ship was ripped open, sank and her entire cargo was lost during a voyage from Tampa, FL to Geraldton, Western Australia on Feb 18, 1991.

In total 5 ships were used: one experienced an accident in the course of transport; another carrying different cargo was completely wrecked. This is clearly an abysmal record and indicates that these ships should not be used for such dangerous transports.

More recently, a dry goods cargo vessel, the "Vishva Parijat" was used to carry a cargo of HEU research reactor fuel from India to the UK for delivery to the reprocessing plant at Dounreay. The cask was checked by authorities in India and its exterior was found to be free of contamination. The ship departed Bombay on Dec. 29, 1990. The ship then crossed the Persian Gulf area, logging in at Port Said, Egypt on Jan. 19, 1991., during the war in the Persian Gulf. The ship arrived at the port of Felixstowe, U.K. on January 30 and was delivered by truck to Dounreay some two days later. At Dounreay, during a photo opportunity for the press, the cask was found to be contaminated after cleaning water used to scrub the cask clean set off alarms in a run off area. Checks were made of the truck bed, and crane at the Port of Felixstowe--all were found to be contaminated. The British government would not release results of its contamination checks, no investigation was mounted of this maritime transport accident and the Vishva Parijat sailed to other ports without a contamination check.[5]

Concern about the use of standard freighters for the transport of irradiated fuel has led politicians and unionists to condemn this practice. In August of 1990, at its international conference in Florence, the International Transport Workers Federation (ITF) passed a resolution condemning the use of "Non purpose-built ships" (ships which have not been specifically designed and constructed for the carriage of irradiated spent fuel). The ITF, the largest international transport workers union with national affiliates in the U.S., citing the inadequacy of such vessels and the potential impact on nuclear transports accidents on the environment, called for the immediate cessation of transports on non purpose-built ships.

After the accident involving the "Vishva Parijat" (see above), the ITF alerted its national affiliates to be forewarned about attempts to make shipments on non purpose-built ships. Accordingly, dockworkers in the Netherlands and Germany have taken action to stop the loading

1137-43 (Cont'd.)

fuel, they would be able to specify the use of special purpose ships as recommended by the commentor. Historically, foreign research reactor spent nuclear fuel has been shipped on commercial carriers without major accidents and no release of radioactive materials.

Nevertheless, despite the precautions taken to select capable shippers, accidents could happen. That is one of the reasons that this EIS was prepared, rather than simply conducting the foreign research reactor spent nuclear fuel shipments with no environmental review. Despite the examples cited by the commentor, such accidents are unlikely to occur, or even if they did, the transportation cask is very capable of protecting the spent nuclear fuel. This is demonstrated by the fact that in over 30 years of foreign research reactor spent nuclear fuel shipments under the expired "Off-Site Fuels Policy,"there was never any instance in which radioactive materials were released from the spent nuclear fuel transportation cask. In the extreme, the worst outcome of a marine accident would be the sinking of the ship, or some other event leading to a loss of a cask of spent nuclear fuel in ocean depths too great to allow recovery. This unlikely accident is analyzed in Section 4.2.1.3 of the EIS. To summarize, this analysis demonstrates that due to the relatively benign nature of the spent nuclear fuel and the protection provided by the transportation cask, even such an accident would result in no more than a very small risk of an impact on the environment. Other accidents, up to and including extremely unlikely hypothetical accidents in which a spent nuclear fuel cask would be breached, are also discussed in Section 4.2.1 of the EIS. None of these accidents results in more than a very small risk of an impact on the environment.

The commentor also refers to the unscheduled stop of the motor vessel *Swallow* in Mexico due to mechanical difficulties. Although such a stop could be the result of a minor accident, the EIS takes such stops into account as part of the analysis of incident free operations as discussed in Appendix C, Section C. 4.1 of the EIS.

The commentor also refers to radioactive contamination having been found on the outside of a transportation cask of spent nuclear fuel that was carried on the cargo vessel *Vishva Parijat*. While DOE has no information concerning the specific instance referred to by the commentor, similar inconsequential occurrences have also taken place in the United States. These events occur due to the fact that, when the casks used to transport spent nuclear fuel are loaded or unloaded they are often lowered into water-filled pools in which the spent nuclear fuel is stored, or into transfer pools similar to storage pools. Other than the radioactivity of the spent nuclear fuel itself, the radioactivity in the spent nuclear fuel storage pools is primarily associated with small particles which are exposed to, or entrained in, the pool water. The particles may be agitated by movement of the cask and spent nuclear fuel during the cask loading or unloading operation, and can adhere to the surface of the cask.

The spent nuclear fuel transportation casks are routinely decontaminated to levels of contamination below the U.S. Department of Transportation mandated limits upon being

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

of non purpose-built vessels with research reactor spent fuel. British and French unions have also called for the immediate cessation of spent fuel transports on these ships.

At the same time, as information about these shipments has circulated, political resistance to the shipments has grown as well. On October 25, 1990, the European Parliament adopted a resolution calling for the immediate cessation of spent fuel transports on non purpose-built ships. Numerous port communities in the U.S., Europe and elsewhere have passed similar resolutions prohibiting such nuclear waste shipments.
It is quite clear that the use of these ships for the carriage of irradiated spent fuel is completely inappropriate.

1137-43 (Cont'd.)

The DoE should realize that their plan not only endangers public health and the environment but that it will meet with great controversy and opposition in client states as well as here in the US. Mentioning the existence of purpose-built ships does not alone fulfill the requirement to fully analyze the options and implications of the management options chosen.

IV.b.2. Failure to Consider the Use of Military Vessels
The DEIS fails to consider the option and merits of using military vessels to transport the HEU SNF. Clearly the use of US military personnel trained in handling nuclear materials and operating on military vessels certified for the carriage of nuclear materials would enhance the safety of the nuclear transports. In addition, given the proliferation danger posed by the long distance, slow-speed transport involved in the maritime movement of weapons-usable HEU, it seems only reasonable to assess the option of military ship use.

1137-44

The failure of the DEIS to adequately address this most obvious alternative would, in and of itself, if carried over into an EIS constitute a fatal flaw under the NEPA case law.

IV.b.3. Failure to Consider the Use of Escort Vessels
The DEIS unaccountably fails to consider the use of an escort vessel to increase the safety and security provided for HEU SNF transports between FRRs and the US. An escort vessel has been required by the US government in the case of other sea transports involving weapons usable nuclear materials; two examples are those of the plutonium transports conducted by Japan with US agreement on the "Sekhin Maru" in 1984 and the Akatsuki Maru in 1992/93. It should be noted that according to a Pentagon review of plutonium sea transport in 1988, it was stated that the worst possible option for such fissile materials movements would be the use of a commercial cargo vessel without any escort (See PESS). Despite the Pentagon's informed recommendation, the maximum risk option is the one the DEIS inexplicably recommends for the transport of this weapons-usable material. There is no explanation of why past US policy is not appropriate for these transports nor is there any explanation of why this alternative--which would objectively increase both safety and security--was not considered or recommended.

1137-45

The failure of the DEIS to adequately address this most obvious alternative would, in and of itself, if carried over into an EIS constitute a fatal flaw under the NEPA case law.

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

removed from the pools (i.e., they are washed to remove any radioactive particles that might adhere to their outer surfaces). However, some of the radioactive particles can be so small that they can become imbedded in microscopic pores in the surface of a transportation cask. Such minute amounts of imbedded contamination cannot be detected on a loaded cask since its presence is masked by the much larger radiation field of the spent nuclear fuel inside the cask. During transportation, minute amounts of this imbedded contamination can migrate to the surface of the cask. Receiving organizations routinely check for such contamination by wiping the surface of casks with clean cloths and measuring the cloths for contamination after they are moved away from the cask. Any transferrable surface contamination detected that is above the U.S. Department of Transportation limits is then removed from the casks. As a consequence of this phenomenon, U.S. Department of Transportation regulations specify that the contamination limits for the outer surfaces of spent nuclear fuel transportation casks are ten times lower at the point from which the shipment is initiated than the limits applicable at the destination. If radioactive particles migrate to the surface of a cask, they can contaminate other surfaces with which they come into contact. This might have been the origin of any contamination found on a truck bed or crane at Dounreay, as reported by the commentor. After detecting such contamination, both the cask and any other contaminated surfaces would be cleaned to below the applicable regulatory limits.

The amount of radioactive contamination involved in such occurrences is extremely small. The impacts from any such contamination would be bounded by the incident free transportation impact analyses included in Section 4 of the EIS. The primary concern related to this type of contamination is not due to any direct impacts that it might cause, which would be very small. Rather the concern is to keep the areas and equipment used for handling of radioactive materials as clean as possible so that this contamination could not mask other contamination that might be the early sign of some other event that could have impacts of a level to be of concern.

Response to Comment No. 1137-44

The use of U.S. military vessels to transport foreign research reactor spent nuclear fuel was not considered in the EIS because such transport does not fall within the mission of the U.S. Navy, and because such an alternative provides no additional environmental benefits than the use of chartered or commercial ships. The HEU in the spent nuclear fuel could not be used in a nuclear weapon without first being separated from the spent nuclear fuel, purified, and then fashioned into weapons components. Completion of these steps would require significant time and funding, and the use of a sophisticated chemical separations facility. While a rogue nation or a well funded terrorist organization might be able to accomplish these tasks, they could not be accomplished during simply in conjunction with the theft or diversion of the spent nuclear fuel during its transportation. These facts significantly reduce the desirability of the spent nuclear fuel as a target for

IV.b.4. The DEIS Fails to Provide a Coherent Analysis of the Benefits and Risks of Single v. Multiple Cask Shipments.

The DEIS only provides superficial and incoherent analysis of the risks and benefits of single v. multiple cask transports despite the fact that this is clearly a matter of concern.

For example, in the sole paragraph explaining the methodology used for assessing transport accident impacts, the DEIS states that "There is no difference between the risks associated with a single shipment with two casks in a hold, and two shipments of a single cask each."(4-17) Yet, this statement is directly followed by one which contradicts it: "The consequences of the accident with two casks in the hold may be as large as twice the consequences of an accident involving one cask." This latter sentence makes it quite clear that the consequence of a two cask shipment is greater than that of a one cask shipment and yet, by the nature of the analysis being conducted, this does not suggest a greater "risk" involved in a two cask transport.

This confusion is further magnified by the concluding statement of the paragraph: "Therefore to bound the potential risk from accidents, marine transportation of spent nuclear fuel was modeled in the port accident analysis as occurring in one cask per shipment." What this means is that the accident modeling for port and sea accidents is based on the model which the DEIS itself suggests is that of lowest potential impact. The sentence also suggests that the theoretical model only allows for one cask shipment but it does not make it clear that the program will be limited to one cask shipments.
In fact the DEIS is silent on this matter despite the fact that it recognizes that the number of casks on the transport are imperative factors in considering the potential environmental impact of an accident.

1137-46

The analysis of one v. multiple cask shipments is clearly inadequate. It is also clear that the DEIS does not make it clear how the program approaches this matter so it is in fact impossible to assess the actual risks involved. This is a fatal flaw and renders the DEIS, and a resultant EIS based on this DEIS, legally inadequate.

IV.c. The DEIS Fails to Adequately Address or Assess Issues Pertaining to Route Planning

IV.c.1. Failure to Address the Reasonable Alternative of Direct Shipments.

Despite the fact that with each port stop, there is an exponential increase in the risk of an accident or attack/attempted seizure, the DEIS fails to address the alternative of requiring these shipments to be made directly between the discharge port to the recipient port. In the past DOE required such vessels to make only one port stop. (See SC89). The current plan's acceptance of intermediate port-calls is a departure from past policy and is unjustified, inexplicable, and dangerous.

1137-47

As the DOE has itself stated, the greatest danger during maritime transports are the periods when the ship is entering or leaving port.(See CA90) Despite this fact, the current plan allows for an

theft or diversion during transportation, and make the added security that might be available on a military ship unnecessary.

Response to Comment No. 1137-45

The commentor is correct that the United States has recommended the use of an escort vessel for transport of weapons-usable fissile materials (e.g., separated, purified plutonium). However, such materials could be used directly in the fabrication of nuclear weapons components. As explained in the response to Comment 1137-44, the same is not true of the HEU in spent nuclear fuel. Accordingly, the use of escort vessels is not warranted.

Response to Comment No. 1137-46

Section 4.2.2.3 of the EIS states that, although the consequences of an accident with two casks in the hold may be twice as large as one cask, the probability of an accident with two casks is half the probability of two ships with one cask each. Since risk is defined as the product of the probability and the consequences, the EIS analysis is presented as the maximum risk of foreign research reactor spent nuclear fuel transport.

Response to Comment No. 1137-47

Under the basic implementation of Management Alternative 1, the foreign research reactor spent nuclear fuel could be shipped by charter or regularly scheduled commercial ships to the United States; charter ships could include purpose-built ships or general purpose ships. This alternative does not propose intermediate stops by any charter ships; the analyses of Section 4.2.1.3 are for the purpose of assessing the range of impacts possible under the alternative, and demonstrates that shipment by either charter or commercial means has very low potential environmental impacts. The need for specifying direct shipments is not warranted by the environmental impact analysis.

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

indeterminate number of intermediate port stops. Not only does this increase the operational danger of these transports, but it also increases the possibilities of terrorist action against or seizure of these cargoes.

The only justification conceivable is that this is an attempt to decrease the cost of the transports themselves. Such cost cutting may amount to financial savings for the FRR operators or the US government but it clearly does so at great potential expense to the environment and public health. This element of the maritime transport strategy is unjustifiable.

1137-47 (Cont'd.)

The failure of the PDD to adequately address this most obvious alternative would, in and of itself, if carried over into an EIS constitute a fatal flaw under the NEPA case law.

IV.c.2. The DEIS Fails to Address or Assess Alternative Shipping Routes.

While the DEIS contains analysis of such US port features as "environmental conditions", "climate conditions", and "ethnic and income characteristics", no specific discussion or analysis is provided of the transport routes which would be used to deliver HEU SNF to the US ports. Yes, a map is provided of possible routes, a map which incidentally shows these dangerous transports potentially criss-crossing the major oceans and seas of the planet, but there is no detailed analysis or comparison of details relating to specifics of environment, meteorology, political and/or cultural factors, or safety and security considerations are cited and/or analyzed.

Discussions of general "oceanography" (3.1.) are not the same as specific analysis of such areas as the Caribbean or North Seas, the English Channel, or the Suez Canal. These specific areas are examples which are likely to be crossed by these transports but which are not discussed in the DEIS. Each of these areas has particular currents, weather patterns, ecological dynamics and sensitivities, as well as social and economic importance. These specific areas should be considered and assessed before they are simply made the routes for these shipments. The DEIS must evaluate and compare these options in order to make rational decisions as to shipping routes to be used. In and of itself, this lack of specificity makes it impossible to address the question of appropriateness of any given route. In turn this makes it impossible to consider alternatives.

1137-48

Finally, nuclear transports have occasioned considerable public and political opposition which has lead to initiatives to block such transports around the planet. We are under the impression that this is true, for example, of the Suez Canal and it is absolutely true for the Caribbean as requested in declarations of the CARICOM heads of State in 1993 and again in 1995.

Route options will need to be addressed in order to comply with US law. At the same time, US policy will need to take into account the will and laws of other countries and/or regions or it will find the OSF program delayed once again.

IV.d. The DEIS Fails to Seriously Address or Assess the Potential Impacts of Serious Nuclear

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Response to Comment No. 1137-48

The purpose of the proposed action is to adopt a policy that reduces the risks of proliferation from foreign research reactor spent nuclear fuels, including alternatives for implementation that address the major issues of safe transport and storage. The proposed action is not to adopt specific routes for such transport, and such a proposal would not be reasonable, in light of the fact that foreign research reactor spent nuclear fuel would be shipped from 41 different countries to ports in the United States, and to one of two management sites in the United States over a period of thirteen years. Therefore, the EIS analyses used representative routes for ocean transport, as depicted in Appendix C, Section C.3.2 of the EIS. Section 4.2.1 of the EIS analyzed impacts to the ocean environment from potential accidents, and discussed those effects upon marine life for both deep ocean environments and coastal water environments. The analyses demonstrated that potential risks to the global commons from transport of foreign research reactor spent nuclear fuel are low. It is unlikely, given the estimated low risk, that additional analyses of particular environments associated with all representative or potential routes, in terms of currents, weather patterns, ecological dynamics, and political and cultural factors, would provide any additional information needed to make a decision on the proposed policy.

Transport Accidents Which Could lead to Radioactive Releases

In shrugging aside the potential impacts of a radioactive release caused by a maritime nuclear transport accident, the DEIS states that "...because the oceans are a very dilute system, effects on marine biota would not be discernible." (4-102). Or, "Assuming the cask was damaged by a severe collision; and the ship remained afloat despite the severe collision; and the cask was engulfed in flames for a time sufficient to release a radioactive plume, there would likely be no human population on the ocean (excluding the crew) who could be affected."(4-11). These outrageous and superficial comments pretty much summarize the cavalier and contemptible attitude taken by the DEIS' Authors towards the risks and dangers posed by nuclear transports.

Statements like these reflect the DOE's apparent adherence to the discredited philosophy that "dilution is the solution to pollution." The statement also reflects the total failure of the DEIS to take seriously any of the risks associated with the Policy, and the failure of DOE to take the NEPA process seriously as a decision-making tool. DOE correctly asserts that there is a lot of water in the ocean. However, DOE is incorrect in assuming that this renders the oceans, and their adjacent coasts, invulnerable to serious irreversible environmental damage due to nuclear contamination. Nor does it address the extended environmental, economic and cultural problems that would be likely to follow in a country or countries potentially affected by an accident involving radioactive releases. Even if the DEIS correctly concludes that risks from ocean transport are minimal, surely these risks may vary depending upon the shipping route chosen, in addition to the other factors mentioned in these comments. 1137-49

It should also be noted that this cavalier posture with regard to the dangers of nuclear contamination of the seas is in direct contradiction to the US government's recent leadership role in supporting the London Convention's total ban on the nuclear waste dumping at sea. This ban, signed on November 12, 1993, bans the dumping of even low-level wastes at sea--material which would be of minor contaminative affect in comparison to HEU SNF.

In order to comply with their NEPA responsibilities, the DOE must undertake serious assessment of the nature and effects of serious accidents leading to serious contamination of the kind described in GP91. Until such time as the DOE takes this responsibility seriously, they can rest assured of public and political opposition to transport activities undertaken under the OSF.

IV.c. The DEIS Fails to Assess the Security Risks Involved in the Nuclear Transports

While the DEIS begins by asserting the extreme importance of this policy to the cause of nuclear nonproliferation--given that "much of this fuel contains highly-enriched uranium (HEU), which can be directly used in simple nuclear weapons"(1-1) -- the Authors have totally failed to address issues relating to securing the transports against seizure and/or attack. 1137-50

Issues like the type of ship to be used, the necessity of non- stop voyages, the vetting of the crew,

Response to Comment No. 1137-49

Appendix C, Section C.5 of the EIS discusses the assumptions, calculations, and results for marine transport accidents, impacts, and risks. The analysis for Section 4.2.1.2 of the EIS utilized the data and experience from the marine radiological assessments of Nuclear Energy Agency of the OECD, with modifications for the nature and content of foreign research reactor spent nuclear fuel, as discussed in Appendix C, Sections C.5.2 and C.5.3. These studies represent the best available data on the risks and effects of radioactive material in the oceans, and DOE considers the assessment to be conservative.

Response to Comment No. 1137-50

While it is true that the HEU in much of the foreign research reactor spent nuclear fuel could be used in the production of nuclear weapons, before this would be possible the HEU would have to be separated from the structure of waste products in the spent nuclear fuel elements, and then converted to a physical form suitable for use in a weapon. An irresponsible nation, or well funded terrorist group, could possibly have the resources to carry out these steps. However, they would need considerable time and the use of a sophisticated chemical processing facility and other major equipment to do so. Simply having possession of spent nuclear fuel containing HEU would not provide a terrorist, or anyone else, with a nuclear weapon. These facts, plus the inherent radioactivity of the spent nuclear fuel and the size and weight of the transportation casks make it a poor target for theft or diversion during shipment.

Nevertheless, security would be provided for all shipments of foreign research reactor spent nuclear fuel, as required by the Code of Federal Regulations (10 CFR Part 73). The general security provisions are discussed in the new Appendix H that has been added to the final EIS in response to public comments. This Appendix describes the general provisions of the Transportation Plans that would be prepared for each shipment of foreign research reactor spent nuclear fuel, including security provisions in port and during transit. DOE does not agree that such security arrangements should be discussed in detail in the EIS, or in any other publicly available document, since such a discussion could give a potential thief or terrorist information with which to attempt to circumvent portions of the security measures.

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

and routing issues, all have security implications. In fact, certain recommendations made in the DEIS would prove singularly ineffective at limiting the risks of fuel seizure and/or terrorism. Use of standard freighters which will stop at numerous ports is obviously maximizing the threat of seizure. Similarly, extending the oceanic and or terrestrial routes also increases these threats.

Despite these obvious and crucial problems, the DEIS provides no discussion let alone analysis of this issue. Once again, it must be said that just because the Agencies find issues difficult, they can not pretend that they do not exist.
The exclusion of the security issue from all aspects of transport planning is a fatal flaw in this document.
Exclusion of this factor from the EIS would render it actionable under NEPA law.

—End—

1137-50 (Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Footnotes

1. Although this DEIS struggles not to come out and say that severe accident can occur and could in turn release contamination to the environment, preceeding EA's conducted on such maritime shipments have said just that. The following categorical statements come from the EA on Taiwanese reactor shipments, Phase II (DOE/EA-0321):

"1. While in the area of a port, shipments might also be involved in accidents which could result in waterborne contamination."
2. Cask breaches with or without radionuclide release into the atmosphere may result from a severe accident. If nuclides are released they may be ingested by persons or by a direct radiation source that leads to a radiation in man." DOE/EA -0321

2. Policy regarding Marine Transport of Irradiated Nuclear Fuel, Report submitted to Commander Ronald W. Turner, Chief, Hazardous Materials Branch, U.S. Coast Guard, October 12, 1989 at 19. Memorandum from J. Christian Kessler, "Information Regarding Spent Fuel Ships," U.S. Department of State, August 1988.

3. See "Nuclear Waste Piling Up in Eastern Europe," Washington Post, July 17, 1990.

4. See Defendant's Response to Plaintiffs' First Set of Interrogatories and Request for Production of Documents at 9, 10 (executed April 7, 1989), Sierra Club v. Watkins, Civ. No.88-3519, D.D.C. pending).

5. See Caithness Courier, Feb. 6, 1991; John-O'-Groat's Journal, Feb. 2, 1991; Press & Journal, Feb. 12, 1991; Caithness Courier, Feb. 13, 1991.

—End—

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

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RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

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MSC92 "A Review of the Proposed Marine Transportation of Reprocessed Plutonium from Europe to Japan," ECO Engineering, Inc, Annapolis, Maryland, March 30, 1992 (Submitted by Greenpeace International to the International Maritime Organization's Maritime Safety Committee and circulated as MSC 61/INF.11)

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—End—

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

Appendix

SUMMARY RECORD OF THE JOINT MEETING OF THE OSLA AND PARIS COMMISSIONS (OSPAR 95)
BRUSSELS,
JUNE 26-30, 1995

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

APPENDIX

Working Group on Radioactive Discharges (RAD)
OSPAR 95/4/WGO.2

4.62 The observer from Greenpeace International introduced OSPAR 95/4/WGO.2, with data regarding a very significant planned increase of authorised radioactive discharges from the Dounreay (Scotland) reprocessing facility. In the opinion of Greenpeace, such increases would represent a clear breach of several OSPAR and NEC agreements, and urged the UK Government to reject the application from the operators of the Dounreay Facility.

4.63 The Irish delegation expressed surprise at the proposals to increase significantly radioactive discharges from Dounreay to the environment, which was contrary to the objectives of the Convention. The Irish Government was taking a very pro-active approach to the question of radioactive discharges, particularly those from Sellafield into the Irish Sea, and to nuclear matters generally. A task force of ministers had been set up to develop and co-ordinate a strategy for progressing Irish Government policy on these issues. It illustrated the Irish Government's serious interest to pursue all realistic courses of action to safeguard the Irish people against the risks of Sellafield and its discharges. The Irish delegation urged the UK Government not to permit increased discharges from Dounreay and to ensure that adequate waste treatment plant was installed at Dounreay to prevent discharges.

4.64 The delegations of Denmark, Iceland, Sweden, the Netherlands, Norway, Portugal and Spain associated themselves with the statement of the Irish delegation and expressed their concern about the development regarding planned increases in radioactive discharges from Dounreay.

4.65 The UK delegation said that an application had been received from the operators of the Dounreay research installation for a revised discharge authorisation. This application was being considered by the competent authority, HM Inspectorate of Industrial Pollution for Scotland. Details of the application had been made public: information was available from HM Inspectorate (Mr Ebbing, Her Majesty's Inspectorate of Industrial Pollution for Scotland, 27 Perth Street, Edinburgh, (Fax: +44 131 244 2903). It was not possible to comment on such a pending application, since to do so might appear to pre-judge the outcome of the consideration. However, if anyone had points which they thought ought to be taken into account, they should draw them to the attention of HM Inspectorate as soon as possible.

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

4.66 After further discussion, OSPAR agreed that RAD 1996, as part of its ongoing work on BAT for nuclear reprocessing plants, should compare existing reprocessing facilities in the Maritime Area with the German Wiederaufarbeitungsanlage.

4.67 OSPAR noted that PRAM 1995 had adopted:

a. Guidelines for the Submission of Information about, and the Assessment of, the Application of BAT in Nuclear Facilities on a trial basis for the current round of reporting on the implementation of PARCOM Recommendation 91/4 (PRAM 95/13/1, Annex 12); and

b. the revised Reporting Format for the collection of data on liquid discharges from nuclear installations (PRAM 95/13/1, Annex 13).

4.68 The observer from Greenpeace International recalled that OSPAR 1994 had agreed to request RAD 1995:

a. to finalise its work on the development of criteria for BAT in order for the results to be reported to PRAM 1995; and

b. to undertake, as a matter of urgency, a detailed examination of options for measures, within the framework of a BAT approach, that could be adopted to reduce or eliminate discharges and/or emissions of radioactive substances, including wastes, from nuclear installations to the maritime area, in pursuance of objective 4.2 of the Action Plan agreed by Ministers in September 1992.

4.69 The Chairman of RAD, Mr D Fraser, explained that due to time constraints, RAD 1995 had not been able to follow up the request from OSPAR 1994. After further discussion, OSPAR agreed to reiterate its request to RAD 1996 (cf. §4.68).

*** TOTAL PAGE.34 ***

RESPONSE TO COMMENT
COMMENTOR NO. 1137: GREENPEACE (CONT'D.)

COMMENTOR NO. 1208: NATIONAL ORGANIZATION OF TEST, RESEARCH, AND TRAINING REACTORS

TRTR NATIONAL ORGANIZATION OF TEST, RESEARCH, AND TRAINING REACTORS

Mark L. Moore
Reactor Facility Director
Armed Forces Radiobiology Research Institute
8901 Wisconsin Avenue
Bethesda, MD 20889-5603
(301) 295-1290 FAX: (301) 295-0735

1994-95 EXECUTIVE COMMITTEE
John A. Bernard, Massachusetts Institute of Technology
Leo Bobek, Worcester Polytechnic Institute
Brian Dodd, Oregon State University
Richard L. Holm, University of Illinois, TRIGA Chairman
J. Charles McKibben, University of Missouri-Columbia
Tawfik M. Raby, National Institute of Standards and Technology/Chairman-elect
Junaid Razvi, General Atomics
Wade J. Richards, McClellan Air Force Base
Marcus H. Voth, The Pennsylvania State University
William G. Vernetson, University of Florida

UNIVERSITY REACTOR SUPPORT COMMITTEE
Marcus H. Voth, Committee Chairman
Breazeale Nuclear Reactor Building
The Pennsylvania State University
University Park, PA 16802
(814) 865-6351 FAX (814) 863-4840

URS COMMITTEE MEMBERS
Brian Dodd, Oregon State University
John A. Mayer, Worcester Polytechnic Institute
Robert U. Mulder, University of Virginia
J. Charles McKibben, University of Missouri

Public Comments on the Draft FRR SNF EIS
Attention: Charles R. Head
Office of Spent Fuel Management (EM-37)
United States Department of Energy
1000 Independence Avenue SW
Washington, DC 20585-0001

July 15, 1995

Dear Mr. Head:

The National Organization of Test, Research, and Test Reactors represents the reactors at universities, national laboratories, and private corporations throughout the United States. The impact of federal actions such as spent fuel disposition probably has the greatest impact on university reactors. Even though the subject EIS concerns foreign fuel, decisions on such matters frequently have adverse impacts on other sectors of related technologies. We therefore share a vested interest in this issue. We wish to submit three comments on the matter at hand.

First, the problem of spent fuel disposal from research reactors is imminent and real, particularly at foreign facilities. Research reactors are generally small and do not have the capacity for storage of spent fuel for extended periods of time. Continued operation is contingent on a viable program for the discharge of spent fuel. From a global perspective it is wiser to remove the fuel from reactor sites frequently and provide the appropriate surveillance at a central collection point such as a reprocessing facility rather than at dozens of small sites. *1208-1*

Second, the requirements places on spent reactor fuel should be based on sound scientific principals and evaluated against commonly accepted criteria for other technologies. Frequently regulations are based on arbitrary criteria such as the ability to achieve a limit, public acceptance or perception of a limit, or a cost-benefit criteria that is out of line with that used in other fields. We believe that each decision should have a scientific basis which is comparable with that used in other commonly accepted practices. *1208-2*

Third, the important contributions of the research reactors should be considered. Research reactors have made major contributions to an improved life for mankind and continue to make them. They support scientific research in areas of major national interest and priority such as medicine, environmental studies, materials research, and pollution abatement. They are used in the study of biology, physics, chemistry, archeology, and art history to list but a few applications. It is important that no precipitous action occurs which will not have an unwarranted adverse impact on such applications.Thank you for considering our input. *1208-3*

Sincerely yours,

Marcus H. Voth

1201 M1
Rev #: 04

RESPONSE TO COMMENT
COMMENTOR NO. 1208: NATIONAL ORGANIZATION OF TEST, RESEARCH, AND TRAINING REACTORS

Response to Comment No. 1208-1

The commentor's concern for immediate action regarding disposition of spent nuclear fuel from foreign research reactors is noted. Sections 2.2 through 2.5 of the EIS describe policy alternatives under consideration for management of foreign research reactor spent nuclear fuel.

The commentor's opposition to onsite storage of foreign research reactor spent nuclear fuel is noted. Section 2.3 (Management Alternative 2) discusses the advantages and disadvantages of overseas storage and reprocessing.

Response to Comment No. 1208-2

The commentor's preference for the use of scientific principals in the regulation of spent nuclear fuel from foreign research reactors is noted. Estimates of radiological risk presented in Section 4 of the EIS are based on internationally accepted standards and calculational procedures.

Response to Comment No. 1208-3

The commentor's support for medical, environmental, materials research, and other applications of foreign research reactors in a variety of disciplines is noted. Such applications are summarized in Section 1.1 of the EIS.

COMMENTOR NO. 1210: CLEAN WATER FUND OF NORTH CAROLINA

Clean Water Fund of North Carolina

Asheville Office: 29 1/2 Page Ave. • Asheville, NC 28801 • 704-251-0518
Raleigh Office: P.O.Box 1006 • Raleigh, NC 27602 • 919-832-7491

18 July 1995

Mr. Charles Head
Office of Spent Fuel Management (EM-37)
United States Department of Energy
1000 Independence Avenue SW
Washington DC 20585

The Clean Water Fund of North Carolina understands that the comment period on the "DEIS Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Fuel" has been extended until 20 July 1995. The Fund appreciates the extension and offers the following comments.

Rod Inventory. The Fund is concerned that the fuel rod inventory may ignore isotopes of some biologically elements (such as C-14, P-32, S-35, Cl-36, K-40, I-131, and Th-228), which could significantly contribute to exposures associated with accidental releases. Such isotopes should be included in the estimates, since (for example) inhaled or ingested I-131 poses a thyroid hazard, while Th-228 similarly poses a bone hazard. The Fund crudely estimated the I-131 inventories for each fuel assembly type (BR-2, RHF, NRU, or TRIGA) by scaling the sum of the U-234, U-235, and U-238 curies of each fuel assembly by the annual (I-131 curies):(U curies) ratio for U.S. domestic commercial LWR spent fuel, as calculated from the data in table B-4 at 280ff in the Department's 1992 integrated data base (DOE/RW--0006-Rev.8). Since the wattage of the neglected I-131 for the TRIGA rods calculated in this fashion exceeds 0.1% of the wattage of the listed isotopes, it is natural to conclude that the thyroid hazard posed by

1210-1

RESPONSE TO COMMENT
COMMENTOR NO. 1210: CLEAN WATER FUND OF NORTH CAROLINA

Response to Comment No. 1210-1

DOE has not ignored any isotopes in this EIS. As discussed in Appendix B, Section B.1.4 of the EIS, all isotopes that could have a potential to contribute 1 mrem from inhalation and ingestion were considered. Then those that contribute 99.9 percent of total health hazard were included in the bounding radionuclide inventory and listed in Table B-6. The isotopes listed by the commentor do not meet these criteria.

For example, I-131 does not meet the criteria because it has a half-life of only eight days and there is a required cooling period of at least one year prior to shipment. After a year of cooling time, virtually all of the I-131 will have decayed away. The commentor apparently used data from Table C.4 (not Table B-4, as stated in the comment) on page 280 of DOE/RW-0006, Rev.8 in his calculation. The data in this table are not applicable because the table includes isotopes from spent nuclear fuel irrespective of its cooling time.

COMMENTOR NO. 1210: CLEAN WATER FUND OF NORTH CAROLINA (CONT'D.)

the unreported I-131 inventories could be significant in the case of human exposure subsequent to accidental release. The Fund considers that the final EIS should include bounding inventory estimates for every isotope listed in table B-4 of [DOE/RW--0006-Rev.8].

Long-Term Storage. The Fund is concerned that the fuel rods may ultimately remain permanently emplaced at the first "temporary storage" site. Should an era of fiscal conservatism and political resistance to social or ecological responsibilities follow the initial unloading of the rods at an existing Department site, the foreign research reactor fuel rods might remain (without adequate maintenance and monitoring) at the initial Department site, which could result in long-term releases. The Fund considers that it is prudent to model such scenarios.

Total Population Dose. The Fund is concerned that the draft EIS appears to understate total population dose. Since no evidence is provided to show that the regulatory limits are generally enforced, nor any evidence that the so-called "historic" cask data are representative, estimates based on these figures must be viewed with some skepticism. Moreover, the Fund was unable to find in the draft any discussion of the costs associated with various transport modes and the associated conclusions about reasonably-anticipated modes.

Draft Table C-5 and associated discussion at C-15 indicate that the commercial ship scenario will result in a population dose of approximately (84.9)/7 = 9.43 person-rem per two cask ocean voyage. Total shipments are estimated at B-2ff as 675 + 162 = 837. Thus, the total population dose from ocean transport alone might be estimated at 7885 person-rem. The Department's assumption of some 2000 person-rem per lethal cancer fatality would therefore suggest three cancer deaths from ocean transport alone. Risk figures from BEIR V or Dr. John Coffman would suggest six or twenty cancer deaths from ocean transport alone (see risk assessment comments *infra*). The Department's discussion of these topics is

1210-1 (Cont'd.)

1210-2

1210-3

RESPONSE TO COMMENT
COMMENTOR NO. 1210: CLEAN WATER FUND OF NORTH CAROLINA (CONT'D.)

Response to Comment No. 1210-2

The commentor's concern that interim management sites for spent nuclear fuel from foreign research reactors could, by inaction or default, be used for ultimate disposition is noted. As discussed in Section 4.2.7 of the EIS, ultimate disposition of foreign research reactor spent nuclear fuel is a priority concern of DOE. Safety is a primary consideration during storage of any radioactive material. If a policy to accept foreign research reactor spent nuclear fuel into the United States is adopted, the interim storage technologies which would be used are described in Section 2.6.5 of the EIS.

Response to Comment No. 1210-3

The EIS actually overstates the total population dose. In fact, the regulatory limits are strictly enforced by the NRC and by State agencies. Historically, however, dose rates near the spent nuclear fuel transportation cask have typically been about a factor of ten below the regulatory limit. The evidence requested by the commentor is presented in Appendix F, Section F.5 of the EIS. Table F-101 lists the actual measurements of dose rates taken near casks loaded with foreign research reactor spent nuclear fuel. Costs of various transport modes are discussed in Section 4.9 and Appendix F, Section F.7.1.1 of the EIS.

The commentor has misinterpreted the last line of Table C-5 in Appendix C of the EIS. The number 84.9 person-rem is the Program Dose Total for All Ships' Crews. This number is rounded off to 85 person-rem in Table 4-2 in Volume 1 of the EIS, and the associated discussion clearly states that this would be the total estimated dose due to ocean transport of all the foreign research reactor spent nuclear fuel.

As discussed in Section 4.1.3 of the EIS, the radiological risk factors for latent cancer fatalities and other human health effects used in this EIS are endorsed and accepted by the NRC and the International Commission on Radiation Protection. Also see the response to Comment 1125-4.

The commentor adjusted Table 6 from the cited EPA report by moving the factor of 500 for skin cancers from a footnote up into the main part of the table. EPA put the factor of 500 in a footnote because the great majority of radiation induced skin cancers should be easily curable and result in little trauma for the patient. EPA excluded nonfatal radiogenic skin cancers from the estimates of risk (from page 23 of the cited EPA report). DOE concurs with EPA on this issue.

The possible existence of noncarcinogenic health effects from low doses of radiation is not supported by NRC or the International Commission on Radiation Protection.

Everyone receives some radiation from natural sources. As discussed in Section 4.10.2 of the EIS, measured variations in this background radiation dose would be larger than the increase that would occur under the proposed action.

COMMENTOR NO. 1210: CLEAN WATER FUND OF NORTH CAROLINA (CONT'D.)

confused and self-contradictory, insofar as the numbers computed in one section do not match those used in another section. The Department needs to justify its calculations better in the area of bounding dose and associated health effects.

Risk Assessment. The Fund is concerned that the risk assessment methodology used in the draft EIS does not adequately represent the human effects associated with radiological exposures.

The Fund considers that the assumed risk associated with population dose (which appears in the EIS to be based upon an postulated population dose around 2E3 person-rem per cancer fatality) underestimates the cancer risk per unit dose: according to table 4-3 at 175 in BEIR V, **more than** 500 excess lifetime cancer mortalities are expected in association with a 1E6 person-rem low-dose exposure for any cohort of a million humans below age 55. More youthful groups are especially at risk: a 1E6 person-rem dose to a million 5-year olds is expected to cause 1276-1532 eventual cancer mortalities, corresponding to about 712 person-rem per cancer death. For a stationary population average, these BEIR V data indicate 770-810 excess lifetime cancer mortalities in consequence of a 1E6 person-rem low-dose exposure, corresponding to 1234 - 1298 person-rem per excess lethal cancer. Thus, the BEIR V midrange average of 1266 person-rem per excess cancer fatality indicates a U.S. population risk more than 50% greater than that assumed by the draft EIS. In fact, the data cited from BEIR V suggest that the Department's risk figures may not be conservative unless the majority of the exposed female population is of age 55 or older and the majority of the exposed male population is of age 60 or older.

Other data also suggests an actual excess fatal cancer risk greater than 2E3 person-rem per cancer. John Goffman's 1990 reexamination of the Japanese A-bomb population fatalities 1950-1982 produced estimates (in his Table 16-C) around 26 excess cancers per 1E4 person-rem of low-dose exposure, corresponding to 385 person-rem per cancer

1210-3 (Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 1210: CLEAN WATER FUND OF NORTH CAROLINA (CONT'D.)

Commentor No. 1210: Clean Water Fund of North Carolina (Cont'd.)

fatality, indicating a U.S. population risk more than five times as large as that assumed by the draft EIS. Goffman's method may underestimate the effectiveness of the cancer-induction by radiation, since it is likely that not all bomb-associated cancers had appeared in the exposed population by 1982.

In addition, the draft EIS ignores health effects other than cancer fatality. Although the E.P.A. currently uses a excess cancer mortality estimate close to the estimate used by the Department and criticized above, the E.P.A. has also produced estimates of the morbidity response to radiation. Data from Table 6 (and footnotes) at 29 in the Agency's June 1994 "Estimating Radiogenic Cancer Risks" for assumed low-dose cancer risks per 1E4 person-gray follow:

Site	Mortality	Morbidity
Esophagus	9.0	9.5
Stomach	44.4	49.3
Colon	98.2	178.5
Liver	15.0	15.8
Lung	71.6	75.4
Bone	0.9	1.3
Skin	1.0	500.0*
Breast	46.2	92.5
Ovary	16.6	23.7
Bladder	24.9	49.7
Kidney	5.5	8.4
Thyroid	3.2	32.1
Leukemia	49.6	50.1
Remainder	123.1	173.4
TOTAL	509.1	1260.6*

* incorporates all skin morbidity as indicated in EPA table footnote

The E.P.A. thus currently assumes about 2.5 times as much cancer morbidity as cancer mortality. The draft EIS should include this morbidity.

1210-3 (Cont'd.)

Response to Comment Commentor No. 1210: Clean Water Fund of North Carolina (Cont'd.)

COMMENTOR NO. 1210: CLEAN WATER FUND OF NORTH CAROLINA (CONT'D.)

The draft EIS should include some appropriate estimates of noncarcinogenic health effects associated with the action. Since cancer is a disease of complex etiology, the development of cancer may sometimes signal the existence of some other moribund conditions; immune dysfunction (for example) has been suggested as a condition which may lead to the development of otherwise undetected neoplasms, and the possible contributory role of the proposed action in the development of such conditions ought to be considered. 1210-3 (Cont'd.)

Accidents and Probabilistic Risk Assessment. The Department's desire to modify the effects of potential accidents, by multiplying the effect with an assumed small probability is understandable, given the unpleasant effects associated with potential accidents. However, the assumed probabilities are largely unjustified. Alleged fault-tree analyses for cask recovery in marine accident conditions should be complemented by available historical data on similar recovery operations, for example. The assumed 1E-6 fractional release of spent fuel may be unrealistic, for example; higher releases would certainly be expected in the context (say) of a collision with a gasoline tanker; and the relatively low population doses reported for the supposedly worst accident scenarios in the draft Table E-52 at E-122 are therefore difficult to take seriously. Failure to consider ingested dose, as discussed in Table E-40 at E-108 is simply inappropriate. 1210-4

Cost-Benefit Analysis. The Fund strongly supports the concept of nuclear nonproliferation as an essential ingredient of global environmental protection. However, it is not clear to the Fund that the proposed action is the most cost-effective way to meet the nuclear nonproliferation goals established as the objectives of the foreign research reactor fuel acceptance. Among the current credible proliferation threats, which may pose a greater danger, the Fund notes especially the continuing possible availability of former Soviet Union weapons grade fissile materials on the international black market. The monies now contemplated for acceptance of spent 1210-5

RESPONSE TO COMMENT
COMMENTOR NO. 1210: CLEAN WATER FUND OF NORTH CAROLINA (CONT'D.)

Response to Comment No. 1210-4

Calculation of risk estimates is the best way to compare the impact of an action or event. Consequences of a terrible event, such as a meteor striking Earth, must be considered in conjunction with the probability of their occurrence. Developing the probabilities used in the EIS was one of the major efforts involved in developing a measure of the impacts. Ship and truck accident probabilities are based on statistics of such events. Some of the less frequently occurring events, such as the recovery of transportation casks from the ocean were based on estimates from other documents and expert opinion. Therefore, the probability values used are subject to question. For this reason conservative values were used wherever possible.

Radioisotope release fractions from foreign research reactor spent nuclear fuel involved in an accident depend on the severity of the accident. Each different radioisotope would have a different release fraction. As the commentor states, the release fractions associated with a severe accident involving a tanker collision and fire would be higher than the same collision without the fire. The release fractions used in the EIS are all based on generally accepted industry practice. Appendix D, Section D.5.3.1.1 of the EIS presents further discussion. In regard to the low population doses being difficult to take seriously, the commentor must remember that the amount of radioactive material involved is relatively small, which results in relatively small doses and contamination levels, even from severe accidents.

Referring to Appendix E, Table E-40 of the EIS, it must be noticed that not considering the ingested dose only applies to the maximum exposed individual. This is appropriate because it is unrealistic to assume that the very same person that receives the maximum dose from the plume is also the individual that eats and drinks all of the contaminated local food to receive the dose from that source.

Response to Comment No. 1210-5

The question of cost-benefit analysis in the EIS addresses the costs and benefits of the foreign research reactor spent nuclear fuel program, not the costs and benefits of federal spending on the foreign research reactor spent nuclear fuel program as compared to other, potentially related programs, such as the acquisition of Russian HEU for conversion to LEU.

COMMENTOR NO. 1210: CLEAN WATER FUND OF NORTH CAROLINA (CONT'D.)

foreign research reactor fuel might more effectively combat the proliferation threat if devoted to international cooperation involving agencies such as Interpol to frustrate arms-smuggling. Moreover, the Fund is not convinced that activities which encourage further reactor use (as opposed, for example, to encouraging the elimination of existing research reactors in favor of accelerators) can effectively prevent the gradual spread of nuclear-capability. Such issues should be addressed by a cost-benefit analysis.

The Fund considers that an appropriate cost benefit analysis must include the costs associated with worker and civilian health effects from the action, as well as the costs of long-term storage. In addition, contingency funds need to be modelled to gauge the cost of an accident; the Price-Anderson liability limits cannot appropriately serve as surrogates for the social costs.

1210-5 (Cont'd.)

Carl Rupert
Raleigh Research Director
The Clean Water Fund of North Carolina
PO Box 1008
Raleigh NC 27602

RESPONSE TO COMMENT
COMMENTOR NO. 1210: CLEAN WATER FUND OF NORTH CAROLINA (CONT'D.)

The usage of LEU in civilian commerce achieves the same nuclear weapons nonproliferation objectives as the use of accelerators instead of research reactors. There would be no need to phase-out research reactors to achieve this objective.

The cost-benefit analysis of worker and civilian health effects is based on a detailed quantitative comparison of latent cancer fatalities and other deaths from accidents to the unquantifiable risk from nuclear weapons proliferation. Although these costs and benefits cannot be strictly compared, the strong national and international interest in successful completion of the program suggests that at the national level (as opposed to that of an individual port, for example), there would no question but that the benefits outweigh the costs.

No attempt was made to estimate the probabilistic cost of an accident. A rough review of the costs and probabilities shows that the accidents with severe cost consequences (e.g., in the hundreds of millions or billions) would have probabilities on the order of 1 in 100,000 or lower. This implies risk-adjusted costs on the order of thousands of dollars, or a tiny percentage of the direct costs of the program.

COMMENTOR NO. 1213: NUCLEAR CONTROL INSTITUTE

NUCLEAR CONTROL
INSTITUTE

1000 CONNECTICUT AVE NW SUITE 804 WASHINGTON DC 20036 202-822-8444 FAX 202-452-0892

July 12, 1995

Charles Head
Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. SW
Washington, DC 20585

Dear Mr. Head,

Attached please find the comments of the Nuclear Control Institute on the Department's Draft Environmental Impact Statement (EIS) on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, DOE/EIS-0218D.

As detailed in the comments, we believe it essential for the final EIS and Record of Decision to provide for indefinite U.S. acceptance of all U.S.-origin highly enriched uranium (HEU) -- whether fresh fuel, spent fuel, or target material -- and acceptance of LEU spent fuel for the proposed 13-year period. Only such a policy, including conditions on take-back as outlined in our comments, can achieve the dual U.S. nonproliferation goal of retrieving the maximum amount of U.S.-origin spent HEU fuel and reducing, and ultimately eliminating, international commerce in fresh HEU fuel.

Please call if you have any questions or would like further information.

Sincerely,

Paul Leventhal
President

Alan Kuperman
Senior Policy Analyst

Enclosure
cc: U.S. Department of State

Strategies for stopping the spread and reversing the growth of nuclear arms.

Paul L. Leventhal, *President*, Peter A. Bradford, David Cohen, Victor Gilinsky, Denis A. Hayes, Julius Koenig, Sharon Tanzer, Roger Richter, Dr. Theodore B. Taylor
BOARD OF DIRECTORS

RESPONSE TO COMMENT
COMMENTOR NO. 1213: NUCLEAR CONTROL INSTITUTE

NUCLEAR CONTROL
INSTITUTE

1000 CONNECTICUT AVE NW SUITE 804 WASHINGTON DC 20036 202-822-8444 FAX 202-452-0892

COMMENTS OF THE NUCLEAR CONTROL INSTITUTE
ON
DRAFT ENVIRONMENTAL IMPACT STATEMENT
ON A
PROPOSED NUCLEAR WEAPONS NONPROLIFERATION POLICY
CONCERNING FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL
(DOE/EIS-0218D)

July 12, 1995

Introduction

The Nuclear Control Institute is a non-profit, public-interest research center concerned with the safety, security and proliferation risks associated with nuclear commerce. One of NCI's primary goals since its founding in 1981 has been to work for elimination of international commerce in weapons-usable nuclear materials -- plutonium and bomb-grade, highly enriched uranium (HEU) -- in order to reduce risks of nuclear proliferation and nuclear terrorism.

NCI has long supported the stated goal of the policy analyzed in the draft Environmental Impact Statement (the "draft"): "To remove as much U.S.-origin HEU as possible from international commerce,"[1] with the "objective of reducing, and ultimately eliminating, civilian commerce in HEU."[2] In reality, this entails two separate, but related, goals:

- Goal 1 -- Facilitating continued international cooperation with the Reduced Enrichment for Research and Test Reactors (RERTR) program, to eliminate commerce in *fresh* HEU fuel; and
- Goal 2 -- Retrieving U.S.-origin *spent* HEU fuel, which is still usable in nuclear weapons if stolen or diverted and, therefore, poses risks of nuclear proliferation and nuclear terrorism until returned to the United States.[3]

1213-1

[1] *Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (DOE/EIS-0218D)*, March 1995, Summary, p. 6. Hereafter referred to as *Summary* or *Volume I*.

[2] *Summary*, p. 32.

[3] *Volume I*, p. 1-3, warns that unless retrieved "some of the spent nuclear fuel might be stolen and its uranium

Paul L. Leventhal, *President*, Peter A. Bradford, David Cohen, Victor Gilinsky, Denis A. Hayes, Julian Keenig, Sharon Tanner, Roger Richter, Dr. Theodore B. Taylor
BOARD OF DIRECTORS

Response to Comment No. 1213-1

The commentor's support of Management Alternative 1 and opposition to Management Alternatives 2 and 3, (because they are considered to undermine United States nonproliferation and security objectives) are noted.

RESPONSE TO COMMENT
COMMENTOR NO. 1213: NUCLEAR CONTROL INSTITUTE (CONT'D.)

COMMENTOR NO. 1213: NUCLEAR CONTROL INSTITUTE (CONT'D.)

Summary of Nuclear Control Institute Comments on Draft EIS on Foreign Research Reactor Spent Nuclear Fuel

Option	Description	Preserves RERTR?	Secures Spent HEU?	Recommendation	Comments
MANAGEMENT ALTERNATIVE 1	ALL FUEL TO U.S. FOR STORAGE	Yes	Yes	APPROVE	
Implementation Alternative 1	Alternative Amounts of Fuel				
Subalternative 1a	Only from developing countries	No	No	Reject	
Subalternative 1b	Only HEU	No	Yes	Reject	
Subalternative 1c	Also target materials	Yes	Yes	APPROVE	Conditional on commitment to convert
Implementation Alternative 2	Alternative Durations				
Subalternative 2a	Only ten years	No	No	Reject	
Subalternative 2b	Subsidize HEU take-back	Yes	Yes	APPROVE	Amend policy on non-convertible reactors
Implementation Alternative 3	Alternative Financing				
Subalternative 3a	Subsidize all shipments	Yes	Yes	Reject	Unnecessarily costly
Subalternative 3b	Charge all full-cost recovery	No	No	Reject	
Subalternative 3c	Charge some full-cost recovery	No	No	Reject	
Implementation Alternative 4	Alternative Title Location	n.a.	n.a.	No Comment	
Implementation Alternative 5	Wet Storage	n.a.	n.a.	No Comment	
Implementation Alternative 6	U.S. Reprocessing				
Subalternative 6a	Foreign fuel and other fuel	Yes	Yes	Reject	Encourages foreign reprocessing
Subalternative 6b	Blend down HEU to LEU	Yes	Yes	APPROVE	Only if U.S. reprocessing is approved
Implementation Alternative 7	Processing Technologies R&D	n.a.	n.a.	APPROVE	Reject those appropriating reprocessing
MANAGEMENT ALTERNATIVE 2	REMOVE FUEL OVERSEAS				
Subalternative 1a	Foreign storage	No	No	Reject	Facilitate only LEU spent fuel storage
Subalternative 1b	Foreign reprocessing	No	Yes	Reject	Reprocessor commitments not obtained
MANAGEMENT ALTERNATIVE 3	HYBRID ALTERNATIVES	No	No	Reject	Reject any hybrid with rejected component
NO ACTION ALTERNATIVE	NO ACTION	No	No	Reject	Worst Alternative

n.a. = alternative has no impact on this question
No Comment = alternative has no impact on nonproliferation objectives

NCI believes the attainment of these goals should be the paramount consideration as decisions are made to issue a final Environmental Impact Statement (EIS) and Record of Decision (ROD). We believe that only one of the draft's proposed management alternatives, and several of its implementation subalternatives, would foster attainment of these goals. The other proposed management and implementation alternatives and subalternatives would do the opposite, undermining U.S. nonproliferation and security objectives, and should be rejected. A summary of NCI's comments on the draft's various proposals is contained in the chart on the following page.

1213-1 (Cont'd.)

Management Alternative 1

NCI strongly supports Management Alternative 1, in conjunction with several of its implementation subalternatives discussed below, to bring U.S.-origin foreign research reactor spent fuel back into the United States. We support the proposal to charge developed nations a "competitive" fee,[4] since any higher charge could impel operators instead to reprocess their spent fuel overseas, undermining the above-stated goals.

1213-2

1213-3

Implementation Alternative 1

NCI supports implementation subalternative 1c under Management Alternative 1, to bring back target materials in addition to spent fuel. This subalternative is necessary to fulfill the stated goal of removing as much U.S.-origin HEU as possible from international commerce. As the draft states, this option "would remove the most HEU from civil commerce and provides the most support to U.S. nuclear weapons nonproliferation policy."[5]

Retrieval of target material under this subalternative can help achieve U.S. nonproliferation goals regarding both fresh and spent HEU. *Spent* target material is especially important to retrieve due to the high enrichment of its HEU. According to a reactor operator from Canada, where the bulk of the target material resides, the uranium remains 91%-enriched after removal from the reactor.[6] That is a higher enrichment than the HEU used in the Hiroshima bomb. More than a half-ton of such U.S.-origin target materials remain outside the United States, containing 216 kilograms of HEU, sufficient for many nuclear weapons.[7]

1213-4

diverted into a nuclear weapons program."

[4]Summary, p. 12.

[5]Summary, p. 40.

[6]Comment at DOE Public Hearing, Washington, DC, May 31, 1995.

[7]Volume I, p. 4-63.

Response to Comment No. 1213-2

The commentor's support for Management Alternative 1 as described in Section 2.2 of the EIS is noted.

Response to Comment No. 1213-3

The commentor's support for the financing arrangement associated with management of the foreign research reactor spent nuclear fuel as discussed in Section 2.2.1.2 of the EIS is noted. It is conceivable that the higher the fee charged by the United States, the more likely foreign research reactor operators would choose overseas reprocessing (in those instances where reprocessing abroad is an option).

Response to Comment No. 1213-4

The commentor's support for accepting target materials in addition to foreign research reactor spent nuclear fuel is noted. Acceptance of target materials is discussed in Section 2.2.2.1 of the EIS.

COMMENTOR NO. 1213: NUCLEAR CONTROL INSTITUTE (CONT'D.)

To help attain the longer-term goal of replacing use of *fresh* HEU in such targets with LEU, NCI supports the subalternative's proposal to apply the same type of conditionality to the take-back of target material as applied to HEU spent fuel.[8] Once LEU targets are successfully developed and qualified, the U.S. should accept U.S.-origin foreign HEU target material only from those operators who agree to convert to the LEU targets. Otherwise, the take-back of target material could help to perpetuate HEU commerce. 1213-4 (Cont'd.)

Consideration also should be given to applying such conditionality *before* LEU targets are developed. Under such a regime, the U.S. would accept HEU target material only from those operators who commit *in advance* to convert to LEU targets as soon as they are successfully qualified. There is statutory precedent for such conditionality. The Energy Policy Act of 1992 placed a similar condition on exports of fresh HEU, limiting them *inter alia* to reactor operators that have "provided assurances that, whenever an alternative [LEU] nuclear reactor fuel or target can be used in that reactor, it will use that alternative in lieu of highly enriched uranium."[9] Operators unwilling to make this commitment would be indicating an intention to use HEU in perpetuity, significantly reducing the nonproliferation benefit of U.S. acceptance of their spent fuel. U.S. take-back under these conditions would undermine nonproliferation objectives by facilitating these reactors' continued use of HEU fuel. 1213-5

NCI opposes implementation subalternatives 1a and 1b because they would undermine the RERTR program. Accepting spent fuel only from developing countries or refusing to accept LEU spent fuel would break U.S. commitments to foreign research reactor operators and force many of them to shut down their reactors or reprocess their spent fuel overseas at higher cost. This could cause many of them to abandon the RERTR program. As NCI explained in its previous comments on the Environmental Assessment of Urgent Relief Acceptance of Foreign Research Reactor Spent Fuel (DOE/EA-0912), such an outcome would trigger a domino effect that would undermine nearly two decades of progress by the RERTR program and revive world commerce in HEU, thereby increasing risks of nuclear proliferation and nuclear terrorism.[10] The draft correctly concludes that excluding LEU fuel "almost certainly would result in the end of the RERTR program."[11] The underlying reason, as the draft notes, is that other countries -- including developed nations that are our allies -- "do not necessarily share our belief in the 1213-6

[8] *Volume 1*, pp. 2-12 and 4-63.

[9] Section 903 of the Energy Policy Act of 1992 established Section 134 of the Atomic Energy Act of 1954, as amended, also known as the "Schumer Amendment."

[10] *Comments of the Nuclear Control Institute on the February 1994 Revision of Predecisional Draft Environmental Assessment of Urgent-Relief Acceptance of Foreign Research Reactor Spent Fuel (DOE/EA-0912)*, March 7, 1994, pp. 5-7. Many aspects of the scenario outlined in NCI's comments were incorporated into the final EA and are incorporated into the draft EIS. See, for example, *Volume 1*, pp. 1-6, 1-7, 4-56, and 4-117. (Also see NCI's comments on an earlier draft of the EA, November 18, 1993.)

[11] *Volume 1*, p. 4-62.

RESPONSE TO COMMENT
COMMENTOR NO. 1213: NUCLEAR CONTROL INSTITUTE (CONT'D.)

Response to Comment No. 1213-5

DOE and the Department of State agree with the commentor's position that acceptance of target materials should be conditioned by agreement by the reactor operators that they will convert to LEU targets, wherever such targets are available.

Response to Comment No. 1213-6

The commentor's opposition to subalternatives 1a and 1b of Implementation Alternative 1, is noted. Implementation Alternative 1 involves alternative amounts of foreign research reactor spent nuclear fuel to be managed in the United States. Implementation Alternative 1 is discussed in Section 2.2.2.1 of the EIS. Although the United States has made no legally binding commitments to accept spent nuclear fuel from all foreign research reactors, it acknowledges that foreign research reactor operators have considered acceptance of their spent nuclear fuel as a quid pro quo for converting to LEU fuel.

necessity for removing HEU from use in civil programs."[12] Thus, the U.S. must use competitively-priced take-back as a key incentive to foreign operators to achieve U.S. nonproliferation aims. (Further explanation of the negative aspects of overseas reprocessing is provided in our analysis of Management Alternative 2).

1213-6 (Cont'd.)

Implementation Alternative 2

NCI generally supports implementation subalternative 2b under Management Alternative 1, to permit the return of U.S.-origin HEU spent fuel even after expiration of the proposed 13-year period. The 13-year period is intended to permit return of all spent fuel produced within 10 years after adoption of the policy, allowing time for cooling of the fuel prior to shipment. Every effort should be made to retrieve such spent fuel during this period. However, should it prove impossible to bring all of it back within 13 years, the United States must have the flexibility to bring back the rest subsequently, to achieve the stated goal of removing as much U.S.-origin HEU as possible from international commerce. Extending the take-back period would *not* increase environmental risks. As the draft states, this option "would promote U.S. nuclear weapons nonproliferation goals" and "the potential environmental impacts would be the same as or slightly less than those of the basic implementation."[13]

1213-7

However, NCI opposes one provision of subalternative 2b, applying to foreign research reactors without lifetime cores that cannot yet convert to LEU fuel. In practice, this includes just three reactors: France's ILL-Grenoble and Orphee, and Belgium's BR-2. This provision would restrict take-back from such reactors to HEU spent fuel generated within *five* years of the effective date of the policy, rather than *10* years under the basic implementation.[14] The provision appears to dismiss such reactors as perpetually non-convertible and, therefore, apparently seeks to limit the amount of spent fuel the U.S. would accept from them.

1213-8

This policy has two flaws. First, it reduces the amount of U.S.-origin HEU that could be removed from international commerce, contrary to U.S. nonproliferation goals. Second, it overlooks the potential progress of the RERTR advanced fuel development program, which the Clinton Administration is pledged to restart and which could develop and qualify suitable LEU fuels to enable conversion of these remaining reactors within five to ten years. Prematurely terminating take-back of spent fuel from these reactors after five years could remove an important incentive for them to convert, thereby undermining U.S. nonproliferation objectives.

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[12] *Volume 1*, p. 4-55.

[13] *Summary*, p. 41.

[14] Under basic implementation, "Spent nuclear fuel (HEU) would be accepted . . . from research reactors for which a suitable LEU fuel is not available" with "a policy duration of 10 years," *Volume 1*, p. 2-3 and p. 2-5. Under Subalternative 2b, this is inexplicably restricted to spent fuel "generated within 5 years" of "the date the policy becomes effective," *Volume 1*, p. 2-13.

Response to Comment No. 1213-7

The commentor's support for subalternative 2b of Implementation Alternative 2, is noted. Implementation Alternative 2 (Section 2.2.2.2 of the EIS) involves alternative policy durations.

Subalternative 2b involves an indefinite time limit of accepting HEU, and finite (10-year) limit for LEU.

Response to Comment No. 1213-8

DOE and the Department of State agree with the commentor's position. The provisions of Implementation Subalternative 2b have been revised to specify acceptance of spent nuclear fuel already at the reactor, or generated within 10 years of the date the policy becomes effective, for HEU fueled reactors that cannot convert to LEU fuel and do not have lifetime cores. A substantially longer period of acceptance might result in more material ultimately being accepted, but would also lessen the incentives for conversion.

COMMENTOR NO. 1213: NUCLEAR CONTROL INSTITUTE (CONT'D.)

Subalternative 2b should be amended so that the take-back period for HEU spent fuel from such reactors is extended indefinitely, to maximize the amount of U.S.-origin HEU that can be removed from international commerce. In the event that any of these reactors is able to convert during the 10-year period of the basic implementation, the U.S. also should accept resulting LEU spent fuel produced during that period, as an incentive to conversion. Finally, to further foster the aims of the RERTR program, consideration should be given to conditioning take-back of HEU spent fuel from such reactors on a pledge similar to that proposed above for take-back of target material. Under such a regime, the U.S. would accept spent fuel from such reactors only if their operators pledge *in advance* to convert to LEU fuel as soon as suitable such fuel is developed and qualified. As stated above, there is statutory precedent for such conditionality in the Energy Policy Act of 1992.

1213-7 (Cont'd.)

NCI opposes implementation subalternative 2a -- to reduce the take-back period to five years -- because it would increase the amount of U.S.-origin HEU remaining in international commerce. In addition, as the draft notes, those foreign operators unable to develop LEU spent fuel management capabilities during the truncated five-year period could be forced "to switch their reactors back to HEU fuel" to permit spent fuel disposition, further undermining the RERTR program.[15]

1213-9

Implementation Alternative 3

NCI opposes all subalternatives under implementation alternative 3 of Management Alternative 1. We oppose subalternative 3a because there is no reason to subsidize developed nations beyond making the U.S. charge competitive; this would be an unnecessary burden on U.S. taxpayers. We oppose subalternatives 3b and 3c because attempting to charge customers more than a competitive price will drive them to reprocess their spent fuel overseas and undermine the above-stated goals. It could also, as the draft states, "lead to HEU spent nuclear fuel stockpiled around the world, much of it remaining in the countries least able to protect it."[16] (Further explanation of the negative aspects of overseas reprocessing is provided in our analysis of Management Alternative 2).

1213-10

1213-11

Implementation Alternative 6

NCI opposes implementation alternative 6 under Management Alternative 1 because reprocessing the spent fuel after its return to the United States is unnecessary on safety grounds and would undermine U.S. efforts to discourage reprocessing in other countries, a key element of U.S. non-proliferation policy.[17] However, if a decision were

1213-12

[15] *Volume 1*, p. 4-69.

[16] *Volume 1*, p. 2-14.

[17] *Volume 1*, p. 4-84, states: "For example, the potential exists that other states (e.g. Iran) might use the restart of reprocessing in the United States as an excuse to continue current programs or begin new ones -- activities that would run counter to U.S. nuclear weapons nonproliferation activities."

RESPONSE TO COMMENT
COMMENTOR NO. 1213: NUCLEAR CONTROL INSTITUTE (CONT'D.)

Response to Comment No. 1213-9

The commentor's opposition to subalternative 2a (five year policy period) of Implementation Alternative 2 is noted. Implementation Alternative 2 (Section 2.2.2.2 of the EIS) describes alternative policy durations for generation of spent nuclear fuel that would be managed in the United States, under Management Alternative 1, if implemented by the Record of Decision.

Response to Comment No. 1213-10

The issue of subsidizing developed countries beyond the level of a competitive fee may arise in the context of developed countries for whom neither reprocessing nor domestic disposal of spent nuclear fuel or high-level waste is feasible. At the policy level of the EIS, it is not possible to provide a country-by-country analysis of financial feasibility, cooperation levels, non-U.S. alternatives, etc. The foreign countries should not be expected to provide any information on these negotiation-type issues nor should the United States expect to estimate the transition point for 41 countries. While some form of negotiated fees might ultimately be implemented, it is impossible to define them, by-country, in advance.

Response to Comment No. 1213-11

Charging countries with the option to reprocess overseas a fee exceeding the cost of reprocessing overseas could motivate some of them to reprocess, request the return of fresh HEU, and undermine the goals of the RERTR program.

Response to Comment No. 1213-12

The commentor's opposition to domestic chemical separation is noted. The advantages and disadvantages of chemical separation are discussed in Sections 2.2.2.6 and 4.3.6 of the EIS.

DOE agrees that any recovered HEU should be blended down to LEU. DOE's position on this is stated in Section 2.2.2.6 and again in Section 4.3.6.2 of the EIS.

made to reprocess any of the HEU spent fuel in the U.S., in conjunction with a limited program to stabilize a pre-determined amount of U.S. military nuclear residues and wastes, it is imperative that the recovered HEU be blended down to non-weapons-usable LEU -- thereby eliminating the HEU from commerce and serving as a model for any other country that might contemplate such reprocessing.

NCI is greatly concerned by the draft's suggestion that HEU separated from foreign spent fuel in the United States might not be blended down to LEU. The draft states: "If DOE decides not to blend down the HEU that is within the scope of the Interim Management of Nuclear Weapons EIS, then the HEU that would be recovered in this implementation alternative would also not be blended down."[18] The draft proposes instead to place such recovered HEU under IAEA safeguards. While this might allay foreign concerns about possible diversion of such recovered HEU to the U.S. weapons program, it would still set a terrible precedent and undermine U.S. efforts to prevent such reprocessing -- for recovery of HEU without subsequent blend-down -- in other countries. Moreover, failure to blend down recovered HEU would violate the President's policy of seeking "to eliminate where possible the accumulation of stockpiles of HEU or plutonium."[19] 1213-12 (Cont'd.)

Implementation Alternative 7

If foreign research reactor spent fuel ultimately must be processed to satisfy criteria for final disposal in a geologic repository, NCI generally favors implementation alternative 7 -- new developmental processing technologies such as vitrification -- over implementation alternative 6, traditional reprocessing. Most of these new technologies would avoid the negative impact on U.S. nonproliferation objectives associated with reprocessing, as discussed above. However, NCI opposes developmental technologies that would recover HEU or a combination of plutonium and other actinides, such as the electrorefining technology being developed by Argonne National Laboratory, because they would have the same negative impact on U.S. nonproliferation efforts as traditional reprocessing.[20] 1213-13 1213-14

Management Alternative 2

NCI strongly opposes Management Alternative 2 because both of its implementation subalternatives would undermine at least one of the goals of the take-back program. 1213-15

[18] *Volume 1*, pp. 2-20 and 2-21.

[19] *Nonproliferation and Export Control Policy*, White House Fact Sheet, September 27, 1993, p. 1.

[20] *Volume 1*, p. 2-22.

Response to Comment No. 1213-13

The commentor's preference for Implementation Alternative 7 over Implementation Alternative 6 is noted. These are discussed in Sections 2.2.2.6, 2.2.2.7, 4.3.6, and 4.3.7 of the EIS.

Response to Comment No. 1213-14

The commentor's opposition to any processing technology that separates the actinides from the fission products is noted. These are discussed in Section 2.2.2.7 of the EIS. Please note, however, that more of these technologies would preclude the decision to blend down HEU after it is recovered. Furthermore, as discussed in Section 4.3.7 of the EIS, technologies that do not remove the uranium from the high-level waste could generate a much higher volume of high-level waste and make disposal in a geologic repository much more technically complex.

Response to Comment No. 1213-15

The commentor's opposition to Management Alternative 2, specifically to Subalternative 1a (storage overseas), for HEU spent nuclear fuel, and commentor's support for Management Alternative 1, are noted. These Management Alternatives are discussed in Sections 2.2., 2.3, 4.2, and 4.4 of the EIS. The commentor's concern that overseas storage and/or overseas reprocessing would undermine U.S. nuclear weapons nonproliferation policies is noted. The EIS discusses the proposed action as a means of supporting U.S. nuclear weapons nonproliferation policy in Section 1.2.

COMMENTOR NO. 1213: NUCLEAR CONTROL INSTITUTE (CONT'D.)

Implementation Subalternative 1a

NCI generally opposes implementation subalternative 1a of Management Alternative 2 -- to facilitate the storage of spent fuel overseas -- because it would increase the vulnerability of *spent* HEU fuel to diversion or theft for weapons purposes. Under the basic implementation of Management Alternative 1, this vulnerability is minimized because all of the HEU spent fuel would be returned to the United States and stored at no more than two, well-guarded sites. By contrast, under this implementation subalternative, "spent nuclear fuel containing HEU would be stored in up to 41 countries around the world."[21] Security is inherently less assured at multiple sites, and several of the countries involved have especially lax physical security measures, as documented in a recent DOE analysis.[22] These concerns would grow with time, as the spent fuel became less radioactive and non-self-protecting against those with malign intentions, and "thus a more attractive target for illicit diversion."[23] Further, "a change in government" in any of the countries where the spent fuel would be stored "could reverse any commitment to withhold the material from production of nuclear weapons." As the draft concludes, "although U.S. assistance in maintaining adequate physical security for foreign research reactor spent nuclear fuel repositories may lessen the potential for diversion, the proliferation risks would still be greater than under the basic implementation of Management Alternative 1."[24]

1213-15 (Cont'd.)

In addition, in most cases, storage would be only an interim measure. In the long run, pressure would grow in many states for one of two more permanent solutions -- reprocessing, most likely in the UK or France, or storage in a state such as Belarus or China, both of which have previously offered such services -- which would undermine U.S. non-proliferation goals.[25]

However, NCI does support U.S. facilitation of overseas storage capability for *LEU* spent fuel. Overseas storage of such fuel does not present as great a proliferation risk as HEU spent fuel. Moreover, after expiration of the proposed 13-year U.S. take-back period under the basic implementation, foreign operators would have no choice but to manage their spent LEU fuel outside of the United States. No foreign reprocessor is currently able to accept such LEU fuel. If this remains the case after expiration of the initial U.S. take-back period, and if foreign operators are unable to store their own spent LEU fuel, they could be compelled to reconvert to HEU fuel in order to facilitate spent fuel management, undermining previous progress of the RERTR program. Thus, U.S. facilitation of foreign storage of LEU spent fuel could play an important role in preserving

1213-16

[21] *Volume 1*, p. 2-23.

[22] *Risks to US-Origin Uranium in Foreign Research Reactor Spent Fuel*, John Rooney, DOE Office of Arms Control and Nonproliferation, May 1995.

[23] *Summary*, p. 44.

[24] *Volume 1*, p. 4-98.

[25] *Volume 1*, p. 4-99.

RESPONSE TO COMMENT
COMMENTOR NO. 1213: NUCLEAR CONTROL INSTITUTE (CONT'D.)

past gains of the RERTR program and, thereby, helping to achieve the U.S. objective of reducing, and ultimately eliminating, civilian commerce in HEU. 1213-16 (Cont'd.)

Implementation Subalternative 1b

NCI opposes implementation subalternative 1b of Management Alternative 2 -- to facilitate overseas reprocessing of the spent fuel -- because we do not believe such reprocessing can be carried out in a manner that preserves international cooperation with the RERTR program. As a result, this subalternative would increase international commerce in HEU, counter to the draft's stated goals.

Foreign reprocessing would undermine the RERTR program and U.S. nonproliferation goals unless the U.S. could obtain three *ironclad* guarantees from any potential reprocessor:

(1) to blend down all recovered HEU to LEU;

(2) to accept spent fuel only from those reactors fully participating with the RERTR program -- that is, *not* from reactors able to convert to qualified LEU fuel but which have refused to do so, *nor* from high-power reactors unable to convert to existing fuels and unwilling to commit to convert to suitable LEU fuels as soon as they are developed and qualified; and 1213-17

(3) to establish an LEU spent fuel reprocessing capability.

Despite repeated attempts, the United States has been unable to obtain *any* of these three commitments -- let alone all of them -- from the only foreign reprocessor currently accepting such spent fuel from abroad, the UK's AEA Dounreay facility. AEA representatives have stated repeatedly that they will not make such commitments due to political and commercial considerations. The foreign reprocessors are awaiting the ROD before engaging in serious negotiations with the United States. If the ROD states that some of the spent fuel must be reprocessed overseas, the foreign reprocessors will be able to accept spent fuel without making any commitments to the United States. The best way to obtain leverage to extract firm commitments from foreign reprocessors would be for the ROD to approve the acceptance in the United States of all the U.S.-origin spent fuel at a competitive or subsidized price, as outlined in Management Alternative 1. Only then could the U.S. extract firm commitments from the foreign reprocessors, in exchange for permitting some of the spent fuel to be reprocessed there.

Further decreasing the likelihood of obtaining ironclad commitments from foreign reprocessors is the draft's failure to state the three conditions categorically or to make them explicit pre-conditions for U.S. approval of this subalternative. Instead, the draft lays out less stringent criteria that only "would have to be considered" by U.S. policy-

Response to Comment No. 1213-16

The commentor's support for overseas storage of LEU spent nuclear fuel and opposition to overseas storage of HEU spent nuclear fuel is noted. Overseas storage in general is under Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

Response to Comment No. 1213-17

The commentor's opinion that overseas reprocessing cannot be conducted in a manner that preserves cooperation with the RERTR program is noted. As discussed in Section 2.3 of the EIS, certain arrangements in support of U.S. nuclear weapons nonproliferation policy would have to be established with the foreign reprocessors and research reactor operators before overseas reprocessing would be consistent with United States nuclear weapons nonproliferation policy. These could include steps such as blending the HEU down to LEU, developing the capability to reprocess high-density LEU spent nuclear fuel, and converting the research reactors to the use of LEU. There is no guarantee that such arrangements can be worked out, but DOE and the Department of State are discussing these issues with the appropriate parties.

COMMENTOR NO. 1213: NUCLEAR CONTROL INSTITUTE (CONT'D.)

makers. These include "an *expectation* that HEU separated during reprocessing would be blended down." Rather than requiring cooperation with the RERTR program, the draft states merely that "research reactors *would be encouraged* to convert to LEU if an LEU fuel exists or is developed that will allow such operation."[26] For the draft to so signal that less-than-ironclad commitments might suffice betrays weakness in the U.S. position and makes a successful negotiation on firm guarantees all the more unlikely.

1213-17 (Cont'd.)

Foreign reprocessing in the absence of ironclad guarantees on any of the three above-listed conditions would do grave damage to the RERTR program:

Blend-down -- Without a guarantee of blend-down, a number of research reactor operators that now can convert, or are in the process of converting, or have already converted to LEU are likely to insist on future use of the HEU fuel recovered during reprocessing of their spent fuel. They are likely to do so because overseas reprocessing entails two penalties for operators, in comparison with U.S. take-back: higher cost and a requirement to accept the return of high-level radioactive waste. In light of these penalties associated with overseas reprocessing, operators will be far less willing to accept the additional penalties of conversion to LEU fuel under the RERTR program: higher fuel-cycle cost and decreased reactor performance. Moreover, the U.S. will be perceived as having broken its longstanding commitment to take back spent fuel it originally exported. From the foreign operators' perspective, if the U.S. can break its commitment on take-back, they can break their commitment on conversion.

1213-18

Cooperation with RERTR (Conversion to LEU) -- The United States established an important precedent in the Environmental Assessment of Urgent Relief Acceptance of Foreign Research Reactor Spent Fuel (DOE/EA-0912) by making take-back of spent fuel conditional on a reactor operator's cooperation with the RERTR program. That is, the U.S. would not accept spent fuel from a reactor which could convert to qualified LEU fuel but had refused to do so. Management Alternative 1 reiterates this sensible policy of using the back end of the fuel cycle as appropriate leverage to ensure widespread cooperation with the RERTR program, stating: "Spent nuclear fuel would not be accepted from research reactors that could convert to LEU fuel but refuse to do so."[27] Such conditionality has a statutory precedent, in the Energy Policy Act of 1992, which denies fuel exports to any reactor that continues to use HEU fuel when an "alternate [LEU] nuclear reactor fuel . . . can be used in that reactor."[28] The statute goes further, as cited above, by barring HEU exports even to reactors unable to convert, unless their operators have made a commitment to convert as soon as suitable LEU fuel is available. Failure to make such cooperation with the RERTR program an explicit precondition for foreign reprocessing would sacrifice valuable leverage required both to lock-in previous gains of the RERTR program and to persuade operators of remaining HEU-fueled reactors to

1213-19

[26] *Volume 1*, p. 2-24, emphasis added.

[27] *Volume 1*, p. 2-5.

[28] See Schumer Amendment, cited above.

RESPONSE TO COMMENT
COMMENTOR NO. 1213: NUCLEAR CONTROL INSTITUTE (CONT'D.)

Response to Comment No. 1213-18

U.S. assistance for overseas reprocessing under the EIS would be conditional on blending down the reprocessed HEU into LEU. Overseas reprocessing may also be conditional on the ability of the reactor operator to accept the reprocessing waste, although this is uncertain

Response to Comment No. 1213-19

The commentors preference for refusing to accept spent nuclear fuel from foreign research reactors that could convert to LEU but decline to do so is noted. DOE and the Department of State are continuing to discuss with representatives from the United Kingdom conditions that would allow United States nuclear weapons nonproliferation policy objectives to be met.

convert to LEU fuel. This failure would obstruct achievement of the U.S. nonproliferation goal of reducing and, ultimately, eliminating civilian commerce in HEU.

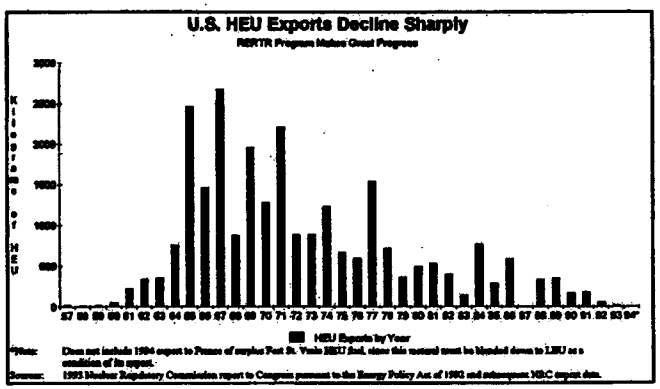
1213-19 (Cont'd.)

LEU Reprocessing Line -- Under all of the proposed management alternatives and subalternatives, the U.S. would accept U.S.-origin, spent *LEU* research reactor fuel for no more than 13 years. However, there is no reprocessing line in Europe currently able to accept such LEU fuel. If this were still the case after expiration of the initial 13-year period, operators would be presented with the choice of disposing of their own spent LEU fuel or *converting back to HEU fuel* to permit the reprocessing option. Therefore, if the U.S. were to facilitate foreign reprocessing without assuring the establishment of an LEU reprocessing line, it would create a perverse incentive for some operators to abandon the RERTR program. As the draft succinctly states: "Reprocessing under these circumstances leads to perpetuation of the HEU fuel cycle."[29]

1213-20

Foreign reprocessing in the absence of all three guarantees would result in an increase in HEU commerce and an undermining of the RERTR program, just at the time when the program is on the verge of eliminating civilian HEU commerce. Because the United States has been the major exporter of HEU for civilian use, and in recent years the sole exporter, U.S. exports approximate world commerce in bomb-grade uranium. As indicated in the following chart, such commerce has dropped to minimal levels as a result of the RERTR program. Building on this progress, as the draft acknowledges, "RERTR program activities can virtually eliminate the need for civilian commerce in HEU."[30]

1213-21



[29] *Volume 1*, p. 1-7.

[30] *Volume 1*, p. 1-3.

Response to Comment No. 1213-20

The proposed action is designed to provide foreign research reactor operators with incentives to use LEU fuel and concurrently help them manage all their spent nuclear fuel for a finite period. After this period, foreign research reactor operators will be responsible for their own spent nuclear fuel management. DOE and the Department of State are continuing to discuss with representatives of the United Kingdom conditions that would allow United States nuclear weapons policy objectives to be met.

Response to Comment No. 1213-21

The broader objective of the proposed action is the advancement of the RERTR program. It is DOE's preference that any U.S. actions regarding reprocessing, whether at a U.S. facility or a foreign facility, would require blending down the separated HEU to LEU.

With respect to the sale and export of HEU, the Energy Policy Act of 1992, prohibits the United States from exporting HEU for civilian use, other than under very specific exceptions.

COMMENTOR NO. 1213: NUCLEAR CONTROL INSTITUTE (CONT'D.)

However, foreign reprocessing in the absence of firm guarantees could dangerously reverse this trend. While only a few reactor operators might defect from the RERTR program initially, this could trigger a domino effect that would soon undermine the entire regime. The draft's analysis of this dynamic is correct: "As some foreign research reactors abandon plans for conversion to LEU or reconvert from LEU to HEU fuels, the credibility of the RERTR program would be seriously, and perhaps irreparably, compromised."[31]

1213-21 (Cont'd.)

This subalternative raises another troubling policy concern in its proposal to facilitate foreign reprocessing by providing "*financial* and/or logistical assistance."[32] In other words, the U.S. would subsidize the operation of a foreign reprocessing plant, rather than store or reprocess the spent fuel in the United States. Without such U.S. assistance, the draft acknowledges, Dounreay might well shut down due to lack of business.[33] In fact, the Dounreay facility that previously reprocessed spent research reactor fuel (the MTR reprocessing plant) is already mothballed,[34] and only the Prototype Fast Reactor reprocessing plant is operating. Thus, this subalternative would use U.S. taxpayer dollars to reopen, subsidize, and keep in business a foreign reprocessing plant, despite the stated U.S. policy of not encouraging foreign reprocessing. It would subsidize a foreign industry rather than spending those dollars to employ Americans to handle the waste at DOE facilities. It would do this in order to export, from the U.S. to Europe, a radioactive waste problem associated with U.S.-origin fuel the U.S. has previously committed to manage.

1213-22

The draft's proposal, that "the United States would commit to accept the high-level waste" resulting from foreign reprocessing of spent fuel from countries lacking their own nuclear waste programs, is unrealistic.[35] It is only made more preposterous by the proposal to swap cemented research-reactor waste for glassified power-reactor waste produced at Sellafield, UK, for disposal in the United States.[36] Likely American public opposition to such a proposal is suggested by the degree of controversy surrounding the recent urgent-relief acceptance of a single combined shipment of U.S.-origin HEU spent fuel from a few foreign research reactors. In the instance of spent fuel take-back, the U.S. at least is acting to remove weapons-usable nuclear material from international commerce.

1213-23

[31] *Volume 1*, p. 4-117.

[32] *Summary*, p. 18, emphasis added.

[33] *Volume 1*, p. 1-4.

[34] Mike Townsley, personal communication, June 1995.

[35] *Volume 1*, p. 4-100.

[36] The American public is not likely to accept the disposal in the United States of concentrated radioactive waste produced in, for example, Japan's nuclear-power program, despite the draft's repeated suggestions. For example, "The government of the United Kingdom might allow an exchange of vitrified commercial waste from Sellafield for cemented waste from Dounreay, which might allow the United States to accept vitrified high-level waste from the United Kingdom," *Volume 1*, p. 4-101. Or, "The United Kingdom Atomic Energy Authority is considering a proposal from British Nuclear Fuels Limited to substitute vitrified waste from its Thermal Oxide Reprocessing Plant at Sellafield for nonvitrified research reactor wastes from Dounreay. According to the UKAEA, acceptance of such a policy could form the basis for waste substitution of research reactor spent nuclear fuels," Volume 1, p. 4-129.

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COMMENTOR NO. 1213: NUCLEAR CONTROL INSTITUTE (CONT'D.)

Response to Comment No. 1213-22

As discussed in Section 4.4.2.1 of the EIS, the U.S. does not encourage the development of reprocessing capabilities overseas, but the capability already exists in the United Kingdom (The MTR reprocessing plant at the Dounreay Site has not been mothballed as suggested by the commentor, but is actually capable of operating). Therefore, contracting with Dounreay for reprocessing services would not be a violation of U.S. policy.

Contracting with Dounreay for reprocessing services would not be "subsidizing a foreign industry" as suggested by the commentor. U.S. taxpayer dollars would be spent only for services rendered.

Response to Comment No. 1213-23

The exchange of vitrified waste from the Sellafield Site for cemented waste from the Dounreay Site and its acceptance in the United States was included for consideration because of the likely technical or regulatory difficulties of accepting cemented waste from Dounreay into the United States. DOE acknowledges that acceptance of high-level waste from abroad may be opposed by certain members of the public, but under certain circumstances it would be a reasonable alternative, and therefore subject to consideration. Public opposition does not justify the omission of a reasonable alternative.

As discussed in Section 2.3 of the EIS, certain arrangements in support of U.S. nuclear weapons nonproliferation policy would have to be established with the foreign reprocessors and foreign research reactor operators before overseas reprocessing could be implemented with U.S. assistance. These could include the three steps of: 1) blending the HEU down to LEU, 2) developing the capability to reprocess high-density LEU spent nuclear fuel, and 3) converting the research reactors to the use of LEU. There is no guarantee that such arrangements can be worked out, but DOE and the Department of State are discussing these issues with the appropriate parties.

By contrast, accepting pure high-level waste makes the United States appear to be volunteering to be the world's radioactive garbage can.

Thus, foreign reprocessing would be a realistic option only for those countries that could accept return of their own high-level waste. Coincidentally, most of these countries are within Euratom, where the U.S. has no consent rights over spent fuel that remains within the Community. This underscores the need to obtain the three ironclad guarantees discussed above, because the U.S. is unable to use consent rights to encourage compliance with the RERTR program. The countries which realistically could have their fuel reprocessed overseas -- because they could accept return of recovered waste -- are precisely those over which the U.S. has no consent rights to insist on the blend-down of recovered HEU to LEU. 1213-23 (Cont'd.)

The draft also wrongly implies that this subalternative would be more environmentally benign than Management Alternative 1.[37] While it is true that the United States would receive fewer shipments if the radioactive waste in the spent fuel were reprocessed, concentrated and glassified before being sent to the U.S., this would be *in addition to* all the shipments of spent fuel to European reprocessors. Overall, there would be *more* shipments of radioactive material, not less, under this subalternative. The draft should acknowledge and make clear that this option would not reduce the environmental risk associated with the management of U.S.-origin fuel, but merely export most of the risk. Currently, the draft relegates to a footnote the fact that it ignores environmental impacts outside the U.S.[38] 1213-24

Management Alternative 3

NCI opposes Management Alternative 3 -- the hybrid alternative under which only some of the spent fuel would be stored in the United States, and the rest reprocessed in the U.S., stored overseas, or reprocessed overseas -- because any hybrid would include a subalternative that we oppose on nonproliferation grounds. However, were a hybrid to be selected involving some storage and some reprocessing of spent fuel in the U.S., in conjunction with a limited program to stabilize a pre-determined amount of U.S. military nuclear residues and wastes, NCI reiterates the need to ensure that the recovered HEU be blended down to non-weapons-usable LEU -- thereby eliminating the HEU from commerce and serving as a model for any other country that might contemplate such reprocessing. 1213-25

The draft states that estimated costs are one factor in DOE's decision-making,[39] and claims that a hybrid alternative involving reprocessing at Dounreay and reprocessing 1213-26

[37] *Volume 1*, p. 4-101.

[38] *Volume 1*, Figure 4-22, p. 4-121.

[39] *Volume 1*, p. 2-1.

Response to Comment No. 1213-24

The commentor's concern with the global environmental effects of overseas reprocessing is noted. Overseas reprocessing is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS. The EIS includes analysis of impacts on the global commons in accordance with Executive Order 12114, but not analysis of impacts in foreign countries. The subject of environmental impacts in foreign countries is outside the scope of this EIS. Furthermore, while the total number of radioactive material shipments would increase, as suggested by the commentor, the length of a large number of the spent nuclear fuel shipments (i.e., those from Europe to European reprocessors) would be significantly shortened. Furthermore, due to the robust nature of the vitrified waste form, the added shipments would have minimal risks associated with them. Due to the shortening of the spent nuclear fuel shipments, DOE does not expect that the overall transportation risk would be reduced.

Response to Comment No. 1213-25

The commentor's opposition to a hybrid alternative that would include management of foreign research reactor spent nuclear fuel overseas is noted. Also noted is the commentor's support of a hybrid alternative that would involve some storage and some chemical separation in the United States. Hybrid alternatives are discussed in Sections 2.4 and 2.5 of the EIS.

Response to Comment No. 1213-26

While it is true that the uncertainty in cost estimates exceeds the estimated costs of the various alternatives, the greatest technical risks (as opposed to discount rate risks) would be associated with geologic disposal of spent nuclear fuel (as opposed to geologic disposal of high-level waste). The certainty of costs for Dounreay is very high. The certainty of costs for geologic disposal of Dounreay wastes is low but not a risk factor to the U.S. The certainty of costs for separation at the Savannah River Site is also high, provided that chemical separation activities under this EIS would be carried out with those of other programs in existing facilities. By combining the Dounreay costs and the Savannah River Site costs (during the period of concurrent activities) not only would the costs be at least

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and storage in the U.S. would "cost less than any U.S.-only approach."[40] Reserving judgment on the accuracy of this claim, NCI reiterates that nonproliferation concerns, rather than cost, should be paramount in DOE's decision-making. NCI also wishes to underscore that there is considerable uncertainty associated with the cost estimates of the various management alternatives in the draft. Indeed, the uncertainty in cost estimates is greater than the difference in cost between the alternatives.[41] It would be doubly foolish to sacrifice nonproliferation goals in a search for economies that could well prove illusory.

1213-26 (Cont'd.)

No Action Alternative

NCI strongly opposes the No Action Alternative because it would combine the worst nonproliferation consequences of the other flawed options. Since the Off-Site Fuels policy would remain lapsed, foreign research reactor operators would be unable to return their U.S.-origin spent fuel to the United States. Some operators would send their spent fuel to foreign reprocessors, and the recovered HEU would likely re-enter international commerce. Other operators would retain their HEU spent fuel on-site, where inadequate physical security could leave it vulnerable to diversion or theft for weapons. Many foreign reactor operators, in light of the United States breaking its long-time commitments to them and with few other options, would abandon the RERTR program and revert to HEU fuel. Russia and/or China could well begin exporting HEU fuel to meet the renewed demand. In short, nearly two decades of progress in reducing HEU commerce would be lost, and the risks of nuclear proliferation and nuclear terrorism would increase markedly.

1213-27

Other Comments

o *Prioritization of Take-Back* -- Certain overseas U.S.-origin HEU fuel poses a greater proliferation and/or safety risk than other such fuel. To address these concerns, NCI supports a prioritization of take-back similar to that proposed by the IAEA:[42]

1. Fresh, unirradiated HEU;
2. Spent HEU that has cooled sufficiently that its radioactivity no longer provides the fuel "self-protection" against diversion;
3. Spent HEU at sites with poor physical security;
4. Badly corroded spent HEU;
5. Other HEU spent fuel;
6. LEU spent fuel.

1213-28

o *Environmental Impact of Proliferation* -- The draft concludes that none of the proposed management alternatives would have a significant environmental impact. At the same

1213-29

[40] *Summary*, p. 47.

[41] *Volume 1*, p. 4-127.

[42] Statement of Ian Ritchie, International Atomic Energy Agency, at DOE Public Hearing, Washington, DC, May 31, 1995.

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as low as any U.S.-only option, but the certainty of costs would be higher. If an acceptable agreement could be worked out that would allow the exchange of vitrified wastes for concreted wastes (if the U.S. agrees to accept the waste), the hybrid reprocessing/chemical separation option would generate a waste form that would cost less to dispose of (mostly because of volume) and has less cost uncertainty (mostly because of fissile material loadings) than any alternative based on disposal of spent nuclear fuel without reprocessing or chemical separation. Appendix F, Section F.7.6 of the EIS addresses the issue of cost versus nonproliferation goals as it relates to DOE's decisionmaking.

Response to Comment No. 1213-27

The commentor's opposition to the No Action Alternative is noted. The proposed action, if implemented, would negate many of the commentor's concerns.

Response to Comment No. 1213-28

If the Record of Decision results in U.S. management of the foreign research reactor spent nuclear fuel, DOE will establish a prioritization schedule that takes into account the IAEA recommendations. However, while DOE and the Department of State agree in general with the prioritization criteria proposed by the IAEA, due to considerations such as the availability of transportation casks or other details of the shipping arrangements, DOE prefers not to address the prioritization in the EIS, and would reserve the right to exercise judgement in the application of any prioritization criteria that would be established. DOE would address this issue as a part of the process of contracting for any spent nuclear fuel management services that might be provided.

Response to Comment No. 1213-29

Successful diversion of weapons-grade material and the consequent detonation of a nuclear device is hypothetical, but would be catastrophic. The proposed action would be beneficial in terms of substantially reducing the diversion and proliferation risk, and as such, detailed qualitative or quantitative analysis of diversion and proliferation risks would be unnecessary. Nevertheless, Chapter 4 of the EIS does discuss the different impacts that could result from implementation of the various alternatives, including increased risks of the proliferation of nuclear weapons, where that is applicable.

time, the draft acknowledges that certain options would hinder achievement of U.S. nonproliferation goals -- that is, they could increase the likelihood of additional nations or terrorists acquiring nuclear weapons. Such an eventuality, including possible detonation of a nuclear weapon, would indeed have a significant environmental impact. The draft should be revised to take into account the environmental impacts of policies that increase the risk of proliferation.

1213-29 (Cont'd.)

o *Logistical Feasibility of Accepting Return of All Fuel* -- Based on the experience of the recent urgent-relief shipment, some skeptics have claimed it is not logistically feasible to accept return of all the fuel under Management Alternative 1 during the 13-year period provided for in the basic implementation, due to a shortage of transportation casks, skilled staff, and/or infrastructure at the potential storage sites. NCI believes it is inappropriate to extrapolate from the logistical experience of the recent urgent-relief shipment, which occurred after a six-year hiatus in U.S. acceptance of such fuel. If the ROD authorizes U.S. acceptance of foreign research reactor spent fuel, market forces will encourage the availability of sufficient casks. DOE can and should upgrade staff and infrastructure sufficiently to permit acceptance of all the fuel in the 13-year period. As a precaution, however, extending the take-back period for spent HEU fuel -- under subalternative 2b of Management Alternative 1 -- would assure that any delays due to inadequate staffing or physical infrastructure do not undermine U.S. nonproliferation goals. It should be stressed that all of the foreign research reactor spent fuel analyzed in the draft represents less than one percent of the total mass of heavy metal that DOE currently manages as spent nuclear fuel and is, thus, seemingly well within DOE's management capabilities.[43] In addition, there is sufficient space in existing DOE facilities -- for example, a combination of Savannah River's RBOF facility and L-Reactor disassembly basin, after minor modifications -- to store all the foreign spent fuel during Phase 1 implementation.[44]

1213-30

o *HEU Removal Overestimated* -- The draft overestimates the amount of HEU that would be removed from international commerce under Management Alternatives 2 and 3, stating that "overseas reprocessing would remove the same amount of HEU from international commerce as would the basic implementation of Management Alternative 1 . . ."[45] As discussed above, this would be true only if all recovered HEU were blended down to LEU rather than being returned to international commerce. However, there is no assurance of this outcome based on the policy outlined in the draft, nor on actual U.S. negotiations with potential foreign reprocessors. The draft should acknowledge that foreign reprocessing will limit the amount of U.S.-origin HEU that can with assurance be removed from international commerce, and thereby undermine U.S. nonproliferation goals. To its credit, the draft acknowledges the adverse proliferation consequences that would arise from the

1213-31

[43] *Volume 1*, p. 6.

[44] *Volume 1*, p. 2-60.

[45] *Volume 1*, p. 4-120 and Figure 4-21, p. 4-119.

Response to Comment No. 1213-30

The commentor's assessment that it is not logistically feasible to accept all foreign research reactor spent nuclear fuel considered under Management Alternative 1 during the proposed 13-year acceptance period provided for in the basic implementation, is noted. Also noted is the commentor's suggestion to adopt the indefinite take-back period for HEU (Subalternative 2b, Implementation Alternative 2, Management Alternative 1), which is discussed in Section 2.2.2.2.

Response to Comment No. 1213-31

The commentor's opinion that the analysis in the EIS overestimates the amount of HEU that would be removed from commerce under Management Alternatives 2 and 3 versus Management Alternative 1 is noted. As discussed in Section 2.3 of the EIS, certain arrangements in support of U.S. nuclear weapons nonproliferation policy would have to be established with the foreign reprocessors and research reactor operators before overseas reprocessing could be implemented with U.S. assistance. These could include steps such as blending the HEU down to LEU, developing the capability to reprocess high-density LEU spent nuclear fuel, and converting the research reactors to the use of LEU. There is no guarantee that such arrangements can be worked out, but DOE and the Department of State are discussing these issues with the appropriate parties. In the interim, NEPA requires consideration of all reasonable alternatives and overseas reprocessing is considered reasonable

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other option under Management Alternative 2, facilitating foreign storage of U.S.-origin HEU spent fuel.[46] 1213-31

o *Cost of Domestic Reprocessing Underestimated* -- The draft underestimates the cost of domestic reprocessing by not taking into account any of the costs of upgrades in existing U.S. reprocessing facilities that would be necessary before reprocessing could take place. The draft states that these costs, totaling hundreds of millions of dollars, "are not included in the known costs or the uncertainties since they would, presumably, be borne by other programs requiring use of the facilities, e.g. programs to stabilize the existing Savannah River Site materials under a separate EIS."[47] However, during Congressional consideration of such upgrades, the need to manage foreign spent fuel has been cited as a leading justification. Thus, a significant portion of the cost of such upgrades should be attributed to the reprocessing of foreign spent fuel, and included in the draft's estimated cost for implementation alternative 6 under Management Alternative 1, as well as any hybrid under Management Alternative 3 that includes domestic reprocessing. 1213-32

o *Outdated NPT References* -- The draft's references to the Nuclear Non-Proliferation Treaty should be revised to reflect the treaty's indefinite extension. 1213-33

Conclusion

Reducing, and ultimately eliminating, international commerce in bomb-grade uranium is a key component of U.S. nuclear nonproliferation policy. Foreign reprocessing of U.S.-origin HEU spent fuel, without ironclad guarantees that would ensure blend-down of recovered HEU and continued cooperation with the RERTR program, would do grave damage to this important U.S. national security objective. Only by issuing an ROD that provides for U.S. take-back of all U.S.-origin foreign research reactor spent fuel, as outlined in Management Alternative 1, can the U.S. ensure that the maximum amount of HEU is removed from international commerce and that international cooperation with the RERTR program continues. After issuance of such an ROD, the U.S. would be in a much stronger position to extract the cited ironclad guarantees from foreign reprocessors, if the U.S. wants foreign reprocessors to be a component of the management solution for U.S.-origin foreign research reactor spent fuel. 1213-34

Finally, it should be underscored that the U.S. take-back program is not an isolated domestic policy, but part of a larger international effort to eliminate HEU from international commerce that the U.S. has led for two decades. In addition to promoting longstanding cooperation with Western nations, the U.S. RERTR program is now actively working with China and Russia to eliminate their use of HEU in research reactors and to prevent their exporting HEU. Were the U.S. to signal a diminished commitment to the RERTR program by failing to renew the take-back program, Russia and China could well 1213-35

[46] *Volume 1*, p. 4-120.

[47] *Volume 1*, p. 4-130.

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Response to Comment No. 1213-32

The cost of upgrades to existing U.S. chemical separation facilities would not be charged to the foreign research reactor spent nuclear fuel program because none would be made during the period in which foreign research reactor spent nuclear fuel would be processed. The $210 million figure in the draft EIS referred to upgrades for 40 years of operations. It has been eliminated from the final EIS. If one or more Canyons were restarted under another program, the initial increments of foreign research reactor spent nuclear fuel could be processed at the same time using spare dissolver capacity. Then the remaining foreign research reactor spent nuclear fuel could be separated chemically on a stand-alone basis after this period, depending on costs and schedules that are being developed under the IMNM EIS.

If costs for operations are allocated to the foreign research reactor spent nuclear fuel program on the basis of average variable costs (including a penalty for deferring phasedown of the Canyon) for all activities after the 1998 to 2002 period of processing incremental to the IMNM EIS. Costs are shown for the proportion of variable costs at F-Canyon over the entire period, taking into account the share of non-foreign research reactor spent nuclear fuel that is also processed. A hybrid involving chemical separation at the Savannah River Site during the period of concurrent operations and then dry storage afterwards would also be possible but more costly than chemical separation only due to diseconomies of scale in staging the receipts for storage and due to the high cost of spent nuclear fuel disposal compared to the high-level waste disposal.

Response to Comment No. 1213-33

The information about the Treaty on the Non-Proliferation of Nuclear Weapon has been updated to indicate its indefinite extension.

Response to Comment No. 1213-34

The commentor's suggestion that only Management Alternative 1, management of all foreign research reactor spent nuclear fuel in the United States (Section 2.2 of the EIS), would ensure the maximum removal of HEU from international commerce, is noted.

Response to Comment No. 1213-35

The leadership that the United States has undertaken in the nuclear weapons nonproliferation arena is demonstrated in the establishment and subsequent success of the Reduced Enrichment for Research and Test Reactors (RERTR) program. The failure to successfully implement a policy to manage foreign research reactor spent nuclear fuel would eventually jeopardize the current negotiations with China and Russia to follow the U.S. lead and start their own RERTR-type programs.

back away from such cooperative efforts. On the other hand, if the U.S. renews the take-back program, prospects are excellent for continued progress towards attainment of U.S. nonproliferation objectives. As Hans Blix, Secretary General of the IAEA, recently wrote to Victor Michailov, Russia's Minister for Atomic Energy:

> If the RERTR programme goals could be achieved and both major supplier countries, the U.S. and Russia, take back spent research reactor fuel, international trade in HEU for research reactors will almost completely disappear and spent HEU fuel will be safely stored in only a few locations.[48]

1213-35 (Cont'd.)

NCI

[48] Hans Blix, letter to Victor Michailov, February 2, 1995.

COMMENTOR NO. 1214:
WESTERN STATES LEGAL FOUNDATION

WESTERN STATES LEGAL FOUNDATION
1440 Broadway, Suite 500
Oakland, California 94612

Jacqueline Cabasso
Executive Director

Telephone: (510) 839 5877
Telefax: (510) 839 9753

Michael Velleva
Counsel to the Foundation
Telephone: (510) 939 3830
Telefax: (510) 909 9916

July 20, 1995

VIA FACSIMILE AND REGULAR MAIL
(202) 586-5256

TO: Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Re: Draft Environmental Impact Statement on a Proposed
Nuclear Weapons Nonproliferation Policy Concerning
Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

Please find enclosed the comment of the Western States Legal Foundation to the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

Very truly yours,

WESTERN STATES LEGAL FOUNDATION

MICHAEL J. VELLUVA
Foundation Counsel

MJV: hs
Enclosure

RESPONSE TO COMMENT
COMMENTOR NO. 1214:
WESTERN STATES LEGAL FOUNDATION

COMMENTOR No. 1214:
WESTERN STATES LEGAL FOUNDATION (CONT'D.)

COMMENT OF THE WESTERN STATES LEGAL FOUNDATION

DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
PROPOSED NUCLEAR WEAPONS NONPROLIFERATION POLICY
CONCERNING FOREIGN RESEARCH REACTOR
SPENT NUCLEAR FUEL

Address: Western States Legal Foundation
1440 Broadway, Suite 500
Oakland CA 94612

Comment Submitted By:

Michael Veiluva Phone: (510) 939-9880
Fax: (510) 939-9916

Jacqueline Cabasso

Comment Date: July 20, 1995

INTRODUCTION

Western States Legal Foundation (WSLF) is a non-profit environmental and peace organization which, since 1982, has participated in administrative proceedings, litigation, and grass-roots activities to further the end of the nuclear arms race, conversion of military activities, and the cleanup of federal facilities engaged in nuclear weapons production. WSLF is a member of the Military Production Network (MPN), and a founding member of the Global Anti-Nuclear Alliance (GANA).

Western States Legal Foundation has participated as an observer in its capacity as a registered non-governmental organization (NGO) in international negotiations in Geneva, Switzerland regarding the Comprehensive Test Ban Treaty (CTB), and the Nuclear Non-Proliferation Treaty (NPT). Most recently, WSLF attended the April- May 1995 New York conference on review and extension of the NPT.

The principal author of this comment is currently serving as a member

RESPONSE TO COMMENT
COMMENTOR No. 1214:
WESTERN STATES LEGAL FOUNDATION (CONT'D.)

COMMENTOR NO. 1214: WESTERN STATES LEGAL FOUNDATION (CONT'D.)

of the NACEPT subcommittee assisting the EPA in rulemaking to establish radioactive site cleanup standards.

WSLF testified at the November 1993 scoping hearing on the proposed policy to return spent nuclear fuel to Oakland and submitted written comments at that time, which are incorporated herein by reference. The authors of this comment testified at the May 22 public hearing in Concord, California.

REQUEST FOR A SECOND HEARING

As of the date of this comment, the cities of Martinez and Concord, and Contra Costa County (where the Concord Naval Weapons Station is situated) have passed resolutions opposing the return of spent nuclear fuel through the Concord Naval Weapons Station (Concord NWS). All three entities requested an extension of sixty to ninety days in which to comment on the DEIS.

Prior to April 1995, local communities in the vicinity of Concord NWS were unaware that the military port was being actively considered as an entry port for spent nuclear fuel. The first notice to the public of the shift from Oakland to Concord NWS was the appearance of the DEIS in the offices of local city planners. Fortunately, one of these planners notified a local newspaper of the proposal to use Concord NWS as an entry port; otherwise, valuable weeks between the Easter weekend and the May 22 hearing would have been lost until DOE settled on a date and hearing site.

1214-1

As a practical matter, members of the public and local governments had less than two months to read and assimilate the DEIS before the original June 20 deadline, and only a week or two prior to the May 22 hearing. This problem was compounded by delays in mailing backlogged orders for the complete document. This is contrary to the experience of local planners in considering proposals for significant changes in land use, in which six months to a year is often the norm. DOE's allowance of a bare two months to consider this document is inadequate and procedurally deficient; at least 120 days' notice should have been provided in advance of the close of the comment period, and 45 days before

Consequently, we respectfully request that DOE conduct a second hearing to permit interested community representatives, citizens, and local government officials an opportunity to more fully comment on the proposal.

WESTERN STATES COMMENT - 3

RESPONSE TO COMMENT COMMENTOR NO. 1214: WESTERN STATES LEGAL FOUNDATION (CONT'D.)

Response to Comment No. 1214-1

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995 (90 days total). Seventeen public hearings were held on the draft EIS in the locations determined most likely to be directly affected by the EIS alternatives, specifically in the ports of entry and at the potential management sites. In addition to accepting comments from the public during these hearings, written comments were also welcomed, and encouraged. DOE considers that these actions have provided ample opportunity for the public to comment on the draft EIS.

COMMENTOR NO. 1214: WESTERN STATES LEGAL FOUNDATION (CONT'D.)

OVERVIEW

The DEIS purports to be programmatic in scope, by attempting to evaluate the nationwide impacts of the proposed return of foreign spent nuclear fuel under Alternatives One and Three. The document appears to recognize that potential impacts may be particularly acute at the ten potential entry ports and at the proposed reprocessing/storage facilities. The DEIS touches on local impacts at these sites but nonetheless relies upon generic risk analysis based upon hypothetical activities divorced from the particular characteristics and surrounding land uses at a given site.

The DEIS accomplishes neither the task of a programmatic document nor a document which competently addresses site-specific environmental impacts. While it is true that a programmatic EIS need not always contain the same level of detail regarding local impacts as one which is site-specific, any significant local action or land use change anticipated by such a programmatic document must depend upon tiered site-specific impact statements. See 40 CFR 1502.20; see, e.g. *Oregon National Council v. Kunzman*, 714 F.2d 901 (9th Cir. 1983); *Natural Resources Defense Council, Inc. v. Nuclear Regulatory Commission*, 606 F.2d 1261 (D.C.Cir. 1979). Moreover, programmatic statements are to be prepared before the program reaches a stage of commitment likely to determine subsequent development or restrict later alternatives. 40 CFR 1502.4(b)(3).

1214-2

The DEIS does not adequately address local impacts at the proposed entry ports, instead applying a single, generic all purpose risk analysis without regards to local land uses, geography, or other conditions. In the specific instance of the Concord NWS, the DEIS overlooks significant land uses and conditions which materially affect the potential risks of the proposed action (see below). The abstract nature of the analysis (mostly relying upon computer modeling) fails to substitute for a planning document which relates to and considers other hazardous activities (such as chemical plants and petrochemical ship traffic) as well as the cumulative impacts of these activities on the environment.

1214-3

At the May 22 public hearing in Concord, the DOE made clear that it plans to commence spent fuel shipments within months of a record of decision following the final EIS. This is unacceptable in view of the CEQ guideline cited above which requires such statements to be prepared well in advance of any significant commitment of resources to the project. Such timing also unlawfully precludes preparation of site-specific impact statements to address fully the local impacts and risks at affected ports and storage sites.

1214-4

RESPONSE TO COMMENT COMMENTOR NO. 1214: WESTERN STATES LEGAL FOUNDATION (CONT'D.)

Response to Comment No. 1214-2

The draft EIS does not purport to be, and is not, a programmatic document (Section 1.3 of the EIS). Programmatic aspects of spent nuclear fuel management, both domestic and foreign, are addressed in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement (Section 1.5 of the EIS).

The analysis in the EIS determined that potential environmental benefits and risks were evaluated at candidate ports, along representative transportation routes, and at interim management sites and were found to be low (Sections 4.2.2, 1.2.3, and 4.2.4, of the EIS). Results of the evaluation are summarized in Section 4 with supporting details provided in Appendices A through F of the EIS. Population and meteorological data used in the analyses were specific to each potentially affected location (Appendices A through F). Activities and accident scenarios used in the analyses are conservative (Section 4.2 of the EIS), and the actual risks are expected to be lower than those calculated in the EIS. No substantive, quantifiable exceptions to the risk analyses provided in the EIS were received during the comment period for the draft EIS.

If a policy of management in the United States were adopted, the site specific analyses provided in the EIS indicate that there would be no significant benefits (other than nuclear weapons nonproliferation benefits) or risks to the environment, including effects on local land use.

Response to Comment No. 1214-3

While computer modeling was used to calculate the impacts associated with the proposed action, the calculation for each site was tailored for local conditions. Local meteorology was used, as was local population distribution. To determine the impacts of contamination on the area, the model was run twice, once assuming the entire area was urban and a second time assuming the entire area was agricultural. The results of all of the calculations for Concord NWS indicated that very little land would be contaminated with essentially no property damage, and that the risk to the population was low.

In regard to the air and water quality as it pertains to the proposed policy of managing foreign research reactor spent nuclear fuel, DOE considers that there would be no significant adverse impacts to any of the ports that might be used to receive the material. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

Because of the low risk due to accidents and the no-impact nature of the shipments on the air or water, no planning document other than a Transportation Plan would be needed.

COMMENTOR NO. 1214: WESTERN STATES LEGAL FOUNDATION (CONT'D.)

THE NATIONAL AND FOREIGN POLICY DRIVERS

WSLF welcomes the opportunity to address nonproliferation policy in the context of a NEPA document, in light of DOE's usual practice of segmenting national policy initiatives into local NEPA reviews without the benefit of discussion of broader policy. However, in engaging in this discussion, DOE (and the Department of State) must take care not to mislead local governments and the public into eschewing local safety and health concerns in light of a purported "national security" interest, in this case, non-proliferation. Certainly, the decision to expose a multitude of local communities along sea and ground routes to the colorable risk of an accident involving spent nuclear fuel shipments requires the that DOE demonstrate by a preponderance of evidence an overriding national interest.

In both the DEIS and the DOE public presentations, the major emphasis of the policy embodied by Management Alternatives One and Three is to prevent the diversion of HEU by terrorists and would-be proliferant nations. Putting aside the issue of the propriety of historical aggressive United States programs to widely distribute HEU to dozens of foreign nations, the DEIS' assumption of the danger of leaving the fuel in place under international supervision must be called into question:

- According to the DEIS, fully 78% of the spent HEU fuel by weight is located in so-called developed nations who are, for the most part, advanced trading partners with the United States.

- The bulk of the remaining 22% of the spent HEU in "developing" nations is with nations who are highly ranked by World Bank standards, that are fully prepared to accept international supervision and are otherwise "stable." At most, the only urgency for return of spent HEU from a "developing" nation would be in instances where international supervision was inadequate or refused.

- The most dangerous and risky circumstance of spent HEU is in transit, during which time the risk of hijacking, tampering, or accident is greatest.

We further challenge the proposal to "exchange" LEU for HEU fuel under the non-proliferation rationale, since the continuing nuclear power programs encouraged by this action pose the greatest continuing environmental and proliferation threat in the host countries. Moreover, a case has been made that the plutonium by-products from spent LEU may pose a serious proliferation threat in their own right.

1214-5

WESTERN STATES COMMENT - 5

RESPONSE TO COMMENT COMMENTOR NO. 1214: WESTERN STATES LEGAL FOUNDATION (CONT'D.)

Response to Comment No. 1214-4

DOE is conducting the NEPA review process in full compliance with NEPA and the applicable regulations. The Record of Decision will determine whether any foreign research reactor spent nuclear fuel will be accepted into the United States. No decision has been made on the acceptance of foreign research reactor spent nuclear fuel into the United States at this time. Thus DOE has not failed to prepare the EIS in advance of any significant commitment of resources and, therefore, is not acting in contravention of 40 CFR Part 1502.4(b)(3).

Response to Comment No. 1214-5

In reference to the commentor's National and Foreign Policy drivers, the following points are material:

While there is some risk associated with marine and ground transport of spent nuclear fuel, Section 4 of the EIS and Appendices C, D, and E, show that the likelihood of an accident involving a release of radioactivity would be low. Over the 30 plus years in which spent nuclear fuel has been shipped overseas to the U.S. and overland within the U.S., there has never been an accident with spent nuclear fuel which resulted in a release of radioactivity. Transportation casks are designed to withstand extreme temperatures, pressures, impacts, etc. As described in Section 4 and the associated Appendices, the risks (consequence times probability) associated with shipments of spent nuclear fuel in the program are low.

Some reasons why the U.S. is considering acceptance of spent nuclear fuel for management in the United States (as opposed to the country in which the spent nuclear fuel was generated) are: 1) to support the RERTR (Reduced Enrichment of Research and Test Reactors) program, 2) to alleviate critical storage and disposal problems in numerous countries, many of which have no capability to safely and securely store spent nuclear fuel, and 3) to minimize costs to the United States. Failure of the United States to accept the spent nuclear fuel for management in the United States could cause premature shutdowns at some reactors, result in unsafe or insecure storage of weapons-grade material at other reactors, and result in a resumption of HEU usage at other reactors. Section 1.2 of the EIS discusses these outcomes.

Stability according to the World Bank would not be a sufficient basis for storing spent nuclear fuel in a country. Many stable countries lack sufficient technical infrastructure for the task. Many stable and developed countries cannot, by law, accept storage. Most entered into the research reactor program on the assumption that the U.S. would retrieve the material. Moreover, the cost of decentralized storage and disposal would be higher than the cost of any centralized storage/reprocessing and disposal option. This is because

COMMENTOR NO. 1214:
WESTERN STATES LEGAL FOUNDATION (CONT'D.)

The ink is barely dry on the recent indefinite extension of the Non-Proliferation Treaty signed in New York, which was secured by the United States over the objections of a number of non-aligned nations who sought periodic extension involving review of the nuclear weapons states' progress toward nuclear disarmament as required under Article VI. While the DEIS is premised upon a concern for nuclear proliferation arising from HEU stockpiles in other nations, it overlooks the fact that DOE is today pursuing a number of policies which encourage the very nuclear proliferation sought to be avoided by Management Alternative One. The first of these policies is none other than the plan to continue exporting and encouraging the use of American-produced (for profit) nuclear fuel in foreign reactors. A second distinct DOE program fostering proliferation is the investment of billions of dollars into an aggressive "stockpile stewardship" program which has as its objective the development of advanced nuclear weapons testing and design facilities. Until these programs are brought to heel, the United States lacks the moral suasion to convince non-aligned nations of its sincerity to meet its obligations under the NPT, and may actually endanger the prospects of a meaningful CTBT.

1214-5 (Cont'd.)

Any DOE program that is premised upon nuclear non-proliferation objectives must address the potential impacts of the program in relation to and in the context of broader US. non-proliferation objectives and policy. As an extension of the 1980s RERTR program, the DEIS addresses the non-proliferation benefits of returning HEU to the United States, but avoids serious discussion of continued exports of LEU to these same countries. The large scale export of LEU fuel as replacement for HEU is a silent but important component of the long term export relationship between DOE/USEC and its customer-nations. The DEIS presents only half the picture, since it is devoid of discussion of the impacts of shipments from the United States to users overseas. Moreover, spent LEU fuel presents its own set of proliferation issues due to its high plutonium content. The final EIS must embrace and develop a thorough analysis of the complete program cycle, not simply the one-way transport of HEU back to the United States for storage and/or reprocessing..

1214-6

The DEIS states that the program to return foreign spent nuclear fuel could run as high as US $1.5 billion, which is taken up in constructing or upgrading storage/reprocessing facilities at the five proposed sites. The DEIS briefly discusses cost recovery in the form of "competitive fees", but leaves to the imagination the actual percentage of program costs that will be recovered at most from the developed host nations.

1214-7

The DEIS does not adequately address the cumulative impact of this waste stream with that of domestic spent fuel or weapons-grade plutonium or uranium from dismantled weapons (each the subject of separate NEPA proceedings), which is a fatal flaw. DOE continues to pursue disposition and

RESPONSE TO COMMENT
COMMENTOR NO. 1214:
WESTERN STATES LEGAL FOUNDATION (CONT'D.)

the economies of scale in handling, storing, and disposing spent nuclear fuel would be significant. For these reasons, notably technical, political, and economic impracticality, decentralized storage was not explored in detail.

The greatest risk of hijacking, tampering, or accident occurs during transit. In the history of spent nuclear fuel shipments to the U.S., none have ever been hijacked or tampered with and no spent nuclear fuel transportation cask has ever had a release of radioactivity following an accident. As discussed in Section 4, the risk of accidents are low. The risk of tampering or hijacking for the purpose of acquiring spent HEU is dwarfed by the risk of diverting fresh HEU. Failure to properly manage the spent nuclear fuel (including LEU) guarantees the continued use of fresh HEU.

The EIS covers research reactors only, not power reactors. The LEU in research reactor fuels cannot be converted into nuclear weapons. The plutonium production from research reactor LEU is insignificant. Substituting LEU for HEU in research reactors (the subject of the EIS) poses no environmental or proliferation threats in the host countries.

Proliferation of plutonium from diversion and separation of LEU spent nuclear fuel from research reactors is technically possible but improbable. Partly because of: 1) the relatively high enrichment of the research reactor LEU (near 20 percent) and the consequent low production of plutonium, 2) the relatively low mass of fissile material in research reactor elements (as opposed to power reactor elements), and 3) the much greater difficulty of working with both spent nuclear fuel and plutonium (compared to fresh fuel and uranium) the diversion of research reactor LEU for the purpose of plutonium extraction is unrealistic.

The Energy Policy Act of 1992, as amended, does not allow exports of HEU, except in a few narrowly defined cases.

The claim that the U.S. has no credibility in the area of reducing civilian use of HEU because of continuing military HEU activities is unsupportable especially considering the reductions in HEU resulting from the U.S. RERTR program.

The EIS does not address proliferation issues associated with LEU in research reactors since there are none. As discussed earlier, diversion of foreign research reactor LEU spent nuclear fuel for the purpose of plutonium separation is futile.

In terms of the impacts of continuing (in fact, encouraging) usage and shipments of LEU, the EIS presents a limited, but balanced picture. A fuller picture would detail the extremely adverse impact of a U.S. shutdown of LEU export operations. These impacts include an expansion of civilian commerce in HEU, a shutdown of research reactor operations in many countries allied with the U.S., reductions in the production of medical pharmaceuticals and commercial and industrial radioisotopes, and elimination of many materials testing programs.

COMMENTOR NO. 1214: WESTERN STATES LEGAL FOUNDATION (CONT'D.)

storage options for these various materials independently of one another, a process which defies intelligent and cohesive policymaking and frustrates environmental review of cumulative impacts.

In our December 1993 scoping comment, we stated that without an analysis of impacts and risks to host nations, there is little basis for comparison of risks under the alternative management proposals. DOE has apparently chosen to disregard this suggestion, since the DEIS avoids any attempt to analyze or compare the environmental consequences of shipping or storage of spent HEU abroad.

1214-7

LOCAL IMPACTS

The proposal to ship spent nuclear fuel through the Concord NWS presents a significant change in use for that facility, which until now has acted solely as a depot and shipping port for nuclear and conventional weapons. DOE conducts no activities at the Concord NWS at present, and no significant shipments of spent fuel are known to travel in the vicinity of the port. No site plans for the Concord NWS have mentioned its possibility as a spent nuclear fuel depot or shipment site, and no such use was mentioned in the state EIR prepared in conjunction with the closure and absorption of Waterfront Road into the Concord NWS.

The shortcomings of the DEIS as it relates to the local conditions and potential impacts at Concord NWS and local communities are legion. Had the drafters of the DEIS engaged in even a cursory examination of local land use documents such as the *Contra Costa General Plan* (see attached charts), they would have ascertained some of the unique conditions concerning the local environment that are completely overlooked in the document. Among these are:

1214-8

- The proximity (within 5 miles) of the Concord NWS to one of the largest refinery and petrochemical regions in the United States, incorporating the ports of Richmond, Benicia and Martinez;

- The proposed passage of ships carrying spent nuclear fuel through narrow channels in which millions of tons of petroleum and chemicals pass each year, under six bridges;

- The extremely close proximity of Concord NWS to the highly active Concord fault, as well as its location in one of the areas most prone to liquifaction in the entire Bay area;

- The proximity of hazardous land uses including petroleum and gas

WESTERN STATES COMMENT - 7

RESPONSE TO COMMENT COMMENTOR NO. 1214: WESTERN STATES LEGAL FOUNDATION (CONT'D.)

Response to Comment No. 1214-6

In general, the competitive fee would be based on the alternatives available to the various countries should they decline to participate in the U.S. program. The level of the fee and the actual percentage of program costs that would be recovered from the developing countries is speculative. This value cannot be estimated in this EIS. Appendix F, Section F.7.5 in the final EIS shows the costs to the U.S. for various fees.

Response to Comment No. 1214-7

Section 4.2 of the EIS presents the cumulative impacts at ports of entry, interim management sites, and along ground transport routes taking into consideration the current proposed action and future anticipated impacts. Impacts overseas from decentralized storage would be less than those in the United States for shipping and more than those in the United States for storage and disposal. The impacts from storage and disposal operations would be higher because more separate facilities (up to 41), individuals, activities, etc. would be required to manage the same amount of material as in a smaller number of centralized facilities.

Response to Comment No. 1214-8

The port selection process that determined that Concord NWS was an acceptable port considered the population of the port and surrounding areas. Appendix D, Section D.1.9.5 of the EIS provides an explanation of the population criterion. In regard to the amount of marine traffic and the number of refineries and bridges along the route to Concord NWS, the passage from San Francisco Bay to Concord meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). The population and favorable transit from open ocean are not the only considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel, if it is accepted by the United States. Other items of importance include population along the route to the management site, port experience with handling containers, and port facilities. Appendix D, Section D.1.9 of the EIS presents details of the port selection process.

The port selection process does not specifically consider the amount of marine traffic as a criterion. In general, the number of ship mishaps is not proportional to the amount or size of ship traffic because port ship traffic is slow and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay Therefore, the port selection process focused on favorable transit from the open water. (Appendix D, Section D.1.9.2 of the EIS.) Also, the port selection criteria do not consider the existence of land-based facilities such as refineries because they have no direct impact on the risk associated with the shipment of foreign research reactor spent nuclear fuel. The worst case

COMMENTOR NO. 1214: WESTERN STATES LEGAL FOUNDATION (CONT'D.)

pipelines within several miles of the port as well as along necessary highway routes.

- The region surrounding the Concord NWS has one of the highest inventories of conventional hazardous materials in the state of California.

1214-8 (Cont'd.)

The apparent ignorance by the DIES authors of these local circumstances reflects the generalised, theoretical nature of the DEIS' risk and impact analysis. The failure to consider even the most rudimentary variations of land use on a site-by-site basis legally preclude under NEPA any action based on a record of decision in the absence of further site-specific analysis.

1214-9

The description of emergency services required in the event of an accident are hopelessly inadequate, and the DEIS assumes (without elaboration) that local governments will assume the burden of providing emergency response services outside the confines of the entry ports or terminal storage facilities. The uniform opposition to these sets of assumptions voiced by Concord, Martinez, Bay Point and Contra Costa County suggest that DOE has a long way to go to satisfy local officials that it has seriously addressed this question.

1214-10

Two major sets of potential impacts escape discussion in the DEIS relating to the proposed project. First, the DEIS utterly fails to address the social and economic impacts of an accident (or deliberate action) that results in the release of radioactive material in the environment. In 1980, Sandia Laboratories estimated that a major release (1 %) of spent fuel in an urban area could result in $700 million in property damages; a release of plutonium could result in economic losses exceeding $2 billion. Even if the health impacts of a major accident and release were mitigated through prompt warning and evacuation, it is unclear whether DOE has even considered the severe dislocation such an accident would have on local communities. In a 1991 analysis using computer modeling, M. Resnikoff estimated that a radiation fallout pattern of 500 mRem/year from a serious shipborne accident could extend over 100 square kilometers, which, at this level of dose, would require at least temporary evacuation. The complete absence of discussion of economic impacts can only be based on the assumption of an entirely-risk free project, which is unsupported by the risk analysis contained in the document (see below).

1214-11

Second, the DEIS avoids discussion of the impacts of deliberate action such as terrorist activity involving spent fuel. This omission is somewhat remarkable since the prevention of such activity abroad is a significant policy driver to Management Alternative One in the DEIS. Nothing in the nation's recent history suggests that the United States is immune from such efforts.

RESPONSE TO COMMENT COMMENTOR NO. 1214: WESTERN STATES LEGAL FOUNDATION (CONT'D.)

accident is considered to be the collision of the ship carrying the foreign research reactor spent nuclear fuel with a petroleum tanker. In this accident the transportation cask is damaged in the collision, then subjected to a fire that resulted from the collision (Appendix D, Section D.5 of the EIS). The addition of some mishap at a land-based facility would not add to the severity of this accident, and so was not considered. Section 4.2.2.3 of the EIS discusses the assumptions that went into the port accident analysis and the results of those analyses.

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the spent nuclear fuel transportation cask.

Response to Comment No. 1214-9

Each port considered in the EIS has developed an Area Contingency Plan. This plan outlines response capabilities, procedures and authorities for responding to and recovering from hazardous material incidents. Additionally, DOE would provide assistance to local authorities to ensure that appropriate measures are taken in any unlikely event of an accident. As part of this assistance, DOE's Radiological Assistance Program teams, from eight offices strategically located throughout the country, would be used to coordinate and to provide remediation assistance. This type of assistance and coordination would be specified in the Transportation Plan that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to final EIS in response to public comments. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. The issues would include capabilities and training of first emergency responders.

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Response to Comment No. 1214-10

The analysis of the consequences and risks associated with an accident in port involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction,

COMMENTOR NO. 1214: WESTERN STATES LEGAL FOUNDATION (CONT'D.)

The DEIS altogether fails to address cumulative impacts from this project as well as ongoing shipments of hazardous materials near the port and over rail and highways in the immediate vicinity. Indeed, the existence of such related activities were not even taken into considerations in the DEIS. The DIEs' omission of such a discussion is legally fatal. See 40 CFR 1508.27(b)(7). 1214-12

DOE's proposed use of the Concord NWS as a shipment port for spent fuel represents a new land use by a new agency, since all activities at that site have been heretofore conducted by the Navy. The DEIS fails to address what facilities will be required or local services demanded by DOE and its contractors to perform the project. DOE also does not mention in the document the possibility of future expansion of its presence at Concord NWS for further shipments and/or storage of nuclear materials outside of the immediate project. 1214-13

RISK ASSESSMENT

The DEIS concludes with comparing the risks of the proposed action to commonly encountered risks such as a 1000 mile airline flight, or eating two jars of peanut butter a year (approximately one in one million each year). (The latter statistic is entirely unsubstantiated based upon recent studies involving aflatoxin). The deliberate thrust of the document is to leave the reader with the impression that the contemplated action is entirely risk free for all statistical purposes. In doing so, the DEIS relies entirely on banks of computer generated statistics without reference to real historical data on maritime accidents, or other incidents involving transportation of radioactive materials. 1214-14

To local government representatives and planners, this conclusion appears at odds with the explanation given by DOE officials of the decision to replace Oakland with Concord NWS as one of the three prospective West Coast entry ports, namely, that less people reside within a ten-mile radius of Concord NWS than Oakland. If population density is indeed such a concern, such decisions suggest that DOE planners lack absolute faith in their statistics of a risk-free project. 1214-15

DOE's calculations regarding the risk of transporting large quantities of spent nuclear fuel through densely populated urban areas have been controversial since the 1970s, yet the agency's public posture toward such shipments has changed little. What is disturbing about the DEIS's approach to risk assessment is its unyielding genetic approach without regard to local conditions or accident patterns. In fact, shortly after the May 22, 1995 public hearing in Concord, there was yet another major petrochemical fire within 10 miles of the Concord NWS that sent of plume of hazardous material over residential communities. It has been further documented that the northern Contra Costa county has a higher than average rate of cancer than the 1214-14 (Cont'd.)

RESPONSE TO COMMENT COMMENTOR NO. 1214: WESTERN STATES LEGAL FOUNDATION (CONT'D.)

or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 and Appendix D, Section D.5 of the EIS) and that the risk associated with accidents in port for the entire proposed acceptance period, would be low. The impacts from a severe accident differ widely from the cited studies because the radionuclide inventory in a transportation cask carrying foreign research reactor spent nuclear fuel is a great deal less than that of a transportation cask carrying spent power reactor fuel. Foreign research reactor spent nuclear fuel contains only trace amounts of plutonium.

DOE has not been provided with adequate information on the cask inventories, release fractions, and meteorological assumptions that Dr. Resnikoff (Greenpeace) used in his analyses. DOE does not know if any changes may have been made to the code used to predict consequences. Without a complete copy of the analyses, it is impossible to determine exactly why his estimates are orders of magnitude greater than DOE's well-documented and publicly available estimates. His statements that large economic impacts would be incurred and are ignored in the analyses is untrue. In fact, the analyses are presented in Section 4.2.2.3 of the EIS and shows that economic impacts are low.

Response to Comment No. 1214-11

Section D.5.9 has been added to Appendix D of the EIS to address the issue of attack by disgruntled persons or terrorists.

Response to Comment No. 1214-12

The EIS does address cumulative impacts due to the proposed action and other ongoing similar actions. Sections 4.2.2.4, 4.2.3.4, and 4.2.4.3 of the EIS address these impacts as they pertain to port activities, ground transport, and management site activities, respectively.

Response to Comment No. 1214-13

DOE does not anticipate the need for any additional facilities or local services beyond those currently existing or planned for future expansion of the Concord NWS for handling containers.

DOE understands that the expansion of capabilities at Concord NWS will continue as scheduled regardless of the outcome of the proposed policy on foreign research reactor spent nuclear fuel. The principal upgrade to occur at Concord NWS is the addition of two container cranes. Although these cranes would facilitate the off-loading of the foreign research reactor spent nuclear fuel, if it were to be shipped to Concord NWS, the current container handling equipment is adequate. Therefore, no new facilities would be required in order to use Concord NWS. The facility upgrade that is to occur at Concord NWS has

COMMENTOR NO. 1214:
WESTERN STATES LEGAL FOUNDATION (CONT'D.)

statewide population.

Risk of Intentional Conduct Causing Breach or Release. The DEIS' risk assessment presumes that no intentional breach of a cask will ever occur, and that any accident will only nominally exceed the test limits of the particular transportation casks. Numerous studies, reports, and comments regarding past environmental assessments and statements have challenged these assumptions. The DEIS' omission of risk assessments based on intentional human conduct is somewhat puzzling given its inclusion in other impact statements such as that prepared for the Waste Isolation Pilot Project (WIPP). Moreover, since one of the policy rationales for Management Alternative One is the threat of such conduct abroad, the absence of any consideration of the possibility once DOE takes title appears as an obvious oversight.

1214-14 (Cont'd.)

In the 1976 Generic Environmental Impact Statement prepared by Sandia Laboratories for the transportation of radioactive materials through densely populated urban areas (Sandia GEIS), the authors noted that the shipments of spent fuel rods would constitute "the single largest source of radioactivity routinely shipped" and that such materials would constitute "an attractive target for sabotage or theft." Unlike the present DEIS, the Sandia GEIS considered (albeit conservatively) that thousands of residents could potentially contract radiation sickness as a result of an intentional cask breach. Indeed, the first draft NRC regulations addressing spent fuel shipments in 1979 discouraged transportation through cities in excess of 100,000, before they were superseded in the 1980s.

1214-16

The standard RADTRAN modeling by DOE upon which its zero-risk conclusions are based also draw upon DOE's historical claim that no one has ever been injured or killed by a release of radioactivity from a cask. This is not to say accidents have not occurred involving radioactivity; however, the DEIS makes no mention of them. DOE's history of shipments, however, must be viewed critically since the several hundred shipments (at most) per year constitute a small sample upon which to base its statistics.

Maritime Accident Risks. The DEIS does not contain detailed information as to what would happen to a spent fuel cask under conditions approaching a representative maritime fire. Cask safety continues to be based upon criteria such as surviving a 30 minute fire at 800 degrees centigrade, a 40 inch drop onto a steel spike, and immersion under water at 15 meters for eight hours. The application of these criteria to DOE's risk analysis further presumes casks that are without flaws, and that have been correctly loaded and properly sealed.

1214-17

According to a study contracted some years ago by the International

RESPONSE TO COMMENT
COMMENTOR NO. 1214:
WESTERN STATES LEGAL FOUNDATION (CONT'D.)

no connection with the proposed policy to manage foreign research reactor spent nuclear fuel. The need for construction of new facilities or modification of existing facilities discussed in Section 1.4 of the EIS is referring to construction or modification of DOE management sites, not ports or bases that might receive the foreign research reactor spent nuclear fuel for transshipment to the management sites.

Response to Comment No. 1214-14

Risk analysis and risk communication require different approaches, thus, DOE attempted to provide some risk comparisons that were meaningful and understandable to the average person. Commentor is not correct about the data sources used for the risk analyses. For marine accidents, historical shipping accident data from Lloyd's of London were used (Section 4.2.2.3 of the EIS). Ground transport risks were assessed using accepted models, as discussed in Appendix E of the EIS, because such models represent a greater spectrum of potential accidents and effects from transporting radioactive materials than any historical data, and because the number of potential ground transportation routes and transport modes from ports of entry to management sites was very high. In terms of actual data, DOE would like to note that spent nuclear fuel has been transported in the United States for over 40 years without any release of radioactive material.

Response to Comment No. 1214-15

Concord NWS was one of ten ports that was indicated to be acceptable to receive the foreign research reactor spent nuclear fuel, if accepted into the United States. Population of the port and surrounding areas is one of the considerations of the port selection criteria, and one of the reasons the port of Oakland was not included in the final list of ports. Section 3151 of Public Law 103-160 (the National Defense Authorization Act for the Fiscal Year 1994), requires that the Secretary of Energy shall, "if economically feasible and to the maximum extent practicable, provide for the receipt of spent nuclear fuel... at a port of entry in the United States which...had the lowest human population in the area surrounding the port of entry..." Public Law 103-160 was signed on November 30, 1993, which is after completion of the scoping process for this EIS, including the scoping meeting in Oakland, California. While the National Defense Authorization Act was written specifically to regulate the receipt and storage of foreign research reactor spent nuclear fuel at DOE's Savannah River Site, DOE elected to apply this criterion, among others, in identifying ports of entry, to the maximum extent practicable.

DOE included consideration of Section 3151 of Public Law 103-160 by including Criterion 5 in the port selection criteria for this EIS (Appendix D, Section D.1.9.5). Application of this criterion resulted in Oakland being dropped from the list of proposed ports of entry, while Concord stayed on the list.

COMMENTOR NO. 1214: WESTERN STATES LEGAL FOUNDATION (CONT'D.)

Atomic Energy Agency (IAEA), the pressure valves of a cask will begin to vent after a high intensity fire of one hour. At four hours, some fuel elements will begin to fail, and at nine hours, all of the fuel pins may fail. International Maritime Organization reports reflect that the mean duration of maritime ship fires may be between 20 and 23 hours; some have exceeded 60 hours. In an accident involving collision with a petrochemical transport (in the densely travelled channels between Richmond and Martinez), a shipborne fire could exceed 1000 degrees Centigrade. No illustrative historical accident data is provided which is either national in scope or local to the San Francisco Bay Area.

1214-17 (Cont'd.)

The immersion tests also underestimate actual conditions encountered in or near the San Francisco Bay, since the ocean depth drops off rapidly within a few miles of the Golden Gate. Moreover, inside the Bay and channel leading to the Concord NWS, fast currents could potentially render a dropped cask nonrecoverable, and further cause the cask to collide with submerged objects.

Health Effects. It is entirely possible to read the entire DEIS and not understand why spent nuclear fuel is so dangerous. The health risks posed by unshielded or partially shielded fuel rods is not mentioned. Instead of analysing the carcinogenic, mutagenic and toxic risks posed by particular components of the shipments (such as plutonium or cesium), the DEIS speaks only of latent cancer fatalities from generic routine actions or accidents. While the authors of the DOEs presume a risk-free project, the DEIS provides little if any information to allow local government officials and the public to independently assess the packaging and other precautions taken, or the public health risks in the event of an actual incident not bounded by the hypothetical scenarios in the document.

1214-18

ENVIRONMENTAL JUSTICE

The arbitrary ten-mile radius used by DOE for its impact analysis skews the impact analysis of the DEIS as it applies to affected minority communities near the Concord NWS. While the ten-mile circle takes in some of the middle class bedroom communities that dominate central Contra Costa County, the proportion of minority residents increases in those communities closest to the port (within five miles), such as Clyde, north Concord, and Bay Point. Once again, this information could have been readily obtained by brief consultation with local planners or by referring to the county's *General Plan*. We suspect that this demographic condition is not unique to Concord but may be quite typical of urban ports.

1214-19

Obviously, those communities closest to the port bear the greatest potential economic and health risk from an accident. The "environmental

RESPONSE TO COMMENT COMMENTOR NO. 1214: WESTERN STATES LEGAL FOUNDATION (CONT'D.)

Response to Comment No. 1214-16

DOE considers that the approach taken in the EIS to risk assessment adequately considers local conditions or accident patterns.

The frequency of accidents on highways has been taken into account in all the ground transport risk estimates in the EIS. As discussed in Section 4.2.3 and Appendix E of the EIS, spent nuclear fuel has been transported along highways, railways, and waterways for over four decades without release of the radioactive contents from the spent nuclear fuel transportation cask.

The population along all truck transport routes was taken into account in the calculations of ground transport risks. In all cases the risk was found to be low. This subject is discussed in detail in Section 4.2.3 and Appendix E of the EIS.

Estimates of radiological health effects presented in Section 4.2.3 of the EIS are based on conservative assumptions using representative truck and rail transportation routes from candidate ports to interim management sites, including consideration of traffic volumes and surrounding populations. Supporting detail for the calculations is given in Appendix E of the EIS. Radiological and nonradiological human health effects of the proposed action and management alternatives were found to be low.

It is important to note that unlike petrochemical products, foreign research reactor spent nuclear fuel is neither volatile nor unstable. The spent nuclear fuel described in the EIS is a metal which contains enriched uranium matrixed in, all clad in either aluminum or stainless steel. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 40 years of spent nuclear fuel ground transports in the United States, no radioactive contents have ever been released from a transportation cask, nor has a spent nuclear fuel transportation cask ever been punctured, even as the result of an accident. The commentor is referred to Section 2.6.1 of the EIS for a detailed description of the fuel and its characteristics.

The commentor's reference to a 1978 Generic EIS is not found in the EIS for foreign research reactor spent nuclear fuel. It may have been concerned with the transportation of commercial nuclear spent nuclear fuel rod casks which is beyond the scope of this EIS.

Response to Comment No. 1214-17

The transportation casks that would be used for the foreign research reactor spent nuclear fuel are certified if their design meets certain tests, including a fire test, and if the individual casks pass periodic inspections (Section 2.6.2 of the EIS). These certification standards were developed for transportation casks on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. The duration of a ship fire is directly related to the amount of combustibles carried

justice" analysis therefore lacks an approach consist with the physical nature of the risk presented. 1214-19 (Cont'd.)

CONCLUSION

The DEIS fails to provide sufficient information on the impacts of spent fuel shipments through specific ports to satisfy requirements imposed under NEPA. Unless DOE is prepared to develop a site-specific EIS for all of the proposed ports, and to develop a further analysis of impacts along known transportation routes at least on a scale similar to that performed for WIPP, the document cannot support the proposed action. 1214-20

On a broader policy analysis, the DEIS provides insufficient support for Management Alternatives One and Three. Absent a permanent storage option for spent fuel (along with other high level wastes), the inchoate fear that advanced nations are less capable of submitting to international supervision and custodianship is an insufficient basis to expose communities and the environment to the risks of transportation. 1214-21

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spentfl.wpm

on board. The number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicate that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures. Hence, contrary to the commentor's assertion, long duration fires are not usual.

In respect to the impact a ship fire might have on a transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship's fire intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum, would keep fires well below the extreme temperatures needed to damage the spent nuclear fuel transportation cask. For these reasons, it would be almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of foreign research reactor spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (see Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F). The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt foreign research reactor spent nuclear fuel. Appendix D, Section D.5.3 of the EIS presents a detailed discussion of accident probabilities and radioactive material source terms and Appendix D, Section D.5.4 presents the results of the analyses.

In conclusion, although long duration ship fires are possible and have occurred, they are uncommon events. Analyses in the EIS indicate that even in the event of a severe ship fire involving a transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5).

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. After construction, every cask is radiographed to ensure that no significant flaws exist. Transportation casks used for spent nuclear fuel transportation within the United States are designed, fabricated, and maintained under Nuclear Regulatory Commission requirements found in 10 CFR Part 71 (Appendix B, Section B.2.1.3 of the EIS).

Commentor No. 1214: Western States Legal Foundation (Cont'd.)

Response to Comment Commentor No. 1214: Western States Legal Foundation (Cont'd.)

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the area on the seaward side of the Golden Gate Bridge. Appendix C, Section C.5.5 of the EIS provides information on the probability of a cask sinking in coastal and deep ocean waters. The probability of a foreign research reactor spent nuclear fuel transportation cask sinking in coastal and deep waters are estimated in the EIS (Appendix C, Section C.5).

Response to Comment No. 1214-18

Spent nuclear fuel is dangerous because it is radioactive, and radiation is one cause of cancer. Heavy shielding is required to transport it safely. Nevertheless, Section D.5.9 has been added to Appendix D of the EIS to address the issue of unshielded or partially shielded fuel elements. The human health risks of all components of the foreign research reactor spent nuclear fuel are discussed in the EIS (Section 4.1.3 and Appendix B, Section B.1.4 of the EIS). DOE did not presume a risk-free project, as the commentor suggested, but rather calculated the real risks based on conservative assumptions. Information on the transportation casks and other precautions is presented in a straightforward manner in the EIS for local government officials and the public (Section 2.6.2 and Appendix B, Section B.2). The hypothetical scenarios in the EIS are more severe than any actual incident that is likely to occur, so the actual health risks to the public would probably be much lower than those presented in the EIS.

Response to Comment No. 1214-19

As discussed in Appendix D, Section D.1.9.5 of the EIS, a circle with a ten mile (16 kilometer) radius centered at each candidate port was selected for the analysis because it is the area most likely affected in the event of an accident involving spent nuclear fuel from foreign research reactors. Table A-1 of Appendix A shows an enumeration of minority populations residing within ten miles of candidate ports and in counties having boundaries within ten miles of the candidate ports. For eight of the twelve terminals listed in Table A-1, Appendix A, the percentage of minority population residing within ten miles of the candidate port exceeded the percentage of minority population residing in surrounding counties. The opposite was found for four of the twelve terminals, including Concord NWS. For most of the terminals the two percentages were reasonably close, but it is difficult to identify a typical demographic

condition. The analysis in the EIS provides an equal treatment for all the candidate ports consistent with the physical nature of radiological risks in the event of an accident. As discussed in Section 4.2.2 of the EIS, implementation of the proposed action would result in no significant benefits or risks to workers or the general population, including minority and low-income populations.

Response to Comment No. 1214-20

DOE is conducting the NEPA review process in full compliance with NEPA and the applicable regulations. The information contained in the draft EIS on impacts upon ports and transportation routes is sufficient under NEPA.

Response to Comment No. 1214-21

The EIS contains sufficient analysis to support a decision among all the alternatives. The impacts of ultimate disposition of foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. A detailed, quantitative discussion of these impacts would have to be the subject of future NEPA documentation. In the meantime, support of U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the spent nuclear fuel (Section 1.1 of the EIS).

COMMENTOR NO. 1217:
NATURAL RESOURCES DEFENSE COUNCIL

1350 New York Ave., N.W.
Washington, DC 20005
202 783-7800
Fax 202 783-5917

July 20, 1995

BY MAIL AND FACSIMILE: (202) 586-5256

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Dear Mr. Head:

The Natural Resources Defense Council hereby comments on the Energy Department's draft environmental impact statement on a proposed nuclear weapons nonproliferation policy concerning foreign research reactor spent nuclear fuel. We adopt and incorporate the detailed comments filed by the Energy Research Foundation, and we add the additional comments below.

We have long supported the off-site fuels policy and the Reduced Enrichment for Test Reactors ("RERTR") program of which that policy is a part. We believe that the goal of reducing and ultimately ending civil commerce in highly enriched uranium ("HEU") is of great importance to international security, and we think that implementing the RERTR program fully will serve nuclear nonproliferation interests in important ways. For these reasons, we fully support the version of Management Alternative 1 in which the spent nuclear fuel is accepted and managed in the United States without incorporation of chemical separation activities. We believe that the relatively modest environmental impacts of this alternative are fully justified in light of the important advance in nonproliferation policy the action would accomplish. 1217-1 1217-2

Our support for this alternative comes with a critical caveat. If chemical separation or reprocessing activities anywhere in the world are included in the alternative selected by the Department, then our support for the agency action vanishes and is transformed into active opposition. We believe strongly that undertaking chemical separation activities would eviscerate all of the nonproliferation advantages of the proposed action, by causing the separation and isolation of fissile material suitable for use in nuclear weapons. Rather than setting a positive example for the world by facilitating conversion of reactors from weapon-useable to non-weapon-useable fuel, we would send the dangerous signal to the entire globe that it is appropriate to 1217-3

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RESPONSE TO COMMENT
COMMENTOR NO. 1217:
NATURAL RESOURCES DEFENSE COUNCIL

Response to Comment No. 1217-1

The commentor's support for the Reduced Enrichment for Research and Test Reactors (RERTR) program and goals is noted. The RERTR program and history are described in Section 1.1 of the EIS.

Response to Comment No. 1217-2

The commentor's support for Management Alternative 1 implemented without chemical separation in the United States, is noted. Management Alternative 1 is discussed in Section 2.2 of the EIS. Chemical separation in the United States is Implementation Alternative 6, which is discussed in Section 2.2.2.6. The commentor's assessment that the relatively modest environmental impacts of the alternative are fully justified in light of the nuclear weapons nonproliferation policy goals is likewise noted.

Response to Comment No. 1217-3

The commentor's opposition to domestic chemical separation and overseas reprocessing is noted. Chemical separation in the United States is discussed in Section 2.2.2.6 of the EIS. Overseas reprocessing is described in Section 2.3 of the EIS.

The fourth criterion mentioned on page 17 of the draft revision of the Summary of the EIS, which is extracted from Section 2.2.2.6, of the EIS, addresses possible circumstances which would justify reprocessing in the event that this method of management is selected. If the circumstances do not occur, then reprocessing would not be used. As stated in Section 2.2.2.6, reprocessing is not a preferred management technology, because it leads to additional waste streams and a potential increase in the stockpile of HEU, but it must be addressed in the EIS as a reasonable alternative.

reprocess spent nuclear fuel for waste management purposes. We would thus encourage the separation of weapon-useable material in nations of varying political orientations and stability, a turn of events with dangerous implications for U.S. and world security. If the United States were to incorporate chemical separation activities in a policy ostensibly designed to advance nonproliferation interests, we would be taking one step forward while we took a full three steps backward.

We specifically object to the fourth criterion on page 17 of the EIS summary, which asserts that it is appropriate to pursue reprocessing activities based on "the unavailability of suitable storage facilities or the likelihood of substantial life-cycle cost savings ;.." We cannot think of a situation in which unavailability of storage facilities would justify a decision to reprocess, given the relative quickness and ease in which storage facilities can be constructed. We also believe that allegations of a cost advantage for reprocessing over storage are almost certainly based on faulty or biased cost assumptions, in light of the demonstrably high costs of canyon operations and the oft-hidden incremental costs of treating and disposing of the new liquid high-level radioactive waste created through chemical separation activities. Indeed, the U.S. commercial nuclear industry has long eschewed reprocessing as a waste management strategy due to its higher cost than direct storage or disposal. If reprocessing is too costly for the nuclear industry, we cannot believe it would be cheaper for the less-efficient Department of Energy.

1217-3 (Cont'd.)

It is not an adequate answer to our concerns about reprocessing to assert that the Department would blend down the HEU product into low-enriched uranium ("LEU"). The world community properly draws a distinction between controls based on what a nation says it will do and controls based on what a nation is capable of doing. Any system in which the Department would have the capability to forego the last stage of a process in which HEU was blended down into LEU, leaving it with an HEU product, is unacceptable and counterproductive in its proliferation implications. If a nation such as Iran were to acquire and operate reprocessing facilities while assuring the world that it would blend down an HEU product into LEU, the United States would quite properly be far from satisfied. The same is true in how the rest of the world views us, and our nation's actions set an example for the rest of the world. Moreover, isotopic dilution does not render separated plutonium unsuitable for weapons, and it is doubtful that the worldwide implications of the U.S. resorting to reprocessing for waste management purposes would be limited to the case of HEU fuels.

COMMENTOR NO. 1217: NATURAL RESOURCES DEFENSE COUNCIL (CONT'D.)

Finally, we observe that the EIS shows the environmental impacts of reprocessing options to be substantially greater than the option of storage and disposal without reprocessing. See, e.g., EIS at S-29 to S-32. On top of the important proliferation implications, this disparity in environmental impacts should be more than enough to persuade the Department not to choose reprocessing in its record of decision. 1217-4

Sincerely,

Andrew P. Caputo
Attorney

cc: Secretary O'Leary
Under Secretary Curtis
Assistant Secretary Grumbly
Assistant Secretary O'Toole

RESPONSE TO COMMENT COMMENTOR NO. 1217: NATURAL RESOURCES DEFENSE COUNCIL (CONT'D.)

Response to Comment No. 1217-4

The commentor's opposition to chemical separation is noted. The advantages and disadvantages of chemical separation are discussed in Section 2.2.2.6 and the environmental impacts are presented in Section 4.3.6 of the EIS.

COMMENTOR NO. 1221: ASSOCIATION OF BAY AREA GOVERNMENTS

ASSOCIATION OF BAY AREA GOVERNMENTS

Representing City and County Governments of the San Francisco Bay Area

ABAG

July 20, 1995

Secretary Hazel R. O'Leary
Secretary of Energy
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

SUBJECT: Opposition to the use of Concord Naval Weapon Station as Transshipment Port-of-Entry for Foreign Research Reactor Spent Nuclear Fuel

Madam Secretary,

On behalf of the Association of Bay Area Governments (ABAG), I am writing to oppose using Concord Naval Weapons Station as a port-of-entry for spent foreign nuclear fuel. At the July 20, 1995 meeting of ABAG's Executive Board, representing 95 of 100 cities and all nine counties of the San Francisco Bay region, the Board agreed that the **Department of Energy's Draft Environmental Impact Statement on a Proposed Nuclear Weapon's Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (DOE EIS)** is inadequate in evaluating the risks specific to our area, and that the Departments of Energy and State have failed to account for the seismic vulnerability of the Bay Area and the elevated risks which are therefore posed.

1221-1

The proposed route for the return, storage, and disposal of the spent nuclear fuel, would involve transportation routes within the Bay Area. Many of these routes criss-cross earthquake fault zones which have been, and are, subject to seismic events. This enhances the possibility of accidents. We have concluded that the worst-case-scenario for the Bay Area is, in fact, more catastrophic than the worse-case-scenario for other proposed points of entry - as well as more likely.

ABAG has directed many of its resources toward researching and documenting the seismic hazards in the jurisdictions which we represent. Not only is seismic activity frequent in the Bay Area, but shaking intensity is adversely affected by Bay mud and filled areas.

Mailing Address: P.O. Box 2050 Oakland, California 94604-2050 (510) 464-7900 Fax: (510) 464-7970 info@abag.ca.gov
Location: Joseph P. Bort MetroCenter 101 Eighth Street Oakland, California 94607-4756

RESPONSE TO COMMENT
COMMENTOR NO. 1221: ASSOCIATION OF BAY AREA GOVERNMENTS

Response to Comment No. 1221-1

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the transportation cask. Further, the analyses of impacts associated with accidents involving foreign research reactor spent nuclear fuel presented in Section 4.2.2.3 demonstrates that the use of any of the selected ports would not pose any significant risk to the port personnel or the population near the ports. Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident and thus effect the probability of such accidents, however, the number of earthquake-induced ship and road accidents is small compared to other causes. Concord NWS has considerable relevant experience in handling containers, and has the capability to safely handle containerized foreign research reactor spent nuclear fuel (Appendix D, Section D.1.9.1 of the EIS).

COMMENTOR NO. 1221: ASSOCIATION OF BAY AREA GOVERNMENTS (CONT'D.)

"The fact that a devastating earthquake occurred in 1906 -- the San Francisco earthquake -- is common knowledge...the San Francisco earthquake caused extensive damage in Oakland, San Jose and Santa Rosa. More recently, the 1989 Loma Prieta earthquake caused extensive damage in the Santa Cruz mountains, as well as in Oakland and San Francisco tens of miles away. But many moderate to great earthquakes (over magnitude 6.0) have affected the Bay Area: 22 such events have occurred in the last 160 years -- for an average of one every seven years." (On Shaky Ground, ABAG 1995)

In addition, according to the County Health Officer for Contra Costa County "The citizens of Contra Costa Count already face a much higher potential risk of exposure to acutely hazardous materials -- because citizens already live among five refineries and numerous chemical plants." And although the DOE EIS assumes the "unlikely event of an explosion" at Port Chicago, an explosion did in fact occur in the 1940s. What would be the consequences of such an explosion when coupled with spent nuclear waste? *1221-2*

The fact that Concord and other Bay Area ports are ill suited to serve as nuclear holding facilities is based, therefore, on the seismic hazards of the Bay Area and on the cumulative risks which make such a decision unwarranted. Considering the susceptibility to accident of spent fuel while in transport, we encourage you to consider sequestration and on-site reprocessing in user nations, as well as less risky ports-of-entry, preferably outside of California. *1221-1 (Cont'd.)* *1221-3*

We believe that the attached map will evidence our arguments and dissuade the decision to place Concord Naval Weapons Station, or any Bay Area port, as a possible point of entry on the Final DOE EIS. We urge you to reconsider the Draft proposal, and look forward to your response.

Sincerely,

Tom Torlakson

Tom Torlakson, President
Supervisor, Contra Costa County

Attachment

cc: Department of State
Dennis Karaim
Senator Diane Feinstein

TT:mls

RESPONSE TO COMMENT
COMMENTOR NO. 1221: ASSOCIATION OF BAY AREA GOVERNMENTS (CONT'D.)

Response to Comment No. 1221-2

Section D.5.9 has been added to Appendix D of the EIS to address the issue of attack by disgruntled persons or terrorists. One of the attack scenarios postulates a large explosion near a transportation cask full of spent nuclear fuel.

Response to Comment No. 1221-3

The risks of transporting the foreign research reactor spent nuclear fuel are presented in Section 4.2.3 of the EIS.

The commentor's preference for the overseas management alternative is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS. The commentor's preference for other ports of entry is also noted.

COMMENTOR NO. 1253: SOUTHERN STATES ENERGY BOARD

AlabamaArkansasFloridaGeorgiaKentuckyLouisianaMarylandMississippiMissouriNorthCarolinaOklahomaPuertoRicoSouthCarolinaTennesseeTexasVirginIslandsVirginiaWestVirginia

Southern States Energy Board

July 20, 1995

Mr. Charles Head, Program Manager
U.S. Department of Energy
Office of Spent Nuclear Fuel Management, EM-37
1000 Independence Avenue, SW
Washington, DC 20585

Dear Mr. Head:

Thank you for the opportunity to comment on the Draft Environmental Impact Statement (EIS) on a Proposed Nuclear Nonproliferation Policy Concerning Foreign Research Reactor (FRR) Spent Nuclear Fuel (SNF), DOE/EIS-0218D. The Southern States Energy Board (SSEB) has been actively involved in issues regarding the transportation of spent nuclear fuel since the formation of the Advisory Committee on Radioactive Materials Transportation in 1986. The committee is comprised of representatives from sixteen (16) states (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia) and the Eastern Band of Cherokee Indians. Two (2) of the five (5) potential storage sites identified in this draft EIS, and six (6) of the ten (10) potential ports of entry, are located in states represented on this committee.

Section 2.7.2 contains a commitment, on behalf of DOE, to "provide support and assistance to State, Tribal and local government agencies responsible for responding to a foreign research reactor spent nuclear fuel incident." We fully expect DOE to honor this commitment, as will be discussed later in these comments. 1253-1

Section 2.7.3.1 of the draft EIS discusses Department of Energy (DOE) financial and technical assistance to state and tribal governments, and mistakenly implies that DOE provides funds directly to state and tribal governments to fund operations related to transportation emergency preparedness by stating that these funds "enhance a jurisdiction's emergency management and response capabilities." While DOE indeed may provide direct funding to certain states, DOE funding to southeastern states is in the form of Cooperative Agreements with SSEB. Under these agreements, SSEB performs several critical regional coordination activities, including funding two (2) meetings of the SSEB Advisory Committee on Radioactive Waste Transportation per year, providing travel funds for committee members and staff to attend national meetings related to the transportation of spent nuclear fuel, and publication of the SSEB Spent Fuel and High-Level Radioactive Waste Transportation Handbook. Funds provided by DOE to SSEB, however, do not provide 1253-2

3091 Governors Lake Drive
Suite 300
Norcross Georgia 30071
(404) 242-7712
Fax (404) 242-0421

RESPONSE TO COMMENT
COMMENTOR NO. 1253: SOUTHERN STATES ENERGY BOARD

Response to Comment No. 1253-1

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Emergency preparedness, security, and coordination of DOE with local emergency response authorities that would be involved with the acceptance and transportation of foreign research reactor spent nuclear fuel will be discussed in detail in the DOE Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment, as discussed in revised Section 2.7.5 of the EIS. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected.

Response to Comment No. 1253-2

See the 1st paragraph of the response to Comment 1253-1, above. The assistance described above is in addition to, and outside of, assistance provided through the SSEB.

The operational items detailed in paragraph 3 and the transportation emergency response capabilities mentioned in paragraph 4 of this letter are normal and routine functions any jurisdiction would be expected to maintain.

As discussed in response to comment 1253-1, above, Appendix H of the EIS contains the general provisions for emergency preparedness associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. Funding for special needs, if necessary, would be addressed during this interface.

COMMENTOR NO. 1253: SOUTHERN STATES ENERGY BOARD (CONT'D.)

support for crucial needs in our member states, such as salaries for state management, planning, training, inspection, public information, communications and emergency response personnel, equipment and supplies, equipment repair and maintenance, office space, utilities, telecommunications charges or other regular operating expenses.

Several of our member states do receive direct funding from DOE in the form of an Agreement in Principle (AIP) for environmental monitoring and emergency preparedness activities related to specific DOE facilities. Conditions included in these agreements, however, prohibit the use of AIP funds for transportation activities. In short, while DOE may indeed be providing substantial sums of money to "states and tribes" for transportation related activities, as is indicated by Table 2-16, little if any of this funding may be used directly by states, tribes or local government agencies to insure the safe, routine transportation of spent nuclear fuel, or to insure that adequate emergency response capabilities exist along transportation routes through their jurisdictions. In order to fulfill the commitment found in Section 2.7.2 and discussed above, DOE must provide direct funding to states, tribes and local governments for these purposes, or require the foreign research reactor operators, particularly those in developed countries, as a condition of DOE management of their fuel, to provide funds specifically for these purposes. Such funding requirements are consistent with the discussion regarding financial arrangements for "basic implementation" contained in Section 2.2.1.2 and the discussion of alternative financial arrangements in Section 2.2.2.3.

1253-2 (Cont'd.)

Section 2.7.3.2 of the draft EIS describes several DOE radiological training courses which have been made available to states, tribes and local governments, including the Radiological Emergency Response Operations (RERO) course, the Radiological Emergency Training for Local Responders (RETLR), and the Transportation Emergency Training for Response Assistance (TETRA) series of courses. These courses have been provided through the Office of Environmental Management (EM) as part of the Transportation Emergency Preparedness Program (TEPP), which is discussed in Section 2.7.3.4. TEPP also provides support for both the TRANSAX and WIPPTREX series of exercises, as shown in Table 2-18. At a DOE Transportation External Coordination Working Group (TEC/WG) meeting in Kansas City, Missouri on July 18, 1995, the Director of the Office of Transportation, Emergency Management and Analytical Services (EM-26) advised DOE stakeholders that the House markup of the 1996 Federal budget eliminates funding for the Emergency Management activity. The anticipated impacts of this action include deferral of planned 1996 WIPPTREX and TRANSAX exercises, and the inability to provide the training courses mentioned above and outlined in Section 2.7.3.2 of the draft EIS. These impacts, and the effects of upcoming organizational changes at DOE regarding emergency management, should be addressed in the final environmental impact statement as they relate to the ability of states, tribes, and local

1253-3

RESPONSE TO COMMENT
COMMENTOR NO. 1253: SOUTHERN STATES ENERGY BOARD (CONT'D.)

Response to Comment No. 1253-3

DOE, like all other Federal agencies, is currently undergoing a comprehensive Congressional, as well as an internal budgetary and operational review and realignment to ensure that all of its resources are used in the most effective manner possible. The end results of this will not be fully known until a final budget is passed by the Congress and signed by the President.

DOE will continue to fulfill its taskings to the best of its ability within the fiscal constraints and realities imposed by the budget.

COMMENTOR NO. 1253: SOUTHERN STATES ENERGY BOARD (CONT'D.)

governments to insure that adequate emergency response capabilities exist along transportation routes through their jurisdictions.

1253-3 (Cont'd.)

The impacts of eliminating EM-26 emergency management funding would appear to be inconsistent with the commitment contained in Section 2.7.2 to provide support and assistance to state, tribal and local governments. We urge DOE to take actions necessary to prevent the erosion of assets required to deliver these training courses and to conduct the exercises detailed above. One option may be to consolidate emergency management resources from various DOE offices into a single, department-wide emergency management program. Given the number of spent nuclear fuel shipments proposed in this action, coupled with DOE's own internal spent nuclear fuel shipments and shipments anticipated by the Office of Civilian Radioactive Waste Management (OCRWM), we believe that the time has come for DOE to establish a National Transportation Emergency Response Training Center, and we believe that the resources at the Nevada Test Site (NTS) provide a solid base upon which to develop this center.

1253-4

Section 2.7.5 of the draft EIS states that states and tribes would be responsible for augmenting their existing emergency management plans and response procedures to accommodate requirements specific to the shipments of foreign research reactor spent nuclear fuel, and for providing personnel and equipment to manage an incident should one occur. Absent provision of funds by DOE or the foreign research reactor operators themselves directly to states, tribes and local governments to facilitate these activities, and absent the radiological training assistance provided in the past by DOE and outlined in this draft EIS, many jurisdictions may find it difficult, if not impossible, to meet the requirements imposed on them by the activity proposed in this draft EIS.

1253-5

Again, thank you for the opportunity to comment on this draft EIS. I look forward to continuing dialogue in this matter.

Sincerely,

Elizabeth Fulmer
for

James C. Hardeman, Chair
Advisory Committee on
Radioactive Materials Transportation

RESPONSE TO COMMENT COMMENTOR NO. 1253: SOUTHERN STATES ENERGY BOARD (CONT'D.)

Response to Comment No. 1253-4

The commentor's suggestions that relate to a DOE-energy management program are noted. DOE will continue to fulfill its task to the best of it's ability within the fiscal constraints and realities imposed by the budget. Funding for emergency preparedness associated with the foreign research spent nuclear fuel acceptance and transportation in the United States, which is the subject of this EIS, is addressed in the response to Comment 1253-1, above.

Response to Comment No. 1253-5

DOE would provide assistance to local authorities to ensure that appropriate measures were taken in the unlikely event of an accident. As part of this assistance, DOE's Radiological Assistance Program teams from the eight offices strategically located throughout the country would be used to coordinate and to provide remediation assistance. This type of assistance and coordination would be specified in the Transportation Plan prepared for any foreign research reactor spent nuclear fuel shipment to be carried out.

As discussed in response to Comment 1253-1, above, Appendix H to the EIS contains the general provisions for emergency preparedness associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. Special training for radiological emergencies, if necessary, would be addressed during this interface.

COMMENTOR NO. 1256: ASSOCIATION OF WASHINGTON CITIES

AWC
ASSOCIATION OF WASHINGTON CITIES

1076 Franklin St. SE
Olympia, WA 98501-1346
(360) 753-4137, FAX 753-4896

July 14, 1995

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue SW
Washington, D.C. 20585

RE: **Draft Environmental Impact Statement (EIS) on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.**

Dear Mr. Head:

The Association of Washington Cities (AWC) recently adopted a resolution opposing the introduction, storage, or trans-shipment of high level nuclear waste introduced from other nations in, through, or over the state of Washington. A copy of the resolution is attached. *1256-1*

Given our position, we appreciate the opportunity to review and comment on the U.S. Department of Energy's (DOE) Draft EIS on management of spent nuclear fuel from foreign research reactors. We recognize that the goal of the nonproliferation policy is important to the well-being of the nation. We also recognize that a long-term solution for the management of this high-level radioactive waste is in the best interest of the citizens of the state of Washington and the Nation. *1256-2*

However, we question the wisdom of DOE in naming the Port of Tacoma or Hanford as possible sites to handle and temporarily store additional wastes with the potential to do further harm to the health and fragile environment at these two sites. Both the Port of Tacoma, located in Commencement Bay on Puget Sound, and Hanford, located in Eastern Washington, are on the Environmental Protection Agency's Federal Superfund Site list. Both are also in the process of cleanup activities costing hundreds of millions of dollars. *1256-3*

This significant economic effort by public and private entities could be viewed by Washington citizens as a lost cause if DOE chooses either site. Our citizens have concerns that government has not been mindful of public health and the environment when managing existing radioactive and hazardous waste issues in our state. A decision to use either site appears short-sighted and would aggravate the problem. *1256-4*

Cooperation for Better Communities

RESPONSE TO COMMENT
COMMENTOR NO. 1256: ASSOCIATION OF WASHINGTON CITIES

Response to Comment No. 1256-1

The Association of Washington Cities' opposition to the introduction, management, or transshipment of high level nuclear waste from other nations in, through, or over the State of Washington, is noted. The port selection criteria discussed in Appendix D, Section D.1.9 of the EIS identifies those ports that can safely handle foreign research reactor spent nuclear fuel. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Sections 4.2.2.3 and 4.5) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Sections 4.2.2.2 and 4.5).

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 1256-2

The commentor's support for the U.S. nuclear weapons nonproliferation policy and long-term solutions for storage of radioactive wastes are noted. Nuclear weapons nonproliferation is discussed in Sections 1.1 and 1.2 of the EIS, and ultimate disposition of spent nuclear fuel from foreign research reactors is discussed qualitatively in Section 4.2.7 of the EIS.

Response to Comment No. 1256-3

On the issue of air and water quality as it pertains to the proposed policy of managing foreign research reactor spent nuclear fuel, DOE considers that there would be no significant adverse impacts to any of the ports that might be used to receive the material. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive material has ever been released from a spent nuclear fuel transportation

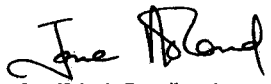
COMMENTOR NO. 1256: ASSOCIATION OF WASHINGTON CITIES (CONT'D.)

The Association also is very concerned over the burden of first response by local government to any incident that might occur during the handling and storage of this spent nuclear fuel. We consider this to be tantamount to yet another unfunded federal mandate that rests on the shoulders of local government. 1256-5

Properly managed and reprocessed spent nuclear fuel is a valuable commodity. A number of foreign countries need this reprocessed fuel to operate their commercial power plants. The draft EIS considers three management alternatives, which are: 1. Bring the spent nuclear fuel all back to the U.S., 2. Mange it overseas, 3. A hybrid of the first two alternatives. Alternative 2 meets the DOE's nonproliferation policy guidelines, is the least expensive, and is a sound overall long-term solution. We encourage DOE to look more closely at this alternative. 1256-6

Bringing this high level nuclear waste through the Port of Tacoma and transporting it across Washington state by rail or truck for possible storage at Hanford poses a health risk, an environmental risk, a security risk and a financial risk for our state and its local government. As stated in our resolution, the Association opposes any such transport of nuclear waste in Washington. 1256-1 (Cont'd.)

Sincerely,



Jane Noland, Councilmember
City of Seattle
AWC President

JN/JL/FT:mll

Enclosure

[FT95:nuclear.ltr]

RESPONSE TO COMMENT
COMMENTOR NO. 1256: ASSOCIATION OF WASHINGTON CITIES (CONT'D.)

cask as a result of an accident. A paragraph has been added to (Section 4.2.2.2 of the EIS) to make this point and to emphasize the no-impact nature of these shipments on air and water quality. With respect to management of the foreign research reactor spent nuclear fuel at the Hanford Site, see the 2nd paragraph of the response to Comment 1256-1, above.

Response to Comment No. 1256-4

See response to comment 1256-1, above.

Response to Comment No. 1256-5

Each port considered in the EIS has developed an Area Contingency Plan. This plan outlines response capabilities, procedures and authorities for responding to and recovering from hazardous material incidents. Additionally, DOE would provide assistance to local authorities to ensure that appropriate measures are taken in any unlikely event of an accident. As part of this assistance, DOE's Radiological Assistance Program teams, from eight offices strategically located throughout the country, would be used to coordinate and to provide remediation assistance. This type of assistance and coordination would be specified in the Transportation Plan that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H of the EIS. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues would include capabilities and training of first emergency responders.

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Response to Comment No. 1256-6

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 1256: ASSOCIATION OF WASHINGTON CITIES (CONT'D.)

Resolution #25: Transport and Storage of Nuclear Waste

BACKGROUND
The Federal Department of Energy is studying the Port of Tacoma as one of ten potential ports for receipt of spent nuclear fuel from other nations. The City of Tacoma passed a resolution opposing the use of the Port of Tacoma for these waste shipments.

ISSUE
The Tacoma resolution cites problems with the Environmental Impact Statement and concerns regarding the potential impacts on Tacoma, Pierce County, and Puget Sound. The resolution also notes that the burden of response to any incident rests with local government and would constitute an unfunded mandate. The Tacoma resolution also expresses concern that many of the city's questions have not been answered and that the fate of the Department of Energy is in doubt, creating operational uncertainties.

1256-1 (Cont'd.)

AWC POSITION
The Association of Washington Cities supports the position of the City of Tacoma and opposes the introduction, storage, or trans-shipment of high level nuclear waste introduced from other nations in, through, or over the state of Washington.

Adopted at the AWC annual business meeting on June 30, 1995.

RESPONSE TO COMMENT
COMMENTOR NO. 1256: ASSOCIATION OF WASHINGTON CITIES (CONT'D.)

COMMENTOR NO. 1268: PEOPLE FOR A NEW NUCLEAR POLICY

July 19, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

Dear Mr. Head,

Here are my comments, and those gathered from People For A New Nuclear Policy, in response to the draft E.I.S. on a "Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel". At the public hearing in Concord, California on May 22, 1995, you stated that of comments solicited, only those relevant to the actual specifics of operational strategy would have bearing on the final E.I.S. I emphatically urge you, instead, to hear these and other comments which reflect on the larger issues of national nuclear policy. These concerns convey a general critique of some aspects of U.S. nuclear policy, including the overall process itself, underlined, especially, by ethical considerations germane to such an important historical decision. 1268-1

The process by which the public is to be informed and involved in the draft E.I.S. is fundamentally flawed. Not only was there entirely inadequate time by which the general public was given notice, we were completely left out of the original scoping meetings that were held in October of 1993. Even though there was ultimately an extension granted to the deadline for public comment, this does not overcome the disadvantage of not being involved at the initial stages of the scoping process. The meeting in Oakland in 1993 did not give prior notice to interested parties in this area nor was the Concord Naval Weapons Stations even mentioned as a possible port of entry at that meeting. Consequently, local residents were outraged that the D.O.E. could "drop this bomb" without at least the decency of foreknowledge that other communities were given. There was no opportunity for citizens who live closest to the Concord Naval Weapons Station to "help identify significant issues to be addressed in the draft E.I.S." until it was too late by reasonable standards. Yet statements like "Yes, your input most definitely does matter!" reveals an attitude by the U.S. government which can only be understood as hypocrisy, if not contempt for local public interest, rather than the authentic respect we are due. 1268-2

Moreover, the slick advertising style of propaganda distributed in the informational packets at the D.O.E. public hearings further demonstrates 1268-3

RESPONSE TO COMMENT
COMMENTOR NO. 1268: PEOPLE FOR A NEW NUCLEAR POLICY

Response to Comment No. 1268-1

Under NEPA and DOE's environmental regulations, public comments are an essential part of the environmental process (Section 5 of the EIS). Responses are provided in this document to written and oral comments received on the draft EIS during the comment period. Comments on matters outside of the scope of the EIS were noted (Section 1.3 of the EIS), however, the purpose of the comment period is to obtain comments of individuals and organizations concerning the draft EIS.

Response to Comment No. 1268-2

DOE's advertising of the public hearings on the spent nuclear fuel proposed policy has been in full compliance with NEPA and the applicable regulations. Advertising included timely public service announcements sent to local radio stations and placement in major newspapers in each of the meeting locations. Also, in accordance with NEPA, announcements of the hearings were published in the Federal Register. The fact that a scoping meeting was not held in the commentor's area is due to the fact that one of the purposes of the scoping meeting, in accordance with NEPA and applicable regulations, is to identify the scope of the EIS through public input. Therefore, based on information and comments provided by participants at the scoping meeting, and based on other considerations, DOE acted within its rights to expand the scope of the EIS to include additional ports as possible candidates for receipt of foreign research reactor spent nuclear fuel. Once such additional port is Concord NWS. The public and other interested parties (government officials, industry, etc.) were afforded an opportunity to comment on the draft EIS for 90 days, both at the public hearing and in writing after the public hearings, up until the time of the closing of the comment period (July 20, 1995).

Response to Comment No. 1268-3

Information packets and materials distributed at public meetings summarize the findings of the environmental evaluation and provide background information for the general public. The question: Should the United States take no action and risk weapons-grade material falling into the wrong hands? was included in the information packets because adoption of the No Action Alternative would have an adverse effect on nuclear weapons nonproliferation objectives of the United States. The discussion in the information packet summarizes information provided in Section 4.6 of the EIS.

The proposed action is intended to support nuclear weapons nonproliferation objectives of the United States. It supports peaceful applications of nuclear technology for nations who agree not to develop or proliferate nuclear weapons. Research, medical, industrial, and agricultural applications of foreign research reactors are described in Section 1.1 of the EIS.

COMMENTOR NO. 1268: PEOPLE FOR A NEW NUCLEAR POLICY (CONT'D.)

the thinly veiled attempt by the federal government to "sell" this program on nuclear policy to the people of the United States. For instance, the particularly disturbing sheet entitled, "Be Part of the Decision Making Process-How You Can make a Difference" reveals the obvious leanings of governmental policy-makers and their determination to hoist their clearly biased opinions on the American public. Under the guise of "scientific objectivity", such rhetorical questions like "Should the United States take no action and risk weapons-grade material falling into the wrong hands?" is indicative of the predetermined objective to persuade the public, rather than present plain facts and a variety of viewpoints in order to truly consider all options-especially ones which reflect the perceptions and concerns of those most directly affected, including ordinary citizens. Were the approach sincerely open, we could afford to risk self-critical questions which would examine the matter of whose hands could be considered "right" for managing fissionable materials and what policy trustworthy enough to guarantee nuclear non-proliferation.

1268-3 (Cont'd.)

The single-minded and narrow stance of the federal government regarding so many nuclear policies like the one presently discussed is obvious to even the least informed persons. "We, the people" are not fooled by the underlying intention of the government to jam this proposal down our throats under the appearance of an inclusive, broad-minded approach which, conversely, excludes and mitigates against public involvement and partnership in decision making. Given the absence of enough time to evaluate and study the draft E.I.S., the overwhelming judgment of this local community, evidenced in elected officials' comments, is that the plan should be cancelled. A more thorough study relevant to and inclusive of public concerns is necessary and mandates a complete re-thinking and revision of national nuclear policy in order for it to reflect the will of the people.

The draft E.I.S. is inherently error-ridden, beginning with its negligence in assessing the "atoms for peace" program as a blatant failure. The most apparent observation currently missing in the draft E.I.S. is that the exporting of nuclear technology has, in fact, not reduced but rather increased the risks of nuclear weapons proliferation. Ironically, while it states the dilemma: "vast quantities of spent nuclear fuel continue to accumulate in foreign countries", the report should, but fails to admit those very contradictions intrinsic to national nuclear policy. Such denial can only lead to increased public mistrust for federal policy-makers who refuse to address the truth about U.S. objectives and intentions both historically and with regard to current political nuclear/military motivations. Without governmental acknowledgment of dissident positions, (views often reflecting the majority of U.S. citizens' values and determinations), the D.O.E. can expect a growing public response that varies from polite to angry disagreement and finally to massive organized resistance. The blatant disregard for public input and shared consent for these policies, despite the elaborate display to feign precisely the democratic principles it pretends,

1268-4

(2)

RESPONSE TO COMMENT COMMENTOR NO. 1268: PEOPLE FOR A NEW NUCLEAR POLICY (CONT'D.)

All public comments on the draft EIS received during the comment period are included in this document. The EIS is primarily an evaluation of environmental effects which would occur if the proposed action were implemented. As demonstrated by the analysis in Section 4 of the EIS, the risks associated with implementation of the proposed action to human health or the environment are low. Thus, there is no environmentally preferred alternative, and decisions regarding management of spent nuclear fuel from foreign research reactors must be made on the basis of non-environmental concerns.

Response to Comment No. 1268-4

As evidenced by the fact that few nations have thus far produced nuclear weapons, the Atoms for Peace Program (described in Section 1.1 of the EIS) has been a success . By supporting peaceful applications of nuclear technology, while discouraging development of nuclear weaponry, nuclear weapons nonproliferation policies of the United States have served as a foundation for worldwide efforts to prevent the spread of nuclear weapons.

Foreign research reactors are not used to construct nuclear weapons. Research, medical, industrial, and agricultural applications for foreign research reactors are described in Section 1.1 of the EIS.

Potential environmental benefits and risks resulting from implementation of the proposed action were evaluated in detail during preparation of this EIS. As demonstrated by the analysis in Section 4 of the EIS, the risks associated with implementation of the proposed action to health or the environment are low. No quantifiable exceptions to the environmental evaluation were received during the comment period. Thus, there is no environmentally preferred alternative, and decisions regarding the proposed action must necessarily be based on non-environmental considerations.

COMMENTOR NO. 1268: PEOPLE FOR A NEW NUCLEAR POLICY (CONT'D.)

prompts suspicion of the callous and devious character of the D.O.E., a suspicion that has haunted governmental policy surrounding the nuclear issue since its inception. From the beginning with the Manhattan Project, through the early years of the Atomic Energy Commission, during the cold war build-up, and up to the present day proposal of managing spent nuclear fuel from foreign countries, the U.S. government has not been up front with its own people. This policy and other potential schemes which perpetuate any rationale for extended uses of fissionable material must be scrapped, and the final E.I.S. should reflect the truth of public outcry against the ongoing profiteering of the nuclear industry with the complicity of the D.O.E. to move forward with this latest proposal. This not only poses unacceptable risks to permanent environmental contamination, but jeopardizes the very goals of nonproliferation it seeks to accomplish. It is clear that if the D.O.E. ignores the strong dissatisfaction from the local community to the plan to utilize the Concord Naval Weapons Station as one of the ports of entry for foreign spent nuclear fuel organized opposition and dramatic resistance will follow. Consequently, a final E.I.S. should anticipate the cost of sustained demonstrations, including non-violent civil-disobedience, and calculate any expenses which the federal government must be prepared to reimburse local law enforcement and other affected agencies.

1268-4 (Cont'd.)

A far more reasonable and safe strategy to deal with the deadly radioactive substances outlined in the draft E.I.S., as well as a bold policy dedicated to genuine peace and true security is needed before the political, social, and economic realities get completely out of hand. A modest beginning point for such a policy would be to abolish any further expansion and exportation or importation of nuclear related technology and material, in all its forms, and to immediately halt the so-called "atoms for peace" programs from which the present danger can trace the roots of its causality. Anything less than a total turn-around of such a notorious legacy and its potentially catastrophic results, already evidenced by the present international predicament, would be remiss and continue to undermine U.S. integrity and authority with regard to a sane and compelling leadership world-wide.

1268-5

Not unrelated, and indeed central to the objectives set forth in the background section of the draft E.I.S. is the obligation of the U.S. government to honor the spirit of the law contained in the Nuclear Nonproliferation Treaty which, at its core, commits our nation to the elimination of all nuclear weapons. As the record shows, the government has absolutely defaulted on this pledge. Since it should act in good faith to advance each and every policy toward this end, our conclusion regarding the spent fuel plan is that it obfuscates the perplexity of the problem when it addresses one aspect of the intent of the N.P.T., yet sidesteps the more pertinent, crucial issue of nuclear disarmament. This is the only logical and morally tenable position we can take if we truly care about disarming the planet. Of course, this can never be achieved if we cannot

1268-6

RESPONSE TO COMMENT COMMENTOR NO. 1268: PEOPLE FOR A NEW NUCLEAR POLICY (CONT'D.)

Response to Comment No. 1268-5

See response to comment 1268-4 immediately above.

Response to Comment No. 1268-6

The proposed action complies with the letter and spirit of the Treaty on the Non-Proliferation of Nuclear Weapons which was indefinitely extended under the auspices of the United Nations in May 1995 (Section 1.1 of the EIS). Foreign research reactors are not used for development or construction of nuclear weapons. Section 1.1 of the EIS describes the research, medical, industrial, and agricultural applications for foreign research reactors. The use of LEU fuel in foreign research reactors is encouraged because LEU cannot be used to make nuclear weapons. In addition, the U.S. accrues significant benefits from the operation of foreign research reactors - including Moly-99 and other medical isotopes.

COMMENTOR NO. 1268: PEOPLE FOR A NEW NUCLEAR POLICY (CONT'D.)

first admit the inextricable link between the supposed "peaceful" uses of nuclear energy and corresponding research, and the potential for continued weapons development of heinous and far-reaching proportions. Every form of proliferation of nuclear power with it subsequent waste, for whatever uses, including the marketing of low-enriched uranium, necessarily prolongs the problems of nuclear weapons proliferation and the monumental threat they present to the future of humankind.

1268-6 (Cont'd.)

Regardless of the assurances the U.S. government continues to reiterate about the safety of nuclear energy and research and its ability to contain the spread of nuclear weapons from which they are derived, the majority of U.S. and global citizens do not take such assurances for granted. Hence, the people of the world do not trust their governments to act in good faith to adhere to the purposes and goals of such treaties as the N.P.T.. The historical secrecy and deceptions of governmental negotiating and political maneuvering has distanced vast numbers of citizenry all over the world who have been left out of decision-making and policy formation. No wonder governments, large and small, have lost credibility, and thus stability, and will continue to have a difficult time selling these nuclear policies like the one this current proposal promotes to the people they purport to represent.

1268-7

The nuclear industry, concomitant with the military-industrial-complex, has profited immensely from these corrupt and death-dealing arrangements, both those enunciated as "lawful" and espoused as progressive for modern civilization, as well as the more hidden, "behind-the-scenes" deals which make a fraction of the people wealthy at the expense of millions of others, economically, politically, socially, and ecologically speaking. Therefore, we urge you to withdraw the "Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel" in favor of an entirely new approach to overall national nuclear policy with sincere regard for and intelligent focus on the N.P.T and in light of the fundamental values of justice, peace and freedom this nation claims to advocate as its own.

1268-8

Sincerely,
Bob Russell

People for A New Nuclear Policy
1626 Barnett Circle
Pleasant Hill, California 94523

RESPONSE TO COMMENT
COMMENTOR NO. 1268: PEOPLE FOR A NEW NUCLEAR POLICY (CONT'D.)

Response to Comment No. 1268-7

The commentor's position on losses of credibility of large and small governments worldwide is noted. Under NEPA and DOE's environmental regulations (Section 5 of the EIS), public comments are an integral part of the environmental process. Prior to preparation of a Record of Decision regarding management of spent nuclear fuel from foreign research reactors, comments received on the draft EIS, and presented in this document, were reviewed and answered.

Response to Comment No. 1268-8

As demonstrated by the analysis in Section 4 of the EIS, the risks of implementation of the proposed action to human health or the environment, including economic benefits would be low. Similarly, implementation of the proposed action would have no significant effect on the distribution of wealth. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). The proposed action supports the Treaty on the Non-Proliferation of Nuclear Weapons. Withdrawal of the proposed action would increase the risks that weapons-grade materials could fall into the hands of nations seeking to develop a nuclear weapons capability.

SECTION 2.6
FOREIGN ENTITIES

COMMENTOR NO. 57: EMBASSY OF GREECE

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: DIMITRIS CHRONOPOULOS **Phone:** (202) 9395804

Title and Organization: First Secretary/Political Affairs/Embassy of Greece

Address: 2221 MASSACHUSETTS AVE. N.W.

City: WASHINGTON D.C. **State** ____ **Zip** 20008

*** COMMENTS ***

As representative of "DEMOKRITOS" NRC I express my support to positions and comments presented by the representatives (see Egan, Sauls Edlow) of the 14 European reactors members of the "EDLOW GROUP"

Comments presented by the representatives of EURATOM and IAEA are also cosponsored by the Embassy of Greece

Finally I would like to point out the lack of alternative options for "DEMOKRITOS" that of Dounreay included, due to the lack of spent fuel storage sites in Greece. 57-2

57-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 57: EMBASSY OF GREECE

Response to Comment No. 57-1

The commentor's position concerning statements of the Edlow Group, EURATOM, and the IAEA is noted.

Response to Comment No. 57-2

The commentor's expression of limited or nonexistent disposition alternatives available to Greece due to lack of spent nuclear fuel storage sites in Greece, is noted.

COMMENTOR NO. 58: ATOMIC ENERGY OF CANADA

Atomic Energy of Canada's Comments on the Draft Environmental Impact Statement (EIS) on a proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

* It is gratifying to see in Section 4.3.1.3 an implementation subalternative 1c, "Accept Target Material in addition to Foreign Research Reactor Spent Fuel."

* Canada has the largest accumulation of Aluminum based spent nuclear fuel materials, currently 4.478 MTHM of which 0.525 MTHM are as spent target materials. Note that the world total estimated holding's of spent target wastes is 0.5554 MTHM. — 58-1

* Canada embraced the aims of RERTR from its inception and after many years of fuel development finally completed the conversion of the NRU reactor from HEU driver fuel to LEU. In that period use of US origin HEU has dropped from approximately 96Kg/a, to approximately 25 Kg/a. The 25 Kg/a HEU now required, is largely for target use for medical isotope production. Most of the diagnoses and treatments using these isotopes, are carried out in the US. — 58-2

* Return of the residual spent target material, which contains weapons usable material, is a strong nuclear weapons non proliferation rationale for ensuring it is included in the scope of this management policy.

* Return of spent target wastes will be in the spirit of RERTR in which, the development and use of LEU targets is the ultimate goal of this program. — 58-3

* ~~In addition to a long term need to return spent target wastes, Canada will have a spent fuel storage problem at its McMaster University reactor. The seven year interruption in the spent fuel return program, has left its storage bays at near saturation and a fuel shipment will have to be made in early 1996, if the reactor is to continue in operation.~~

* Canada's development of its RERTR program, was predicated on several objectives such as, return of spent fuels, use of cheaper LEU alternatives as well as, support of the non proliferation initiative. It should be noted, that "cheaper" finished LEU driver fuels have been somewhat illusive, in Canada at least. — 58-4

DOE has a responsibility, under these RERTR and Non proliferation umbrella's, to reopen the spent fuel return agreements and take back the fuel, at a price consistent with its prices at the "expiry" of the agreements in 1988. — 58-5

RESPONSE TO COMMENT
COMMENTOR NO. 58: ATOMIC ENERGY OF CANADA

Response to Comment No. 58-1

Acceptance of target material containing HEU is an implementation alternative which is currently under consideration as part of Management Alternative 1 (Section 2.2.2.1 of the EIS). The inclusion of this alternative is in accord with the U.S. nuclear weapons nuclear weapon nonproliferation objectives.

Response to Comment No. 58-2

DOE agrees with the commentor's assertion that development of LEU targets is a key objective of the proposed policy.

Response to Comment No. 58-3

Acceptance and management of target material is in accord with the U.S. nuclear weapons nonproliferation policy.

Response to Comment No. 58-4

Atomic Energy of Canada's support for the RERTR Program, the use of LEU fuel, and the nonproliferation initiative are noted.

Response to Comment No. 58-5

DOE understands the position of the foreign research reactor operators regarding their desire for DOE to restart acceptance of spent nuclear fuel, and regarding the desired acceptance fee. As discussed in Section 2.2.1.2 and 2.2.2.3 of the EIS, several financing options have been considered, ranging from collection of fees from the research reactor operators that would pay all of the costs of the program to full subsidization of the program by DOE. A compromise between these extremes would be for developed countries to be charged a competitive fee, while U.S. taxpayers would absorb the full costs of the program for developing countries and absorb the amount above a competitive fee for developed countries to accept and manage their spent nuclear fuel. Charging a competitive fee is a market-based approach to the problem. Alternative financing arrangements discussed in Section 2.2.2.3 of the EIS include full subsidization for all countries, charging all countries the full costs of management, and subsidizing developing countries, but charging developed countries a full-cost recovery fee.

COMMENTOR NO. 58: ATOMIC ENERGY OF CANADA (CONT'D.)

* The alternative of spent fuel reprocessing, should of course be kept open. Reprocessing reduces the total volume of spent fuel wastes and maximises fuel utilization. However, it should not be included in this EIS as an option. This option itself could involve significant delays through further EIS's and lawsuits. The one and only option, at this point in time, is return of the spent fuel. 58-6

* The term, "Competitive price" for return of the spent fuel, should be rewritten to read "reasonable" or "consistent with that being charged at the time of expiry of the previous agreement." With only one other "player" in the market ie Dounreay, who do not offer the storage option, using their reprocessing price, does not appear to be a relevant comparison. 58-7

* In closing DOE should be congratulated on bringing the issue to this point, with the prospect of a reopening of the spent fuel return agreement at last within reach. However, with the S.C. litigation still in progress, one shouldn't be too complacent. There are still many side issues which can prolong or divert the process if vigilance is allowed to waiver. 58-8

Frank Keely

May 31 1995

RESPONSE TO COMMENT COMMENTOR NO. 58: ATOMIC ENERGY OF CANADA (CONT'D.)

Response to Comment No. 58-6

The commentor's support for accepting the foreign research reactor spent nuclear fuel into the United States and for chemically separating it is noted. NEPA requires that the environmental impacts of all reasonable alternatives be evaluated, regardless of political opposition or potential litigation.

Response to Comment No. 58-7

DOE considers that reprocessing at Dounreay provides a reasonable basis for establishing a competitive price since it would be the alternative to the U.S. program that several countries are considering. DOE also considers that the price, however determined, should be based on current conditions rather than those prevailing at the expiration of previous agreements.

Response to Comment No. 58-8

The commentor's position on this matter is noted.

COMMENTOR NO. 62: ICI TRACERCO

Tracerco

Mr C Head
Office of Spent Fuel Management (EM-37)
US Department of Energy
1000 Independence Avenue SW
Washington DC 20585
U.S.A.

ICI Tracerco
ICI Chemicals & Polymers Limited
PO Box 1 R2 Building
Billingham
Cleveland TS23 1LB
Telephone (01642) 522350
Fax (01642) 522991

Our Ref	Direct Line	Ext	Date
DG LF 763W	01642 523302	3302	28 April 1995

Dear Mr Head

ENVIRONMENTAL IMPACT STATEMENT - REPATRIATION OF HEU AND LEU FUEL

I would wish to offer the following comment on the above document which is being circulated within the USA for public consultation. I manage a Triga reactor facility in the UK which has LEU fuel purchased from General Atomics over the past 25 years.

The original decision to purchase the Triga Reactor rather than opt for a UK facility was strongly influenced by the safety features of the fuel design and the reassurance that the spent fuel would be eventually returned to the USA. The change in policy on repatriation has, in common with other Triga operators, created major problems in defining decommissioning strategies. We are currently wishing to decommission our Triga Reactor at the earliest opportunity and are extremely interested in the current debate on repatriation. 62-2

We fervently hope that an early decision will be made which will alleviate the difficult situation in which most Triga Operators now find themselves.

Yours sincerely

DR D GREEN
Environmental & Reactor Services Manager

RESPONSE TO COMMENT
COMMENTOR NO. 62: ICI TRACERCO

Response to Comment No. 62-1

The commentor's position on acceptance of TRIGA spent nuclear fuel under Management Alternative 1 is noted. Section 1.2 of the EIS describes the purpose and need for the proposed action and United States obligations under the Treaty on the Non-Proliferation of Nuclear Weapons.

COMMENTOR NO. 104: GKSS FORSCHUNGSENTRUM

GKSS

FORSCHUNGSZENTRUM

GKSS - Postfach 1160 - D-21494 Geesthacht

Mr. Charles Head, Program Manager
U.S. Department of Energy
Office of Spent Nuclear Fuel Management
(EM-37)
1000 Independence Avenue, SW

Washington, DC 20585

Max-Planck-Straße
D-21502 Geesthacht
Tel.-Zentrale: 04152/87-0
Telefax: 04152/87-1338

Ihr Zeichen/Your reference	Unser Zeichen	Durchwahl Telefon	Durchwahl Telefax	Datum
	RZL-Dr.Kr/ti	04152/87- 1200	04152/87- 1338	June 7, 1995

Ref.: DOE/EIS-0218D, March 1995: Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Sir,

on behalf of the GKSS-Forschungszentrum Geesthacht GmbH we would like to thank you for the opportunity to comment the draft EIS. GKSS has already commented the draft EA as well as participated in a hearing at Washington, DC, on that draft on February 10, 1994 and expressed its position and concerns in papers presented at the last two RERTR meetings and in a publication in the journal "Nuclear Engineering International":

1. Letter to Mr. John J. Jicha, (DOE, Office EM-37), dated February 18, 1994
2. Paper: GKSS position on the back end of the fuel cycle of its research reactor FRG-1, presented at the hearing on the EA on February 10, 1994 in Washington, DC
3. W. Krull: Comments on the future activities of the RERTR program, paper presented at the 16. RERTR meeting, Oarai, October 3-7, 1993, Japan
4. W. Krull: Comments on the future activities of the RERTR program - part II, presented at the 17. RERTR meeting, Williamsburg, September 19-22, 1994, USA
5. W. Krull: Operators beware, Nuclear Engineering International, page 33-36, December 1994

Background informations for the following comments can be found especially in no. 2 to 5 of the above mentioned documents and papers. GKSS has some general comments on the necessity for

GKSS-Forschungszentrum Geesthacht GmbH · Max-Planck-Straße · D-21502 Geesthacht
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RESPONSE TO COMMENT
COMMENTOR NO. 104: GKSS FORSCHUNGSENTRUM

COMMENTOR NO. 104: GKSS FORSCHUNGSENTRUM (CONT'D.)

implementing the proposed policy, some special comments on the draft EIS and remarks on the situation of its FRG-1 research reactor.

I General comments

I-1 With the publication of the Draft EIS the DOE has reached after years of preparation an important milestone the second after the announcement of the Secretary of DOE in her letter from July 13, 1993 in reentering the Policy on the Receipt of Spent Nuclear Fuel from Foreign Research Reactors. This is gratefully appreciated.

I-2 But these milestones are only the beginning and other more important ones must follow, especially the effective implementation of that proposed policy. Only then the international research reactor community can believe that DOE is again a reliable partner.

I-3 DOE must stay on that way with extreme efforts as at the moment some operators and countries are looking or implementing already independent national solutions. Such solutions will cause the worldwide spread of not sufficiently physical protected HEU forever with all consequences on nonproliferation. 104-1

I-4 DOE must consider for the existing spent fuel at reactor facilities that a large quantity has never been self protecting, another part is no longer self protecting and more fuel will loose its self protection soon. Physical protection does not follow in many cases the necessary requirements. 104-2

I-5 Due to the offset of the Policy for the Receipt of Spent Fuel from Foreign Research Reactors since the last decade the stockpile of fresh fuel (including spent fuel loosing its self protection) increases worldwide with all negative consequences in proliferation risk. It is on DOE to take over this responsibility and burden for some time.
The increase of the stockpile of HEU at the back end of the fuel cycle is directly opposite to the INFCE conclusion and it undermines the efforts of the RERTR program to reduce the stockpile of HEU on the front end of the fuel cycle. 104-3

I-6 The research reactor operators worldwide have to be convinced upon the necessity of reducing the proliferation risk and to continue with the RERTR program. The US should lead the way now by positive examples. Hesitating and not converting own reactors soon is no method convincing others. The offset of developing higher density fuel is in the same way a step in the wrong direction. 104-4

I-7 DOE must consider what actions should be taken if in spite all positive intentions the number of barriers are so high that first shipments will be significantly delayed. 104-5

I-8 To reduce the proliferation risk coming up from the operation of research reactors with HEU for a long period of time the only effective possibility is the return of this material to 104-6

RESPONSE TO COMMENT
COMMENTOR NO. 104: GKSS FORSCHUNGSENTRUM (CONT'D.)

Response to Comment No. 104-1

The commentor's position on the urgency of implementing the proposed action is noted. Section 1.2 of the EIS discusses the need for action and some potential consequences of inaction.

Response to Comment No. 104-2

Section 4.6.1 has been edited to include a discussion similar to that provided by the commentor.

Response to Comment No. 104-3

The commentor's position on the lapse of the Off-Site Fuels Policy is noted.

Response to Comment No. 104-4

The commentor's position on the conversion of research reactors in the United States is noted. The majority of nongovernmental research reactors in the United States have either converted or are in the process of converting to the use of LEU fuels. DOE is also considering the utility of converting U.S. Government owned reactors to the use of LEU fuels. The United States is the originator and strongest supporter of the RERTR program and continues to pursue the goal of eliminating the civilian use of HEU. To this end, DOE has requested money for Fiscal Year 1996 to resume development of advanced, high density LEU fuels to facilitate reactor conversion.

Response to Comment No. 104-5

If a decision is made to manage foreign research reactor spent nuclear fuel in the United States, the actions that DOE would take in the case that implementation of the policy is delayed depend on the specific implementation alternatives that will be selected in the Record of Decision.

Response to Comment No. 104-6

The commentor's support for the return of HEU to the country of origin is noted. Other options are discussed in Section 2.3 of the EIS.

the country of origin. Having it stored at many locations worldwide may be safe today. But the world is changing. 104-6 (Cont'd.)

I-9 Since DOE's offset of the Off-Site Fuel Policy for the Receipt of Spent Nuclear Fuel from Foreign Research Reactors operators and countries started to look at other solutions e.g.:

- reprocessing in Dounreay and further use of the reprocessed HEU
- building and licensing national long term storage facilities
- designing, licensing and construction of casks for long term dry storage
- building additional storage racks to have storage capacity for the scheduled life time of the reactor and then indirectly forever.

104-7

These actions undermine the efforts to reduce the proliferation risk worldwide.

I-10 DOE should state in the EIS that there are legal obligations to take back the spent fuel e.g.:

- contracts with some operators
- Fed. Reg. Note from December 1987 to issue a new Fed Reg. Note for a 10 years period
- Fed. Reg. Note from February 1986 for the LEU spent fuel acceptance to ensure the return of HEU during the conversion from HEU to LEU and later on LEU!
- letter of the Secretary of DOE from July 13, 1993, which has to be seen as a Record of Decision under the condition that the risk is acceptable. This has now been confirmed in the Draft EIS.

104-8

II Specific comments

II-1 After implementing the EIS it is without any doubt that there will be a termination of this policy. DOE must be a reliable partner again, but the US must not be the world storage place for these spent fuel elements forever. 104-9

II-2 Termination for 10 years for the production of spent fuel seems to be a reasonable time frame. But the additional 3 years only for shipment of all the spent fuel elements containing fuel of US origin seems to be away from practice. Only if everything runs well, 3 years are enough. 104-10

II-3 DOE should consider delays between implementing the new Policy, scheduled shipments and real shipments. Delays will be caused by force majeure, law suits at all possible levels, availability of necessary licenses or permissions, availability of suitable casks meeting the feasibilities at the operators site, availability of carriers, local intervenors and demonstrants at the US and non US sites and harbors etc. Within the EIS precautions should be included for these delays. 104-11

Response to Comment No. 104-7

The reactor operators' options in case the DOE selects the No Action Alternative are noted. These are also discussed in Sections 1.2 and 4.6 of the EIS.

Response to Comment No. 104-8

It is DOE's position that neither DOE nor the United States Government has any legal obligation to accept spent nuclear fuel from foreign research reactors.

Response to Comment No. 104-9

The commentor's position on the policy duration alternatives under Management Alternative 1 as described in Section 2.2.2.2 of the EIS is noted. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

Response to Comment No. 104-10

If Management Alternative 1 (Management in the United States, Section 2.2 of the EIS) is adopted and if delays in implementation occur, the delays are anticipated to occur mainly in the early portions of the program. The three year acceptance period which follows the ten year policy period is intended to allow for cool down and shipment of the last elements of spent nuclear fuel from foreign research reactors to the United States.

Response to Comment No. 104-11

It is not feasible to include in an EIS precautions to account for uncertainties such as delays resulting with suits brought to stop implementation of the action as decided in the Record of Decision.

COMMENTOR NO. 104: GKSS FORSCHUNGSENTRUM (CONT'D.)

- 4 -

II-4 Not all casks listed are licensed today. And the number of necessary shipments listed are diffferent between this EIS and DOE/EIS-0203-F. Some casks have to be used for US domestic shipments, too. — 104-12

II-5 Many solutions are possible. But only the management alternative 1 with the basic components is the only acceptable one in bringing back trust in the actions of DOE and reducing the proliferation risk really. If other management alternatives will be chosen research reactor operators will not be willing to suffer under the penalties (increasing fuel cycle costs, loss of reactor performance, licensing difficulties) of conversion of their reactors to LEU and they will stay on HEU. HEU will be spread worldwide forever. — 104-13

II-6 If DOE is not taking management alternative 1 with the basic components
- only a marginal reduction in proliferation risk and
- the complete loss of reliability
will be the consequence. — 104-14

II-7 HEU should be taken back under special conditions for some additional years after the implemented EIS expires for LEU. There are many reasons possible to miss the given time schedule (money can be one, even for operators in industrial nations). Reduction of proliferation risk should be the driving force. — 104-15

II-8 Target material should be accepted, too. Stay on this way. — 104-16

II-9 The EIS clearly demonstrated that the amount of heavy metal in foreign research reactor spent fuel is negligible compared with other sources already managed, presently managed or need to be managed by DOE. — 104-17

II-10 All risks involved with shipment, storage and disposal of the spent fuel under this EIS is negligible, too. Therefore it should be without any doubt acceptable. — 104-18

II-11 US tax payers should not subsidize the foreign reactor operators in the future. They did not so in the past as prices paid for the reprocessing services published in the Fed. Reg. have been calculated on a full cost recovery basis. The new prices must be an updating of the old ones as the old prices included the same services more or less plus reprocessing. — 104-10

II-12 Prices should not be prohibitive high. It is clear that many operating organizations will wait in such cases for other solutions and therefore this EIS may not be successful. — 104-20

II-13 The final EIS should give a preferred alternative which must be close to Management Alternative 1 with Basic Implementation Components and to the letter of the Secretary of DOE, dated July 13, 1993 (see I-10). — 104-21

III Situation at the research reactor FRG-1

III-1 GKSS as operator of the FRG-1 has fully and successfully cooperated since 15 years to a very high degree with the RERTR program and the relevant activities at the IAEA.

RESPONSE TO COMMENT
COMMENTOR NO. 104: GKSS FORSCHUNGSENTRUM (CONT'D.)

Response to Comment No. 104-12

a. The potential spent nuclear fuel transportation casks identified in the EIS for marine transport (as given in Appendix B, Table B-13), except for Unifetch, have been certified by the U.S. Department of Transportation in the past. At the present time however, except for the LHRL-120 and GNS-11 casks, all others have expired certificates and need to be recertified by the U.S. Department of Transportation according to the requirements of 49 CFR Part 173.473. This is a normal procedure that each cask needs to follow in order to maintain an up-to-date certificate of compliance.

b. The difference in the number of estimated shipments in this EIS and that provided in DOE/EIS-0203-F, (Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement, [or Programmatic SNF & INEL EIS]), is due to the following reasons:

1. This EIS's estimate of the number of shipments from foreign research reactors is based on 22,700 spent nuclear fuel elements, whereas the Programmatic estimate is based on 25,000 spent nuclear fuel elements. The Programmatic SNF & INEL EIS used a bounding number of elements to cover any uncertainties in the estimated projection.

2. The Programmatic SNF & INEL EIS also adds the number of shipments containing target materials (140 shipments), whereas this EIS considers the target material shipments separately as an implementation alternative.

Both EIS's provide correct estimates of the potential spent nuclear fuel shipments from foreign research reactors, considering the different purposes of the two documents.

c. Table B-15 of Appendix B of the EIS identifies the potential domestic casks for shipments between the management sites. The domestic research reactor fuels are not considered in this EIS, but were evaluated in the Programmatic SNF & INEL EIS.

Response to Comment No. 104-13

The commentor's support for Management Alternative 1 (Section 2.2 of the EIS) is noted.

Response to Comment No. 104-14

The commentor's opposition to alternatives other than Management Alternative 1 (Section 2.2 of the EIS) is noted. Management Alternative 2, Management Alternative 3, and the No Action Alternative are described in Sections 2.3, 2.4, and 2.5 of the EIS, respectively.

COMMENTOR NO. 104: GKSS FORSCHUNGSENTRUM (CONT'D.)

III-2 GKSS has converted its FRG-1 early in 1991 totally to LEU as the first European and till today the only German research reactor.

III-3 GKSS was accepting the penalties caused by the conversion as it was and is fully convinced on the necessity to make the world safer by reducing the proliferation risk.

III-4 GKSS needs to operate its reactor FRG-1 for its research program and will undertake all necessary measures to reach this condition.

III-5 GKSS has approx. 16 kg HEU (~ 75 % enriched) from reprocessed uranium and is still waiting for solutions. DOS and DOE have been asked to take this material back but did not answer yet.

III-6 GKSS has from the operation of its research reactors FRG-1 and FRG-2 (shutdown in 1995) 141 spent HEU fuel elements. The last spent HEU fuel elements have been produced in 1991.

III-7 The 141 spent HEU fuel elements are loosing its self protection. Actions must be taken. The by far most convincing action will be to ship these fuel elements in two shipments (2 x 66) soon to the US. Casks (GNS-II) are available and can be used at the research reactor facility.

III-8 GKSS got a new license for its FRG-1 dated April 12, 1995, limiting explicitly the amount of fresh HEU fuel and spent HEU fuel loosing its self protection (see page 3 and 4 of this license). Therefore actions are really necessary. A copy of parts of the license is being attached.

III-9 Shipments of the spent HEU fuel elements must therefore be made in 1996 and 1997 to DOE facilities. GKSS is prepared to cover the costs.

III-10 GKSS is willing and prepared to cooperate as in the past with the RERTR program and the IAEA in all relevant activities at all necessary levels.

Dear Sir,

we are looking forward to the actions that will be made within this year at the DOE. Your decisions will be in any way very important for the RERTR program, the efforts in reducing the proliferation risk, the survival of many research reactors and for the reliable cooperation between partners. GKSS is willing to assist, if so required.

Sincerely yours,

GKSS-FORSCHUNGSZENTRUM GEESTHACHT GMBH

i.A.

(pp. Dr. [illegible]) (Dr. W. Kroll)

Enclosure

RESPONSE TO COMMENT
COMMENTOR NO. 104: GKSS FORSCHUNGSENTRUM (CONT'D.)

Response to Comment No. 104-15

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). To this end, one of the implementation alternatives for Management Alternative 1 evaluated in this EIS is for indefinite acceptance of HEU (Section 2.2.2.2).

Response to Comment No. 104-16

The commentor's support for accepting target materials in addition to foreign research reactor spent nuclear fuel is noted. Acceptance of target materials is discussed in Section 2.2.2.1 of the EIS.

Response to Comment No. 104-17

The commentor's observation on the amount of heavy metal in spent nuclear fuel accepted from foreign research reactors is noted (Section 2.2.1.3 of the EIS).

Response to Comment No. 104-18

The commentor's position that the risks resulting from implementation of the proposed action would be negligible is noted.

Response to Comment No. 104-19

As discussed in Section 2.2.1.2 and 2.2.2.3 of the EIS, several financing options have been considered, ranging from collection of fees from the research reactor operators that would pay all of the costs of the program to full subsidization of the program by DOE. A compromise between these extremes would be for developed countries to be charged a competitive fee, while U.S. taxpayers would absorb the full costs of the program for developing countries and absorb the amount above a competitive fee for developed countries, to accept and manage their spent nuclear fuel. Charging a competitive fee is a market-based approach. It is likely that full-cost recovery would exceed the competitive fee.

Response to Comment No. 104-20

The competitive fee discussed in Section 2.2.1.2 of the EIS would be based on an estimate of what similar services would cost at other sites (e.g., Dounreay), with adjustments made for such factors as waste storage costs. DOE is aware that setting a fee too high would cause the program to fail. DOE is attempting to balance the interests of the RERTR program, taxpayers, and the research reactor operators.

Response to Comment No. 104-21

The commentor's preference for Management Alternative 1 is noted. Section 2.2 of the EIS describes Management Alternative 1.

COMMENTOR NO. 133: RISO NATIONAL LABORATORY

RISØ
Risø National Laboratory

Management
P.O. Box 49
DK-4000 Roskilde, Denmark
Phone +45 46 77 46 77, Telex 43116
Fax +45 42 36 85 31

United States Department of Energy
Office of Environmental Management (EM-37)
1000 Independence Avenue, S.W.
Washington, D.C. 20585-0001
USA

1995-06-09
HBM/KS/GC

Attention Mr. Charles Head

Subject: Draft Environmental Impact Statement on a Proposed Nuclear Weapons Non-Proliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, US Department of Energy, March 1995, DOE/EIS-0218D

Dear Mr. Head,

Risø National Laboratory (Risø) in Denmark hereby submits comments to the above mentioned Draft Environmental Impact Statement.

We wish to express our appreciation of the great effort, which has been performed by the Department of Energy and the Department of State preparing this very comprehensive and detailed document. We see it as a strong commitment by the US Government to reestablish the earlier policy for return of US origin spent nuclear fuel from foreign research reactors. 133-1

We urge DOE to carry the ongoing process through to an early and finally positive Record of Decision in order to end nearly seven years of uncertainty concerning the future of our research reactor.

Being a member of the "Edlow Group" of foreign research reactors, Risø wants to refer to the detailed statements and comments from this group, which we strongly support.

RESPONSE TO COMMENT
COMMENTOR NO. 133: RISO NATIONAL LABORATORY

Response to Comment No. 133-1

The commentor's appreciation for the efforts put forth in preparation of this document is noted. It should be noted, however, that the acceptance of all the spent nuclear fuel from foreign research reactors (Management Alternative 1) is only one of three management alternatives and one of four overall alternatives being considered in this EIS. While the final EIS does contain a preferred alternative (Sections 2.9 and 4.7 of the EIS), the final decision on implementation of the proposed action will be presented in the Record of Decision.

COMMENTOR NO. 133: RISO NATIONAL LABORATORY (CONT'D.)

2

Danish Background

In what follows, we will give our comments in particular with background in the Danish situation:

Denmark has always strongly supported all international initiatives leading up to the Non-Proliferation Treaty, and Denmark was one of the first countries to ratify this treaty in January 1969. Denmark, and especially Risø, actively supported and participated in the International Nuclear Fuel Cycle Evaluation, INFCE, and in accordance with this Danish policy Risø as operator of the Danish research reactor DR 3 actively joined the US-initiated RERTR Programme. Under this programme, Risø developed its own manufacturing process for low-enriched uranium-silicide fuel elements for the DR 3 Reactor.

Conversion to LEU fuel started in 1988 and full conversion was achieved in 1990, DR 3 being one of the first converted research reactors. Out of its own limited research funds, Risø invested more than 1 Million US Dollars in this conversion process.

Risø National Laboratory is a governmental institution, which was founded in 1956 as a consequence of an agreement, signed on July 25, 1955, between the Government of the United States and the Danish Government, for cooperation on civil uses of atomic energy. This agreement was later amended, and the first two research reactors at Risø were of American origin, while the third reactor, DR 3, operating since 1960, is a British type. Up to 1973, the spent fuel, containing HEU of US origin, was shipped to the U.K. for reprocessing in agreement with US authorities. Between 1978 and 1988, 684 spent fuel elements from the DR 3 reactor were shipped in 19 shipments to the US for reprocessing.

Thus, for more than 33 years, the operation of the DR 3 has depended on the shipment of the spent fuel elements for reprocessing and/or final storage, first to the U.K. and later on to the United States.

Plans for final storage of high-level radioactive waste in Denmark have never been established. After the decision in 1985 by the Danish Parliament to exclude nuclear power reactors from the Danish energy systems, no such plans could be expected to be established in a foreseeable future. Therefore reprocessing at the British Dounreay Plant is no option for Risø because this would include the obligation for Denmark to take back the high-level waste.

The 10 MW heavy-water moderated and cooled research reactor, DR 3, is today one of the most efficiently exploited research reactors in Europe and is part of the Large Installations Programme under the research programmes of the European Union. Annually this attracts more than 100 European and American scientists, specialized in Materials Science to join the international recognized group of Danish scientists. The reactor is globally also one of the largest producers of irradiated silicon for semi-conductors, and covers the Danish needs for short-lived and specialized radio-isotopes for medical use.

RESPONSE TO COMMENT
COMMENTOR NO. 133: RISO NATIONAL LABORATORY (CONT'D.)

COMMENTOR NO. 133: RISO NATIONAL LABORATORY (CONT'D.)

3

Specific Comments on the Draft EIS

From what has been said above, it is obvious that the continued operation of the Danish research reactor DR 3 can only be assured under the Management Alternative 1: "Manage Foreign Research Reactor Spent Nuclear Fuel in the United States", or under Management Alternative 3: "A Combination of Components of Management Alternatives 1 and 2" (Hybrid Alternative). 133-2

Management Alternative 2: "Facilitate the Management of Foreign Research Reactor Spent Nuclear Fuel Overseas" would not be a politically acceptable solution in Denmark, even in the case where the reprocessing waste might be accepted by the United State for storage and ultimate geological disposal. It should be noted that all of the Scandinavian countries are opposed to reprocessing of nuclear fuel, and more specifically, they want the Dounreay Facility closed, based on environmental arguments. 133-3

Policy Duration

The proposed formulation: "Spent nuclear fuel containing HEU and LEU of US origin, that is currently being stored or is to be generated during the 10 year policy period" and "the shipment of spent nuclear fuel could be made for an additional 3 years' period", is reasonable but should also be considered as a minimum duration period. Any shorter duration would be extremely harmful to the planning and operation of the research reactors and to the possibilities of ensuring the shipment of all spent fuel, currently being stored. 133-4 133-5

The DR 3 reactor has now been in operation for 35 years, and the remaining life-time of the reactor is estimated to 10-15 years.

Therefore, we suggest that the possibility of negotiating individual bilateral contracts between e.g. DOE and Risø, covering the reception of spent nuclear fuel for the remaining life-time of the reactor, could be taken into consideration. 133-6

Financing Arrangements

As previously mentioned, Risø National Laboratory is a governmental institution, with about 50% financial funding from the Government. The remaining funds come out of national and international research programmes, which normally do not cover the related overheads. Only a limited amount of income arises from commercial contracts. This means that Risø is not a commercial company, and the high costs of running an advanced research reactor must entirely be covered within Risø's budget. Therefore the "competitive fee" which will be charged by DOE, and to which has to be added the transportation costs, should not be unrealistic high, compared to the price of 1000 Dollars per kilogramme heavy metal existing before 1988 and which price was supposed to be on a full cost recovery basis. 133-7

RESPONSE TO COMMENT COMMENTOR NO. 133: RISO NATIONAL LABORATORY (CONT'D.)

Response to Comment No. 133-2

The commentor's preference for Management Alternatives 1 or 3 is noted. These alternatives are described in Sections 2.2 and 2.4 of the EIS, respectively.

Response to Comment No. 133-3

The commentor's opposition to Management Alternative 2 and to reprocessing in general, is noted.

Response to Comment No. 133-4

The commentor's position that thirteen years represents a minimum appropriate acceptance period for spent nuclear fuel from foreign research reactors is noted. Sections 2.2.1 and 2.2.2 of the EIS discuss policy duration.

Response to Comment No. 133-5

See response to comment 133-4, above.

Response to Comment No. 133-6

Bilateral agreements are possible so long as they comply with the adopted policy and do not result in environmental impacts not addressed in this EIS.

Response to Comment No. 133-7

A competitive fee should be based on current market conditions for the most realistic alternatives, e.g., reprocessing at Dounreay, rather than on non-market fees charged before 1988. The ultimate fee structure would depend on the implementation alternative specified in the Record of Decision, and would include the charges for U.S. acceptance and disposal of high-level waste from Dounreay, if that is part of the alternative.

COMMENTOR NO. 133: RISO NATIONAL LABORATORY (CONT'D.)

4

Legal Obligations

The draft EIS does not make reference to any legal obligations by DOE to receive spent research reactor fuel.

For the record, we want to point out that as a consequence of the RERTR Programme, an agreement (dated June 15, 1984) exists between the University of Chicago (Operator of Argonne National Laboratory, ANL) and Risø National Laboratory, in which ANL agrees to accept three spent LEU fuel elements from Risø. This transfer has not taken place, and it is stated that this agreement shall remain in force until the designated fuel elements are delivered to the designated site and accepted by Argonne National Laboratory.

133-8

Amount of Foreign Research Reactor Spent Nuclear Fuel

We can agree with the figures given in Table 2-1 on Page 2-7, Vol. 1, concerning Denmark. The estimated number of shipments will, of course, depend on the size of casks available. For reason of comparison, it might be noted that during the years 1962 to 1988, Risø has performed in all approximately 60 shipments with more than 1700 spent fuel elements without any technical problems.

On behalf of Hans Bjerrum Møller, Managing Director

Yours sincerely,

Jørgen Kjems
Deputy Director

RESPONSE TO COMMENT COMMENTOR NO. 133: RISO NATIONAL LABORATORY (CONT'D.)

Response to Comment No. 133-8

With the exception of cases in which DOE has executed contracts for acceptance of spent nuclear fuel from specific foreign research reactors, DOE considers that neither the DOE nor the United States Government has any legal obligation to accept spent nuclear fuel from foreign research reactors.

COMMENTOR NO. 161: MCMASTER UNIVERSITY

McMASTER UNIVERSITY
NUCLEAR REACTOR
1280 Main Street West, Hamilton, Ontario, Canada L8S 4K1
Telephone: (905) 525-9140 Ext. 23270; Fax: (905) 528-4339
Email: reactor@mcmaster.ca

13 June 1995

Mr. Charles R. Head,
Office of Spent Fuels Management, EM-37
U.S. Department of Energy,
1000 Independence Avenue, SW,
WASHINGTON, DC 20585-0001,
U.S.A.

Dear Mr. Head:

Subject: McMaster Nuclear Reactor's Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

In reviewing the draft EIS several general comments and some specific ones were formulated. As a member of the Edlow Group we have already tabled our general comments which we will not repeat here for brevity. Likewise our Canadian colleagues from Atomic Energy of Canada Limited (AECL) have stated some general comments addressing the Canadian perspective which we support. We would like, however, to address concerns specific to the McMaster Nuclear Reactor (MNR).

The most important comment from MNR is that the proposed schedule for completion of the Final EIS and the resulting Record of Decision (ROD) be adhered to and, in fact, accelerated as much as possible. As stated on several previous occasions, MNR will run out of spent fuel storage space very early in 1996. The fact that McMaster recently announced that the reactor will be shutdown for decommissioning in January 1996 does not reduce the problem, in fact it may exacerbate it. 161-1

We gather from the wording in Appendix E - Evaluation of Human Health Effects of Overland Transportation, that the truck routes shown in Figure E1-21 - Representative Truck Routes from Eastern Canada to Department of Energy Sites, are just that; representative. The routes shown are those that would be taken for the AECL shipments from Chalk River, Ontario, entering United

.... continued

RESPONSE TO COMMENT
COMMENTOR NO. 161: MCMASTER UNIVERSITY

Response to Comment No. 161-1

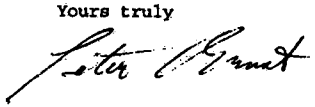
DOE intends to complete work on this EIS as soon as practicable. However, in completing this effort, DOE must comply with NEPA and applicable internal DOE procedure and regulation which require a thorough review of the document and the analyses contained therein, and approval by all appropriate officials, including the Secretary. In accordance with NEPA, DOE anticipates issuing the Record of Decision no sooner than 30 days after publication of the final EIS.

COMMENTOR NO. 161: MCMASTER UNIVERSITY (CONT'D.)

States at Alexandria Bay, NY. The route from MNR is not shown but presumably, from the wording - representative - could be used. That route, approved by the USNRC for many shipments in the past, enters United States at Buffalo, NY and then follows I-190 south to I-90, I-90 west to I-79, I-79 south to US-48, US-48 east to US-40, US-40 east to I-70, and I-70 south to I-81 where we are back on the route shown in Figure E1-21 to the Savannah River Site (SRS). Our comment is to ensure that the MNR route to SRS be explicitly included if it is not implicitly included by the word "representative". 161-2

We congratulate DOE on bringing the return of foreign spent fuels issue to a point where a favourable resolution seems imminent. We trust that DOE's commitment to this policy will not be derailed by side issues and look forward to the issuance of the Final EIS in early September. 161-3

Yours truly



Peter C. Ernst
Reactor Manager

cc: Guy Saint-Jacques, Canadian Embassy, Washington
Jack Edlow, Edlow International
W. J. Garland, MNR

RESPONSE TO COMMENT
COMMENTOR NO. 161: MCMASTER UNIVERSITY (CONT'D.)

Response to Comment No. 161-2

The word representative does allow for the inclusion of additional routes. Representative routes were chosen for the purpose of risk analysis. On the other hand, the shipments from the MNR reactor could travel over Canadian roads to enter the United States at Alexandria Bay, NY. The shipper would request that the NRC approve its exact route before each shipment or campaign of shipments.

Response to Comment No. 161-3

The commentor's preference for acceptance of the spent nuclear fuel from foreign research reactors into the United States is noted (Section 2.2 and 2.4 of the EIS, Management Alternative 1 or 3).

COMMENTOR NO. 164: AUSTRALIAN NUCLEAR SCIENCE & TECHNOLOGY ORGANIZATION

AUSTRALIAN NUCLEAR SCIENCE
& TECHNOLOGY ORGANISATION

LUCAS HEIGHTS RESEARCH LABORATORIES NEW ILLAWARRA ROAD, LUCAS HEIGHTS, NSW

PRIVATE MAIL BAG 1
MENAI NSW 2234

14 June, 1995

Mr Charles Head
Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
US Department of Energy
1000 Independence Avenue, SW
WASHINGTON DC 20585
USA

by fax: 1-202-586-5258

Dear Mr Head

ANSTO Comments on Draft EIS, DOE/EIS-0218D of March 1995

The Australian Nuclear Science and Technology Organisation (ANSTO) is grateful for the opportunity to comment on the *Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.*

ANSTO's comments on the Draft EIS are attached and we trust these will be taken into account in the finalisation of this important document. In summary, we are highly supportive of the proposal which we believe will serve well the interests of nuclear nonproliferation as well as meeting existing USDOE obligations to research reactor operations.

Yours sincerely

John Rolland

John Rolland
Director, Information Services

ansto

Telephone (02) 717 3111 • Telegram Ansto Sydney • Facsimile (02) 543 5097 • Telex AA 24562

RESPONSE TO COMMENT
COMMENTOR NO. 164: AUSTRALIAN NUCLEAR SCIENCE & TECHNOLOGY ORGANIZATION

COMMENTOR NO. 164: AUSTRALIAN NUCLEAR SCIENCE & TECHNOLOGY ORGANIZATION (CONT'D.)

AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION
COMMENTS ON DRAFT EIS ON A PROPOSED NUCLEAR WEAPONS NONPROLIFERATION POLICY CONCERNING FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL

GENERAL

We greatly welcome the issue of this Draft EIS on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. The quality of the report is of a very high standard and the coverage comprehensive. The analysis provided in the EIS is convincing and a more than adequate basis to support the conclusions that the policy to accept foreign research reactor fuel will have an extremely low health and environmental impact. 164-1

We particularly welcome the clear statement that the objective of the policy is to secure for the United States the nonproliferation benefits of reducing, and ultimately eliminating, HEU from civilian commerce. We believe that the proposed policy will produce real nonproliferation gains by reducing the quantities and locations of HEU holdings around the world. It follows that where the EIS offers alternatives or proposes conditions or criteria for participation, then only those alternatives, criteria or conditions that lead to maximising the return of HEU to the US, and hence maximising the benefits to the US, should be seen as meeting the basic objectives of the EIS. 164-2

It follows from the above that of the major options analysed the clearly preferred approach should be the Basic Implementation of Management Alternative 1, as this approach fully maximises the quantity of returned spent fuel and is thus likely to be most successful in addressing the fundamental objectives of the policy. 164-3

We feel that in assessing the environmental impact of this proposed policy it is important to keep in perspective that the total amount of foreign research reactor spent fuel considered for return to the US (less than 20 tonnes HM) is only a tiny fraction of the existing US holdings of DOE research reactor (2,700 tonnes) or commercial power reactor (28,000 tonnes) spent fuel. 164-4

Finally, it is noted that the EIS is jointly the responsibility of the United States Department of Energy and the United States Department of State. We consider this to be highly appropriate and would suggest that this fact be reflected by inclusion of Department of State on the Cover of the EIS as joint sponsor. 164-5

In addition to these general comments we have a number of suggestions to offer regarding details of the EIS which we feel would further improve the technical soundness of the case. These suggestions and comments are provided in the following section.

1

RESPONSE TO COMMENT
COMMENTOR NO. 164: AUSTRALIAN NUCLEAR SCIENCE & TECHNOLOGY ORGANIZATION (CONT'D.)

Response to Comment No. 164-1

The commentor's acknowledgment that the analysis in the EIS supports the conclusion of low human health or environmental impacts as described in Section 4 of the EIS, is noted.

Response to Comment No. 164-2

The commentor's position on the need for reduction of HEU in civilian commerce is noted.

Response to Comment No. 164-3

The commentor's support for the basic implementation of Management Alternative 1 as described in Section 2.2.1 of the EIS is noted.

Response to Comment No. 164-4

As discussed in Section 2.2.1.3 of the EIS, the amount of foreign research reactor spent nuclear fuel to be managed under the proposed action is less than 1 percent of the total mass of heavy metal that DOE currently manages as spent nuclear fuel. The environmental impacts evaluated in Section 4 of the EIS reflect the management of the foreign research reactor spent nuclear fuel portion.

Response to Comment No. 164-5

In compliance with the National Environmental Policy Act and Council on Environmental Quality Regulations (Section 5 of the EIS), DOE is the lead agency for the proposed action, and the Department of State is a cooperating agency. While DOE assumes primary responsibility for preparation of this EIS, the document was developed under consultation with the Department of State. It is customary to include the names of the lead agencies on the cover of the EIS and acknowledge the cooperative agencies in the text of the EIS. Omission of the cooperating agency's status on the cover is not intended to diminish the Department of State's significant contributions to this EIS.

COMMENTOR NO. 164: AUSTRALIAN NUCLEAR SCIENCE & TECHNOLOGY ORGANIZATION (CONT'D.)

DETAILED COMMENTS

Reprocessing Wastes - Throughout the EIS these are frequently referred to as high level wastes and vitrified HLW. For example in the Summary Volume on p 11, p 24, and p 46. Our understanding is that the UK reprocessor does not produce a vitrified HLW waste form but that the waste is cemented and of such low heat generation and activity that it does not qualify as HLW but rather is long-lived ILW. This distinction can be important for some disposal options and should be recognised in the EIS. 164-6

Costs/charges - The cost estimates, eg on p47 of the Summary, seem inflated. If these costs were to be charged on a full cost recovery basis the charges would certainly not be competitive with other current reprocessors and would be several times the charges previously levied by USDOE or included in earlier USDOE reprocessing contracts. Such charges would clearly undermine the policy and cause foreign research reactor operators to seek alternative solutions such as overseas reprocessing which is only available for HEU fuels. This would perpetuate the undesirable worldwide holdings of HEU and continuation of HEU use, contrary to the intended impact of the policy. We note that the US Government Accounting Office has recommended, in GAO/RECD-94-118 (p14), that the DOE should assess the operators of foreign research reactors a charge for returned spent fuel that balances the need to minimise the cost burden on the US with the reactor operators' need for a reasonable affordable charge. We strongly endorse this approach. We further point out that the fundamental objective of the policy is not to provide a commercial service for the foreign research reactor operators but to support US nonproliferation policies. It is also meeting commitments given to foreign research reactor operators over many years, including contractual obligations in some cases. We therefore consider that the US should clearly expect to meet a significant part of the resultant cost in obtaining these nonproliferation benefits. 164-7

Specific Comments on Vol 1

Management Alternative 2 generally - We give little support to this alternative as it would result in a perpetuation of overseas storage and/or processing of HEU which is directly contrary to the objectives of the EIS. However, should this option be adopted we make the point that Australia is one of those countries without a nuclear power industry that is not in a position to readily take back reprocessing wastes. We would therefore look for any wastes to be accepted by the US for storage and ultimate geologic disposal. 164-8

P 2-55, Section 2.6.5.2 - In connection with "chemical separation", the statement is made that "Vitrification of the high-level waste is the preferred waste management approach." We would see benefit in having a range of approaches available to optimise waste management on the basis of, for example, whether the waste is really HLW or, in some cases, ILW, and depending on what specific disposal alternatives are available. For some circumstances cement or Synroc or other wasteforms might be preferable to glass. 164-9

2

RESPONSE TO COMMENT
COMMENTOR NO. 164: AUSTRALIAN NUCLEAR SCIENCE & TECHNOLOGY ORGANIZATION (CONT'D.)

Response to Comment No. 164-6

In the United States, the waste stream from chemical separations that contains most of the fission products is always termed high-level waste, independent of the specific activity. The cemented waste produced at the Dounreay site would not be acceptable in the United States. The possible exchange of vitrified high-level waste from Sellafield for cemented waste from Dounreay is discussed in Section 4.4.2.3 of the EIS.

Response to Comment No. 164-7

The price of overseas reprocessing would be a consideration in establishing the U.S. price (not cost) for management of spent nuclear fuel accepted from developed countries. The analysis in the final EIS assumes that the price of foreign reprocessing is similar to the cost of chemical separation in the United States.

The requirement that countries reprocessing at Dounreay (or Marcoule) accept the return of their high-level waste is a factor that these countries must consider in deciding how to proceed. For countries without waste handling capability, accepting the waste would not be feasible. For countries with waste handling capability, especially those with large-scale power reactor programs, accepting the waste could be acceptable.

One alternative is for the United States to base its fee on the competitive fees charged by others, notably Dounreay. These fees would have to be adjusted for factors such as the ultimate acceptance of the high level waste. For developed countries, affordability would be treated in the context of the cost to the foreign research reactors for alternatives to U.S. acceptance, not the revenues or budgetary factors affecting the foreign research reactor operators.

Response to Comment No. 164-8

The commentor's opposition to Management Alternative 2 is noted. The fact that Australia has no nuclear power infrastructure is also noted.

Response to Comment No. 164-9

See the response to Comment 164-6, above.

COMMENTOR NO. 164: AUSTRALIAN NUCLEAR SCIENCE & TECHNOLOGY ORGANIZATION (CONT'D.)

P 3-9, Section 3.1.2 - It is mentioned that seawater naturally contains around 1 pCi/L of uranium radioactivity as a baseline for assessing potential impacts on the marine environment. It would place marine radioactivity into a more accurate perspective if the EIS also showed the 300 pCi/L of potassium-40 radioactivity that is also ubiquitous in seawater. 164-10

Pp 4-9 to 4-10 - The assessment that the population dose to ships' crews for the entire 13 year program would not exceed 85 person-rem for the case of regularly scheduled commercial ships and 75 person-rem in the case of chartered ships is certainly a convincing demonstration that the impact on crew will be inconsequential. However, given the precision of the estimates and underlying assumptions, the difference between 85 person-rem and 75 person-rem does not permit the conclusion on page 4-9 that "the use of a chartered ship represents the means of shipping the foreign research reactor spent nuclear fuel expected to result in lower total crew exposures, and lower overall crew risk for basic implementation of Management Alternative 1." Rather the conclusion should be that "shipment by either mode results in similar, inconsequential exposure and risks to crews and estimated radiation exposure cannot be a basis for preferring one mode of shipping over another." ANSTO considers that the sea shipment of the spent fuel should be in accordance with the internationally agreed provisions of the IAEA Transport Regulations and the IMO Code. Any EIS requirement to use only specially chartered vessels would be unwarranted and would be an extreme financial disincentive against participation, particularly for countries like Australia and other Pacific and Indian Ocean countries where there is no opportunity to aggregate shipments from several countries. Such an outcome would therefore be highly prejudicial to the fundamental objectives of the EIS. 164-11 164-12

P 4-117, Section 4.6 and data in Section 4.7 - In these sections and throughout the EIS it is suggested that the No Action Alternative will have no impact within the US. This is not correct, at least at the inconsequential scale of the many other impacts that are examined in great detail in the EIS. As stated in the EIS the US currently relies on overseas research reactors for essentially 100% of its medical radioisotopes. It is also acknowledged that adopting the No Action Alternative will inevitably lead to the closure of a number of these overseas reactors. It follows directly that in this circumstance the availability of medical radioisotopes to the US will decrease with obvious detrimental public health impact in the US. Alternatively, the US could address any shortfall by establishing major isotope production operations at its own research reactors. The radiation exposures and risks from such an implication, though undoubtedly very small, should nonetheless be counted as a detriment against the No Action Alternative as they would be a direct consequence of adopting this alternative. 164-13

ANSTO Specific Comments (Volume 2 refers)

Number of fuel elements from Australia included - We note that 975 elements are shown as the Australian total of US-origin elements up to year 2006 (Table 2-1), while Table B-9 shows 795 elements up to year 2001. We note that in arriving at these 164-14

3

RESPONSE TO COMMENT
COMMENTOR NO. 164: AUSTRALIAN NUCLEAR SCIENCE & TECHNOLOGY ORGANIZATION (CONT'D.)

Response to Comment No. 164-10

Mention of non-uranium radioisotopes found in seawater has been added to Section 3.1.2 of the EIS.

Response to Comment No. 164-11

The section cited by the commentor (Section 4.2.1.2 of the EIS) has been revised to indicate that the selection of chartered or regularly scheduled ships would be based on several factors, including crew exposures and costs.

Response to Comment No. 164-12

DOE agrees with the commentor. The analysis in the EIS demonstrates that the use of commercial ships is a viable means to transport the foreign research reactor spent nuclear fuel.

Response to Comment No. 164-13

Most of the radioisotopes used in nuclear medicine in the United States (Section 1.1 of the EIS) come from foreign research reactors. In the event that foreign research reactors that supply medical isotopes to the United States were forced to shut down, it would be necessary to find alternative foreign suppliers or augment capabilities for domestic production of medical radioisotopes. Construction of a new reactor, if these shutdowns occur and if a new reactor in the United States were required, would have to be addressed under a separate environmental document.

Response to Comment No. 164-14

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy. The policy is limited to those spent nuclear fuel elements that contain uranium enriched in the United States (Sections 1.3 and 2.1 of the EIS). DOE and the Department of State consider that only 50 percent of the spent nuclear fuel elements in question contain U.S.-origin enriched uranium. It is the amount of U.S.-origin material that is of concern to the United States, and not the precise atoms or molecules which must be accounted for. Therefore, consistent with the policy, 221 out of 441 elements were considered to be acceptable.

COMMENTOR NO. 164: AUSTRALIAN NUCLEAR SCIENCE & TECHNOLOGY ORGANIZATION (CONT'D.)

numbers the DOE has counted some 441 HIFAR fuel elements that contain both US-origin and UK-origin HEU as if they are only 220 US-origin elements. This is a curious and arbitrary decision because it serves to unnecessarily deprive the US of the nonproliferation benefit of the return of the additional 221 elements that could otherwise be achieved if all the elements containing US-origin HEU were included. The physical facts are that all 441 relevant elements contain US-origin HEU, all 441 elements have been regularly included in the US-origin inventory that Australia is required to submit to US authorities and all 441 elements have been accepted by US authorities as being part of the Australian inventory of US-origin HEU. It is contrary to the objectives of the EIS to omit these additional 221 elements from the EIS and hence deny the US the benefits of their inclusion so clearly spelt out in the EIS.

164-14 (Cont'd.)

MOATA Status, Table B-6 - In line with the recent ANSTO Board decision to cease operating Moata at the end of May 1995, it would now be appropriate to have Moata moved to the category of "Shutdown Reactors Possessing HEU Fuel". The IAEA has been formally advised of the shutdown of Moata.

164-15

LHRL-120 Configuration - The statement on the bottom of page B-21 that LHRL-120 has only one internal configuration and can accommodate only a specific type of spent nuclear fuel is incorrect and should be deleted as it could have commercially prejudicial impact. LHRL-120 holds the fuel in removable baskets just like IU-04, and these can be manufactured to accommodate the different geometries of a wide range of fuels, subject only to the decay heat/activity and criticality limits of the certificate. (This would not however change the "bounding cask" decision for the EIS.)

164-16

Finally, we are disappointed to note that nowhere does the EIS indicate that USDOE has legal obligations in the form of a signed contract with ANSTO to take back US-origin spent fuel and that failure to proceed with this policy could expose DOE to legal proceedings for redress. Indeed, failure to honour this commitment has already lead to the Australian Government reviewing its options for the management of spent research reactor fuel and may force Australia to consider conditioning its spent fuel into a more stable and more amenable wasteform for storage and ultimate disposal, recognising that waste acceptance criteria for direct disposal of research reactor spent fuel in a repository have not been developed. Australia's unique and large holdings of UK-origin, US-origin and unobligated (Australian-origin) HEU spent fuel lend some attraction to this domestic conditioning option in the circumstances of uncertain and expensive overseas options.

164-17

Australian Nuclear Science and Technology Organisation
June 1995

4

RESPONSE TO COMMENT
COMMENTOR NO. 164: AUSTRALIAN NUCLEAR SCIENCE & TECHNOLOGY ORGANIZATION (CONT'D.)

Response to Comment No. 164-15

Table B-3 of Appendix B has been revised and the status of MOATA reactor is changed to Shutdown Reactors Possessing HEU Fuel.

Response to Comment No. 164-16

The reference to LHRL-120 in Appendix B (page B-21) of the EIS was only intended to indicate that a variety of certified spent nuclear fuel transportation casks (including basket and internals) are available. Currently, the LHRL-120 does not have a certification to use fuels other than the one that it is specifically designed for, which is HIFAR spent nuclear fuel. The IU-04 transportation cask has already been certified to carry different baskets and fuels. Nevertheless, Appendix B, Section B.1.6 has been revised to avoid any commercially prejudicial impact.

Response to Comment No. 164-17

It is DOE's position that neither DOE nor the United States Government has any legal obligation to accept spent nuclear fuel from foreign research reactors.

COMMENTOR NO. 199: COMMONWEALTH DEPARTMENT OF PRIMARY INDUSTRIES AND ENERGY

COMMONWEALTH DEPARTMENT OF PRIMARY INDUSTRIES AND ENERGY
EDMUND BARTON BUILDING, BARTON ACT
Postal Address: GPO Box 858, Canberra ACT 2601 Tel: (06) 272 3933 Telex: 62188 Fax: (06) 272 5161

Mr Charles Head
Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
US Department of Energy
1000 Independence Avenue, SW
WASHINGTON DC 20585
USA

Dear Mr Head

The Australian Department of Primary Industries and Energy (DPIE) which has responsibility for radioactive waste management policy in Australia, welcomes the opportunity to comment on the *Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.*

Australia has given long standing international support to policies which contribute to nuclear non-proliferation. Most recently Australia made a significant contribution to achieving indefinite extension of the *Treaty on the Non-Proliferation of Nuclear Weapons* (NPT). Australia's efforts complemented the US approach to achieve this objective. DPIE believes that continuance of US policy on the return of spent research reactor fuel will also contribute considerably to non-proliferation.

DPIE would therefore wish to place on record its support for the policy and the maintenance of non-proliferation as the primary objective throughout the draft EIS. DPIE supports full implementation of Management Alternative 1 and believes that the draft EIS convincingly supports the conclusion that the policy will have minimal environmental impact. *199-1*

On a more practical level, it is important to state that as Australia does not have a nuclear power industry, it is not in a position to readily accept for storage or disposal waste from the reprocessing of research reactor spent fuel. Australia has therefore come to rely on undertakings given by the US over the past thirty years that it will repatriate research reactor spent fuel of US origin. *199-2*

We should add that we consider that there is also a contractual commitment in place on the part of the US to take back research reactor spent fuel of US origin. *199-3*

Lastly, full implementation of Management Alternative 1 would also greatly assist in Australia's considerations on a replacement research reactor. A decision in this regard is dependent on the satisfactory resolution of the management of our existing inventory of spent fuel. *199-4*

RESPONSE TO COMMENT
COMMENTOR NO. 199: COMMONWEALTH DEPARTMENT OF PRIMARY INDUSTRIES AND ENERGY

Response to Comment No. 199-1

The commentor's support for the proposed action, the maintenance of nonproliferation and the full implementation of Management Alternative 1, as described in Section 2.2 of the EIS is noted.

Response to Comment No. 199-2

DOE acknowledges that Australia is not in a position to readily accept for storage or disposal waste from the reprocessing of research reactor spent nuclear fuel. This alternative is discussed in Sections 2.3 and 4.4.2 of the EIS.

Response to Comment No. 199-3

It is DOE's position that neither DOE nor the United States Government has any legal obligation to accept spent nuclear fuel from foreign research reactors.

Response to Comment No. 199-4

DOE does not wish to complicate Australia's decisions regarding a replacement research reactor. Nevertheless, as specified in Section 2.1 of the EIS, spent nuclear fuel (either HEU or LEU) would not be accepted from any new research reactor starting operation after the implementation date of any new foreign research reactor spent nuclear fuel management policy. Accordingly, this comment is beyond the scope of the EIS.

COMMENTOR NO. 199: COMMONWEALTH DEPARTMENT OF PRIMARY INDUSTRIES AND ENERGY (CONT'D.)

In summary our views should be seen as supportive of Management Alternative 1.

Yours sincerely

R N Rawson
Assistant Secretary
Uranium & Nuclear Policy Branch

13 June 1995

RESPONSE TO COMMENT
COMMENTOR NO. 199: COMMONWEALTH DEPARTMENT OF PRIMARY INDUSTRIES AND ENERGY (CONT'D.)

COMMENTOR NO. 214: EURATOM SUPPLY AGENCY

950623

EURATOM-VERSORGUNGSAGENTUR
EURATOM SUPPLY AGENCY
AGENCE D'APPROVISIONNEMENT D'EURATOM

Brussels, 15. VI. 1995
JM237jm/jms

Fax No. 1-202-586 5256

Mr. Charles Head
Office of Spent Fuel Management,
EM-37
US Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

Subject: Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head,

The Euratom Supply Agency welcomes the completion and publication of the subject Draft Environmental Impact Statement (EIS). We regret that it took so long to arrive at the decision to prepare such a draft EIS given the hardship on the reactor operators for having to store their spent fuel for much longer than could reasonably be anticipated.

The return of spent research reactor fuel originally supplied by the United States is vital, in particular for countries which do not have a commercial nuclear power programme and which therefore have no sites for the disposal of spent nuclear fuel/waste. As these countries have relied on assurances provided by the United States for the final disposal of their spent fuel, it would be highly uneconomical and unreasonable for them now to have to build repository sites for minute quantities of fuel or high level waste.

214-1

Some reactor operators are under intense pressure to remove spent fuel from their sites to be able to justify continued operation or to decommission the reactors. Any further delays by DOE in completing the EIS, or in issuing a Record of Decision, would create emergency situations which should be avoided.

Yours sincerely,

M. Goppel
Director-General

Postal address: Rue de la Loi 200, B-1049 Brussels, Belgium - MDR 805
Telephone: direct line (+32-2)295.28.68 exchange 295.11.11 Telex: COMEU B 21877 . Fax: 295.08.27
Office address: Rue du Luxembourg 46, B-1040 Brussels, Belgium

RESPONSE TO COMMENT
COMMENTOR NO. 214: EURATOM SUPPLY AGENCY

Response to Comment No. 214-1

The commentor's support for Management Alternative 1, as described in Section 2.2 of the EIS, is noted.

COMMENTOR NO. 216:
PHYSIKALISCH-TECHNISCHE BUNDESANATALT

W. Hajek In

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

PTB

Physikalisch-Technische Bundesanstalt Postfach 33 45 38038 Braunschweig

Charles Head, Program Manager
Office of Spent Nuclear Fuel
Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585
U.S.A.

Ihr Zeichen, Ihre Nachricht vom	Unser Zeichen, unsere Nachricht vom	Telefon	Datum
	7.11/95/Haj-wa	7110	16.06.95

Comment on: Published Draft Environmental Impact Statement on a Proposal Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Charles Head

First of all, we like to thank you for your extraordinary efforts which led to the publication of the Draft EIS, highly appreciated by us.

We are memeber of the so-called 'Edlow Group' and support the comments which have been filed through this Group on behalf of the foreign Research Reactor group members.

In addition, with reference to the our specific facility - the FMRB reactor - we believe it is imperative that DOE supplements ist eligibility criteria on page 2-5 of Volume 1 of the Draft EIS to include following language:

„Spent nuclear fuel (HEU) would be accepted from research reactors (e.g. FMRB of PTB) planning to shut down by a specific date and which, although they have not yet converted to LEU fuel, consume only that HEU fuel which was already previously purchased and is available on site."

We believe, this language is essential to minimize the likelihood of ambiguity or confusion in the existing language.

216-1

Hausadresse, Lieferanschrift:
Bundesallee 100
38116 Braunschweig
Deutschland

Telefon (Zentrale):
(0531) 592 0
Telefax:
(0531) 592 92 92

Bundeskasse Hannover
Postbank 3005-304 (BLZ 250 100 30)
Bundesbank Hannover
LZB Hannover 250 01 000 (BLZ 250 000 00)

PTB Berlin-Charlottenburg
Abbestraße 2-12, 10587 Berlin
PTB Berlin-Frohnau
Fläminwalder Damm 386, 12587 Berlin

RESPONSE TO COMMENT
COMMENTOR NO. 216:
PHYSIKALISCH-TECHNISCHE BUNDESANATALT

Response to Comment No. 216-1

DOE considers that the discussion in Section 2.1 of the EIS under Qualifying Fuel Types and Policy Stipulations is appropriate. The proposed policy is not intended to cover spent nuclear fuel from foreign research reactors that plan to shutdown at a date beyond the expiration of the policy.

COMMENTOR NO. 216: PHYSIKALISCH-TECHNISCHE BUNDESANATALT (CONT'D.)

We count on your continued co-operation and like to thank your for unterstanding of our urgent need of a successful implementation of this Policy.

Yours faithfully

Address Correspondence to:

Physikalisch-Technische Bundesanstalt
Walter Hajek
Bundesallee 100
38023 Braunschweig
Tel. +int+ 531 592 7110
Fax +int+ 531 592 7015
Email: Walter.Hajek@.PTB.DE

RESPONSE TO COMMENT
COMMENTOR NO. 216: PHYSIKALISCH-TECHNISCHE BUNDESANATALT (CONT'D)

COMMENTOR NO. 258: STUDSVIK

Studsvik

Handläggare - Matter handled by

Datum - Date
June 16, 1995
Ert datum - Your date

1(2)
Vår referens - Our reference
LE/Kdt
Er referens - Your reference

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585
USA

Comments of Studsvik AB on DOE's Draft Environmental Impact Statement on a Proposed Nuclear Weapons Non-proliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Studsvik AB is pleased to have the opportunity to comment on DOE's Draft Environmental Impact Statement DOE/EIS-0218D released in April 1995 and discussed at DOE's public hearing held on May 31, 1995 in Washington DC.

These comments are made in addition to the comments of the Edlow Group submitted jointly by 14 research reactor operators including Studsvik AB.

Three management Alternatives listed in the Draft EIS are understood as follows:

1 Acceptance and management of foreign fuel from US enrichment origin at DOE sites – with interim storage or near-term chemical separation in the US.

2 Facilitation of financial and technical assistance to foreign research reactor operators to store SNF at their sites – or ship it for reprocessing at French or British facilities.

3 Development of a hybrid approach, using a combination of the first two alternatives.

Of these three Management Alternatives, Studsvik finds only Alternative 1 to be totally acceptable as it is listed. However, Studsvik could support and participate in the development and implementation of Alternative 3, ***provided that reprocessing or chemical separation was not*** an integral part of the approach. Reprocessing of the SNF is not an acceptable option for Studsvik since it involves relinquishing control of the fuel to a foreign nation(s). *258-1* *258-2*

RESPONSE TO COMMENT
COMMENTOR NO. 258: STUDSVIK

Response to Comment No. 258-1

The commentor's support for Management Alternative 1, as described in Section 2.2 of the EIS, is noted.

Response to Comment No. 258-2

The commentor's qualified support for Management Alternative 3 as long as no reprocessing or chemical separation is included, is noted. Management Alternative 3 is described in Section 2.4 of the EIS.

Studsvik

Handläggare - Matter handled by

Datum - Date
June 16, 1995
Ert datum - Your date

2(2)
Vår referens - Our reference
LE/Kdt
Er referens - Your reference

The cost for the take-back of the spent fuel is very important but is not clearly addressed in the EIS.

Too high a cost level would jeopardize the take-back and would also force research/test reactors to shut down. The price level for irradiation services provided by research/test reactor including radioisotope production are generally too low to balance a significant increase of the cost for the take-back of the spent fuel. 258-3

The cost structure should distinguish between HEU-fuel and LEU-fuel.

In the joining of the RERTR-program for conversion from HEU to LEU reactor operators were promised that those converting to LEU would not be penalized economically or competitively compared to those sticking to HEU. 258-4

In reality, operating the reactor with LEU-fuel is about 20 % more expensive than operating with HEU-fuel taking into account differences in the cost for fresh fuel and reactor capacity.

In order to restore balance economically or competitively the cost for the take-back of an LEU-element need to be 20 % lower than for an HEU-element.

It should be noted that an LEU-fuel element is typically 55 % heavier than an HEU-element of the same type and dimensions. Thus, the cost for the take-back should not be related to the weight of the fuel element but rather to the volume. 258-5

The next shipment of HEU-elements from Studsvik needs to take place in February 1996. This is the time point when HEU-elements have decayed to such a low radiation level that the requirements for self protection are no longer fulfilled. 258-6

Sincerely yours

STUDSVIK AB

J. Kivikas

Tõive Kivikas

Response to Comment No. 258-3

DOE agrees that if the fee charged for any spent nuclear fuel management activities that might be undertaken by DOE were too high, some research reactor operators would choose not to participate. DOE is addressing this issue by studying ways to keep the cost of any spent nuclear fuel management activities as low as a possible, including possible fee levels. However, DOE prefers not to use the EIS as the vehicle through which to establish the fee which would be charged if DOE does decide to implement foreign research reactor spent nuclear fuel management activities. Instead, the fee would be specified in a Federal Register notice, as it was under the Off-Site Fuels Policy.

Response to Comment No. 258-4

Since its inception in 1978, the goals of the RERTR program have been to convert research reactors to LEU fuel without decreasing their safety and without significantly affecting their performance.

In the mid-1980's, an extensive joint study on LEU conversion of the R2 reactor was performed by Studsvik and the Argonne National Laboratory. The study involved analyses of both reactor performance and fuel cycle economics, and the testing of LEU fuels in the R2 reactor. The studies concluded that an LEU fuel element containing 400 grams of U-235 would give a cycle length of 24 days and would be a good comparison between considerations of fuel economy and performance. This fuel element was used for LEU conversion of the R2 in the early 1990's. For comparison purposes, the HEU fuel element with 250 grams of U-235 that was used in the R2 reactor for many years had a cycle length of only 17 days. To provide future options for more economical operation, an LEU fuel element containing 490 grams of U-235 was successfully tested in the R2 reactor in the late 1980's.

A cost structure that fairly distinguishes between the acceptance costs for HEU and LEU fuel elements for all reactors covered by the proposed action would not be practical. Each reactor that has undergone conversion has different fuel cycle economic circumstances, and substantial documentation of operating costs would be required. Instead, Studsvik may wish to give serious consideration to increasing the U-235 loading of the R2 fuel elements in order to make both the front end and the back end of the R2 fuel cycle more economical.

COMMENTOR NO. 258: STUDSVIK (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 258: STUDSVIK (CONT'D.)

Response to Comment No. 258-5

DOE is considering a number of options for final disposal of spent nuclear fuel that may be accepted into the United States under the proposed action. While no decisions on final disposition have been made, initial analyses indicate that many of the final disposition costs are related to the weight of a spent nuclear fuel element, rather than to its volume. On this basis, DOE plans to continue to use the final delivered weight of the spent nuclear fuel elements for purposes of costing the actions that might be undertaken subsequent to completion of this EIS.

Response to Comment No. 258-6

The commentor's statement that Studsvik needs to ship HEU elements by February 1996 because the elements have decayed to a point where their radiation level will no longer be self-protecting is noted.

COMMENTOR No. 261: MULL AND IONA WASTE WATCHERS

MULL AND IONA WASTE WATCHERS

Hazel O'Leary,
Energy Secretary
USA Department of Energy,
1090 Independence Avenue SW.
Washington. DC. 20585

Kinloch Steadings,
Isle of Mull,
Scotland. PA70 6HB.

19 June 1995

Dear Hazel O'Leary,

Proposal to Re-process Highly Enriched Uranium at Dounreay, Scotland

We understand that the US Department of energy is considering options for dealing with the spent fuel rods constituting the balance of the highly enriched uranium which the USA supplied to various countries during the Atoms for Peace Era. Since 1988 it has not. of course. been possible to re-process this material in the USA following action by environmental groups.

We are one such group in the UK and are perturbed to learn that one of the options under consideration is to contract for the re-processing of part of this material at Dounreay in Scotland.

We can only assume that you are unaware of the problems at this installation. some of which were revealed in the second report of the UK Committee on Medical Aspects of Radiation in the Environment, published on 13 June. The original Fast Reactor, which ceased operation in 1977, still contains jammed fuel rods. and no way has yet been found to remove these or the fuel coolant. Areas surrounding Dounreay, including the cliffs to the east and the slipway are contaminated with radio-active material and radio-active particles have been found on the foreshore. There is also a 65 metre shaft in which radio-active wastes were dumped and in which there was an explosion in 1977 caused by sodium and potassium reacting with water seeping through the fractured rock: test bores have found contamination in this rock. There is no record of what the shaft contains and no safe way of clearing it has yet been identified. Nevertheless the management is now applying for planning permission for new waste pits. There have been safety violation incidents at Dounreay in six of the last seven months. Further, the re-processing installation is now 40 years old and said to be in poor shape. We have, therefore, no confidence in the safety of future operations on this site.

261-1

It this were not enough, we understand that the proposal calls for the transport of twenty shipments a year of highly radio-active fuel rods across the UK by narrow and congested roads or by rail through thickly populated areas in which most people would oppose such an operation. Transport by sea would involve the passage of dangerous and environmentally sensitive waters.

We accordingly write to urge you to reject the option of re-processing the fuel rods at Dounreay We further urge you to bear in mind that such a course would add to the existing stock-pile of nuclear waste, and to recognise that whilst no environmentally benign means of its disposal has been found every effort should be made to avoid its further accumulation.

Yours sincerely,

A.B. Gardner,
Hon. Secretary.

RESPONSE TO COMMENT
COMMENTOR No. 261: MULL AND IONA WASTE WATCHERS

Response to Comment No. 261-1

The commentor's opposition to reprocessing at Dounreay (Management Alternative 2, Subalternative 1b) is noted. This alternative is discussed in Sections 2.3 and 4.4.2 of the EIS. If any foreign research reactor spent nuclear fuel were to be sent to Dounreay for reprocessing as a result of decisions made after completion of this EIS, that action would be subject to regulation and oversight under the laws of the United Kingdom, including consideration and any required resolution of issues such as those discussed by the commentor.

COMMENTOR NO. 268: JAPAN ATOMIC ENERGY RESEARCH INSTITUTE

Japan Atomic Energy Research Institute

2-2, Uchisaiwai-cho 2-chome, Chiyoda-ku, Tokyo 100
Telephone: (03) 3592-2190
Facsimile: (03) 3592-2199
Telex: J29456
Cable: JAERINIPPON TOKYO
Our ref.:

June 9, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management(EM-37)
U.S.Department of Energy
1000 Independence Avenue, SW
Washington.DC 20585
U.S.A.

Dear Mr. Head.

Enclosed please find a copy of our comments on the Department of Energy's Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy concerning Foreign Research Reactor Spent Nuclear Fuel.

I would appreciate your kind consideration of the above.

Sincerely yours.

Eiji Shirai

Eiji Shirai
Director
Office of Safety and Control
Japan Atomic Energy Research Institute

Telephone: (03)3592-2190
Facsimile: (03)3592-2199

(SHARON)
•TOKAI RESEARCH ESTABLISHMENT, Tokai, Ibaraki 319-11 Tel. (0292) 82-5678, Fax. (0292) 82-5111
•NAKA FUSION RESEARCH ESTABLISHMENT, Naka, Ibaraki 311-02 Tel. (0292) 70-7289, Fax. (0292) 85-1849
•TAKASAKI RADIATION CHEMISTRY RESEARCH ESTABLISHMENT, Takasaki, Gunma 370-12 Tel. (0273) 46-3030, Fax. (0273) 47-2581
•OARAI RESEARCH ESTABLISHMENT, Oarai, Ibaraki 311-13 Tel. (0292) 64-5225, Fax. (0292) 64-5471
•MUTSU ESTABLISHMENT, Mutsu, Aomori 035 Tel. (0175) 23-4211, Fax. (0175) 22-0395

RESPONSE TO COMMENT
COMMENTOR NO. 268: JAPAN ATOMIC ENERGY RESEARCH INSTITUTE

COMMENTOR NO. 268: JAPAN ATOMIC ENERGY RESEARCH INSTITUTE (CONT'D.)

Comments by Japan Atomic Energy Research Institute
and Kyoto University
on
The Department of Energy's Draft Environmental Impact Statement
on a Proposed Nuclear Weapons Nonproliferation Policy
concerning Foreign Research Reactor Spent Nuclear Fuel

June 1995

We are filing written comments on the draft Environmental Impact Statement (EIS). Although we generally support its analysis, we have great concerns in the following points:

1. The cost estimates by DOE are tremendously high. Statements on the items of the costs, namely, the basis of actual cost, are necessary to be categorized. 268-1

2. Although we are willing to pay a truly cost-based price, any additional fee which would come from the change of the management, is difficult to be paid for budgetary clarification. 268-2

3. A failed fuel which would be sealed in a can, needs to be accepted by the U.S. 268-3

4. The Department of Energy shall compensate the reactor operator for uranium in the spent nuclear fuel accepted in the U.S. Such compensation by DOE will consists of providing LEU of equivalent value or financial settlement. 268-4

5. When DOE decided to promote reprocessing of the U.S. origin spent nuclear fuel outside of the U.S., such as the United Kingdom or France, the United States should accept the radioactive wastes resulting from the processing.

6. Typical transportation casks are illustrated in the EIS. Unfortunately, JAERI's casks, such as JRC-80Y-20T and JMS-87Y-18.5T, are not found in Volume 1 or Appendix B. 268-5

Those casks were licensed in the past, and their certificate number were USA/0208/B(U)F and USA/0401/B(U)F-85, respectively. We think that those casks approved by the U.S. Competent Authority, can be used for the transportation of our research reactor spent nuclear fuel.

Japan Atomic Energy Research Institute is joining in the Edlow Group which is an association of 14 foreign research reactors facilities. We believe that our comments mentioned above, are fundamentally in conformity Edlow's and we support them, firmly.

Finally, we would like to request that a Record of Decision followed by the final EIS will be issued by the end of December 1995 as scheduled.

RESPONSE TO COMMENT
COMMENTOR NO. 268: JAPAN ATOMIC ENERGY RESEARCH INSTITUTE (CONT'D.)

Response to Comment No. 268-1

Costs for the important components of the program are based on information received from the Savannah River Site, the Idaho National Engineering Laboratory, the United Kingdom Atomic Energy Authority, shippers of spent nuclear fuel (including Edlow International), and the DOE's Office of Civilian Radioactive Waste Management. Excluding uncertainties, the final EIS shows that the overall costs for chemical separation at the Savannah River Site and geologic disposal of high-level waste in the United States would cost about the same as reprocessing at Dounreay and geologic disposal outside the United States.

Response to Comment No. 268-2

As stated in Appendix F, Section F.6.5 of the EIS, both sound and damaged spent nuclear fuel would be accepted. However, any damaged spent nuclear fuel would have to be canned before shipment. The canning process would ensure that any damaged spent nuclear fuel elements to be shipped is mechanically sound by sealing the damaged elements inside an aluminum or stainless steel can.

Response to Comment No. 268-3

Such compensation is not offered at this time and is not addressed in this EIS.

Response to Comment No. 268-4

Management Alternative 2, Subalternative 1b, involves U.S. assistance in overseas reprocessing and is discussed in Sections 2.3 and 4.4.2 of the EIS. One of the options under this alternative includes the acceptance of the vitrified high-level waste from reprocessing into the United States. The commentor's support for this option is noted.

Response to Comment No. 268-5

Appendix B, Table B-14 of the EIS identifies representative casks that might be used during spent nuclear fuel transport. Other casks could be used if they become available and are approved by the U.S. Department of Transportation.

COMMENTOR NO. 270: INTERNATIONAL ATOMIC ENERGY AGENCY

INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)
WAGRAMERSTRASSE 5, P.O. BOX 100, A-1400 VIENNA (AUSTRIA)
Telephone: +43 1 2360-0 (or ext.) Telex: 112645 ATOM A Facsimile: +43 1 23 45 64

762065 10 III 95

DIVISION OF NUCLEAR FUEL CYCLE AND WASTE MANAGEMENT
NUCLEAR MATERIALS AND FUEL CYCLE TECHNOLOGY SECTION

FACSIMILE + 43 1 20607, TELEPHONE: +43 1 2060, Ext. 22759

TO: Mr. Charles Head
Program Manager
Office of Spent nuclear Fuel Management (EM-37)
US Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585
USA

INFO COPIES:

DATE:1995-06-19

TOTAL NO. OF PAGES 4

Fax: 202 586 3256

File Ref. 641.T1-T10

MESSAGE:

Dear Charles,

I have only just returned to my Office after the trip that I made to D.C. and on to the Hanford site. I believe that I promised to send you a fair copy of the statement that I made at the Public Hearing on the EIS and a copy of the letter from Mr. Blix to Mr. Michailov.

I hope that the EIS stays on track and is followed by a positive ROD and then promptly by shipments of spent fuel. Congratulations on the excellent job that you did in presenting the EIS in Washington. I look forward to meeting you again, perhaps at the RERTR meeting in Paris next September.

Yours sincerely,

Iain Ritchie

Iain Ritchie
Division of Nuclear Fuel Cycle and
Waste Management

[redacted]

RESPONSE TO COMMENT
COMMENTOR NO. 270: INTERNATIONAL ATOMIC ENERGY AGENCY

COMMENTOR NO. 270: INTERNATIONAL ATOMIC ENERGY AGENCY (CONT'D.)

Statement made by Dr. I. G. Ritchie of the IAEA at the Public Meeting on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, held 31 May 1995 at the Omni Shoreham Hotel, Washington D.C.

My name is Iain Ritchie and I am a Nuclear Engineer in the Nuclear Materials and Fuel Cycle Technology Section in the Department of Nuclear Energy and Safety of the International Atomic Energy Agency (IAEA). The IAEA has supported the Reduced Enrichment for Research and Test Reactors (RERTR) programme since its inception and it goes without saying that the IAEA supports all of the non-proliferation goals of RERTR. When it looked as though RERTR was in jeopardy two years ago, the Director General of the IAEA, Dr. Hans Blix, wrote to Secretary O'Leary urging the Department of Energy to reinstate the lapsed Off-Site Fuels Policy that was threatening to slow down or even reverse RERTR. One of the crisis reactors at that time was Astra, located in Sieberadorf, Austria, which the IAEA has relied upon for the training of safeguards inspectors. Fortunately, Astra was able to ship its spent fuel of US origin under the Emergency Environmental Assessment (EA) last September and is still operating. Other research reactors with similar crises were not as lucky and their crises continue.

The IAEA commends DOE on the draft EIS and trusts that the Record of Decision will be positive and promptly followed by the resumption of shipments of spent fuel of US origin back to the US. The IAEA stands ready to help in any way that it can consistent with its mandate and budgetary constraints.

Once the shipments of fuel from the crisis reactors identified in the Emergency EA have taken place, the IAEA believes that if the driving force for the take-back programme is non-proliferation, the priorities should be the following:

1. Return of fresh (unirradiated) highly enriched uranium (HEU) fuel elements.
2. Return of spent HEU that has lost much of its self-protection through decay of the radioactive species present during long storage times.
3. Return of spent fuel from facilities thought to have inadequate levels of physical security.
4. Return of spent fuel in poor physical condition from corrosion of the fuel cladding.

270-1

The IAEA would very much like to see both RERTR and fuel take-back programmes become universal with the goal of reducing and eventually eliminating all civil commerce in HEU for research reactors. Towards these ends, the Director General of the IAEA, Dr. Hans Blix, wrote a letter on 2 February 1995 to Mr. Viktor Michailov, Minister of Atomic Energy of the Russian Federation, suggesting that his country, as a full partner in RERTR, consider taking back spent fuel of Russian origin from foreign research reactors.

RESPONSE TO COMMENT
COMMENTOR NO. 270: INTERNATIONAL ATOMIC ENERGY AGENCY (CONT'D.)

Response to Comment No. 270-1

The commentor's suggestion for prioritization of foreign research reactor spent nuclear fuel shipments is noted. The only prioritization considered in the EIS is for foreign research reactor operators who possess both HEU and LEU fuel, the HEU would have priority (Section 2.1). Any further prioritization is not considered for the purposes of the EIS. DOE would consider the merit of the suggestion, if contractual agreements are made for shipments under a new policy.

COMMENTOR NO. 270: INTERNATIONAL ATOMIC ENERGY AGENCY (CONT'D.)

INTERNATIONAL ATOMIC ENERGY AGENCY

THE DIRECTOR GENERAL

1995-02-02

Sir, Dear Minister Michailov,

I have the honour to refer to the international Reduced Enrichment for Research and Test Reactors (RERTR) programme, which originated in the United States and has become almost world-wide over the last several years with the full participation of your country. The objective of this programme is to limit the use and location of highly enriched uranium (HEU) fuel.

The RERTR programme assists research reactor operators to convert their reactor cores from burning HEU to low enriched uranium (LEU) that is less than or equal to 20% enrichment. When and where the possibility exists, the programme is facilitated and sustained by the ability of the reactor operators to return their spent fuel to the country where it was originally enriched.

The plan in the former USSR was to convert research reactors in two steps, firstly to 36% eprichment and secondly to less than or equal to 20% enrichment. It was implemented in parallel with the original RERTR programme in the United States and has gone a long way to reducing proliferation concerns about research reactor HEU of Russian origin. Nevertheless, to reach and sustain the objective of the RERTR programme, the possibility of your country accepting the return of foreign research reactor fuel of Russian origin should be seriously considered at this stage.

Many foreign research reactor operators with fuel of Russian origin are experiencing problems with the management of their spent fuel. Several spent fuel stores are filled to capacity and there is concern about the integrity of the ageing fuel. The research institutes in question face the prospect of building extra spent fuel storage capacity or permanently shutting down their research reactors. Countries with research reactors but with no nuclear power programme will eventually have to construct permanent spent fuel repositories for relatively small quantities of spent fuel, if the possibility of sending it back to Russia is not offered to them. The cost of such a facility is likely to be much greater than the cost of reprocessing the fuel in its country of origin, and therefore, if the cost of transportation and subsequent reprocessing is reasonable, paying for spent fuel to be reprocessed in its country

The Honourable Victor Michailov
Minister for Atomic Energy
ul. B. Ordynka, 26
101000 Moscow
Russian Federation

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WAGRAMERSTRASSE 5, P. O. BOX 100, A-1400 VIENNA, AUSTRIA, TELEX: 1-2645, CABLE: INATOM VIENNA, TEL. 2360-0

RESPONSE TO COMMENT
COMMENTOR NO. 270: INTERNATIONAL ATOMIC ENERGY AGENCY (CONT'D.)

COMMENTOR NO. 270: INTERNATIONAL ATOMIC ENERGY AGENCY (CONT'D.)

of origin could be an attractive proposition for the research institute in question. Some of the research facilities concerned by this question are the only sources of radioisotope production for medical uses in these countries and their closure would limit the benefits of nuclear medicine and hinder the progress of fundamental science in many disciplines.

I am fully aware that certain legislative difficulties will be encountered when trying to address the issue of foreign research reactors returning their spent fuel to Russia. Nevertheless, the Agency hopes that your Ministry will manage to present convincing political, non-proliferation and economical arguments to overcome such difficulties and initiate appropriate changes in legislation. On 1 July 1993, I wrote a similar letter to the Secretary of Energy of the United States of America urging the Department of Energy to reinstate its Off-Site Fuels Policy for the return of foreign research reactor fuel of U. S. origin. There are also legal barriers in the U. S. that have to be overcome before the acceptance of foreign research reactor fuel can take place. To comply with the National Environmental Policy Act the U. S. Department of Energy is legally bound to prepare a full Environmental Impact Statement (EIS), leading to a Finding of No Significant Impact, before acceptance of foreign research reactor spent fuel can be reinstated. The preparation of such an EIS is well advanced.

If the RERTR programme goals could be achieved and both major supplier countries, the U. S. and Russia, take back spent research reactor fuel, international trade in HEU for research reactors will almost completely disappear and spent HEU fuel will be safely stored in only a few locations.

The Agency stands ready to help in this worthwhile international endeavour in any way it can, consistent with its mandate and budgetary constraints.

Accept, Sir, the expression of my highest consideration.

With best personal regards

Yours sincerely,

Hans Blix

Hans Blix

RESPONSE TO COMMENT
COMMENTOR NO. 270: INTERNATIONAL ATOMIC ENERGY AGENCY (CONT'D.)

COMMENTOR NO. 272: EMBASSY OF THE FEDERAL REPUBLIC OF GERMANY

EMBASSY
OF THE
FEDERAL REPUBLIC OF GERMANY
WASHINGTON, D.C.

Dear Mr. Head:

I have the honor of presenting to you the enclosed message from the German Foreign Office regarding nuclear weapons nonproliferation policy.

Peter Wenzel-Constabel

(Counselor, Science and Technology)

Washington, D.C., June 19, 1995

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel, Management (EM-37)
US Department of Energy
1000 Independece Avenue, SW
Washington, DC 20585, USA

RESPONSE TO COMMENT COMMENTOR NO. 272: EMBASSY OF THE FEDERAL REPUBLIC OF GERMANY

COMMENTOR NO. 272: EMBASSY OF THE FEDERAL REPUBLIC OF GERMANY (CONT'D.)

Comments on the draft environmental impact statement on a proposed nuclear weapons nonproliferation policy concerning foreign research reactor spent nuclear fuel.

The government of Germany welcomes the opportunity to comment on the draft environmental impact statement related to the policy of the US government concerning spent fuel from foreign research reactors.

Germany has always strongly supported the policy of nonproliferation of nuclear weapons and has supported the indefinite extension of the NPT at the New York Conference some weeks ago. The conversion of most research reactors from HEU to LEU fuel has confirmed this Germany policy. 272-1

The German government, acting on behalf of the operators of research reactors in Germany, would welcome a decision of the US government retaining management alternative 1 as the preferred option because it may be regarded as a continuation of previous obligations most easily. Under certain circumstances an option for management alternative 3 in a form which would enable operators of research reactors using HEU or LEU of US-origin to return significant quantities of that fuel to the US might be acceptable as well. 272-2 If neither of these options will be put into action some research reactor operators will be forced to seek reprocessing elsewhere or shut down their reactors. In case however, reprocessing will become necessary the German government would not agree to a blending down of reprocessed HEU. 272-3

In this context the German government takes an interest because the Hahn-Meitner-Institut, Berlin (MHI), a research institution and operator of the research reactor BER-2, which will be converted to LEU soon, has stated to the Berlin licensing authorities that with regard to the management and disposition of spent nuclear fuel from the reactor HMI intended to take advantage of DOE's "site fuels policy" as confirmed by Secretary O'Leary in a policy statement dated 13 July 1993. The government of Germany and HMI trust that the US Department of Energy will be in a position to implement acceptance policy announced in that statement." 272-4 272-5

RESPONSE TO COMMENT
COMMENTOR NO. 272: EMBASSY OF THE FEDERAL REPUBLIC OF GERMANY (CONT'D.)

Response to Comment No. 272-1

The commentor's support of policies for the nonproliferation of nuclear weapons is noted.

Response to Comment No. 272-2

The commentor's support for Management Alternative 1, as described in Section 2.2 of the EIS, is noted.

Response to Comment No. 272-3

The commentor's qualified support for Management Alternative 3 is noted. Management Alternative 3 is discussed in Section 2.4 of the EIS.

Response to Comment No. 272-4

The commentor's position on reprocessing or shutting down reactors is noted. Management Alternative 2, Subalternative 1b, involves U.S. assistance in overseas reprocessing and is discussed in Sections 2.3 and 4.4.2 of the EIS. Under this alternative, the U.S. would encourage the reprocessor to blend down the recovered HEU and encourage the research reactor operators to use LEU fuel in their reactors.

Response to Comment No. 272-5

The 13 July 1993 letter from Secretary O'Leary to Secretary Christopher announced that DOE would be preparing this EIS. The decision on whether DOE will or will not implement any of the alternatives analyzed in this EIS will be announced in a Record of Decision no sooner than 30 days after issuance of this final EIS.

COMMENTOR NO. 283: GREENPEACE INTERNATIONAL

GREENPEACE
international

Keizersgracht 176
1016 DW Amsterdam
The Netherlands
Telephone (31) 20-523 6222
Fax (31) 20-523 6200
ABN-Amro: 54.03.03.909
email: greenpeace.international@green2.dat.de

June 16 1995

Dear Sir,

Please find enclosed copies of articles from the UK press related to the Dounreay nuclear installation. These are submitted as supporting information for Greenpeace International's comment on the Department of Energy and Department of State draft Environmental Impact Statement (EIS) on Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. 283-1

Our comments will be submitted on June 20th, 1995.

Yours sincerley,

Shaun Burnie
Research Coordintor
Greenpeace International

STICHTING GREENPEACE COUNCIL

GREENPEACE OFFICES ARGENTINA, AUSTRALIA, AUSTRIA, BELGIUM, BRAZIL, CANADA, CHILE, CZECHOSLOVAKIA, DENMARK, FINLAND, FRANCE, GERMANY, GREECE, GUATEMALA, IRELAND, ITALY, JAPAN, LUXEMBOURG, MEXICO, NETHERLANDS, NEW ZEALAND, NORWAY, RUSSIA, SPAIN, SWEDEN, SWITZERLAND, TUNISIA, UKRAINE, UNITED STATES OF AMERICA, UNITED KINGDOM

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RESPONSE TO COMMENT
COMMENTOR NO. 283: GREENPEACE INTERNATIONAL

Response to Comment No. 283-1

DOE appreciates the articles submitted by the commentor regarding the Dounreay Facility.

COMMENTOR NO. 284:
AUSTRIAN RESEARCH CENTRE SEIBERSDORF

FORSCHUNGSZENTRUM SEIBERSDORF
Verfahrens- und Umwelttechnik

Forschungszentrum
A-2444 Seibersdorf
Telefon 02254-780-*
Fax 02254-74060
Telex 14-353 fzs

Stadtbüro
Krämergasse 1, A-1010 Wien
Telefon 0222-533 96 24
Fax 0222-533 96 29-11

Bankverbindungen
BAWAG 01110-760-736
CA-BV 56-34343/02
Die Erste 012-10122
Bank Austria AG 106-100-432

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
WASHINGTON, DC 20585-0001
USA

Ihr Zeichen, Ihre Nachricht vom	Unser Zeichen, Sachbearbeiter	Tel. (Durchwahl) *	Datum
- -	VF/Ca/ss Dipl.-Ing. J. Casta	3221	1995-06-14

Draft EIS comments

Dear Mr. Head,

A general description of the status of the ASTRA-Reactor, which is operated by the Austrian Research Centre Seibersdorf (ÖFZS) is given in the "Environmental Assessment of Urgent Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel" (page 2-30 - 2-33). Due to the shipment of 26 fuel elements under the EA in 1994 the fuel situation of the ASTRA-Reactor has improved. The next shipment of spent fuel elements will be necessary about the year 2000. Constraints on ordering fresh fuel were lifted by the Austrian government. Two LEU fuel elements were received in March 1995 and several fresh fuel elements have been already ordered guaranteeing fuel supply for the ASTRA-Reactor at least to the year 2000.

The situation in Austria with respect to nuclear power and high level waste storage is still the same as described in the EA. Austria has no power reactor program and there are no plans to build a high level waste storage facility. It is not possible in Austria, neither to store spent fuel elements, nor to take back high level waste after reprocessing. Therefore the further operation of the ASTRA is completely depending on the willingness of the US to implement a new policy to manage foreign research reactors spent nuclear fuel.

ASTRA would prefer strongly the management alternative 1 with a policy duration of 10 years and a truly cost based price. This would give us a fair chance either to find a new solution to manage our spent fuel in the future or to plan an organized shut down of the ASTRA-Reactor in a reasonable time period. *284-1*

./2

RESPONSE TO COMMENT
COMMENTOR NO. 284:
AUSTRIAN RESEARCH CENTRE SEIBERSDORF

Response to Comment No. 284-1

The commentor's preference for Management Alternative 1, with a policy duration of 10 years as discussed in Section 2.2.2.2 of the EIS and a price based on cost is noted. Financing arrangements are discussed in Section 2.2.2.3 of the EIS.

COMMENTOR NO. 284: AUSTRIAN RESEARCH CENTRE SEIBERSDORF (CONT'D.)

page 2 Mr. Charles R. Head
Office of Spent Fuel Management, RM-37
U.S. Department of Energy
WASHINGTON, DC 20585-0001

Implementation alternatives 1a (Accept spent nuclear fuel only from developing countries), 1b (Accept only HEU) and 2.5 (No action alternative) are extremely unfair, since we relied from the beginning of reactor operation on the repeated assurances of the U.S. government, that the United States would accept the return of our spent fuel elements. 284-2

Moreover the ASTRA was one of the first reactors, which was converted from HEU-fuel to LEU-fuel. After the EA shipment most of our fuel inventory is consisting of high density LEU-fuel, which neither can be reprocessed at Dounreay nor would be taken back by the United States.

Implementation alternative 2a (Five years policy duration) gives practically no chance to build up a new fuel cycle and would cause a quick decision to shut down our reactor and we assume also a lot of other research reactors. Such a decision would cause transport problems and we doubt, based on our experience with the EA transport and the lack of suitable transport containers, that 18 800 fuel elements could be shipped in a time period of 8 years. 284-3

We checked the data of the Austrian Reactors in the draft EIS and we found a mistake in table B-3, page B-6, Volume 2. The SAR-Graz (line 18 in table B-3) has two reactor cores

1. a highly enriched core consisting of 90 % enriched fuel plates (125 plates, total amount of U-235: 2505 g)
2. a low enriched core consisting of 20 % enriched fuel plates (234 plates, total amount of U-235: 4870 g) 284-4

The low enriched core is not indicated in the column "Initial Enrichments, Enr. 3". The correction is indicated on page B-6, which is attached to the comments.

We hope that you will successfully compleas the final EIS.

Sincerely.

M. Coster

Dipl.-Ing. Jörg Costa
Head of Reactor Operation

RESPONSE TO COMMENT
COMMENTOR NO. 284: AUSTRIAN RESEARCH CENTRE SEIBERSDORF (CONT'D.)

Response to Comment No. 284-2

The commentor's opposition to Implementation Subalternative 1a (Section 2.2.2.1 of the EIS, accepting spent nuclear fuel only from developing countries), to Implementation Subalternative 1b (Section 2.2.2.1 of the EIS, accepting only highly enriched uranium), and the No Action Alternative (Section 2.5 of the EIS) is noted. The bases for the opposition were also noted.

Response to Comment No. 284-3

The commentor's opposition to Implementation Subalternative 2a for Management Alternative 1, wherein the policy period for receipt would be 5 years (Section 2.2.2.2 of the EIS), is noted.

Response to Comment No. 284-4

Based on the commentor's information on SAR-Graz research reactor nuclear fuel usage, Tables 2-1 and 2-4 of Volume 1 and Tables B-1, B-3, B-9, B-11 and B-12 of Appendix B of the EIS have been revised.

COMMENTOR NO. 442: UNITED KINGDOM ATOMIC ENERGY AGENCY

UKAEA

Government
Division
Nuclear Site
Operations

Dounreay
Thurso
Caithness KW14 7TZ
United Kingdom
Telephone 0847 802131

Mr Charles Head
Programme Manager
Office of Spare Nuclear Management (EM37)
US Department of Energy
1000 Independence Ave SW
Washington DC 20585

Dear Charles,

Appendix F of the Draft Environmental Impact Statement DOE/EIS-0218D contains some inaccuracies relating to the UKAEA reprocessing option. These inaccuracies are reflected elsewhere in the draft EIS.

1. Para F.7 Page F268

A more correct statement would be:

"The UKAEA have yet to develop proposals for waste substitution in respect of reprocessing MTR fuels. BNFL have developed some proposals for the substitution of waste from THORP (substituting vitrified waste for cemented waste). However these proposals are currently under discussion and have not yet been accepted by the UK Government. If they are accepted they might form the basis for the development of waste substitution proposals that will be applied to MTR fuel reprocessing".

442-1

2. Para F.7.1 Page F.271

Comments as above.

3. Para F.7.3 Page F.298

Comments as above.

4. Para F.7.3 Page F.298

The UKAEA price of $5000 to $6000 does not relate to 100 element batches but is the price range that would apply to a substantial campaign extending over several years, reprocessing some 600-700 elements per year.

RESPONSE TO COMMENT COMMENTOR NO. 442: UNITED KINGDOM ATOMIC ENERGY AGENCY

Response to Comment No. 442-1

Appendix F, Section F.7 of the EIS has been modified to reflect the commentor's concerns.

COMMENTOR NO. 442: UNITED KINGDOM ATOMIC ENERGY AGENCY (CONT'D.)

5. Para F.7.4 Page F.298

"The core of nuclear weapons non-proliferation" equals the difference between the non-US alternatives and the US costs is a statement which could be interpreted as indicating the non-US option could allow proliferation.

442-2

It perhaps could be emphasised in this section that all work on the MTR fuel cycle within the UK and the Euratom countries falls under the control of the Euratom Safeguards organisation. Their main aim is to ensure the non-proliferation of material that could be used to make nuclear weapons.

It is not correct to say as on page 1-7 of Volume 1 Section 1.2 that the potential for diversion increases when the separated HEU leaves the reprocessing plant; as export is only permitted to countries operating full Euratom or International Safeguards procedures. Much of the material produced from reprocessing is being downblended to HEU. The attached figure shows the current performance and expectations of UKAEA in this case. The material "pending" is waiting customer decisions on its final enrichment and form.

442-3

The re-use of reprocessed uranium achieves the maximum value for HEU reducing the requirement for fresh HEU supplies from the US for specifically approved reactors. The uranium isotopic composition of recycled HEU rapidly (after a few cycles) makes the manufacture of fresh fuel increasingly more difficult, such that when <60%U235 is present further value is best obtained by blending to <20%U235.

The stocks of US supplied HEU will in the next few years rapidly reach the unusable enrichment level of <60%U235 "mopping up" the European stockpile and requiring only minimal "top up" from the US.

Yours sincerely

30/6/95.

DAVID THOM
Group Manager, Business Development

RESPONSE TO COMMENT
COMMENTOR NO. 442: UNITED KINGDOM ATOMIC ENERGY AGENCY (CONT'D.)

Response to Comment No. 442-2

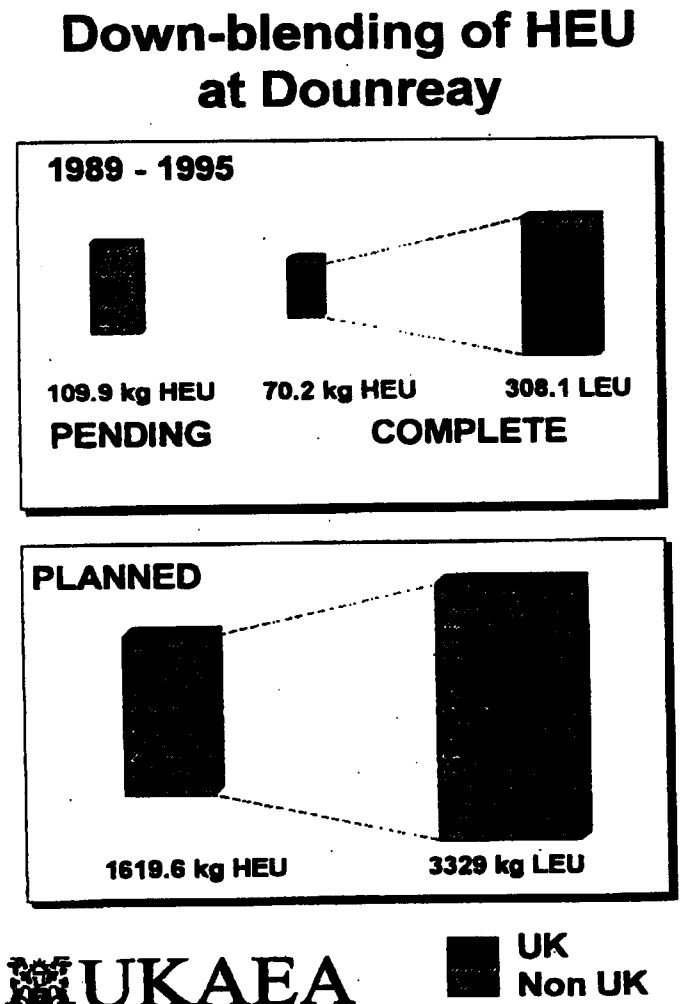
The change recommend by the commentor has been added to Appendix F, Section F.7.4 of the EIS.

Response to Comment No. 442-3

DOE acknowledges the effectiveness of United Kingdom Atomic Energy Authority's export restrictions that act as barriers to potential diversion. Nevertheless, HEU from reprocessing would be significantly more desirable to a potential proliferator than spent nuclear fuel containing the same HEU, so the concern about illegal proliferation would be heightened. The text cited by the commentor has been revised in the final EIS to emphasize that the proliferation concern stems only from the physical properties of the HEU, not the United Kingdom Atomic Energy Authority's export procedures.

DOE also acknowledges the United Kingdom Atomic Energy Authority's capability to blend down HEU to LEU. When separated HEU is blended down to LEU inside the reprocessing facility, the United States' nuclear weapons nonproliferation policy is satisfied.

The Energy Policy Act of 1992 placed strict limitations on the export of HEU by the United States (Section 1.1 of the EIS). Since passage of this Act, no new export licenses for HEU have been issued by the United States. Therefore, it is unlikely that the United States would top the European HEU stockpile, as suggested by the commentor.


Down-blending of HEU at Dounreay
1989 - 1995
109.9 kg HEU
70.2 kg HEU
308.1 LEU
PENDING
COMPLETE
PLANNED
1619.6 kg HEU
3329 kg LEU
UKAEA
UK
Non UK

COMMENTOR NO. 445: CHALK RIVER LABORATORIES

AECL EACL

RESEARCH AND PRODUCT DEVELOPMENT
Nuclear Operations
Radioactive Materials Services
Chalk River & Whiteshell

RECHERCHE ET DÉVELOPPEMENT DES PRODUITS
Exploitation nucléaire
Services des matières nucléaires
Chalk River et Whiteshell

Chalk River Laboratories
Chalk River Ontario
Canada K0J 1J0
Tel (613) 584-3311
Fax (613) 584-1394

Laboratoires de Chalk River
Chalk River (Ontario)
Canada K0J 1J0
Tél (613) 584-3311
Fax (613) 584-1394

1995 June 20
RMSC-95-192

Mr. C.R. Head
Office of Spent Fuel Management
Department of Energy
Washington, DC 20585

Dear Mr. Head:

ATOMIC ENERGY OF CANADA'S COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS) ON A PROPOSED NUCLEAR WEAPONS NONPROLIFERATION POLICY CONCERNING FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL

Atomic Energy of Canada (AECL) and a representative from the Canadian Embassy in Washington, attended the 1995 May 31 public hearing in Washington, DC on the above EIS. At the hearing, AECL presented both verbal and written comments to the EIS process, comments which we wish to restate, emphasize and add to.

Canada has embraced the aims of non proliferation through the RERTR from its inception and after many years of fuel development, finally completed the conversion of the NRU reactor (130 MW) from HEU driver fuel to LEU. In that period, use of US origin HEU has been reduced from 96 Kg/a to approximately 25 Kg/a. This 25 kg HEU is largely used as target material for medical isotope production, i.e. Mo^{99}. Most of the diagnoses and treatments, ~90%, using these isotopes, are carried out in the US. Spent target wastes, containing HEU at about 91% U-235, are produced as a result of this Mo^{99} production. Canada has the largest accumulation of these low burnup spent target fuels, i.e. 0.525 MTHM out of a world total of 0.555 MTHM.

In the Draft EIS, Section 4.3.1.3 is an implementation subalternative 1c, "Accept Target Material in Addition to Foreign Research Reactor Spent Fuel". It is important that serious consideration is given to incorporating management of this material, as a preferred management alternative. Return of spent target wastes will be in the spirit of RERTR, and DOE has a responsibility under these RERTR and non proliferation umbrella's, to reopen the spent fuel return agreements and take back this fuel.

445-1

RESPONSE TO COMMENT
COMMENTOR NO. 445: CHALK RIVER LABORATORIES

Response to Comment No. 445-1

The commentor's support for accepting target materials in addition to foreign research reactor spent nuclear fuel is noted. Acceptance of target materials is discussed in Section 2.2.2.1 of the EIS.

The term, "competitive price", for return of the spent fuel, should be rewritten to read "reasonable" or "consistent with that being charged at the time of expiry of the previous agreement". With only one "player" in the market, i.e. Dounreay, who do not offer the storage option, using their reprocessing price does not appear to be a relevant comparison. 445-2

The alternative of spent fuel processing, should, of course, be kept open, but should not be included in this EIS as an option. This option in itself, could involve significant delays through further EIS's and lawsuits. The one and only option at this point in time is, return of the spent fuel. 445-3

In addition to the low burnup spent target material and spent driver fuels described (note that out of a world holding of 18.185 MTHM Research Reactor spent fuel, Canada holds 4.478 MTHM), an additional 17.568 Kg of HEU in 16 low burnup (3%) booster fuel rods, is held at Chalk River, Canada. These fuel rods, consisting of fuel elements containing 22.5% U/Al alloy fuel meat in an aluminum cladding, are similar in construction to NRU and NRX spent fuels which have been delivered in previous years to Savannah River. The rods were used intermittently for xenon poison overide in the G-1 power reactor at Gentilly in Quebec which has since been shut down and decommissioned. These elements are very similar to NRU fuel elements and contain HEU ~91% U-235. Storage would not pose any problems over and above that of NRU fuel elements and subsequent post storage treatment would not involve any process variants over and above those needed for NRU type elements. 445-4

Despite their brief power reactor involvement, AECL requests that these rods be considered, for non proliferation purposes, in the same envelope as Research Reactor U/Al fuels, for return to the US.

The DOE are to be congratulated on bringing the prospects of reopening of the return of Research Reactor spent fuels, at last within reach. Return of these material can be seen to complement the aims of the RERTR program and its non proliferation ideals.

Yours truly,

F. Keeling
Manager Nuclear Materials

FK/ns

c: M.G. Wright

Response to Comment No. 445-2

DOE considers that any fee that might be charged for foreign research reactor spent nuclear fuel management activities conducted by DOE, however determined, should be based on current conditions rather than on those prevailing at the expiration of the previous spent nuclear fuel acceptance policy. Nevertheless, DOE recognizes the need to find a compromise that would allow all parties to any future foreign research reactor spent nuclear fuel policy to consider the fee to be fair. Determination of any competitive fee would have to include consideration of such concepts.

Response to Comment No. 445-3

The commentor's support for accepting the foreign research reactor spent nuclear fuel into the United States is noted. The commentor's opposition to including chemical separation as an alternative (Implementation Alternative 6) is also noted. NEPA requires that the environmental impacts of reasonable alternatives be evaluated, regardless of political opposition or potential litigation.

Response to Comment No. 445-4

DOE considers the commentor's suggestion to be consistent with the overall nuclear weapons nonproliferation policy of the United States and with the fuel type acceptance detailed in the EIS. The booster rod spent nuclear fuel elements have similar design characteristics to that of the NRU reactor fuel pins and contain a total of almost 17 kilograms of uranium-235. They have been irradiated to a very low burnup similar to that of the target materials that have been considered for inclusion in the EIS. This addition of 16 spent nuclear fuel rods is not expected to change the total number of shipments estimated for Canada. In addition, if McMaster research reactor were to shutdown as announced during the May 25, 1995 public meeting in Washington D.C., there would be less fuel available to be brought back from Canada.

COMMENTOR NO. 450: NUCLEAR FREE LOCAL AUTHORITIES

NUCLEAR FREE
LOCAL AUTHORITIES

NATIONAL STEERING COMMITTEE

NUCLEAR POLICY AND INFORMATION UNIT
MANCHESTER CITY COUNCIL
TOWN HALL
MANCHESTER
M60 2LA

SECRETARY: STEWART KEMP

Your Ref:
Our Ref: SK/NPIU
Date: 20 June 1995
Contact Officer: Stewart Kemp
Direct Tel: 0161 234 3324
Fax: 0161 236 0864
Email: nfzasc@gn.apc.org

United States Department of Energy
Office of Environmental Management
Attn: Mr Charles Head
1000 Independence Avenue, S.W.
Washington, D.C. 20585-0001

Dear Sir

Draft Environmental Impact Statement (EIS) on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

I am responding belatedly to the consultation on the above EIS without having had the benefit of sight of the complete document. However, I am advised that one option being considered under the above proposed policy is the return of a proportion of spent HEU fuel elements to Dounreay. In the circumstances outlined below my Committee, which is supported by 157 local authorities in England, Scotland and Wales who represent the interests of more than half the population in Britain, strongly opposes any further reprocessing at the Dounreay site because of the poor environmental record and historical mismanagement.

Part of your EIS which I have seen describes the UK having "modern fuel cycle facilities". This cannot be said of Dounreay where the reprocessing facilities have operated for nearly 40 years and which is the principal source of radioactive contamination of surrounding terrestrial and marine environments. Importation of spent HEU would, ofcourse, increase the volume of reprocessing, prolong plant operation and increase waste streams for management within the UK or discharge to the environment. 450-1

Currently we are contesting an application by the management of the Dounreay plant for authorisation to increase atmospheric and marine discharges on average between 600-900% compared to actual discharges over the previous four years. The increase results from UK Department of Trade and Industry proposal to step up reprocessing work at Dounreay. The DTI propose to process thirty tonnes of fast reactor fuel in 3-5 years. This is more than the total of 20 tonnes reprocessed at Dounreay in the previous thirty years.

We are also investigating discharges of large quantities of radioactive nitric acid without consent. The acid has been discharged since the late 1950s, but only since 1985 has the Dounreay plant management needed to inform the Highland

PRINTED ON RE-CYCLED PAPER

RESPONSE TO COMMENT
COMMENTOR NO. 450: NUCLEAR FREE LOCAL AUTHORITIES

Response to Comment No. 450-1

Complete copies of the draft and final EIS's have been sent to the commentor. The commentor's opposition to reprocessing at Dounreay (Management Alternative 2, Subalternative 1b) is noted. This alternative is discussed in Sections 2.3 and 4.4.2 of the EIS.

While some of the facilities at the Dounreay Site are old, the United Kingdom has complete modern fuel cycle facilities at the Sellafield Site. The point of the statement in the EIS is that the technical expertise to reprocess already exists in France and the United Kingdom. Thus, contracting for reprocessing services in one or both of those countries would not increase the risk of proliferation.

The subjects of airborne and liquid releases from reprocessing operations in foreign countries are outside the scope of this EIS. Please see Section 4.4.2.1 of the EIS and the response to Comment 484-11. The subject of fast reactor spent nuclear fuel reprocessing is also outside the scope of this EIS.

DOE is considering a wide range of alternatives for the management of the foreign research reactor spent nuclear fuel and cannot eliminate an alternative for reasons that are outside the scope of the EIS.

COMMENTOR NO. 450:
NUCLEAR FREE LOCAL AUTHORITIES (CONT'D.)

River Purification Board (HRPB) and obtain consent, which it has not done and does not have.

My Committee has instructed its Legal Adviser to review, inter alia:

- The case for judicial review of the decision to reprocess PFR fuel as quickly as possible, even though this increases environmental discharges in contravention of the current authorisations which require Dounreay to adopt the best practical means to minimise discharges of activity from the site.
- The case for judicial review of the decision by the DTI to reprocess fast reactor fuel, with resulting environmental discharges, including illegal nitric acid discharges, when there is no longer any need for the separated plutonium to fabricate new fuel. The Government withdrew funding from the fast breeder reactor programme last year because it was a waste of money.
- Whether an interim interdict (injunction) should be sought to stop practices (ie. reprocessing of fast reactor fuel) which result in illegal discharges of radioactive nitric acid until a neutralising plant is built or other method of neutralising the discharges is implemented, or a consent has been issued by regulatory authorities.
- The case for judicial review of the decision by HRPB to allow Dounreay to continue discharges of illegal nitric acid.
- The case for judicial review of the decision to allow Dounreay to begin fast reactor fuel reprocessing -

  (a) on the basis of old authorisations despite there being a substantial change in circumstances ie. closure of the fast reactor and no need for the plutonium, and when revised authorisations are already overdue;

  (b) despite the fact the fuel reprocessing from the shutdown fast reactor core represents a significantly different scale of operation from previous activity and should be subject to full and separate regulatory and public scrutiny;

  (c) when the proposed reprocessing should be subject to the test of justification according to European and UK laws (HMIPI inspectors for Dounreay say they entirely accept that the English THORP ruling about the need to justify harm caused by discharges to the environment in terms of the benefits a proposed practice will bring, applies in Scotland and should be applied to Dounreay's application for revised discharge authorisations.

450-1 (Cont'd.)

In these circumstances it is irresponsible to consider Dounreay a fit place to send spent HEU fuel elements. Further, it is vital that you be aware of the recent findings of two Government Advisory Bodies which serve to underscore our concern. The details are as follows:

450-2

Radioactive Waste Management Advisory Committee (RWMAC) and Committee on the Medical Aspects of Radiation in the Environment (COMARE) Joint Report on Possible Sources of Radioactive Particles near Dounreay

RESPONSE TO COMMENT
COMMENTOR NO. 450:
NUCLEAR FREE LOCAL AUTHORITIES (CONT'D.)

Response to Comment No. 450-2

If the Record of Decision for this EIS results in foreign research reactor spent nuclear fuel being sent to Dounreay for reprocessing, that action would be subject to regulation and oversight under the laws of the United Kingdom. It is DOE's understanding that the radioactive particles mentioned in the CoMARE/RWMAC report are already being surveyed and cleaned up at the Dounreay Site. This issue, however, is outside the scope of this EIS.

COMMENTOR NO. 450: NUCLEAR FREE LOCAL AUTHORITIES (CONT'D.)

In short, this report identifies the explosion in 1977 in a radioactive waste shaft on the Dounreay site as the most likely source of local off-site contamination and recommends a review of how to stop it, believing waste retrieval, repackaging and disposal elsewhere together with shaft decontamination to be the most likely requirement. Little alternative to waste removal appears to exist because cliff erosion at Dounreay is likely to expose the waste shaft within the next century.

Both the CoMARE Chairman and the RWMAC Chairman accused Dounreay Management and accused the regulators, HM Industrial Pollution Inspectorate of providing incomplete and inaccurate information during the preparation of their report.

450-2 (Cont'd.)

The investigation was prompted by CoMARE's observation that incidents of radiation related cancers near Dounreay were associated with use of the Plant's foreshore (which has only recently been closed) and were highest following the explosion in 1977. The RWMAC issued a press statement at the time of report publication and this is attached as Annex A.

In the light of the above observations I trust you will agree the Dounreay plant is a considerable environmental burden on the UK and will cost the UK taxpayer many hundreds of millions of pounds to ensure its waste legacy is safely managed for the future. This burden must be minimised not exacerbated.

Finally, I am not aware of potential sources and volumes of HEU spent fuel which you consider could be disposed at Dounreay, or the conditions under which it is proposed to transport it, or the routes to be taken. I would be grateful for information on these matters and the environmental impacts which you have identified. I would also be grateful for information on the accident hazards you have identified in shipping spent HEU fuel to Dounreay and how you assess the implications for North Sea communities dependent on the maintenance of public confidence in the fisheries, food and tourism products they offer.

450-3

Thomas Grumbly's 10 April letter advises that you plan to issue the final EIS in September 1995. Again I would be grateful if you would provide my Committee with a copy at the earliest opportunity.

Your confirmation that my Committee's views will be fully considered would be appreciated.

Yours sincerely

Stewart Kemp
Secretary

RESPONSE TO COMMENT COMMENTOR NO. 450: NUCLEAR FREE LOCAL AUTHORITIES (CONT'D.)

Response to Comment No. 450-3

The potential sources and volumes of foreign research reactor spent nuclear fuel involved in the proposed action are listed in Tables 2-1 and 2-2 in Section 2.2.1.3 of the EIS. The transport conditions, routes, and potential environmental impacts in the United Kingdom are outside the scope of this EIS. Actions within the United Kingdom are subject to the laws and regulations of the United Kingdom, not those of the United States. The accident hazards and implications for North Sea communities are also outside the scope of this EIS.

COMMENTOR NO. 482: INSTITUT MAX VON LAUE

INSTITUT MAX VON LAUE - PAUL LANGEVIN

Division Réacteur

Charles HEAD, Program Manager
Office of Spent Nuclear Fuel
Management (EM-37)
U.S Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Grenoble, le | V/lettre du | Notre référence à rappeler :

20 june 1995

DRe-EB/RV 95.220

Objet : **Draft Environmental impact statement - DOE/EIS-0218D**
March 1995

Dear Mr. HEAD,

Thank you for the copy of the draft Environmental Impact Statement DOE/EIS 0218D which I received on 19.06.1995.

Volume 2, Appendix B, Table B3 "Foreign Research and Test Reactors that Possess Only Aluminium-Based contains an error concerning the High Flux Reactor (RHF) operated by the Institut Laue-Langevin.

Line 50 RHF is given in the wrong category "HEU Reactors Fully-or Partially-Converted to LEU Fuel".
The correct category is "HEU Operating Reactors that Cannot Be Converted With Current Technology" the same as line 48 BR-2 and line 49 ORPHEE.

I would be grateful if you could take into account this correction.

482-1

Sincerely,

Dr. Ekkehardt BAUER
Chef de la Division Réacteur.

RESPONSE TO COMMENT
COMMENTOR NO. 482: INSTITUT MAX VON LAUE

Response to Comment No. 482-1

As stated by the commentor, the header of Table B-3 in Appendix B of the EIS places RHF reactor in the wrong category. The correct category is that of the BR-2 and ORPHEE reactors which is HEU operating reactors that cannot be converted with current technology. The table has been revised accordingly.

COMMENTOR NO. 487: SCOTLAND AGAINST NUCLEAR DUMPING

SCOTLAND AGAINST
NUCLEAR DUMPING

S.A.N.D.

4 Fountainhead,
Bunessan,
Isle of Mull,
Argyll PA67 6DF
tel/fax 01681 700 431

19th June 1995

Charles Head,
Office of Spent Fuel Management (EM-37),
US Department of Energy,
1000 Independence Ave., S.W.,
Washington D.C. 20585

Dear Mr Head,

SPENT FUEL TO DOUNREAY?

I am writing on behalf of an umbrella organization with affiliated groups from Shetland to Dumfries in Scotland, S.A.N.D., to give the US Department of Energy our views on the transport and reprocessing of spent fuel rods from European MTRs.

There is shock here in Scotland, that no non governmental organizations have been asked to contribute their views, which is the protocol ratified at the Rio Summit in Agenda 21.

There has been a public consultation in the form of a draft Environmental Impact Assessment in the USA seeking to ascertain the future of this spent fuel. It appears that representations have been made to your department by the UK Department of Trade and Industry and by the management of Dounreay for the contract of reprocessing up to 9,000 fuel rods over a period of 10-12 years. This is re-enforced by the quotation from a memo from your Department dated 8th February saying that "We need Dounreay as a partner to accomplish the mission of minimising the civil use of HEU worldwide."

There has not been, nor will there be, any form of public consultation or Environmental Assessment in Scotland, or elsewhere in the U.K. into a controversial commercial deal which will have a significant impact on the environment, and the potential for an accident for which no technology exists to remedy.

487-1

RESPONSE TO COMMENT COMMENTOR NO. 487: SCOTLAND AGAINST NUCLEAR DUMPING

Response to Comment No. 487-1

The commentor's opposition to reprocessing at Dounreay (Management Alternative 2, Subalternative 1b) is noted. This alternative is discussed in Sections 2.3 and 4.4.2 of the EIS. The subject of public consultation in Scotland is outside the scope of this EIS.

COMMENTOR NO. 487:
SCOTLAND AGAINST NUCLEAR DUMPING (CONT'D.)

-2-

The USA should therefore take full heed of the objections raised in this letter as part of their consultation process. 487-1 (Cont'd.)

** Transporting highly enriched uranium spent fuel rods across Scotland and particularly along the narrow twisting roads in the Highlands of Scotland was publicly unacceptable in 1983, and will be again. The general public, local authorities, as well as environmental campaigners are aware of the risks involved of such transports, and find the risks associated with the number of proposed transports per year completely unacceptable. The route such dangerous loads take is directly through many urban areas, where people do not expect such hazardous loads to be passing through, nor do the local public authorities have provision for nuclear accidents. The route is also along the A9 to Thurso, where there are frequent road accidents, and which has precipitous drops of 40m and exceedingly steep gradients. 487-2

** The flasks used for transportation are inadequate for their task. They are licensed only to operate to the limit of a 9 metre drop, which as detailed above, is less than required.

Should the HEU be sent by sea, the flasks are even less suitable, as they are tested for immersion to a depth of 200 metres for half an hour. This raises the question of how flasks would or could be raised within that time, given the remote nature of Scotland's coastline, and the lack of provision for dealing with a major nuclear incident of this kind by either the local authority fire, coastguard or medical services.

In the event of a fire, these flasks are tested to 800°C for 30 minutes. This temperature is that of the beginning of an average fire incident in a house, and when glass will break and furnishings blaze, and is obviously too low a temperature for a road accident involving highly flammable petroleum or diesel, or other fuels, chemicals or gases which are regularly taken by road rather than rail. Should a ship fire occur, were the spent fuel to be taken by sea, the average fire on board ship lasts for 24 hours or longer, and exceeds 1000°C. If a ship fire occurred with a prevailing on shore breeze, there would be such a major nuclear incident that could cause death, radiation sickness, cancers in the long term, and render whole cities and counties uninhabitable and uncultivatable for thousands of years 487-3

RESPONSE TO COMMENT
COMMENTOR NO. 487:
SCOTLAND AGAINST NUCLEAR DUMPING (CONT'D.)

Response to Comment No. 487-2

Any actions in the United Kingdom resulting from decisions made after completion of this EIS will be subject to the laws and regulations of the United Kingdom and oversight by appropriate regulatory authorities in the United Kingdom. Accordingly, the subject of ground transport in the United Kingdom is outside the scope of this EIS.

Response to Comment No. 487-3

It is inaccurate to state that the spent nuclear fuel transportation casks are licensed only to operate to the limit of a 9 meter drop, as the commentor suggested. The rigorous tests of representative transportation casks have shown that the casks would survive (not lose confinement) even with broadside crashes at 84 miles per hour, or the equivalent of a 70 meters free fall drop. The cask immersion test to a depth of 200 meters for half an hour, as required by the International Atomic Energy Agency, does not mean that the sunken cask has to be retrieved in half an hour. The test is to determine the tightness of the cask seals, and is not for structural damage evaluation.

In respect to the impact a ship fire might have on a spent nuclear fuel transportation cask, there are three facts that mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship fire's intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which as a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it is almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of research reactor spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).

COMMENTOR NO. 487: SCOTLAND AGAINST NUCLEAR DUMPING (CONT'D.)

-3

** The radioactive emissions to the sea and the air from reprocessing at Dounreay will of necessity increase dramatically.
Dounreay are already renegotiating its permits from Her Majesty's Industrial Pollution Inspectorate to discharge radioactivity into the environment.
The AEA want to increase alpha discharges into the sea by over 900%; caesium-137 by 580% and plutonium by over 400%.
Emissions into the air of iodine could increase by nearly 1,000% and of plutonium by 625%.

487-4

There already exists an excess of leukaemia cases in Thurso, the town nearest to Dounreay, which mirrors the situation at the UK's other reprocessing plant at Sellafield, therefore caution must be exercised and radioactive discharges to the sea and the air ought to be zero.

** The US Government argue that the HEU must be reprocessed by Dounreay to minimise the spread of HEU. Dounreay are claiming that they can down blend the HEU to LEU, and thereby comply with USA aspirations.

It must be made quite clear to your department and government that Dounreay are running a commercial operation, and will of course say what they hope will be true in order to win the contract. The US Dept. of Energy should know that on the best independent authority known to S.A.N.D., it is technologically extremely difficult to down blend HEU to LEU, if not nigh on impossible. Dounreay's capabilities to carry this out must be thoroughly examined in this instance. It is our further understanding that MTRs are not presently configured to use LEU, and that there is no wish to reconfigure any MTRs that we are aware of, either now or in the future. Under EURATOM the USA cannot enforce the process of down blending, so it is more than likely to our thinking that the HEU will remain HEU< as that will be the cheapest option. Furthermore, Dounreay's record of honesty, public accountability and transparency is non existent. See press cutting appended. It would indeed be very surprising should the USA. government choose to trust an establishment with such a track record.

487-5

** Nuclear wastes arising from the reprocessing of HEU are supposed to be sent back to the country of origin for disposal in a repository. As there are few such facilities at present, it is more likely that a substitution would be agreed. This will not be acceptable.

RESPONSE TO COMMENT
COMMENTOR NO. 487: SCOTLAND AGAINST NUCLEAR DUMPING (CONT'D.)

Response to Comment No. 487-4

The subjects of airborne and liquid releases from reprocessing operations in foreign countries are outside the scope of this EIS. Please see Section 4.4.2.1 of the EIS and the response to Comment 484-11.

Response to Comment No. 487-5

DOE disagrees with the commentor's assertion that it is extremely difficult to blend down HEU to LEU. This operation has been performed successfully in the past at the Dounreay Site (see the figure attached to Comment Document 442).

As discussed in Appendix B, Section B.1.1 of the EIS, many MTRs are presently configured to use LEU and others are being converted. It is true that the U.S. cannot enforce the process of downblending, but the U.S. can encourage the foreign research reactor operators to use only LEU and the fuel reprocessors (such as United Kingdom Atomic Energy Authority) to supply only LEU. (See Section 2.3 of the EIS.)

The commentor's opposition to a waste substitution arrangement is noted. This possibility is described briefly in Section 4.4.2.3 of the EIS.

The commentor's speculation about curtailed nuclear transports in Europe is outside the scope of this EIS.

COMMENTOR NO. 487:
SCOTLAND AGAINST NUCLEAR DUMPING (CONT'D.)

It is also likely, given the public concern and increased environmental knowledge throughout Europe, that nuclear transports will be curtailed in the future, leaving high and intermediate level nuclear waste in Scotland which does not belong here.

** There is already serious public concern about the US Dept. of Energy proposal, and should the proposal become fact, the USA and Dounreay must face massive public and political outcry and opprobrium, not just in Scotland, nor just the U.K., but across the whole of Europe.

I trust that these objections to the proposal to reprocess HTR spent fuel at Dounreay will be taken fully into account in the decision making process. If there is any further information you require, I will be happy to assist.

I look forward to your response.

Yours sincerely,

Anne E. Baxter.

Anne Baxter,
Convener

487-5
(Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 487:
SCOTLAND AGAINST NUCLEAR DUMPING (CONT'D.)

COMMENTOR NO. 490: FRIENDS OF THE EARTH, SCOTLAND

Charles Head
Programme Manager
Office of Spent Nuclear Fuel Management (RW-37)
US Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585
USA

20 June 1995

Dear Mr Head

REPROCESSING OF HEU AT DOUNREAY — COMMENTS IN RESPONSE TO THE DRAFT EIS

As one of Scotland's leading environmental organisations, Friends of the Earth Scotland strongly objects to the proposal for reprocessing US-origin spent highly enriched uranium (HEU) at Dounreay.

The proposal, contained in the draft Environmental Impact Statement (EIS) published in April, would have significant environmental impacts which we consider to be unacceptable. Furthermore, the EIS contains a number of inconsistencies and misunderstandings with regard to Dounreay.

The history of operations at Dounreay is a catalogue of mis-management, contamination and accidents. As well as the risk of radioactive release resulting from an accident, reprocessing of US-origin HEU would result in significant increases in radioactive discharges to air and sea. Dounreay has already applied to Her Majesty's Industrial Pollution Inspectorate for permission to increase its discharges by nearly 1,000% from current actual levels.

Transportation to Dounreay is likely to be in non-purpose-built ships to the south coast of England and by road to Dounreay in the north of Scotland. We believe that the current safety standards for transports of spent nuclear fuel to be inadequate.

The EIS discusses using the Prototype Fast Reactor Reprocessing Plant, but this plant would not be available for additional reprocessing work until the end of 1997 at the earliest, and possibly not until 1999 or later. The UK Department of Trade and Industry, which owns the plant, has expressed concerned over the age of the plant and the possibility of a serious breakdown.

The EIS gives two different figures for the number of spent fuel elements to be reprocessed at Dounreay. The summary document mentions 750 elements a year for 12 years (9,000 elements), while volume one states that 5,613 elements would be reprocessed outside the US.

MORE/...

FRIENDS OF THE EARTH SCOTLAND

Friends of the Earth Scotland is committed to the conservation, restoration and sustainable use of the environment for the benefit of the community.

72 Hanover Road
Edinburgh EH2 2ND
Scotland UK

Telephone 0131 554 9977
Fax 0131 554 8656
E-mail foescotland@gn.apc.org

A charity (SC003412)

Friends of the Earth Scotland is a member of Friends of the Earth International which campaigns for the environment in over 50 countries worldwide.

Friends of the Earth
Les Amis de la Terre
Amigos de la Tierra

490-1

490-1 (Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 490: FRIENDS OF THE EARTH, SCOTLAND

Response to Comment No. 490-1

The commentor's opposition to reprocessing at Dounreay is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

The text in the Summary has been revised to eliminate the reference to the Prototype Fast Reactor Reprocessing Plant. The decision of which Dounreay plant(s) to use would be up to the plant operators and United Kingdom government regulators, not DOE.

Every alternative involves the same amount of spent nuclear fuel: approximately 22,700 elements as shown in Tables 2-1 and 2-2 in Section 2 of the EIS. Under Management Alternative 2, Subalternative 1b, all 22,700 elements could be reprocessed at Dounreay. Under Management Alternative 3, only a portion of the total amount would be sent to Dounreay: 5,613 elements as shown in Table 2-3. The references to 750 elements per year from 1996 through 2008 in Section 4.9.4 of Volume 1 and in Section S.4.10 of the draft Summary have been revised.

The discussion about current reprocessing activities at Dounreay in Section 2.3 of the EIS has been revised. Reprocessing at Dounreay, as it has been conducted in the past, could only be used as a means of spent nuclear fuel management by reactors that are using HEU for fuel. This would serve to perpetuate the use of HEU in civil programs, in direct opposition to United States nuclear weapons nonproliferation policy goals. However, if some means can be developed for revising the practices for reprocessing at Dounreay, in a manner that will achieve United States nuclear weapons nonproliferation policy objectives (such as are discussed in Section 2.3 of the EIS), then this approach might be acceptable. DOE and the Department of State are actively working with counterparts in the United Kingdom in an attempt to make this a feasible option.

COMMENTOR NO. 490:
FRIENDS OF THE EARTH, SCOTLAND (CONT'D.)

Whichever figure is used, it represents a massive increase on previous reprocessing of overseas spent fuel elements at Dounreay. Between 1958 and 1994 Dounreay reprocessed a total of 3,415 spent fuel elements from overseas research reactors.

It is claimed in the EIS that Dounreay is "currently reprocessing foreign reactor fuel", this is not the case.

Finally, we do not believe that reprocessing of spent HEU fuel at Dounreay is the best option for reducing the proliferation risks associated with HEU. Rather, it is likely to perpetuate the use of weapons grade HEU.

We trust that you will take on board our comments in considering your future policy on dealing with spent HEU.

Yours sincerely

Graham Stein

Graham Stein
Safe Energy Project Co-ordinator

490-1
(Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 490:
FRIENDS OF THE EARTH, SCOTLAND (CONT'D.)

COMMENTOR NO. 577: WEST LOTHIAN DISTRICT COUNCIL

Our Ref: DA/14/4/CL

Your Ref:

If calling please ask for: Christine Lav

Direct dial no: 01506-637254

WEST LOTHIAN
DISTRICT COUNCIL
Administration
St David House South Bridge Street
Bathgate West Lothian EH48 1TT
Tel: (01506) 637000 Fax: (01506) 635454
DX No. 485

27 June 1995

Charles Head
Office of Spent Fuel Management (RW 37)
US Department of Energy
1000 Independence Ave, S.W.
Washington D.C.
United States of America
20585

Dear Sir

Re-processing of Spent Fuel Rods

West Lothian District Council is aware that the United States Department of Energy propose to send up to 9000 spent fuel rods to Dounreay for re-processing over the next 10 - 12 years and considers that it is unacceptable that the Scottish public have not been consulted on this issue. My authority wishes to convey its total opposition to this course of action which it considers would (i) cause a major hazard in the transportation of the highly enriched uranium through the length of Scotland and (ii) result in the dumping of nuclear waste into the sea and air through re-processing. 577-1

In addition, recent confirmed incidences of radioactive accidents and leaks into the public environment at Dounreay as reported in the national press have added to public concerns over the safety of the operation of the Dounreay plant, especially since assurances of total safety control have been repeatedly given over a period of many years.

Accordingly, I write to convey the District Council's exhortations that your government take account of the above observations and resolve to send the spent fuel rods to the nuclear facility nearest to their point of origin for safe above-ground storage and monitoring. 577-2

Yours faithfully

Assistant Director of Administration

Copied to the Department of Trade and Industry

[illegible]

RESPONSE TO COMMENT
COMMENTOR NO. 577: WEST LOTHIAN DISTRICT COUNCIL

Response to Comment No. 577-1

The commentor's opposition to reprocessing at the Dounreay Site is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

The subjects of ground transport in foreign countries, allowed airborne and liquid releases in foreign countries, and public concerns over safety in foreign countries are outside the scope of this EIS. See Section 4.4.2.1 of the EIS and the response to Comment 484-11.

Response to Comment No. 577-2

The commentor's preference for overseas storage at facilities near the research reactors is noted. This is covered under Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

COMMENTOR NO. 730: FORSKNINGSMINISTERIET, MINISTRY OF RESEARCH (CONT'D.)

Conversion to LEU fuel started in 1988 and full conversion was achieved in 1990, DR 3 being one of the first converted research reactors.

For more than 33 years, the operation of the DR 3 has depended on the shipment of the spent fuel elements for reprocessing and/or final storage, first to the U.K. and later on to the United States.

Plans for final storage of high-level radioactive waste in Denmark have never been established. After the decision in 1985 by the Danish Parliament to exclude nuclear power reactors from the Danish energy systems, no such plans could be expected to be established in a foreseeable future. Therefore reprocessing at the British Dounreay Plant is no option for Risø because this would include the obligation for Denmark to take back the high-level waste.

Today DR 3 is one of the most efficiently exploited research reactors in Europe and is part of the Large Installations Programme under the research programmes of the European Union. Annually this attracts more than 100 European and American scientists, specialized in Materials Science to join the international recognized group of Danish scientists. The reactor is globally also one of the largest producers of irradiated silicon for semiconductors, and covers the Danish needs for short-lived and specialized radio-isotopes for medical use.

The Danish Ministry of Research therefore fully support the intention of the U.S. Department of Energy to reestablish the policy for return of U.S. origin spent fuel from foreign research reactors as soon as possible in order to end nearly seven years of uncertainty in this matter.

I refer to the detailed comments forwarded directly to the U.S. Department of Energy by the Managing Director of Risø National Laboratory, Dr. Hans Bjerrum Møller, which are fully supported by the Danish Ministry of Research.

Yours sincerely,

Knud Lassen
Permanent Secretary

730-1

RESPONSE TO COMMENT
COMMENTOR NO. 730: FORSKNINGSMINISTERIET, MINISTRY OF RESEARCH (CONT'D.)

Response to Comment No. 730-1

The commentor's support for Management Alternative 1, management of foreign research reactor spent nuclear fuel in the United States, as described in Section 2.2 of the EIS, is noted.

COMMENTOR No. 730: FORSKNINGSMINISTERIET, MINISTRY OF RESEARCH

FORSKNINGSMINISTERIET

Ministry
of Research

Bredgade 43
DK-1260 København K.

Tel. + 45 3392 9700
Fax + 45 3392 9901
Telex 19388 fd

15 JUNI 1995

Mr. Thomas P. Grumbly
Assistant Secretary for Environmental Management
Department of Energy
Forrestal Building
1000 Independence Avenue, S.W.
Washington, D.C. 20585-0001
USA

Subject: Draft Environmental Impact Statement on a Proposed Nuclear Weapons Non-Proliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, US Department of Energy, March 1995, DOE/EIS-0218D

Dear Assistant Secretary,

The Danish Ministry of Research, under whose auspices Risø National Laboratory (Risø) belongs, would like to submit the following comments on the above mentioned Draft Environmental Impact Statement.

We wish to express our appreciation of the great effort, which has been performed by the Department of Energy and the Department of State, preparing this very comprehensive and detailed document. We see it as a strong commitment by the US Government to reestablish the earlier policy for return of US origin spent nuclear fuel from foreign research reactors.

Denmark has always strongly supported all international initiatives leading up to the Non-Proliferation Treaty, and Denmark was one of the first countries to ratify this treaty in January 1969. Denmark, and especially Risø, actively supported and participated in the International Nuclear Fuel Cycle Evaluation, INFCE, and in accordance with this Danish policy Risø as operator of the Danish research reactor DR 3 actively joined the US-initiated RERTR Programme. Under this programme, Risø developed its own manufacturing process for low-enriched uranium-silicide fuel elements for the DR 3 Reactor.

RESPONSE TO COMMENT
COMMENTOR No. 730: FORSKNINGSMINISTERIET, MINISTRY OF RESEARCH

COMMENTOR NO. 857: GUNN, JOHN

CHARLES HEAD
OFFICE OF SPENT FUEL MANAGEMENT (EM-34)
U.S. DEPARTMENT OF ENERGY
1000 INDEPENDENCE AVE S.W.
WASHINGTON DC. 20585

26 JUNE 1993.

JOHN GUNN.
16 OWEN PL
WICK. CAITHNESS
SCOTLAND KW1 4HT.

Sir

I am taking the liberty of writing to you about a serious matter that concerns your country and mine. It is about the efforts of the UKAEA. to convince your people to send spent nuclear fuel to the Dounreay nuclear plant for re processing.

The management at Dounreay can not be trusted, their safety standards are poor. Beaches here have been contaminated with nuclear waste, there has been countless accidents with the release of radio activity into the environment, one bad one recently. when radio activity escaped into the air would have contaminated the county of Caithness and beyond, if the wind had been from the north.

857-1

Nuclear material frequently goes missing from the nuclear plant (I have enclosed some newspaper cuttings) I believe the U.S. government is very concerned about the availability of ~~radioactive~~ nuclear material that can be used for making nuclear weapons. I understand that the Dounreay re processing plant is past its safe working life

RESPONSE TO COMMENT
COMMENTOR NO. 857: GUNN, JOHN

Response to Comment No. 857-1

The subjects of airborne and liquid releases from reprocessing operations in foreign countries are outside the scope of this EIS. Please see Section 4.4.2.1 of the EIS and the response to Comment 484-11. Nevertheless, the commentor's opposition to reprocessing at the Dounreay Site is noted.

COMMENTOR NO. 857: GUNN, JOHN (CONT'D.)

Sending spent fuel rods to Dounreay for reprocessing would be hazardous in transporting it the length of Scotland, and would cause more nuclear waste to be dumped into the sea and the air in the reprocessing.

There is a cluster of child leukemia cases around Dounreay, it is obvious that it is caused by the nuclear plant, but they just deny everything.

I understand that the USA. is consulting with their public on whether to or send your spent fuel rods here to our country. Nobody here consults the Scottish people about such things, the UK government just imposes what it wants on us, everybody I talk to is against the plan to send your spent fuel rods from Europe to Scotland. The USA is very concerned for the environment, please show some concern for ours. Would it not be a better plan to send the spent fuel rods to their nearest nuclear facility for safe, above ground storage, and monitoring?

Yours sincerely John Gunn

857-1 (Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 857: GUNN, JOHN (CONT'D.)

COMMENTOR NO. 865: AUSTRALIAN DEPARTMENT OF FOREIGN AFFAIRS AND TRADE

DEPARTMENT OF FOREIGN AFFAIRS AND TRADE

CANBERRA ACT 2600

Mr Charles Head
Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
US Department of Energy
1000 Independence Avenue, SW
WASHINGTON DC 20585
USA

29 June, 1995

Dear Mr Head

The Australian Department of Foreign Affairs and Trade (DFAT) welcomes the opportunity to comment on the United States Department of Energy's Draft Environmental Impact Statement (EIS) on a Proposed Nuclear Weapons Non-Proliferation Policy concerning Foreign Research Reactor Spent Nuclear Fuel.

Our approach to this issue is guided by the primacy of our interests in nuclear non-proliferation. Both Australia and the United States have long been supportive of the international nuclear non-proliferation regime. This shared commitment to promoting nuclear non-proliferation was evident at the recent Nuclear Non-Proliferation Treaty Review and Extension Conference (NPTREC) through our common support for, and our respective efforts to secure, indefinite extension of the Treaty. An important part of our shared non-proliferation effort entails ensuring the proper management, accounting, physical protection, safety and eventual disposition of nuclear material. The NPTREC gave explicit endorsement, as part of its agreed Principles and Objectives for Nuclear Non-proliferation and Disarmament, to maintaining the most rigorous international standards in these practices.

The Draft Statement states clearly that one of the main intentions of the proposed new policy is to remove as much US-origin HEU as possible from international commerce so as to promote nuclear non-proliferation. DFAT strongly supports this approach. We consider that, of the three basic alternatives canvassed by the Draft Statement, Management Alternative 1, which requires the return to the US (for disposal or other management) of US-origin foreign research reactor spent nuclear fuel, represents by far the most effective way of pursuing this non-proliferation objective. Australia would be particularly concerned if a decision by the United States not to accept the return of spent reactor fuel were to lead to increased demand for reprocessing facilities in countries now holding US-origin fuel. Australia believes this would be contrary to sound non-proliferation principles which require sensitive nuclear facilities to exist in as few countries as possible. Nor do we believe it to be in the best interests of non-proliferation for there to exist substantial holdings of fissile material, albeit in spent fuel, in countries excess to their requirements. In Australia's case, where there is no call

865-1

865-2

RESPONSE TO COMMENT COMMENTOR NO. 865: AUSTRALIAN DEPARTMENT OF FOREIGN AFFAIRS AND TRADE

Response to Comment No. 865-1

The commentor's support for accepting and managing foreign research reactor spent nuclear fuel in the United States, is noted. Acceptance of foreign research reactor spent nuclear fuel in the U.S. is considered under Management Alternative 1 or 3, described in Section 2.2 and 2.4 of the EIS, respectively.

Response to Comment No. 865-2

The commentor's concern that selection of Management Alternative 2, as described in Section 2.3 of the EIS might lead to an increased demand for overseas reprocessing facilities is noted. In the event that Management Alternative 2 is selected, the United States would seek cooperative agreements with foreign reprocessing facilities to blend down the resultant HEU to LEU. It would also be important that existing foreign reprocessing facilities develop or maintain the capability to reprocess LEU so that conversions to or continued use of LEU in research reactors would be encouraged.

COMMENTOR NO. 865: AUSTRALIAN DEPARTMENT OF FOREIGN AFFAIRS AND TRADE (CONT'D.)

on such stocks for nuclear power generation, this fissile material is clearly excess to requirements and should desirably be removed.

The Draft Statement analyses in some detail the possible effects on the environment of the return of US-origin spent nuclear fuel. It notes the return of the spent fuel under Management Alternative 1 would be carried out according to strict international safety regulations relating to transport of radioactive material by ship and over land. Additionally, the various proposed ports of entry, management sites and storage technologies are canvassed with a view to minimising the impact on the environment and any possible risks to human health. We note that the Draft Statement concludes that the potential impact on the environment of Management Alternative 1 would be small.

The right of the United States to recover excess HEU (including irradiated HEU) supplied to Australia is clearly established in the United States-Australia Agreement concerning the Peaceful Uses of Nuclear Energy of 5 July 1979. The United States gave an undertaking that it would exercise that right when in January 1987 the DOE concluded a contract with the Australian Nuclear Science and Technology Organisation (ANSTO) for the return and reprocessing, on a commercial basis, of all its (then) US-origin holdings of spent fuel. Since then, Australia's consideration of the management of its spent fuel has been based upon the assumption that at least that material would be returned to the US. The spent fuel is held in storage at ANSTO pending a decision by DOE to proceed with its return. Since 1987, the inventory of spent research reactor fuel at ANSTO has grown close to filling the available storage facilities. Uncertainty about the United States' long-term position has undermined the basis for ANSTO pursuing its spent fuel management strategies.

865-3

The Department of Foreign Affairs and Trade considers the above factors should be taken fully into account in considering the various management alternatives in the EIS. They lead us to the clear conclusion that our common interests in effective and sound non-proliferation policies and practices would be best served by the implementation of Management Alternative 1.

Yours sincerely

Les Luck
Assistant Secretary
Nuclear Policy Branch

RESPONSE TO COMMENT
COMMENTOR NO. 865: AUSTRALIAN DEPARTMENT OF FOREIGN AFFAIRS AND TRADE (CONT'D.)

Response to Comment No. 865-3

It is DOE's position that neither DOE nor the United States Government has any legal obligation to accept spent nuclear fuel from foreign research reactors.

COMMENTOR NO. 1012: GILMOUR, M.

27 MacRae St.
Wick,
Caithness KW1 5QN.
Scotland.

24.6.95

Dear Sir,

The public in U.S.A. have been consulted on their views regarding the sending of 9000 spent fuel rods to Dounreay (Scotland). As there is no such opportunity in the U.K. I would like to give my objection to the scheme.

The major hazard involved in the transporting of this highly enriched uranium half way round the world seems ludicrous and with the end result being more nuclear waste to contend with, unacceptable.

1012-1

RESPONSE TO COMMENT
COMMENTOR NO. 1012: GILMOUR, M.

Response to Comment No. 1012-1

The commentor's opposition to reprocessing at the Dounreay Site is noted. This is part of Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 1012: M. GILMOUR (CONT'D.)

As you are probably aware, the problems with disposal of the nuclear waste, especially in this part of the county have reached disturbing conclusions, with leaks being found on the shore & surrounding areas.

1012-1 (Cont'd.)

For the sake of future generations please do not agree to this alarming project but approve the spent fuel rods being sent to their nearest facility for safe, above ground storage where they can be monitored, until they can be dealt with safely.

1012-2

Sincerely
M Gilmour.

RESPONSE TO COMMENT
COMMENTOR NO. 1012: M. GILMOUR (CONT'D.)

Response to Comment No. 1012-2

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

COMMENTOR NO. 1021: HEATH, BERNARD J.

TELEPHONE (0847) 85664

Bernard and Betty Heath
"Little Clett"
Brough, DUNNET
Caithness
KW14 8XR

30-6-95

Charles Head
Office of Spent Fuel
U.S. Dept of Energy
1000 Independence Ave SW
WASHINGTON DC 20585

Dear Sir

The majority of the people up here in the NORTH of SCOTLAND have no faith in Dounreay's self styled "Centre of Excellence". There have been some terrible cock-ups over the years — many of these incidents are just now coming to light — you must be aware of these. 1021-1

Space age technology may come up with the final disposal answer, meantime please don't send your dangerous materials over here to our tiny island, store it safely meantime.

Yours sincerely
Bernard J Heath BEM
E.B. Heath BEM

RESPONSE TO COMMENT
COMMENTOR NO. 1021: HEATH, BERNARD J.

Response to Comment No. 1021-1

The commentor's opposition to reprocessing at the Dounreay Site is noted. This is part of Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 1117: NUCLEAR FREE LOCAL AUTHORITIES

Nuclear Free Local Authorities (Scotland)
Secretariat

Our Ref: 23/4/5 GG
Date: 12/7/95

City of Aberdeen

SOLICITOR'S DIVISION
Town House, Aberdeen, AB9 1AQ
Telephone: 01224 276276
Fax: 01224 522491
DX: AB52

CONFIRMATION OF FAX.

Charles Head,
Programme Manager,
Office of Spent Nuclear Fuel
Management (EM-37),
US Department of Energy,
1000 Independence Avenue SW,
WASHINGTON, DC 20585.

Dear Mr. Head,

Response to Consultation on Draft Environmental Impact Assessment
Reprocessing of HEU Fuel

I am writing on behalf of Nuclear Free Local Authorities (Scotland). NFLA(S) is an organisation to which most of the Regional, District and Islands Councils in Scotland are affiliated; local authorities in membership presently represent more than 90% of the Scottish population. NFLA (Scotland) is part of International Nuclear Free Local Authorities, an international organisation of several thousand local councils spanning all major continents and recognised by the United Nations as a non-governmental organisation. In this way, local councils are united in pressing their national governments to do more to reduce and ultimately eliminate the risks associated with the continued use and proliferation of nuclear technologies.

The Scottish Steering Committee, at their meeting in Aberdeen on 19th June, instructed that I submit on their behalf a response to the consultation presently being undertaken by the Department of Energy on proposals which may, inter alia, allow the reprocessing of HEU fuel from overseas reactors at UK AEA's Dounreay Nuclear Establishment in Caithness. The response is enclosed with this letter.

Whilst I am aware that the consultation period was to have expired on 20th June, I now understand that this has been extended to 20th July.

I should therefore be obliged if you would acknowledge timeous receipt of this letter and confirm that the submission enclosed herewith will be taken fully into consideration in the preparation of your Department's report on the issues which, I understand will be available in September, although perhaps you would confirm that this is so.

I should be grateful if you would provide me with a copy of the final EIS at the earliest opportunity.

Yours faithfully,

John A. Marr
Solicitor
Secretary to NFLA (Scotland)

ALAN T TOWNS
City Solicitor

RESPONSE TO COMMENT
COMMENTOR NO. 1117: NUCLEAR FREE LOCAL AUTHORITIES

COMMENTOR NO. 1117: NUCLEAR FREE LOCAL AUTHORITIES (CONT'D.)

SUBMISSION OF NUCLEAR FREE LOCAL AUTHORITIES (SCOTLAND)

to

US DEPARTMENT OF ENERGY CONSULTATION

on

REPROCESSING OF HEU FUEL

1. **Proposals**

In order to facilitate the reprocessing of approximately 22,700 US-origin weapons grade spent highly enriched uranium (HEU) fuel rods from research reactors in 41 countries, it has been proposed that 5,613 rods be reprocessed at UK AEA's Dounreay Nuclear Establishment in Caithness, Scotland.

2. **Timescale for Consultation**

A draft Environmental Impact Statement (EIS) concerning this and other proposals for the reprocessing of HEU fuel from overseas research reactors was published by the US Department of Energy in April, 1995. Responses to the statement were invited as part of a consultation exercise which expired originally on 20th June, 1995, but which is now due to expire on 20th July, 1995.

NFLA(S) are concerned that, whilst the EIS was published for consultation in the United States in April, the Statement did not become available in Scotland until the beginning of June thereby allowing insufficient time for the significant proposals contained therein to be assessed and evaluated. 1117-1

Accordingly, NFLA(S) are concerned that the Department of Energy may be seeking to hasten the consultation process by allowing less time for the preparation of submissions from this Country than those from the US. 1117-1

NFLA(S) further feel that the effect of the shorter time available for preparation of submissions will be that the concerns of many organisations in Scotland may either go unheard, or may be stated hastily with the result that the Consultation may be concluded without the benefit of the best information presented in a rational, unhurried manner. 1117-1

2. **The Suitability of Dounreay as a Venue for Intensive Spent Fuel Reprocessing**

NFLA(S) understands that the Department of Energy has proposed using plant at Dounreay associated with the Prototype Fast Reactor (PFR) and not the Materials Testing Reactor (MTR) which has carried out such work in the past. 1117-2

RESPONSE TO COMMENT COMMENTOR NO. 1117: NUCLEAR FREE LOCAL AUTHORITIES (CONT'D.)

Response to Comment No. 1117-1

DOE regrets any delay that may have occurred in the commentor's receipt of the draft EIS. Notice of the proposed policy was provided with the publication in the *Federal Register* (60 FR 19899, April 21, 1995) of the availability of the draft EIS. In order to ensure that an interested party (e.g., a foreign nation) has adequate time to review a document prepared under NEPA, it is recommended that attempts be made to secure access to the *Federal Register* so that such interested parties may review, at the earliest opportunity, announcements by a Federal agency (e.g., DOE) of proposed major Federal actions.

Response to Comment No. 1117-2

The text in the Summary has been revised to eliminate the reference to the Prototype Fast Reactor Reprocessing Plant. The decision of which Dounreay plant(s) to use would be up to the plant operators and United Kingdom government regulators, not DOE. The discussion about current reprocessing activities at the Dounreay Site has also been revised in Section 2.3 of the EIS. (See the response to Comment 490-1.)

COMMENTOR NO. 1117: NUCLEAR FREE LOCAL AUTHORITIES (CONT'D.)

It is likely, however, according to estimates of AEA which runs the Dounreay site, that the PFR plant would not be able to undertake such work until 1997/98 when the reprocessing of the last charge of PFR fuel has been completed.

Accordingly, NFLA(S) would wish to question the rationale behind the desire of the Department of Energy that the work be undertaken at the PFR plant which is engaged until 1997/98 when the MTR plant is already idle and was, in fact, mothballed in 1994, and would call for clarification of which reprocessing plant the Department of Energy proposes making use of.

Part of the EIS describes the UK as having modern fuel cycle facilities. NFLA(S) believe this cannot be said of Dounreay where reprocessing facilities have operated for nearly 40 years.

NFLA(S) is concerned that the EIS presents an inaccurate picture of events at Dounreay by claiming that "the British facilities at Dounreay are currently reprocessing foreign research reactor fuel". This is not so, as earlier reprocessing contracts expired in 1994.

NFLA(S) is further concerned by the inevitable increases in marine and aerial discharges which would accompany any intensification of reprocessing work undertaken at the plant which is already nearing the end of its working life.

1117-2 (Cont'd.)

Aware that US policy is to discourage reprocessing, NFLA(S) is concerned that any moves towards US-backed contracts for sending HEU fuel to Dounreay would prolong the operation of the plant which would otherwise close.

Between 1958 and 1994, Dounreay reprocessed some 3,415 spent fuel elements from foreign research reactors. Now, however, it is proposed that the plant increase its throughput massively by reprocessing some 5,613 elements in just 12 years; indeed NFLA(S) is aware that some sources suggest up to 15000 elements are being considered for overseas reprocessing.

Importation of spent HEU fuel for remediation on this scale would increase waste streams for management in this Country or discharge to the environment.

Dounreay is currently renegotiating its permits to discharge radioactivity into the environment and has submitted an application to HM Industrial Pollution Inspectorate (HMIPI) which seeks approval to increase its actual discharges by up to 1000%. NFLA (Scotland) is working with NFLA (UK) in contesting the application on a number of grounds.

RESPONSE TO COMMENT COMMENTOR NO. 1117: NUCLEAR FREE LOCAL AUTHORITIES (CONT'D.)

While some of the facilities at the Dounreay Site are old, the United Kingdom has complete modern fuel cycle facilities at the Sellafield Site. The point of the statement in the EIS, however, is that the technical expertise to reprocess already exists in France and the United Kingdom. Thus, contracting for reprocessing services in one or both of those countries would not increase the risk of proliferation.

The subjects of airborne and liquid releases from reprocessing operations in foreign countries are outside the scope of this EIS. See Section 4.4.2.1 of the EIS and the response to Comment 484-11.

The commentor's statement that U.S. policy is to discourage reprocessing is incorrect. As explained in Section 1.1 of the EIS, the U.S. Government does not encourage the civil use of plutonium, but it is also committed to being a reliable nuclear trading partner and to avoiding interference in peaceful nuclear programs.

For the number of elements that could be reprocessed at the Dounreay Site under each of the alternatives, see the response to Comment 490-1.

COMMENTOR NO. 1117: NUCLEAR FREE LOCAL AUTHORITIES (CONT'D.)

NFLA(S) is therefore extremely concerned by the current situation regarding a possible lack of valid discharge authorisations in respect of reprocessing activities at the site and is further gravely concerned by the safety implications of massively increasing reprocessing throughput given the site's poor safety record as evidenced by continuing instances of accidents involving the escape of plutonium dust from reprocessing plant D1206 together with ongoing problems in respect of a redundant radioactive and chemical waste storage shaft which exploded in 1977 and which was highlighted in a recent joint report by two UK Government Advisory Bodies (the Radioactive Waste Management Advisory Committee and the Committee on Medical Aspects of Radiation in the Environment) as the most likely source of radioactive contamination found on nearby beaches and also within the site itself. Indeed, at the time of writing, further radioactive hotspots have been discovered within the site which are believed also to have originated from the waste shaft explosion, together with small quantities in a Dounreay office building.

1117-2 (Cont'd.)

Whilst the RWMAC/COMARE report highlighted the waste shaft as the most likely source of the contaminants, it could not rule out other possible sources including the fuel handling area which would be most likely to receive the HEU fuel in the first instance.

3. **Transport Implications**

Transport routes to Dounreay from foreign research reactors will depend on the country of origin but experience so far suggests that waste will arrive on non-purpose built ships at ports in the south of Britain and then travel by road to Dounreay.

It is understood that the International Atomic Energy Agency (IAEA) require flasks for transporting spent fuel be designed to survive the impact of a nine metre fall, being engulfed in fire for 30 minutes at a temperature of 800°C and immersion at a depth of 200 metres for one hour.

1117-3

It is further understood that International Maritime Organisation statistics show a average duration of a ship-board fire as 28 hours at sea and 23 hours in port with temperatures exceeding 1000°C.

Accordingly, NFLA(S) is extremely concerned that IAEA requirements regarding flask integrity may be inadequate. Indeed, such are the possible consequence of a major accident during transportation of radioactive materials that the world's leading marine insurance markets have introduced clauses into their policies excluding coverage of accidents involving radioactive contamination.

RESPONSE TO COMMENT COMMENTOR NO. 1117: NUCLEAR FREE LOCAL AUTHORITIES (CONT'D.)

Response to Comment No. 1117-3

The transportation casks that would be used for the foreign research reactor spent nuclear fuel are certified if their design meets certain tests, including a fire test, and if the individual casks pass periodic inspections (Section 2.6.2 of the EIS). These certification standards were developed for use of the transportation casks on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. The duration of a ship fire is directly related to the amount of combustibles carried on board. The number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicate that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures.

In respect to the impact a ship fire might have on a transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship's fire intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the spent nuclear fuel transportation cask. For these reasons, it would be almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of research reactor spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (see Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).

The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt foreign research reactor spent nuclear fuel. Appendix D, Sections D.5.3 of the EIS presents detailed discussion of accident probabilities and radioactive material source terms and Section D.5.4 presents the results of the analyses.

In conclusion, although long duration ship fires are possible, and have occurred, they are uncommon events. Analyses in the EIS indicate that even in the event of a severe ship fire involving a transportation cask, neither the consequences nor risks are great (see Appendix D, Section D.5.5 of the EIS).

COMMENTOR NO. 1117: NUCLEAR FREE LOCAL AUTHORITIES (CONT'D.)

NFLA(S) has campaigned vigorously for many years against the transportation of radioactive waste materials and in this regard the Organisation is concerned by proposals contained in the EIS for intensive transportation of considerable quantities of radioactive wastes to the Dounreay site for remediation.

4. Conclusions

NFLA(S) recognises the importance of reducing and ultimately eliminating the threat of proliferation of nuclear weapons through proper management of spent fuel from foreign research reactors. — *1117-4*

In this regard, NFLA(S) is of the view that "proper management" should not include the option of remediation either in the US or abroad but should concentrate instead, on high security above-ground storage and monitoring of waste materials. — *1117-5*

NFLA(S) believes Dounreay will not be a suitable site for the intensive waste remediation proposed by the Department of Energy because — *1117-2 (Cont'd.)*

- risks associated with an accident in transportation may not be minimised.
- the Dounreay site is elderly and may not be able to safely handle an intensive programme of reprocessing work.
- the Dounreay site has a very poor safety record.
- UK Government bodies believe radioactive hotspots in and around the plant are most likely to have originated from an unstable waste shaft although the fuel handling area cannot be ruled out as a possible source.
- Dounreay management has demonstrated a cavalier attitude to regulatory and safety requirements.

NFLA(S) would be grateful to receive a copy of the final EIS as soon as it is available.

John A. Marr
Solicitor and Secretary
on behalf of Nuclear Free Local Authorities (Scotland)

RESPONSE TO COMMENT
COMMENTOR NO. 1117: NUCLEAR FREE LOCAL AUTHORITIES (CONT'D.)

Response to Comment No. 1117-4

The commentor's support for the nonproliferation of nuclear weapons is noted.

Response to Comment No. 1117-5

The commentor's preference for storage over reprocessing, whether in the U.S. or abroad, is noted. Storage is included under Management Alternatives 1, 2, and 3, which are discussed in Sections 2.2, 2.3, 2.4, 4.2, 4.3, 4.4, and 4.5 of the EIS.

COMMENTOR NO. 1119: GREENPEACE, NETHERLANDS

Stichting GREENPEACE Nederland

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585
U.S.A.
FAX: 00.1.202.586.5256

Amsterdam, July 18th, 1995.

Dear Sir,

Please find below our comments on the "Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Fuel".

General information

In the Netherlands there are three research reactors using high enriched uranium (HEU) of US origin:

1. High Flux Reactor (HFR of pool type) of 45 Megawatt using 93% HEU. This reactor is located near the village Petten and operated by the Joint Research Center of the European Commission (EC). The EC (Euratom) is the formal owner.

2. Low Flux Reactor (LFR of Argonaut type) of 30 Kilowatt using 90% HEU. This reactor is owned and operated by the state-owned Netherlands Energy Research Foundation (ECN) which is also a major client of the HFR. The LFR is also on the premises of ECN near Petten.

3. Hoger Onderwijs Reactor (HOR of pool type) of 2 Megawatt using 93% HEU. This reactor is owned by the University of Delft and operated by the Interuniversity Reactor Institute (IRI). The HOR is the only reactor in the Netherlands to be converted in the near future to use LEU.

RESPONSE TO COMMENT
COMMENTOR NO. 1119: GREENPEACE, NETHERLANDS

COMMENTOR NO. 1119: GREENPEACE, NETHERLANDS (CONT'D.)

Nonproliferation objectives

As it comes to US nonproliferation policies the main concern of Greenpeace Netherlands is the High Flux Reactor (HFR) since this reactor is one of the most powerful multi-purpose research and test reactors in the world.

In short, the main reason for this concern is the actual transformation of the HFR as a reactor for scientific research into a production reactor for commercial purposes.

Recently the ECN asked for new licences in order to exploit the HFR for more commercial use in the medical field. One of the main activities of the HFR in the near future is the production of Molybdenum-99 which will be separated in a special ECN laboratory from HFR's irradiated fual elements.
This molybdenum-99 (Mo-99) is the 'raw material' for the production of technetium-99m (Tc-99) by the US firm Mallinckrodt Medical BV, also based at the premises of ECN at Petten. TC-99 is a decay product of Mo-99.
Although the owner, the European Commission, seems to be willing to convert the HFR to LEU according to the US RERTR program, it is in the commercial interest of ECN and of the US company Mallinckrodt to continue the irradiation and fission of HEU targets (Ual) in the HFR since production of molybdenum-99 is much more effective and cheaper from HEU than from LEU.

Production of Mo-99 from LEU is possible by using U3Si2 targets instead of Ual targets. Separation of Mo-99 from Silicate targets, however, needs a different dissolution technology, new installations and a new development process. It is, therefore, not in the interest of the US company Mallinckrodt to promote a rapid conversion program. So the ongoing delay of a conversion program of the HFR - conversion studies have been carried out already from 1985 onwards -is not only the responsability of Euratom and the ECN, but also of the US company Mallinckrodt.
Since the purpose of the proposed US policy is to promote nonproliferation objectives by seeking reduction of HEU from civilian commerce, Greenpeace Netherlands believes the US government should address the proliferation issue also to the US company Mallinckrodt which, as the major client of ECN, is also responsable for the present deadlock situation in respect to conversion plans of the HFR.

In the near future governmental responsabilities of the HFR might shift more and more from the European level to the national level, in casu to the Dutch government. At the moment, for a four-year period (1992-1996), the HFR is financed via Euratom by government subsidies from Germany (42.5 million Ecu or 85 million Dutch guilders) and the Netherlands (75 million Dutch guilders).
The German government has indicated it will not renew its subsidies for the next four-year period. As part of a nuclear phase-out

1119-1

RESPONSE TO COMMENT
COMMENTOR NO. 1119: GREENPEACE, NETHERLANDS (CONT'D.)

Response to Comment No. 1119-1

The commentor's reiteration of the fact that some foreign research reactors are used to produce medical isotopes, and the commentor's emphasis on the importance of converting foreign research reactors from using HEU to LEU, are noted. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

At a power rating of 45 MW, this reactor is one of the most powerful research reactors fueled by HEU enriched in the United States. The commentor's concern about the HFR and support for its quick conversion are noted. As shown in Appendix B, Table B-3, this reactor can be converted to the use of LEU fuel and this conversion is expected to begin before 2001.

DOE and the Department of State are also promoting the conversion of HEU targets to LEU targets in foreign research reactors by offering the same incentives for target material as for spent nuclear fuel from foreign research reactors. These incentives apply to the reactor owners, reactor operators, or whoever else may be responsible for management of target material. If Mallinckrodt Medical BV is responsible, directly or indirectly, for the management of target material that was enriched in the United States, then it could benefit from these incentives. DOE and the Department of State cannot, however, apply any additional or direct pressure on Mallinckrodt Medical BV, as suggested by the commentor. Consideration of U.S. corporations' roles as clients to foreign research reactor owners/operators is outside the scope of this EIS.

The issue of funding for HFR is also outside the scope of this EIS.

policy the Dutch government has already cut subsidies for nuclear research by ECN and is encouraging the ECN to find funding from commercial sources. At the moment it is not clear if the Dutch government will continue to fund the HFR.

In this situation, where continued exploitation of the HFR has become very controversial in the Netherlands, where there have been discussions with the Russian company Minatom as an alternative supplier of HEU, and where there is a real threat of sending HFR's spent fuel to the ill-managed Dounreay reprocessing plant in Scotland, Greenpeace Netherlands concludes that the proliferation risks of the use of HEU of US origin can only be solved by a quick conversion process.

1119-1 (Cont'd.)

Sincerely yours,

Jaap Bodenburg

Greenpeace Netherlands
Nuclear Campaign

COMMENTOR NO. 1131: DEJONGHE, PAUL

DR. IR. PAUL DEJONGHE

8400 OOSTENDE
KAROL JANSSENSLAAN 6, BUS 7
TEL. 059/80 10 62

Oostende, 23.05.1995

Edlow International Company
1666 Connecticut Ave., N.W. Suite 500
Washington D.C. 20009, USA

Fax 00.1.202.483.4959

Dear Jack,

conc. : meeting of the "Edlow Group" May 30 and 31 in Washington D.C.

Please find herewith two notes which we prepared after we received your messages in view of the meeting of next week end which were submitted to the new management at SCK/CEN. I will try to have at hand a new version of the table which summarizes our needs in shipping or reprocessing during the coming years.

Looking again at page 3 of the EIS Summary document, which illustrates Uses and Benefits of Research Reactors, I am surprised finding no single reference towards a major use of research reactors, which is the testing of materials and fuels. In recent years, more and more attention is being paid to testing various modern fuel forms, not only MOX (safety experiments) but also NPT more friendly fuels such as cermets and fuels for actinide burning programmes; Reactor safety is also a major subject requiring irradiations. Ignoring such uses of research reactors can sound very good if one wants to illustrate that research reactors mainly serve objectives of scientific research, medicine and quality control in industry. However, it does not necessarily reflect the total truth and this might become counterproductive at some time. 1131-1

I am looking forward to our meeting.

Sincerely,

Paul Dejonghe

encl : 2
Total # of pages : 3

RESPONSE TO COMMENT
COMMENTOR NO. 1131: DEJONGHE, PAUL

Response to Comment No. 1131-1

In Section 1.1 of the EIS, testing of materials was attributed to the research reactor benefits. Testing of materials and fuels has been added to Figure S-1 of the EIS Summary to highlight further the research reactors' usefulness and benefits.

COMMENTOR NO. 1132: JAPAN ATOMIC ENERGY RESEARCH INSTITUTE

May 19, 1999

Ms. Marilena Conde
Assistant to the President
Edlow International Company
1666 Connecticut Ave., N.W., Suite 201
Washington, D.C. 20009
U.S.A.

Dear Ms. Conde,

Thank you very much for your welcome letter dated April 17, 1999. I also be happy to work with you for research reactors.

Now, I am sending our comments for the draft EIS which was released April 12. Please find it in the attached paper. I would be happy if you could synthesize the these comments into your comments.

One of our staff in JAERI's Washington office will attend the public hearing on the EIS in Washington on May 21, as well as the meeting of the Edlow Group on May 26.

Sincerely yours,

H. Tsuruta

H. Tsuruta
General Manager
Office of Nuclear Fuel Management
Office of Safety and Control
Japan Atomic Energy Research Inst.

1

RESPONSE TO COMMENT
COMMENTOR NO. 1132: JAPAN ATOMIC ENERGY RESEARCH INSTITUTE

COMMENTOR NO. 1132: JAPAN ATOMIC ENERGY RESEARCH INSTITUTE (CONT'D.)

JAPAN ATOMIC ENERGY RESEARCH INSTITUTE
OFFICE OF SAFETY AND CONTROL

FUKOKU-SEIMEI BLDG
2-2-2 UCHISAIWAI-CHO
CHIYODA-KU. TOKYO 100
JAPAN

FAX 81-3-3592-2180
PHONE 81-3-3592-2381

TO : FAX 202-488-4840

MRS. MARILENA CHURE
ASSISTANT TO THE PRESIDENT

EDLOW INTERNATIONAL COMPANY
1666 CONNECTICUT. AVE.,N.W.,SUITE 201
WASHINGTON,D.C. 20009
U.S.A.

FROM : HARUHICHI YOSHIDA
OFFICE OF NUCLEAR FUEL MANAGEMENT

DATE : JUNE 20. 1988

TOTAL PAGES INCLUDING THIS COVER PAGE: 2

SUBJECT : COMMENTS BY JAERI AND KYOTO UNIV. ON DRAFT EIS

TEXT : FOR YOUR REFERENCE, ATTACHED IS A COPY OF OUR COMMENTS ON DOE'S DRAFT EIS UNDER JOINT SIGNATURE OF JAERI AND KYOTO UNIV. THE COMMENTS WERE SUBMITTED TO MR. CHARLES HEAD, PROGRAM MANAGER OF U.S.DOE. ON JUNE 10. 1988. 1132-1

AS STATED IN ITEM 5 OF THE COMMENTS, WE THINK THAT JAERI'S TRANSPORTATION CASKS CAN BE USED FOR OUR TEST AND RESEARCH REACTORS, SUCH AS JMTR, JRR-2, JRR-3 AND JRR-4. ACCORDING TO OUR REPRESENTATIVE AT EDLOW'S CONFERENCE HELD AT WASHINGTON D.C. ON MAY 30, 1988, HOWEVER, MR. JACK EDLOW MENTIONED THAT JAPAN IS NOT LIKELY SHARE THE CASKS AND A NEW CASK TYPE IS NEEDED. I WOULD APPRECIATE IT IF YOU WOULD KINDLY EXPLAIN MORE DETAILS WHY OUR CASKS ARE NOT APPLICABLE. 1132-2

WE LOOK FORWARD TO HEARING FROM YOU. THANK YOU.

RESPONSE TO COMMENT
COMMENTOR NO. 1132: JAPAN ATOMIC ENERGY RESEARCH INSTITUTE (CONT'D.)

Response to Comment No. 1132-1

The attachment which contains additional specific comments on the draft EIS has been received by DOE and is identified as document 268. Responses have been provided to each of the attached comments in the response to document 268.

Response to Comment No. 1132-2

Table B-14 of the EIS identifies representative transportation casks that might be used during spent nuclear fuel transport. Other casks could be used if they become available and are approved by the U.S. Department of Transportation.

COMMENTOR NO. 1132: JAPAN ATOMIC ENERGY RESEARCH INSTITUTE (CONT'D.)

Comments by Japan Atomic Energy Research Institute
and Kyoto University
on
The Department of Energy's Draft Environmental Impact Statement
on a Proposed Nuclear Weapons Nonproliferation Policy
concerning Foreign Research Reactor Spent Nuclear Fuel

June 1995

We are filing written comments on the draft Environmental Impact Statement (EIS). Although we generally support its analysis, we have great concerns in the following points:

1. The cost estimates by DOE are tremendously high. Statements on the items of the costs, namely, the basis of actual cost, are necessary to be categorized.

2. Although we are willing to pay a truly cost-based price, any additional fee which would come from the change of the management, is difficult to be paid for budgetary clarification.

3. A failed fuel which would be sealed in a can, needs to be accepted by the U.S.

4. The Department of Energy shall compensate the reactor operator for uranium in the spent nuclear fuel accepted in the U.S. Such compensation by DOE will consists of providing LEU of equivalent value or financial settlement.

5. When DOE decided to promote reprocessing of the U.S. origin spent nuclear fuel outside of the U.S., such as the United Kingdom or France, the United States should accept the radioactive wastes resulting from the processing.

6. Typical transportation casks are illustrated in the EIS. Unfortunately, JAERI's casks, such as JRC-20Y-20T and JMS-27Y-18.5T, are not found in Volume 1 or Appendix B.
These casks were licensed in the past, and their certificate number were USA/0208/B(U)F and USA/0401/B(U)F-85, respectively. We think that these casks approved by the U.S. Competent Authority, can be used for the transportation of our research reactor spent nuclear fuel.

Japan Atomic Energy Research Institute is joining in the Edlow Group which is an association of 14 foreign research reactors facilities. We believe that our comments mentioned above, are fundamentally in conformity Edlow's and we support them, firmly.

Finally, we would like to request that a Record of Decision followed by the final EIS will be issued by the end of December 1995 as scheduled.

RESPONSE TO COMMENT
COMMENTOR NO. 1132: JAPAN ATOMIC ENERGY RESEARCH INSTITUTE (CONT'D.)

COMMENTOR NO. 1133: PAUL SCHERRER INSTITUT

PAUL SCHERRER INSTITUT

CH-5232 Villigen PSI
Schweiz

Telefon zentral 056 / 99 21 11
direkt 056 / 99 28 93
Telefax direkt 056 / 99 23 27

Villigen 20.5.95

United States Department of Energy
Office of Environmental Management (EM-37)
Attn: Mr. Charles Head
1000 Independence Avenue, S.W.
Washington, DC 20585-0001

SUBJECT: EIS Draft Comments from Paul Scherrer Institute

Comment 1
In the introduction of the EIS-Draft DOE's "Off-Site Fuels Policy" is defined contradictive to the prior consent between PSI and DOE. In 1986 DOE declared to accept all spent fuel which contains uranium, enriched in the US as a prerequisitive of the implementation of the RERTR program.
PSI trusted on the assurance of the US to accept this fuel and started very early under great effort and costs the conversion of its research reactor to LEU-fuel . We also supported the international cooperation to reach the goals of the non proliferation policy by assisting the IAEA's consultant' group. Our contributions are documented in the "Research Reactor Core Conversion from the Use of Highly enriched Uranium to the Use of Low enriched Uranium Fuels guidebook" (IAEA-TECDOC-233).
We are concerned about the change in the US policy, when the "Off-Site Fuels Policy" of 1988 was unilaterally declared as expired in spite of the contract which we still regard as valid. *1133-1*

Comment 2
In the introduction on page 1-3, 4th paragraph, concerning the non acceptance of spent fuel, only 153 elements are excepted from non acceptance the instead of the 409 elements, for which DOE has signed contracts. The second shipment is still due to be accepted by the US. *1133-2*

Comment 3
In the table B-1 in of Appendix B, 159 spent fuel elements from Switzerland are estimated to be managed under the EIS policy by january 2006. Included in this total number of elements are the 33 elements to be shipped under the EA agreement as soon as the ligitation in South Carolina is resolved.
PSI has a valid contract for the return of these elements under the EA agreement and can therefore not accept, that these 33 elements are accounted under the EIS, as published in the draft of the EIS. These 33 elements are prepared for shipment by cutting off the bottom adaptors and top ends with handles.
An extraordinary extension for temporarily storage of these elements in our hotlab's transfer pool expires in August 1995 because this pool is only licenced for loading fuel transportation casks. *1133-3*

Yours sincerely
Paul Scherrer Institute
R. Brogli
R. Brogli

RESPONSE TO COMMENT
COMMENTOR NO. 1133: PAUL SCHERRER INSTITUT

Response to Comment No. 1133-1

The commentor's position that the United States is legally obligated to accept spent nuclear fuel from the Paul Scherrer Institut is noted. It is DOE's position that neither DOE nor the United States Government has any legal obligation to accept spent nuclear fuel from foreign research reactors.

Response to Comment No. 1133-2

The Environmental Assessment of Urgent-Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel covers 409 spent nuclear fuel elements, of which 153 have been shipped to the United States as of September 1995. Shipment of the remainder of the elements is pending.

Response to Comment No. 1133-3

Tables 2-1 (Section 2.2.1, Volume 1) and B-1 (Appendix B) of the EIS show the total number of spent nuclear fuel elements from Switzerland that are estimated for management under the proposed action. Totals shown include elements to be accepted under the Urgent-Relief Environmental Assessment (Section 1.5 of the EIS).

COMMENTOR NO. 1134: NATIONAL CENTRE FOR SCIENTIFIC RESEARCH "DEMOKRITOS"

NATIONAL CENTRE FOR SCIENTIFIC RESEARCH "DEMOKRITOS"
153 10 AG. PARASKEVI ATTIKIS POB 60228 TEL. 6513111-9 6518811-9 TLX 218199 ATOM

Research Reactor Laboratory
Tel.: 6514118
Fax: 6533491

Aghia Paraskevi, 26/5/95

To: Edlow International Company
1666 Connecticut Ave.,
N.W. Suite 500
Washington, D.C. 20009
U.S.A.

Dear Jack,

Unfortunately I cannot attend the meeting of May 30th. I hope that Mr. Chronopoulos will represent us like last time did.

We agree with your arguments stated on the "Statement" on the DOE's EIS and the whole text is very solid and sound. 1134-1

Additionally we send you some comments on the draft EIS.

Finally we would like you to make clear the situation concerning the transportation cask for our case. In the draft EIS, vol. 2, ap. B, page B36, it is stated that NAC-LWT cask is "NA for MTR", but in page B45 it is stated that the cask "could be used with a proper basket design". Since we have signed a contract to use NAC-LWT casks please explain if there is any problem. On the other hand Transnucleaire shows a strong interest to undertake the transportation although we have repeatedly stated to them that we already have signed the above mentioned contract. 1134-2

I hope that the meeting will be quite successful and that the Public hearing will turn to be very favourable for all of us.

Best regards,

RESPONSE TO COMMENT
COMMENTOR NO. 1134: NATIONAL CENTRE FOR SCIENTIFIC RESEARCH "DEMOKRITOS"

Response to Comment No. 1134-1

The commentor's support for the proposed action and the acknowledgment for the soundness of the analysis presented in the EIS is noted.

Response to Comment No. 1134-2

As indicated in Appendix B, NAC LWT cask could be used with a proper basket to ship foreign research reactor spent nuclear fuel. At the time of the draft EIS, NAC LWT did not have a certificate of compliance to be used for shipment of HEU spent nuclear fuel. Recently the cask manufacturer has received a certificate from the U.S. Department of Transportation. Appendix B of the EIS has been revised to accommodate the changes regarding the new certification.

COMMENTOR NO. 1134: NATIONAL CENTRE FOR SCIENTIFIC RESEARCH "DEMOKRITOS" (CONT'D.)

Comments on the draft EIS from GRR-1

1. ***Application of draft EIS***

The draft EIS gives a solution to the problem for GRR-1 for the future.
The situation now is quite critical.
The reactor is operating only two or three days per week (9 hours/day) due to high burn-up of HEU fuel in use. LEU fuel has already been delivered but the conversion procedure has stopped for the present, due to lack of availability of storage for spent fuel.

2. ***Programmating and regulatory aspects***

GRR-1 is the sole nuclear research reactor operating in the country.
It is used for basic and applied research, as well as for radioisotope production and other applications in medicine, agriculture, industry e.t.c.

We consider the operation of our reactor quite valuable for the country.
The accumulation of big number of spent fuel assemblies produces not only operational problems for the reactor, but also troubles with the regulatory authorities.

In the past, the regulatory authorities were demanding us to ensure about the shipment of the spent fuel in order to issue the import licence for the LEU fuel which was about to be delivered.

1134-3

RESPONSE TO COMMENT
COMMENTOR NO. 1134: NATIONAL CENTRE FOR SCIENTIFIC RESEARCH "DEMOKRITOS" (CONT'D.)

Response to Comment No. 1134-3

The commentor's acknowledgment that the proposed action would resolve problems with the continued operation of the Greek research reactor GRR-1 is noted.

COMMENTOR NO. 1134: NATIONAL CENTRE FOR SCIENTIFIC RESEARCH "DEMOKRITOS" (CONT'D.)

3. Needs during 1996-1997

The Needs for shipment during the transition period 1996-97 depend on the court decision for "urgent relief". If the decision is favourable for "Edlow Group" and the shipment of 66 spent fuel assemblies from GRR-1 takes place in the near future (in 1995), then we can program shipment under EIS in 1997. In case the decision is not favourable, we must program a shipment of 60-70 assemblies in 1996 or a shipment of 30-35 assemblies in 1996 and one equal shipment in 1997.

1134-4

4. Reprocessing at Dounreay

The lack of a high radiation waste disposal site in Greece makes the Dounreay solution unapplicable for our case if we have to take back and store the highrad waste.

1134-5

For GRR-1,

C. Papastergiou

Reactor Manager

RESPONSE TO COMMENT
COMMENTOR NO. 1134: NATIONAL CENTRE FOR SCIENTIFIC RESEARCH "DEMOKRITOS" (CONT'D.)

Response to Comment No. 1134-4

The commentor's position that court decisions for urgent relief shipments could affect shipping schedules under this EIS is noted. If a policy to manage foreign research reactor spent nuclear fuel in the United States is adopted, the Record of Decision for this action would be scheduled for publication no sooner than 30 days after publication of this document.

Response to Comment No. 1134-5

DOE acknowledges the lack of high-level waste handling, storage, and disposal capabilities in Greece.

COMMENTOR NO. 1218: ATOMIC ENERGY BUREAU, SCIENCE AND TECHNOLOGY AGENCY

SCIENCE AND TECHNOLOGY AGENCY
PRIME MINISTER'S OFFICE

2-2-1 Kasumigaseki, Chiyoda-ku, Tokyo 100, JAPAN
Telephone: Tokyo (03)581-5271
Telex: 02228720 STASGDJ

Fax: +81-3581-5198

科学技術庁
〒100 東京都千代田区霞が関２－２－１

July 20, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Manager
U.S. Department of Energy
1000 Independence Avenue. SW
Washington, DC 20585
U. S. A

Dear Mr. Head,

I express my gratitude for your study for restarting of acceptance of foreign research reactor spent nuclear fuel by the United States Department of Energy (DOE). I wish that the acceptance of the spent fuel of research reactors of Japan will be restarted soon by USA., from the view point of continuous and smooth operation of research reactors in Japan.

I also hope you to consider the comments of Japan Atomic Energy Research Institute and Kyoto University on the Draft Environmental Impact Statement (EIS) on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, which was announced on 12 April 1995.

In this concern, I wonder why the spent fuel of the Hitachi Training Reactor (HTR) owned by Hitachi Nuclear Engineering Co., Ltd is not included in the list of object of foreign research reactor in draft EIS (Table B-4 in appendix B p. b-8). I hope that the spent fuel of HTR is to be included in it. The spent fuel of HTR was described in "information regarding spent nuclear fuel originating in the United States and irradiated in foreign research reactors", which was sent you on 27 July 1994

1218-1

1218-2

RESPONSE TO COMMENT
COMMENTOR NO. 1218: ATOMIC ENERGY BUREAU, SCIENCE AND TECHNOLOGY AGENCY

Response to Comment No. 1218-1

The commentor's support for the restarting of acceptance of foreign research reactor spent nuclear fuel by DOE is noted.

Response to Comment No. 1218-2

The acceptance of foreign research reactor spent nuclear fuel types, as detailed in Section B.1.1.1 of Appendix B, include those types of fuel that were accepted under the Offsite Fuels Policy which was in effect until 1988. The HTR reactor spent nuclear fuels are of the UO2 rodded type that have never been accepted back under any previous policy of the United States, and there has never been an expectation that these fuels were going to be accepted into the United States under this proposed action.

Commentor No. 1218: Atomic Energy Bureau, Science and Technology Agency (Cont'd.)

SCIENCE AND TECHNOLOGY AGENCY
PRIME MINISTER'S OFFICE

科学技術庁
〒100 東京都千代田区霞が関２－２－１

2-2-1 Kasumigaseki, Chiyoda-ku, Tokyo 100, JAPAN
Telephone : Tokyo (03)581-5271
Telex : 02226720 STABGDJ

Fax: +81-3581-5198

on the name of my predecessor (enclosed).

If you need further information about this reactor, I will be pleased to provide with it for you.

Sincerely yours,

Shinichiro Izumi
Director,
Nuclear Fuel Division,
Atomic Energy Bureau,
Science and Technology Agency

Response to Comment Commentor No. 1218: Atomic Energy Bureau, Science and Technology Agency (Cont'd.)

COMMENTOR NO. 1282: SHETLAND ISLANDS COUNCIL, ENVIRONMENTAL SERVICES DEPARTMENT

Shetland Islands Council
ENVIRONMENTAL SERVICES DEPARTMENT

Director: Martin R. Hall, B.Sc., M.R.E.H.I.S., M.I.E.H.
Telephone: Lerwick (01595) 696789
Fax: Lerwick (01595) 692605

Greenhead,
Lerwick,
Shetland.
ZE1 0PY

Our Ref: JGL/MEC

29 August 1995

Mr C Head
Office of Spent Nuclear Fuel Management
(EM-37)
US Department of Energy
1000 Independence Avenue, SW
Washington DC
USA

Dear Sir

EIS CONSULTATION EXERCISE
POTENTIAL USE OF DOUNREAY COMPLEX, CAITHNESS FOR REPROCESSING SPENT FUEL

I refer to the above subject on which you are currently accepting comments as part of the Draft Impact Statement Consultation exercise.

I understand my colleagues in Highland Regional Council, Scotland have already commented, and Shetland Islands Council, as members of NFLA (Nuclear Free Local Authorities) and KIMO (Kommunenes Internasjonale Miljoorganisasjon) would like to add our concerns in this regard.

Recent events and disclosures regarding the Dounreay site cause the Council and other interested bodies a great deal of concern. Standards of waste accommodation, management and control of, in particular the so called "Dounreay Shaft", give rise to serious doubts over whether any new initiatives should take place and assurances have already been sought from the UK Government in this regard.

The Council also has serious concerns over the importation of or indeed any transportation of foreign fuels for reprocessing and have in place a policy of objection in this regard.

1282-1

RESPONSE TO COMMENT
COMMENTOR NO. 1282: SHETLAND ISLANDS COUNCIL, ENVIRONMENTAL SERVICES DEPARTMENT

Response to Comment No. 1282-1

The commentor's opposition to foreign research reactor spent nuclear fuel being transported to, and reprocessed at, the Dounreay Site is noted. If any foreign research reactor spent nuclear fuel were to be sent to Dounreay for reprocessing as a result of decisions made after completion of this EIS, that action would be subject to regulation and oversight under the laws of the United Kingdom. The cleanup of the Dounreay Shaft mentioned by the commentor is being regulated by the United Kingdom authorities, but no waste from the reprocessing of foreign research reactor spent nuclear fuel would be placed down that shaft anyway.

The subjects of airborne and liquid releases from reprocessing operations in foreign countries are outside the scope of this EIS. See Section 4.4.2.1 of the EIS and the response to Comment 484-11.

COMMENTOR NO. 1282: SHETLAND ISLANDS COUNCIL, ENVIRONMENTAL SERVICES DEPARTMENT (CONT'D.)

Shetland has a very high standard and reputation for clean environmental conditions, and any contamination entering the North Sea has potential to be carried by the Gulf Stream to our area with consequential detrimental impact to Shetland's indigenous industries.

1282-2

As I understand, the local regulatory bodies are investigating the current discharges and outfalls on the site and this Council believes it would be precipitous in the extreme, to even consider expanding the site capabilities prior to publication of the full investigative report.

1282-1 (Cont'd.)

I would ask that you take account of these comments within your consultation exercise. I would also request a copy of the final EIS report.

Yours faithfully

Martin R Hall
Director of Environmental Services

cc: Scottish Office Environment Department, 27 Perth Street, Edinburgh
J Wallace, MP, House of Commons, Westminster, London

RESPONSE TO COMMENT
COMMENTOR NO. 1282: SHETLAND ISLANDS COUNCIL, ENVIRONMENTAL SERVICES DEPARTMENT (CONT'D.)

Response to Comment No. 1282-2

The commentor's concern with the potential environmental effects on the North Sea of reprocessing at the Dounreay Site is noted. Overseas reprocessing is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS. The EIS includes analysis of impacts on the global commons in accordance with Executive Order 12114, but not analysis of impacts in foreign countries. The subject of environmental impacts in foreign countries is outside the scope of this EIS.

COMMENTOR NO. 1283:
SCOTLAND AGAINST NUCLEAR DUMPING

Midoxgate House
Fearn
Rossshire
IV20 1RP

12 July 1995

Charles Head,
Office of Spent Fuel Management
US Department of Energy
1000 Independence Avenue SW
Washington DC 20585
USA

Dear Sir,

Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

I have only recently come to hear of your consultation on the Draft Environmental Impact Statement in relation to the above policy. Despite the fact that your proposed policy may have significant effects in our country, local authorities who control planning in relation to such proposals are not yet fully aware of the consultation and of the contents of the Draft EIS.

We are particularly concerned that all or part of the material under discussion may come to the Dounreay Nuclear Establishment in the Scottish Highlands.

The facility in which Dounreay would reprocess this material is not, as stated in your EIS "currently reprocessing foreign research reactor fuel" (2-24). The facility is, in fact, closed and has now been mothballed for about nine months. We are extremely concerned about this particular plant and about management of the Dounreay site as a whole.

Dounreay was the UK's only fast reactor site. The final fast reactor on the site closed in March 1994, and since then, the site has switched to decommissioning work. There are two reprocessing plants on the Dounreay site, the PFR (Prototype Fast Reactor) reprocessing plant and the MTR (Materials Testing Reactor). Both of these are very elderly. The PFR reprocessing plant is now 25 years old and the MTR reprocessing plant is 38 years old.

The PFR reprocessing plant is the one which your EIS seems to suggest would be involved in the reprocessing. This is not the case. The PFR reprocessing plant is fully occupied, by government order, with the reprocessing of Dounreay's own fast reactor fuel core and is prohibited from taking any further work until this is completed. This is likely to be no earlier than 1998. The reason that Dounreay has been refused government permission to take any additional contracts for the PFR reprocessing plant is that the government appears concerned that, with a 25-year-old plant, the risk of expensive repairs is unacceptable. The government would, of course, have to pick up the tab for such repairs if the PFR fuel reprocessing had not been completed. In addition, enquiries at Dounreay have confirmed that the PFR plant would not, in any case, be suitable for work of this nature.

It is the MTR reprocessing plant which Dounreay intends to use, should it get contracts to reprocess foreign spent fuel. As previously outlined, this plant is some 38 years old and does not currently operate having been mothballed for some months. We are not aware of major refurbishment work having been undertaken at the MTR plant over the past 10 years, and in 1986

1283-1

RESPONSE TO COMMENT
COMMENTOR NO. 1283:
SCOTLAND AGAINST NUCLEAR DUMPING

Response to Comment No. 1283-1

The MTR reprocessing plant has not been mothballed as suggested by the commentor. It is not currently operating, but would be capable of operating if necessary. Nevertheless, the text of the EIS (Section 2.3) has been revised to indicate that the facilities are currently capable of reprocessing foreign research reactor spent nuclear fuel. Also see the response to Comment 1137-10.

The age of the facilities at Dounreay does not necessarily imply unsafe operating conditions. All decisions on safety of the facilities would be made by the UKAEA and the regulatory authorities in the United Kingdom.

The text in the Summary has been revised to eliminate the reference to the Prototype Fast Reactor Reprocessing Plant. The decision of which Dounreay plant(s) to use would be up to the plant operators and the United Kingdom government regulators, not DOE or the Department of State.

With regard to the revision of discharge authorizations, UKAEA has submitted the required document to the Scottish Office. The document is titled, "Social and Economic Effects of Dounreay's Projected Programme of Work 1995-2005" and is dated 15 September 1995. The discharge authorizations and the public consultation process in the United Kingdom, however, are outside the scope of this EIS. The cleanup of old waste pits and the operation of new waste pits at Dounreay are also outside the scope of this EIS.

COMMENTOR NO. 1283:
SCOTLAND AGAINST NUCLEAR DUMPING (CONT'D.)

at the Dounreay Public Inquiry Dounreay's own witnesses, including their then head of fuel services, Owen Pugh, described the MTR plant as being in a less than satisfactory condition. It is questionable whether the MTR plant should be allowed to reopen even in the short term; it is virtually impossible that it could continue to function over the timescale which will be necessary for your purposes.

It is believed that the MTR plant has, over the past 38 years, reprocessed about 10,000 spent fuel pins, an average of about 250 per year. Even at this average level of throughput, there have been various problems and accidents. We do not believe that the MTR plant would be capable of handling the increased throughput you propose.

There are several other major problems associated with Dounreay.

Pending legal action

Dounreay has been ignoring legislation in this country which prohibits them from discharging radioactive acids directly into the sea. The appropriate regulatory authority (Highland River Purification Board) is now taking Dounreay to court over this. It is not clear when the case will be heard but it seems clear that they are likely to be required to build a neutralisation facility at the site to neutralise their acid discharges. This will take several years, even if they are able to get planning permission for such a facility. In the meantime it is not clear whether the courts would allow an illegal practice to continue or whether they will require Dounreay to desist immediately from discharging the offending materials. If the latter course is taken, Dounreay will be unable to carry out any reprocessing at all until they have completed their neutralisation plant.

The Local Authority with responsibility for planning for the area is Highland Regional Council. On April 6 1996, Highland Regional Council will cease to exist and a new Highland Council will become the planning authority. It is far from clear whether either of these bodies will be prepared to grant planning permission for a neutralisation facility. If planning permission is turned down, an appeal to the Secretary of State for Scotland would follow.

When appeals go to the Secretary of State, he then becomes the planning authority. He has to take evidence, either in written form, or in the form of a Public Inquiry. Parties to the planning application are consulted and if the Local Authority requests a Public Inquiry (which would be normal for situations such as this) a Public Inquiry will certainly be held. The timescales at present are as follows:- from announcement of Public Inquiry to commencement of same - 9 months to a year; duration of Public Inquiry - several weeks to a year; from conclusion of Public Inquiry to announcement of Secretary of State's decision - a year to fifteen months.

Revision of Discharge Authorisations

Some three years ago, Dounreay was required to submit an application for revised Discharge Authorisations to the relevant regulatory authority (Her Majesty's Industrial Pollution Inspectorate). Submissions were received eighteen months ago, but a judgement against British Nuclear Fuels in relation to discharges from their Sellafield plant has resulted in a requirement for operators to justify their level of discharges in social and economic terms. HMIPI asked Dounreay for a document stating their justification arguments, but nothing has been forthcoming.

Dounreay proposes to increase its discharges tenfold over the highest they have been in any year from 1987 - 1992 (the last years for which figures are available). This proposed increase is mainly to allow for increased reprocessing of the fast reactor fuel core. HMIPI anticipates receiving Dounreay's completed application in the very near future and will then formulate its own response. After that the whole issue has to go to public consultation.

1283-1 (Cont'd.)

1283-2

1283-1 (Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 1283:
SCOTLAND AGAINST NUCLEAR DUMPING (CONT'D.)

Response to Comment No. 1283-2

The commentor's position on regional planning and legal issues is noted. These issues are outside the scope of this EIS (Section 1.5 of the EIS). It would be inappropriate for DOE to interfere in regulatory and legal issues in Scotland.

COMMENTOR NO. 1283:
SCOTLAND AGAINST NUCLEAR DUMPING (CONT'D.)

There is likely to be considerable resistance to proposals for such large increases in discharges to the environment. The issue of justification will also be a rather fraught one and it is difficult to see how it is possible to formulate reasonable social and economic justifications for such large increases in discharges. There will be particular concern that the last time discharges were a high as this, they were followed by a ten-fold increase in the incidence of childhood leukaemia within 12.5 kilometres of Dounreay.

Dounreay has already started discharging the increased levels in advance of receiving the appropriate consents. It argues that it can do this under current consents as the permitted limits currently stand at about thirty times the highest level of actual historical usage. When revised limits are finally agreed, however, Dounreay may require to reduce substantially its level of reprocessing activity in order to keep within the new regime. This would, effectively, rule out the reprocessing of foreign research reactor fuel.

Waste Pits

In 1993 Dounreay submitted a planning application to Highland Regional Council for the construction of a new low-level-waste pit at the Dounreay site.

It is important to note that the UK's classification of wastes depend solely on concentration rather than on half-life or type of disintegration (alpha, beta, etc). We do not have the restrictions which apply in the States which require the separate classification of transuranic wastes. Therefore, extraordinary as it may seem, Dounreay is allowed to dispose of materials that are contaminated with plutonium directly into low level waste pits and also to discharge plutonium into the sea and air. A recent accident involving the release of 20 million becquerels of plutonium into the atmosphere did not contravene the site's discharge limits!

1283-1 (Cont'd.)

Highland Regional Council has refused planning permission for the waste pit, following an unexpected site visit where the council saw for the first time the way waste is kept at Dounreay. In the open trenches, they saw rusting drums and barrels of waste. Some had holes in the side you could put your fist through. In others the lids had fallen off. The drums were scattered in a haphazard way in the pit. The pit was open to the air and chicken wire had recently been stretched across the top in an attempt to stop the wind, birds and vermin picking up the waste and distributing it around the countryside. Stacks of rusting drums were also sitting at the side of the pits. These stacks were about 4- 5 metres high and were badly corroded having stood in the sea air close to the pits (which are right on the shore) for about seven years. Several hundred drums were stacked in this way. In another pit, the council saw an example of "tumble tipping". Dounreay had simply been driving a tipper truck loaded with loose items of radioactive waste to the pit and tipping them in. It was hardly surprising that, in the light of all this, they refused planning permission for another pit.

Dounreay has now dealt with some of the stacks of waste and has made cosmetic improvements to the pits; basically covering them with ground and planting grass seed on the top so that you can't actually see what sort of condition they are in underneath. Having invited councillors to have a look around their nice neat site, they will shortly submit a fresh planning application for the new pit.

Again, it is by no means certain that councillors will be taken in by the cosmetic improvements there have been and it is far from certain that the new application will fare any better than the old one. If planning permission is, again, refused then the issue will revert to the Secretary of State and to a Public Inquiry, as outlined in the section on Legal Action (above).

Competence

RESPONSE TO COMMENT
COMMENTOR NO. 1283:
SCOTLAND AGAINST NUCLEAR DUMPING (CONT'D.)

COMMENTOR NO. 1283:
SCOTLAND AGAINST NUCLEAR DUMPING (CONT'D.)

In addition to all of this, there are serious doubts as to the competence of the staff and management at Dounreay, doubts which have been brought into sharp focus recently by the discovery of several areas of serious contamination both on and off site.

Five main contaminated areas have been found off site. The most serious contamination comprises 170 metallic fragments which range from 10^8 to 70 becquerels each. The government's Radioactive Waste Management Advisory Committee has estimated that there is a "reservoir" of particles in the soil around the top of a disused waste shaft and that the number of such particles is likely to greatly exceed the number which have already been found. The particles are thought to have arisen as a result of an explosion in the waste shaft. While most of the particles have been found on the rocky foreshore at Dounreay which, while a public area, is little used, one such particle has been found on a local public beach. Particles continue to be discovered at the rate of about one per month.

The government's Commission on Medical Aspects of Radiation in the Environment has expressed its disquiet that, while investigating the leukaemia excess around Dounreay they were misled as to the level of discharges. Total figures which they were given by Dounreay management for discharges were less than the levels of radioactivity in a single particle. Interestingly, the particles in question are thought to have originated in the MTR reprocessing plant - the same one which Dounreay intends to use for the reprocessing of foreign spent research reactor fuel.

Other areas of contamination exist around Dounreay Castle, a historic building near the Dounreay site; on a slipway; on a grassy cliff top area east of the Dounreay site and in a "non-active" rubbish dump off the Dounreay site. These have varying levels of contamination, though none are as serious or severe as the foreshore problem.

More metallic particles - the same as those found on the foreshore - have been found in various places on the site, mostly on grass verges beside the site roads. These were discovered when street lighting on site was being replaced.

Dounreay's current management are criticised by the regulatory bodies for the inadequacy of documentation submitted in relation to the foreshore particles, and Dounreay's current management are refusing to release the report of the shaft accident to the public.

Additional contamination is now starting to be found in buildings on the site. Yesterday (12th July) a contaminated area was found on a worker's chair in the administration building, a non-active area. Thankfully, the level of contamination was low but as the contamination has been there, it is thought, for some years, there is no saying the sort of damage cleaners or office staff may have been exposed to. The real lesson to be learned from this contamination is that the safety procedures which are supposed to set off alarms as soon as any radioactivity is transported into a non-active area has patently failed. The other conclusion of both this incident and the discovery of particles on the roadside verges is that Dounreay's current monitoring regime is completely inadequate. As I write the monitoring work in buildings is on-going but it is anticipated that more particles will be found, and an announcement is due next week.

There have also been several accidents recently in the PFR reprocessing plant including two incidents, in February and April, during which workers were exposed to plutonium dust. In the first incident 20 million becquerels of plutonium dust were released up the Dounreay chimney stack into the atmosphere. In the second the contamination was contained within the building.

I request that all of the above is taken into consideration when you produce your final EIS.

1283-1 (Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 1283:
SCOTLAND AGAINST NUCLEAR DUMPING (CONT'D.)

COMMENTOR NO. 1283:
SCOTLAND AGAINST NUCLEAR DUMPING (CONT'D.)

I further request that:-

1) as the effects of the proposals in the EIS have such fundamental importance for Scotland, the Draft EIS should be consulted upon in Scotland as well as in the US. Copies of the Draft EIS should be sent to all parties with a locus in the matter and placed in public libraries. In addition, responses should be requested from the planning authority and from the public via newspaper advertisements.

2) work should be commissioned to assess the environmental impact in Scotland of reprocessing foreign research reactor fuel at Dounreay;

3) the deadline for the consultation should be extended as required to allow points 1 and 2 to be implemented.

1283-3

Yours sincerely,

Lorraine Marin
Scotland Against Nuclear Dumping

RESPONSE TO COMMENT
COMMENTOR NO. 1283:
SCOTLAND AGAINST NUCLEAR DUMPING (CONT'D.)

Response to Comment No. 1283-3

It would not be feasible, nor does U.S. environmental law require, that hearings be conducted in foreign nations which might be affected by this action. All nations who elect to participate in the proposed action would do so voluntarily. It is the responsibility of each participant to comply with their own laws and regulations. Copies of the draft and final EIS were mailed to all potentially affected foreign nations. An evaluation of potential environmental benefits and burdens which could affect Scotland are the responsibility of the appropriate authorities in Scotland. DOE and the Department of State would cooperate with the Government of Scotland should Scottish authorities conduct an environmental evaluation in this matter. No plans currently exist to extend the period for public comment beyond the ninety days ending on July 20, 1995.

NEPA TEAM

DOE/EIS-0218F
February 1996

Volume 3

FINAL ENVIRONMENTAL IMPACT STATEMENT

on a

Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Public Comments and Department of Energy Responses
Part 3a – Individuals (Pages 2.7-1 through 2.7-530)

United States Department of Energy
Assistant Secretary for Environmental Management
Washington, DC 20585

Volume 3 is organized into three sections:

- Section 1 - Overview
- Section 2 - Written Comments and Responses
- Section 3 - Public Hearings

The Overview sets the tone for the document by summarizing the public comment process, by explaining how the receipt of written comments and the public hearing process were handled, and by summarizing the major issues raised by commentors and DOE's responses to these issues.

Section 2 of Volume 3, "Written Comments and Responses" contains all of the written comments received by DOE on the draft EIS. Upon receipt, these documents were assigned a sequential log number to be used in tracking during the comment response process. For presentation in Volume 3, these documents maintained their original log number, but were separated into the following seven distinct "affiliation" categories:

Section 2.1 - Federal Government
Section 2.2 - State Government
Section 2.3 - Local Government
Section 2.4 - Native American Groups
Section 2.5 - Non-Government Organizations
Section 2.6 - Foreign Entities
Section 2.7 - Individuals

Since these documents retained their original log number, the reader should note that while the documents in each respective section are in ascending order, their numbering therein is not sequential.

In order for a reader to find a specific document, a full "List of Commentors" has been included in each book (or part) of Volume 3, immediately following the "Table of Contents." This "List of Commentors" has been compiled alphabetically using either the commentors last name, the name of the submitting organization, or the name of a Federal, State, Tribal, or local government branch. City and State government bodies are listed under "City of" or "State of." Members of Congress are listed by the Senator's or Representative's name, with the government branch following.

To locate a document(s):

1. Find the "List of Commentors" and the name of the individual submitting the comment (or the name of the organization or agency if the comments were submitted on their behalf), and note the page number assigned to the first page of the comment document (i.e., a document from a Native American Group would be number 2.4-1, etc.).

2. Find the Volume 3 book (or part) that contains the section and page number for which you are looking and turn to the appropriate page to find a scanned copy of the document along with the responses to each of the comments delineated therein.

the written comments, the comments received during each of the 17 public hearings. Oral comments provided at these hearings have been summarized, rather than individually identified by each respective speaker. As such, there is not a list of speakers or identification of the commentors at the public hearings. A list of all registered attendees is provided immediately following the summary of each of the public hearings.

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Attachment 1

Transcript of Public Hearing Held in Tacoma, Washington on June 19, 1995 on the Draft Environmental Impact Statement on the Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel A.1

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SECTION 2.7
INDIVIDUALS

COMMENTOR NO. 3: THOMAS, HENRY G.

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Henry G. Thomas **Phone:** (803)884-2885
Title and Organization: Hobcaw Yacht Club
Address: 614 East Hobcaw Drive
City: Mt. Pleasant **State** SC **Zip** 29464

*** COMMENTS ***

Attached is a copy of a 1979 Federal Court Order. Defendants include Sec'y of Army, Corps of Engineers, EPA, Dept. of Interior and the USA. One of the many conditions of this agreement deals with Air & Water Quality: Page 12, E. Pollution Control and Monitoring. The monitoring system was removed in 1985. For 15 years the defendants together with the SC State Ports Authority have operated in contempt of court. What reason does anyone have to suppose any assurance is sufficient? 3-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 3: THOMAS, HENRY G.

Response to Comment No. 3-1

DOE was not a party to the 1979 Federal Court Order which the commentor references, hence is not familiar with the issues, or the actions/inactions of the parties directly involved. For these reasons, DOE will make no comment on the specific issue raised.

However, on the issue of air and water quality as it pertains to the proposed policy of managing foreign research reactor spent nuclear fuel, DOE considers that there would be no significant adverse impacts to any of the ports that might be used to accept the material. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality. In the unlikely event of a severe accident, the analysis performed for the EIS indicates that some radioactive material could be released from the cask and distributed into the environment. However, the analyses in Section 4.2.2.3 and Appendix D, Section D.5 of the EIS determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident. Close in to the accident, near the cask would likely require some cleanup, but the overall impact on the water and air quality in the port would be very small.

COMMENTOR NO. 4: JENSEN, M.

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: M Jensen Phone: 803 884 6289

Title and Organization:

Address: 236 Molesses Ln

City: Mt. Pleasant State SC Zip 29464

*** COMMENTS ***

Pg D-39 pp 6, 2nd line from bottom: I-526 does not entirely bypass the City of Charleston. 4-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 4: JENSEN, M.

Response to Comment No. 4-1

The text in Appendix D, Section D.2.1.1 of the EIS has been revised to indicate that I-526 does not entirely bypass the City of Charleston.

COMMENTOR NO. 5: MCGAHEE, BERNY

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Berny McGahee **Phone:** 706-860-2917

Title and Organization: concerned citizen

Address: 122 Lakeview Ct.

City: Augusta **State** Ga. **Zip** 30909

*** COMMENTS ***

It seems the best action is to process spent fuel at SRS by existing technologies on site known as chemical seperation & vitrification. 5-1

Burning spent fuels with a ~~commercial~~ multi-Purpose reactor at SRS only makes common sense as a third technology on mission at SRS to deal with non-proliferation of nuclear weapons 5-2

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 5: MCGAHEE, BERNY

Response to Comment No. 5-1

The commentor's preference for chemical separation of foreign research reactor spent nuclear fuel at the Savannah River Site is noted. This is Management Alternative 1, Implementation Alternative 6, and is discussed in Sections 2.2.2.6 and 4.3.6 of the EIS.

Response to Comment No. 5-2

DOE is considering the use of a multi-purpose reactor as part of its decision on the Tritium Supply and Recycling EIS. DOE is also considering the use of a multi-purpose reactor as part of its decision on the Storage and Disposition of Weapons-Usable Fissile Materials EIS, dealing primarily with plutonium. This foreign research reactor spent nuclear fuel EIS will not lead to any decision on the use of a multi-purpose reactor.

COMMENTOR NO. 6: MCGAHEE, BERNY

Charles Head

May 9, 1995

As a concerned citizen, I fully support the processing of spent nuclear fuel at the Savannah River Site.

It is my understanding that SRS has built a recycling and glassification plant that is capable of safely processing these rods and other materials. The capability is here, so the volume of production should be increased so that the mission will be cost-effective. SRS should be permitted to process this country's spent fuel and do the same for other countries. By having some control over this, the chances of rogue countries and terrorists obtaining these materials for nefarious purposes such as making bombs would be greatly reduced. 6-1

In addition, as you know, DOE is considering using a multi-purpose reactor that will burn spent fuel rods, and make tritium and electricity. This should expedite the process of disposing of these dangerous materials. 6-2

The excellent safety record at SRS for over 40 years has earned it a nuclear-friendly relationship with the community, making it a most desirable location for future missions. This area has always welcomed and supported the projects at SRS, and continues to do so. 6-1 (Cont'd.)

Berny McGahee
122 Lakeview Ct.
Martinez, Ga. 30907
phone - 706-860-2917

RESPONSE TO COMMENT
COMMENTOR NO. 6: MCGAHEE, BERNY

Response to Comment No. 6-1

The commentor's support for using the Savannah River Site's facility for chemical separation of the foreign research reactor spent nuclear fuel is noted. Chemical separation at the Savannah River Site is part of Implementation Alternative 6 of Management Alternative 1 in the EIS. Section 2.2.2.6 of the EIS describes this alternative and Sections 2.4 and 2.6.5.2 describe the chemical separation facilities.

Response to Comment No. 6-2

A multi-purpose reactor, if it is built, would burn plutonium, not spent nuclear fuel from foreign research reactors. The decision to build a multi-purpose reactor is outside the scope of this EIS.

COMMENTOR NO. 9: PECK, DIANE

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: DIANE PECK Phone: 409-762-6762

Title and Organization:

Address: 3121 AVENUE P.

City: GALVESTON, State TEXAS Zip 77550

*** COMMENTS ***

I AM OPPOSED TO THE PROPOSED USE OF THE PORT OF GALVESTON FOR THE TRANSPORT OF SPENT NUCLEAR FUEL. 9-1

KEEP IT IN THE COUNTRIES THAT BOUGHT IT!! 9-2

DON'T SELL IT TO THEM (FOREIGN COUNTRIES OR WATER) 9-3

WE HAVE ENOUGH NUCLEAR WASTE ATO DISPOSE IN THIS COUNTRY AT PRESENT. 9-4

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 9: PECK, DIANE

Response to Comment No. 9-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Galveston, or to any port analyzed in the EIS, is low.

Response to Comment No. 9-2

The commentor's preference for overseas management of foreign research reactor spent nuclear fuel is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

Response to Comment No. 9-3

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). Past and present nuclear weapons nonproliferation policies of the United States support peaceful applications of nuclear technology, such as research reactors for nations who agree not to develop nuclear weaponry. The use of LEU fuel is encouraged by the United States and since passage of the Energy Policy Act of 1992, no new export licenses for HEU have been issued by the United States.

Response to Comment No. 9-4

The commentor's opposition to the addition of spent nuclear fuel from foreign research reactors to the existing inventory of nuclear waste in the United States is noted. As discussed in Section 2.2.1.3 of the EIS, acceptance into the United States of the spent nuclear fuel from foreign research reactors would increase the existing inventory of spent nuclear fuel approximately one percent by mass and ten percent in volume.

COMMENTOR NO. 10: BRONDALILS, PHILIP

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Philip Brondalils Phone: (409) 765-7766

Title and Organization:

Address: 3115 Avenue P

City: Galveston State Tx Zip 77550

*** COMMENTS ***

I am against this in Galveston! 10-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 10: BRONDALILS, PHILIP

Response to Comment No. 10-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Galveston, or to any port analyzed in the EIS, is low.

COMMENTOR NO. 11: WEBER, DENISE

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: DENISE WEBER (409) Phone: 765-7766

Title and Organization:

Address: 3115 AVENUE P

City: GALVESTON ISLAND State TX Zip 77550

*** COMMENTS ***

I AM OPPOSED TO ANY NUCLEAR WASTE BEING BROUGHT THROUGH GALVESTON.

THIS "SALES PITCH" IS WORTH MORE TO "OUTSIDE" PEOPLE THAN IT IS WORTH TO "OUR" RISKS.

IF THE PEOPLE (THAT ARE TRYING TO "SELL" THIS) LIVED HERE ... THEN THEY WOULD NOT WANT IT HERE.

I agree with all of the mentioned Risks.

I AM AGAINST THIS BEING CRAMMED DOWN OUR THROATS!

11-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 11: WEBER, DENISE

Response to Comment No. 11-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Galveston, or to any port analyzed in the EIS, is low.

COMMENTOR NO. 13: MUHICH, MARK

MARK MUHICH
2808 STRAND
GALVESTON, TX.
77550
409 762-6042

15 MAY, 1995

DEPARTMENT OF ENERGY
PUBLIC HEARING
NON-PROLIFERATION TREATY
FOREIGN RESEARCH REACTOR HIGHLY ENRICHED MATERIALS IMPORT PROJECT
THE PORT OF GALVESTON
GALVESTON, TX. 77550

TO DATE, THE NUCLEAR ENERGY AND NUCLEAR WEAPONS INDUSTRIES HAVE FAILED TO ADDRESS THEIR RADIO ACTIVE WASTE PROBLEMS. NUCLEAR FACILITIES ARE TEMPORARILY STORING THESE RADIO-ACTIVE WASTES IN STRUCTURES AND AT LOCATIONS NOT ORIGINALLY DESIGNED FOR THIS PURPOSE. 13-1

THESE WASTES, WORLDWIDE, CONSTITUTE A SECURITY AND ENVIRONMENTAL THREAT. CLEARLY, A SYSTEMATIC POLICY TO PERMANENTLY REMOVE THESE HAZARDOUS MATERIALS FROM VULNERABLE SOCIETIES AND ECOLOGIES IS WELCOME.

MANAGERS OF THIS PROJECT, FROM THE LOCAL GALVESTON PORT OFIICIALS TO INTERNATIONAL DIRECTORS SHOULD DEMONSTRATE, AT THE OUTSET, THEIR AWARENESS OF THE RICHNESS OF THE GALVESTON BAY COMMUNITY.

GALVESTON BAY HAS BEEN DECLARED A NATIONAL ESTUARY. IT IS AFFORDED SPECIAL PROTECTIONS FROM DEGRADATION, POLLUTION, AND EXPLOITATION. GALVESTON BAY WAS SO DESIGNATED BECAUSE OF ITS INTERGAL ROLE IN THE VITALITY OF SO MANY SPECIES OF FLORA AND FAUNA, THE ECONOMIC LIFE OF THE REGION AND THE CULTURE OF THE CITIZENS WHO RESIDE HERE. 13-2

GALVESTON BAY IS THE NURSERY TO A VARIETY OF COMMERICIAL FISHES AND CRUSTACEANS. THE BAY IS THE SECOND MOST PRODUCTIVE ESTUARY IN THE UNITED STATES.

SPORT FISHING ALONE CONTRIBUTES OVER ONE BILLION DOLLARS TO THE STATE ECONOMY.

RESPONSE TO COMMENT
COMMENTOR NO. 13: MUHICH, MARK

Response to Comment No. 13-1

A national nuclear waste policy does not currently exist. Although such a policy would, no doubt, clarify and direct this country's efforts to address the nuclear waste issue, the question of managing foreign research reactor spent nuclear fuel that is addressed by this EIS cannot wait for a national nuclear waste policy to be developed. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). This issue cannot wait, especially since the amount of nuclear waste involved here is so small compared to that elsewhere in the public and private sectors.

Response to Comment No. 13-2

Although ports are generally not environmentally sensitive areas within the context of NEPA, Section 3.2.1.2 of the EIS has been modified to note that Galveston Bay has been named an "estuary of national significance." DOE also notes the commentor's statements related to the commercial fishing industry and migratory bird populations near the Port of Galveston. DOE considers that there would be no significant adverse impacts to any of the ports that might be used to accept foreign research reactor spent nuclear fuel. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive materials. To date, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality. In the unlikely event of a severe accident, the analysis performed for the EIS indicates that some radioactive material could be released from the casks and distributed into the environment. However, the analysis in section 4.2.3.3 and Appendix D, Section D.5 of the EIS determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident. Close in to the accident, near the cask would likely require some cleanup, but the overall impact on the water and air quality in the port, and on wildlife and marine life, would be very small.

COMMENTOR NO. 13: MUHICH, MARK (CONT'D.)

PROJECT MANAGERS SHOULD INFORM THEMSELVE OF THE UNIQUE POSITION GALVESTON ISLAND AND ENVIRONS SERVE TO THE VAST MIGRATORY BIRD POPULATION. MILLIONS AND MILLIONS OF BIRDS VISIT GALVESTON EACH SPRING EN ROUTE NORTH FROM CENTRAL AND SOUTH AMERICA. ANY DISPRUPTION TO THESE PRIMORDIAL RITES OF PASSAGE WOULD BE CATACLYSMIC.

THE NATIONAL RECORD FOR THE AUDUBON CHRISTMAS BIRD COUNT, APPROXIMATELY 230 SPECIES, WAS RECORDED IN FREEPORT, TX. SOME TWENTY FIVE MILES FROM THE PORT OF GALVESTON. GALVESTON ISLAND ITSELF CONTINUALLY RANKS IN THE TOP TWENTY REGIONS NATIONALY FOR NUMBER OF BIRD SPECIES SIGHTED IN A TWENTY-FOUR HOUR PERIOD. PROJECT MANAGERS MUST BE ZEALOUS IN PROTECTING THIS INTERNATIONAL BIO-TREASURE.

13-2 (Cont'd.)

SUGGESTIONS:

1. THE PORT OF GALVESTON SHOULD BE CONSIDERED AS A PORT OF ENTRY FOR IMPORT OF ENRICHED NUCLEAR WASTES FROM FOREIGN REACTORS. — 13-3

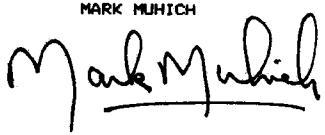
2. NO PLANS, EITHER PRIMARY NOR CONTINGENT, FOR THE STORAGE OR LAY-OVER OF NUCLEAR WASTE CARGO SHOULD BE DEVELOPED AT THE PORT OF GALVESTON. — 13-4

3. LOCAL GOVERNMENT OFFICIALS AND THE ENVIRONMENTAL COMMUNITY SHOULD BE CONSULTED THROUGHOUT THE DESIGN AND IMPLEMENTATION OF THI. PROJECT. — 13-5

4. PORT OF GALVESTON OFFICIALS SHOULD BE EMPOWERED TO HALT THE IMPORT OF NUCLEAR WASTE CARGO IF SUCH CARGO CANNOT BE TRANSPORTED FROM THE PORT FACILITY TO ITS FINAL DESTINATION WITHOUT DELAY. — 13-6

THANK YOU FOR THE OPPORTUNITY TO EXPRESS MY CONCERNS ABOUT THE DEPARTMENT OF ENERGY IMPORT PLAN FOR THE PORT OF GALVESTON.

MARK MUHICH



RESPONSE TO COMMENT
COMMENTOR NO. 13: MUHICH, MARK (CONT'D.)

Response to Comment No. 13-3

The commentor's support for the inclusion of the Port of Galveston as a potential port of entry for foreign research reactor spent nuclear fuel is noted.

Response to Comment No. 13-4

No port would be used as a storage site for foreign research reactor spent nuclear fuel. Cargoes from foreign research reactors would remain in port only as long as necessary for completion of inspections, documentation, and loading for transportation to an interim management site - usually, under normal circumstances, less than 24 hours. Section 2.6.3.2.2 of the EIS describes port activities.

Response to Comment No. 13-5

DOE is required to inform the Governor of each State and any Tribal chair, or their designee, along a transportation route seven days prior to shipment of hazardous cargos, including radioactive materials. It would be the responsibility of the Governor to provide any further notification to State and local officials.

Emergency preparedness, security, and coordination of DOE with local emergency response authorities that would be involved with the acceptance and transportation of foreign research reactor spent nuclear fuel will be discussed in detail in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

Response to Comment No. 13-6

The Coast Guard Captain of the Port has the authority to prevent the unloading of a cargo if he or she believes that the port cannot safely receive that cargo. If port officials believe that the foreign research reactor spent nuclear fuel could not or would not be transported from the port facility within the 24 hours estimated by the calculations in the EIS, then the Captain of the Port should be contacted. The Captain of the Port could then consider delaying unloading of the foreign research reactor spent nuclear fuel.

Commentor No. 15: Hansen, Dick

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Dick Hanson **Phone:**

Title and Organization: Scripps Consultation Group

Address: 528 Rimini Road

City: Del Mar **State** Ca **Zip** 92014

***** COMMENTS *****

I agree that DOE should fulfill their responsibility to the foreign countries involved for receipt of foreign research reactor spent fuel. 15-1

I further believe that a combination of research and reprocessing for stabilization, preferably for dry storage. The obstacles to reprocessing must be overcome. We need to take advantage of a great natural resource. 15-2

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

Response to Comment
Commentor No. 15: Hansen, Dick

Response to Comment No. 15-1

The commentor's support for the proposed policy is noted. DOE and the Department of State consider that it is imperative that the United States maintain its leadership role in reducing the amount of HEU in global commerce.

Response to Comment No. 15-2

The commentor's support for the chemical separation of the foreign research reactor spent nuclear fuel, and dry storage of the resulting waste, is noted. Chemical separation in the United States is discussed in Sections 2.2.2.6 and 4.3.6 of the EIS.

COMMENTOR NO. 18: QUINN, ROBERT

TO: DEPARTMENT OF ENERGY
FROM: ROBERT QUINN.
P.O. BOX 10177
SOUTHPORT, N.C. 28461
(910)457-5121

SUBJECT: MOVEMENT OF NUCLEAR WASTE FROM SUNNY PT. BY RAIL

The Department of Energy environmental study to determine the feasibility of shipping nuclear waste by rail through Sunny Point Army Ocean Terminal has missed some significant points.

The study, while claiming research slanted to the conservative side, has missed significant data. In Volume 1, para. 3.2.1.5 Military Ocean Terminal Sunny Point, NC, p. 3-23 it is stated that the terminal is serviced by well maintained roads, 98 miles of a U.S. Army rail line connecting to CSX and that the 1990 population within 10 miles was 7995. It further states on p. 3-25 that ENVIRONMENTAL CONDITIONS are the same as the Port of Wilmington. 18-1

The Brunswick County Land Use Plan states, "it is anticipated that the following roads would be experiencing capacity related problems during the period 1988-2005". This includes the Hwy 133/87 areas of Sunny Point. The Land Use Plan further documents that correction of this problem is not in the state plan.

The county planning document shows a seasonal population of approximately 60,000 within 10 miles. The season runs for an extended period.

Sunny Point and its associated rail facilities run through the middle of an intense "lime sink community".

The study has failed to grasp the impact of the actions of the U.S. Army in granting consent agreements to a mining operation without knowing the hazards associated with the activity. This impact relates to the area in general and the rail line upon which Department of Energy nuclear waste will be shipped specifically. 18-2

What is most disconcerting to the citizens in the Brunswick County area is the fact that numerous studies by FEDERAL AGENCIES document these dangers in detail, yet it is not discussed and not addressed in the study. 18-3

RESPONSE TO COMMENT
COMMENTOR NO. 18: QUINN, ROBERT

Response to Comment No. 18-1

The U.S. Army rail line mentioned by the commentor was used by DOE for the urgent-relief acceptance of foreign research reactor spent nuclear fuel discussed in Section 1.5 of the EIS. Tourist or seasonal populations were not considered in the population figures used for the "human population" port selection criterion (Criterion 5), only resident populations as indicated by the 1990 census. As shown in Appendix D, Section D.1.9.5 of the EIS, the seasonal population figure of 60,000 within 10-miles of MOTSU given by the commentor is still lower than the other 9 ports described in Section 3 of the EIS.

The environmental conditions mentioned by the commentor relate to the Cape Fear River and surrounding area, and is an accurate description of the affected environment for both MOTSU and the Port of Wilmington, NC.

In regard to Routes 133/87 "experiencing capacity related problems" during the period 1988-2005, DOE considers that if the foreign research reactor spent nuclear fuel is accepted into the United States through MOTSU, the contribution to traffic from this effort would be negligible. The maximum number of casks that might be accepted under this proposed action is approximately 721 (736 if targets were included). Even if all of them were to be accepted through MOTSU, this amounts to an average of one shipment per week over the proposed 13 year acceptance period under the basic implementation of Management Alternative 1 (less if a hybrid alternative under Management Alternative 3 were adopted).

DOE estimates that the transportation of foreign research reactor spent nuclear fuel would have about the same impact on the structural integrity of local roadways and bridges as the commercial transportation of gravel and cement. As discussed in Table B-14 in Appendix B of the EIS, transportation casks for foreign research reactor spent nuclear fuel weigh between 10.9 and 25.5 metric tons. Including the truck (an 18-wheeler), the total weight would be approximately 24 to 38 metric tons. For comparison, commercial ten-wheel sand and gravel trucks usually weigh almost 30 metric tons when fully loaded. Newer sand and gravel trucks which have an additional axle can weigh as much as 34 metric tons.

Since the number of trucks would be limited and their weight would be within the legal limits, the added burden to the State highways would be minimal.

Response to Comment No. 18-2

The EIS does not specifically address the possibility of a train carrying a cask of foreign research reactor spent nuclear fuel falling into a sinkhole. The EIS does, however, address a broad range of accidents involving dropped casks. This broad range of accidents covers some that are more severe than the falling into a sinkhole scenario. Section 4.2.3 of the EIS describes environmental effects for the most severe accidents which might reasonably occur.

COMMENTOR NO. 18: QUINN, ROBERT (CONT'D.)

The packet submitted to you contains the following:

1. U.S. Army Corps of Engineers LETTER OF CONSENT for Martin Marietta Aggregates Company to operate a limestone mine in the safety buffer area of the Sunny Point Terminal, dated 3 May 1993.

2. STUDY OF SINKHOLES: THEIR GEOLOGY,ENGINEERING AND ENVIRONMENTAL IMPACT, by the Florida Sinkhole Research Institute and the North Carolina Department of Transportation.
(Documents that the majority of sinkholes in North Carolina are in the Southeastern part of the state and the Brunswick County area of the Sunny Point terminal and Railroad)

3. RECONNAISSANCE GEOLOGIC AND GEOPHYSICAL INVESTIGATION OF POTENTIAL SINKHOLE COLLAPSE OF SUNNY POINT ACCESS RAILROAD AT BOILING SPRINGS LAKE, NORTH CAROLINA, dated October 1984, by TECHNO INC. for the U.S. Army.
(Documents the severe magnitude of the occurrence of sinkholes in this area. 27 PRIMARY ANOMALIES and 13 SECONDARY ANOMALIES)

4. RAILROAD LAND BRIDGE MILITARY OCEAN TERMINAL SUNNY POINT,CONCEPT DESIGN REPORT, dated February 1985, by U. S. Army Corps of Engineers.
(Documents that active sinkholes have occurred immediately east of the rail line...attributed to increased flow rates imposed on the lime stone aquifer)

5. U.S. GEOLOGICAL SURVEY CIRCULAR 968, dated 1987.
Documents:
A. Costly loss to roads and railroads from man induced sinkholes. p. 1
B. Man induced sinkholes are the sole source of the worst forms of sinkholes. p. 13
C. The de-watering activities of pumping bring on man induced sinkholes. p. 14
D. Maps Brunswick County, Sunny Point location as area of numerous man induced sinkholes. p. 15
E. Decline in aquifer pressure brings on sinkholes. pp. 16-20
F. Recognizes the primary cause of man induced sinkholes as DE-WATERING CONDUCTED BY MINING ACTIVITIES. p. 38
G. States that mining activities should be KEPT away from populated or HAZARD AREAS. p. 38.

6. Letter from, U.S. DEPARTMENT OF INTERIOR, GEOLOGICAL SURVEY DIVISION to Congressman Charlie Rose, dated February 1994.
(Evaluating the mining proposal and stating that de-watering in this area will cause sinkhole development)

RESPONSE TO COMMENT
COMMENTOR NO. 18: QUINN, ROBERT (CONT'D.)

Response to Comment No. 18-3

A discussion of sinkholes in the Sunny Point area has been added to Section 3.2.1.5 of the EIS in response to public comments. MOTSU has been identified as an area with significant sinkhole activity (Kock, 1984). Sinkholes can occur naturally or as a result of human activity. Occurrences of sinkholes are closely tied to the drainage pattern in areas whose geologic formations provide a collapse mechanism. Human activities which modify the natural drainage pattern in such an area can increase the rate of sinkhole formation. Sinkholes pose a potential hazard to truck and rail traffic in the Sunny Point area. Due to the robust nature of the casks which are used to transport spent nuclear fuel from foreign research reactors, sinkholes are not expected to cause a radiological accident (Appendix B of the EIS presents a description of the casks).

COMMENTOR NO. 18: QUINN, ROBERT (CONT'D.)

7. CAROLINA POWER AND LIGHT COMPANY LETTER OF OBJECTION TO MARTIN MARIETTA MINE PROPOSAL, dated December 1993.
(Documenting "SUBSTANTIAL PHYSICAL HAZARD " to the nuclear power plant) p. 1
(Sinkhole damage to the transmission and railroad line) p. 3

8. Letter from, DEPARTMENT OF THE ARMY, SUNNY POINT COMMANDER, OUTLINING MODIFICATIONS REQUIRED TO PREVENT DAMAGE TO THE BASE, dated November 1993.
(Outlining modifications required to prevent damage to the base facilities from sinkholes and potential of secondary explosions on the base from underground blasting)

9. Raleigh News and Observer article, SHIPPING NUCLEAR WASTE BY RAIL HAS RISKS, dated May 1994.
(Documents state record count of 89 accident in 10 years along North Carolina tracks that will haul your waste material)

10. Wilmington Morning Star article, SINKHOLES OPEN IN BRUNSWICK, dated Spring 1994.
(Documents sudden sinkhole within 50 yards of the Sunny Pt. railroad)

To summarize :

In May of 1993, without knowing or asking what the proposed mining operation would entail, the Corps of Engineers at SAVANNAH granted a consent agreement for mining operations within the government buffer area.

In November of 1993, public hearings documented a danger to the health safety and welfare of the public caused by sinkhole development as a result of pumping 10 to 12 million gallons of water a day from the underlaying Castle Hayne Aquifer. The Army failed to identify the dangers in the mining proposal. 18-4

Research data over a 10-year period by FIVE FEDERAL AGENCIES verifies that these dangers were ignored in the decision process to grant the consent agreement.

As long as this consent agreement is in effect, the potential for dangers to the PUBLIC HEALTH, SAFETY and WELFARE will continue. If you are to move nuclear waste in this area on a rail line that has documented failure from sinkholes, you would be negligent in failing to consider the safety of hundreds of thousands of people in this area.

Since this is an issue created by the action of a federal agency, I recommend that you take appropriate action to have this time expired consent agreement voided and insure no others are issued. 18-5

RESPONSE TO COMMENT
COMMENTOR NO. 18: QUINN, ROBERT (CONT'D.)

Response to Comment No. 18-4

DOE understands the potential impact that would be associated with the development of sinkholes along the rail track in the area of Sunny Point, N.C. DOE, however, would like to point out that the transportation casks that would be used to transport the foreign research reactor spent nuclear fuel are designed and certified to survive drops of 30 feet onto an unyielding surface. Sinkholes are rarely 30 feet deep and they have soft soil bottoms. A cask carrying foreign research reactor spent nuclear fuel would survive a fall into a sinkhole without releasing any of its radioactive contents. The standards for spent nuclear fuel transportation casks have been summarized in Figure B-7 of Appendix B of the EIS.

Response to Comment No. 18-5

DOE has reviewed the issue of sinkhole development in and around the Sunny Point Terminal and railroad. As explained in the response to comment 18-4 above, a sinkhole is not likely to appear at the time a foreign research reactor spent nuclear fuel transportation cask would be passing over on the rail line. The risk of releasing radioactive material from a spent nuclear fuel transportation cask as the result of a sinkhole event is low. Transportation casks are designed to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a sinkhole event, even if it damaged the rail cars, would not be expected to compromise the spent nuclear fuel transportation cask. The existence of any consent agreement between the Corps of Engineers and mining interests is outside the scope of this EIS.

COMMENTOR NO. 19: BROWN, PAULA

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Paula Brown **Phone:** 910-259-4994

Title and Organization: citizen

Address: PO Box 1242

City: Burgaw **State** NC **Zip** 28425

*** COMMENTS ***

Provide need to know on shipment date and location to State Officials ONLY. – Shipments become media circus and inflame public opinion. 19-1

Most local citizens believe in the ability of local and State officials to protect themselves and property. Most citizens believe, as well, that if it is in the best interest of the US, local sacrifice is worth while. 19-2

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 19: BROWN, PAULA

Response to Comment No. 19-1

DOE is required to inform the Governor of each State and any Tribal chair, or their designee, along a transportation route at least seven days in advance of each shipment of hazardous cargos, including radioactive materials. It would be the responsibility of the Governor to provide any further notification to State and local officials.

Response to Comment No. 19-2

The commentor's position that local and State officials are capable of responding to an emergency involving spent nuclear fuel from foreign research reactors is noted. Emergency management and response are discussed in Section 2.7 and Appendix H, which was added to the final EIS in response to public comments. As demonstrated by the analysis in Section 4 of the EIS, the risks associated with implementation of the proposed action to health or the environment would be low.

COMMENTOR NO. 20: PENNOCK, JOYCE E.

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Joyce E. Pennock Phone: 910-457-6050

Title and Organization:

Address: 4819 Oakview Dr.

City: Southport State N.C. Zip 28461

*** COMMENTS ***

I do not have any problems bringing back what we sold & said we would take back. My only concern is that we are still ~~selling~~ selling overseas.

I feel that we should bring back what we have sold & has been used (spent), but we should not sell anymore. Thank you. 20-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 20: PENNOCK, JOYCE E.

Response to Comment No. 20-1

The Energy Policy Act of 1992 prohibits the United States from selling HEU to foreign nations except in narrowly defined circumstances. No new export licenses for HEU have been issued by the United States since passage of this Act. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

COMMENTOR NO. 21: GREENEBAUM, HOWARD

May 23, 1995

The citizens of North Carolina and South Carolina are being put at grave risk by the proposed shipping of 10's of 1,000's of spent nuclear rods through NC to be stored in SC. 21-1

First point of fact is the vulnerability of these two areas to hurricanes. A ship at sea carrying this deadly cargo up the Cape Fear River could become a mass disaster if it were caught in one of the frequent hurricanes visiting these areas. The Dept. of Energy is considering a long term program of these deadly visits by ships, and their proposed route is extremely perilous. 21-2

Second point of fact is that this area is subject to earthquakes. The worse earthquake in US history occurred in 1886 in Charleston, SC. Recently both SC and the area that you are sitting in has experienced several earthquake tremors. On Feb. 20, 1995 I personally made presentations to both the Brunswich and New Hanover County Boards of Commissioners urging them to buy a seismograph. On April 18, 1995 the New Hanover County Board of Commissioners voted 4-1 to consider purchasing a seismograph. We are indeed taking seriously the possibility of an earthquake in this very area that you are proposing to send numerous ships loaded with dangerous cargoes. 21-3

American taxpayers should be alerted that at least 94 more nuclear reactor plants will be operating around the world in the next 15 years. These numbers came from the Dept. of Energy's own survey. How many of these plants have deals with the US Government to dump their waste in our country ? 21-4

And American taxpayers should be made aware of the huge costs for nuclear waste clean up that these ill conceived deals will ultimately cost all of us. Taking the Dept. of Energy's own figures for cost clean up of our nuclear weapons plants, the estimate for a partial 21-5

RESPONSE TO COMMENT
COMMENTOR NO. 21: GREENEBAUM, HOWARD

Response to Comment No. 21-1

The commentor's concerns related to potential transport of foreign research reactor spent nuclear fuel through North Carolina are noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to MOTSU, or to any of the ports analyzed in the EIS, is low. Section 4.2.4 of the EIS demonstrates that the risk associated with interim storage of the spent nuclear fuel at any of the potential management sites is also low.

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radioactive material has been released from a spent nuclear fuel transportation cask, even as the result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

Response to Comment No. 21-2

Any ship that would be used to transport foreign research reactor spent nuclear fuel would be equipped with long range communication equipment and would remain in contact with weather advisory services. Therefore, the ship would be aware of the existence of a hurricane or other dangerous storm with sufficient advance notice in order to avoid being in the Cape Fear River specifically, or any port or other restricted waterway when such a storm hit. Since docking the ship and unloading of the foreign research reactor spent nuclear fuel would be accomplished quickly, typically well within a day, the foreign research reactor spent nuclear fuel would not be caught in restricted spaces due to an extended port stay. Even if the ship were to experience a collision or sink as the result of a severe storm or other cause, the analysis in the EIS indicates that the risk to people nearby is low, very much shy of a "mass disaster." Appendix D, Section D.5 presents details on the calculation of consequences and risk associated with accidents in port and their approaches.

Response to Comment No. 21-3

Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident, and thus affect the probability of such accidents; however, the number of earthquake-induced ship and road accidents is small compared to other causes.

COMMENTOR NO. 21: GREENEBAUM, HOWARD (CONT'D.)

clean up is $ 230 billion ! If the clean up for these polluted facilities is done completely, the cost will double to one half a trillion dollars ! The cost for a partial clean up in Aiken, SC is estimated at $ 48.2 billion ! 21-5 (Cont'd.)

American and foreign contractors made a profit building nuclear power plants. Private power companies are making a profit operating nuclear power plants. Why should American tax payers be stuck with huge bills paying for the transportation, storeage, and inevitable clean ups that will cost hundreds of billions of dollars ? 21-6

American taxpayers should not be asked to subsidize other nations' energy needs. Each nation should be responsible for their own nuclear waste. If they can't provide the security, then they should not build nuclear power plants. It's bad enough that Americans are expected to fight other nations' battles for them. It's too much to ask us to collect their dangerous garbage for them. American tax payers should protest this program of the Dept. of Energy. If it is not stopped, look out for the clean up bill. It will be enormous. 21-7

I am handing you some papers written by UNC professors about earthquake activity and faults in this area. I hope you will read them and cancel this program. 21-3 (Cont'd.)

Howard Greenebaum 841 Settlers Lane Kure Beach, NC 28449
(910) 458-0543

RESPONSE TO COMMENT
COMMENTOR NO. 21: GREENEBAUM, HOWARD (CONT'D.)

Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at MOTSU to fail, is not expected to compromise the transportation cask. Further, the analyses of impacts associated with accidents involving foreign research reactor spent nuclear fuel presented in Section 4.2.2.3 demonstrates that the use of any of the selected ports would not pose any significant risk to the port personnel or the population near the ports.

Response to Comment No. 21-4

The proposed policy is limited to foreign research reactor spent nuclear fuel containing uranium enriched in the United States (Section 2.1 of the EIS). Consideration for acceptance of spent nuclear fuel from any other source is outside the scope of this EIS.

Response to Comment No. 21-5

Costs associated with cleanup of nuclear weapons plants are outside the scope of this EIS.

Response to Comment No. 21-6

The receipt of spent nuclear fuel from power reactors is outside the scope of this EIS. With respect to the foreign research reactor spent nuclear fuel at issue, financing alternatives under consideration range from full subsidization of all participating nations to charging all nations the full cost for receipt, shipment, handling and management of their spent nuclear fuel (Section 2.2.2.3 of the EIS).

Response to Comment No. 21-7

See response to comment 21-6, above.

COMMENTOR NO. 24: MICALLEF, PAUL

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: PAUL MICALLEF Phone: 510 932-1766

Title and Organization:

Address: 431 LA VISTA RD.

City: WALNUT CREEK State CA Zip 94598

*** COMMENTS ***

I am joined with my wife in absolutely opposing the importation, transportation, and storage of nuclear waste in and through Concord, Calif. We do not approve of the United States taking the burden of storing fuel for 28 foreign countries. In terms of government agency responsibility I have no trust in your ability to perform the necessary tasks to dispose of this Toxic waste with safety. The history of Toxic waste storage is a fiasco in this country. 24-1 24-2 24-3

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 24: MICALLEF, PAUL

Response to Comment No. 24-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 24-2

The commentor's opposition to the management of foreign research reactor spent nuclear fuel in the United States is noted. Sections 2.3, 2.5 and 4.4 of the EIS describe other alternatives under consideration for implementation of the proposed policy.

Response to Comment No. 24-3

The commentor's concern regarding the government's ability to perform the tasks necessary to dispose of the foreign research reactor spent nuclear fuel is noted. As discussed in Section 4 of the EIS, foreign and domestic spent nuclear fuel have been transported in the United States for over four decades without a single radiological incident. As discussed in Section 4 and Appendix F of the EIS, foreign research reactor spent nuclear fuel could be safely stored at one or more of the candidate management sites pending ultimate disposition.

COMMENTOR NO. 25: CHASE, BARBARA

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: BARBARA CHASE Phone: 510-932-2848

Title and Organization:

Address: 435 SUMMIT RD

City: WALNUT CREEK State CA Zip 94598

*** COMMENTS ***

THIS PROPOSAL SHOULD NOT PROCEED UNTIL ITS FEASIBILITY CAN BE RE-EXAMINED. — 25-1

- THE CONCORD WEAPONS DEPOT - IS SURROUNDED BY DENSE POPULATIONS OF PEOPLE, OIL REFINERIES AND ASSORTED DANGEROUS MANUFACTING AGENCIES SITTING ON AN EARTH QUAKE FAULT. TO ADD A NUCLEAR SWORD TO THE MIX, WITH OUT SUFFICIENT THOUGHT, IS UNTHINKABLE. 25-2

SLOW DOWN— MORE MEETINGS - NO DECISON, YET

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 25: CHASE, BARBARA

Response to Comment No. 25-1

The commentor's concern regarding the feasibility of the proposed action is noted. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of LEU spent nuclear fuel. The analysis of impacts presented in Sections 4.2.2 and 4.5 of the EIS demonstrate that the risks associated with accepting and managing foreign research reactor spent nuclear fuel in the United States are low. The analyses presented in the EIS, and the historical success of United States acceptance and management of foreign research reactor spent nuclear fuel, demonstrate the feasibility of the proposed policy.

Response to Comment No. 25-2

The port selection process that determined that Concord NWS was an acceptable port considered the population of the port and surrounding areas (Appendix D, Section D.1.9.5 of the EIS). Additionally, all populations within a fifty mile radius of the Concord NWS were considered when analyzing the potential impact of a range of hypothetical port accidents. The risks were found to be low (Appendix D, Section D.5 of the EIS).

The passage from San Francisco Bay to Concord NWS does meet the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2). The port selection criteria do not consider the existence of land-based facilities such as refineries because they have no direct impact on the risk associated with the shipment of foreign research reactor spent nuclear fuel. The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the transportation cask.

COMMENTOR NO. 26: LUCAS, STAN

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: STAN LUCAS Phone: 825-7257

Title and Organization:

Address: 4057 LUCAS LN

City: CONCORD State CA Zip 94521

*** COMMENTS ***

I do not think it right to put the waste plant here in Concord, it should have been put up for a vote 26-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 26: LUCAS, STAN

Response to Comment No. 26-1

If accepted into the United States, the foreign research reactor spent nuclear fuel would be stored at one or more of the five candidate management sites discussed in Section 2.6.5 of the EIS. No "waste plant" would be sited in the Concord, California area.

COMMENTOR NO. 27: SMITH, SUSAN

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Susan Smith **Phone:** _____

Title and Organization: individual

Address: 837 Ruth Dr

City: Pleasant Hill **State** CA **Zip** 94523

*** COMMENTS ***

I oppose your plan to ship spent nuclear fuel through our community. Plutonium is one of the most dangerous substances known to humankind & has no place in a populated community. & there is no 100% safe way to contain it. I have a 2 year old child, live nearby the weapons station & feel your plan is immoral & extremely dangerous to our lives & health.

27-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 27: SMITH, SUSAN

Response to Comment No. 27-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through Concord NWS is noted. Health and safety were primary considerations during the evaluation of environmental effects for the proposed action and its management alternatives. Conservative estimates of radiological and non-radiological impacts show that risks to the population and workers are low (Sections 4.2.2 and 4.5 of the EIS).

COMMENTOR NO. 28: ACE, CAROL A.

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Carol A. Ace **Phone:** 676-6183
Title and Organization: Citizen of Concord
Address: 4596 Adams Dr
City: Concord **State** Ca **Zip** 94521

*** COMMENTS ***

I am a Citizen of Concord & live in Bishop Estates a Burrowing development that backs up to Naval Weapons Station.

I am concerned that Concord Weapons Station may be considered to deposit further nuclear waste. There must be an area that is away from civilization that is barren & available to deposit this waste.

28-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 28: ACE, CAROL A.

Response to Comment No. 28-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternatives 1 or 3), there would be no storage of this material at Concord NWS, or any other port. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

COMMENTOR NO. 29: NAVMANN, MICHAEL

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: MICHAEL NAVMANN Phone: 510 279-6277

Title and Organization: _____

Address: PO BOX 27294

City: Concord State CA Zip 94527

*** COMMENTS ***

I AM NOT CONFIDENT THAT THE US GOVERNMENT CAN GUARANTEE RESIDENTS OF CONCORD THAT THIS IDEA IS 100% SAFE. I KNOW ABOUT VARIOUS OTHER PROJECTS THAT WERE FATAL DUE TO HUMAN ERROR AND/OR OTHER PROBLEMS. THE SPACE SHUTTLE, PORT CHICAGO, FRIENDLY FIRE, WACO, OKLAHOMA, ETC. CALIFORNIA HAS NUMEROUS NATURAL (EARTHQUAKES, CIVIL UNREST, FIRES) AND MAN ENHANCED CRIME - TERRORISM.

29-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 29: NAVMANN, MICHAEL

Response to Comment No. 29-1

Every activity carries some risk. Radiological and non-radiological risks analyzed in Section 4 of the EIS indicate that there would be no significant impact to either human health or the environment as a result of the proposed action and its management alternatives. Nuclear weapons proliferation also carries risks, and the purpose of the proposed action is to reduce those risks through a cooperative foreign policy.

COMMENTOR NO. 30: WILLIAMS, LES

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Les Williams Phone: _____

Title and Organization: _____

Address: 1391 Monument Blvd #13

City: Concord State Ca Zip 94520

*** COMMENTS ***

Stop All Nuclear Development !!
No Storage in Concord
No transporting

30-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 30: WILLIAMS, LES

Response to Comment No. 30-1

The commentor's opposition to nuclear development, as well as to transport of foreign research reactor spent nuclear fuel through Concord NWS or to storage at Concord NWS, is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to Concord NWS, or to any port analyzed in the EIS is low.

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternatives 1 or 3), there would be no storage of this material at Concord NWS, or any other port. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

COMMENTOR NO. 31: ALIYY-WMS, TRUMILLA

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: TRUMILLA ALIYY-WMS **Phone:** —

Title and Organization: VICE PRESIDENT MONUMENT OAKS

Address: 1391 MONUMENT BLVD. #13

City: CONCORD **State** CA **Zip** 94520

*** COMMENTS ***

DON'T WANT THAT NUCLEAR TRANSPORTATION COMING THROUGH CONCORD. 31-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 31: ALIYY-WMS, TRUMILLA

Response to Comment 31-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 33: JAMERSON, JANET

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Janet Jamerson Phone: 676-8521

Title and Organization: Social Science III - Bob Mananberg

Address: 154 The Trees Dr

City: Concord State CA Zip 94518

*** COMMENTS ***

Yes, I think Concord Naval Weapon Station may be able to handle the arms they have right now but I think they aren't able to handle the foreign research reactor spent Nuclear Fuel that they are trying to ship in, without failure of some sort to our City 33-1

To Mail in Comments, Address Correspondence to:

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Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 33: JAMERSON, JANET

Response to Comment 33-1

As the port selection process described in Appendix D, Section D.1 of the EIS explains in detail, Concord NWS and the other nine ports all meet the criteria and hence are considered to be able to safely handle the foreign research reactor spent nuclear fuel. The experience criterion used in the port selection process (Appendix D, Section D.1.9.1 of the EIS) evaluates the port's experience in handling containerized cargo, such as would be the case for any spent nuclear fuel shipments. Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the casks used to transport it would be low, so no special handling is required.

COMMENTOR NO. 34: ELLYSON, MARY

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Mary Ellyson **Phone:** _____

Title and Organization: _____

Address: 1086 Orchard Ave.

City: Vallejo **State** CA **Zip** 94591

*** COMMENTS ***

While at the EIS meeting, a statement by the DOE ~~rep~~ represented really caught my attention. The question of terrorist activity during the transportation was brought up. The response was ~~it~~ terrorist would not be interested in the spent rods. If we are not concerned with terrorist activity during transportation, why is it necessary to move the spent rods back to the U.S. if terrorist aren't interested in them? 34-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 34: ELLYSON, MARY

Response to Comment No. 34-1

The HEU in spent nuclear fuel from foreign research reactors could be used to manufacture nuclear weapons. However, to do so would require a sophisticated chemical processing plant to separate the HEU from the spent nuclear fuel and purify it to remove the fission products and structural materials in the spent nuclear fuel, and time and money to perform the preceding activities. These steps could be taken by a foreign nation that is supportive of terrorist activities or wishes to acquire nuclear weapons itself. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

However, it would not be possible to remove the HEU from spent nuclear fuel and convert it into a nuclear weapon during the transport of spent nuclear fuel. In fact, the physical size and bulk of the transportation casks used to contain the spent nuclear fuel during transport (Section 2.6.2 and Appendix B of the EIS) and the security measures implemented during transport (Section 5.4.2 and Appendix H of the EIS) make it a poor target for terrorist activity.

COMMENTOR NO. 39: BROWN, RACHEL

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Rachel Brown Phone: (206)324-3809

Title and Organization: Citizen

Address: 602 E. Howell St.

City: Seattle, State WA Zip 98122

*** COMMENTS ***

I do not approve of my tax dollars to bring in high-level nuclear waste and pollute this country any more.

This is ludicrous!

39-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 39: BROWN, RACHEL

Response to Comment No. 39-1

The commentor's opposition to acceptance and management of foreign research reactor spent nuclear fuel in the United States is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

COMMENTOR NO. 39: BROWN, RACHEL (CONT'D.)

May, 24, 95

To whom it may concern:

I would like to start off by saying that I am dissapointed that my comments could not be taken verbatim at this hearing. I strongly dissagree with and oppose the proposal of these Spent fuel Shipments. 39-1 (Cont'd.)

First, the risk of accidents is a major problem. If this waste is to come into the states for a period of ten years or longer, where is it all going to go? We are already having problems with the waste stored in the United States now. If we take in this waste we are just making are problems worse. 39-2

EVERYONE SHOULD KEEP THEIR OWN WASTE!!!

Thank You

Rachel Brown

Rachel Brown
602 E. Howell St.
Seattle, WA., 98122

RESPONSE TO COMMENT
COMMENTOR NO. 39: BROWN, RACHEL (CONT'D.)

Response to Comment No. 39-2

Section 4 of the EIS evaluates the impacts of accident conditions that could result from the acceptance and management of foreign research reactor spent nuclear fuel in the United States. Accident conditions were considered for marine transportation, activities at ports of entry, ground transportation and at DOE management sites (Sections 4.2.1, 4.2.2, 4.2.3, and 4.2.4, respectively). The analyses determined that the risks to the environment and the health and safety of the workers and the public due to potential accidents were low.

For planning purposes, DOE has determined that its spent nuclear fuel, including foreign research reactor spent nuclear fuel, that is not otherwise dispositioned (e.g., chemically separated, with the high-level waste being converted into a vitrified glass for repository disposal), is authorized for disposal in a geologic repository. However, since the repository characterization program is in its early stages, the waste acceptance criteria for deposit of DOE's spent nuclear fuel have not been developed. Thus, a determination cannot be made at this time as to the requirements that must be met to allow placement of the foreign research reactor spent nuclear fuel in the repository. As a result, the analysis in the EIS for the time period beyond 40 years is qualitative rather than quantitative. The impacts due to ultimate disposition are discussed qualitatively in Section 4.2.7 of the EIS.

COMMENTOR NO. 40: ZEPEDA, BARBARA

5-24-95

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: BARBARA ZEPEDA Phone: 329-8571

Title and Organization: WA DEMOCRATIC COUNCIL, BOARD MEMBER

Address: 1937-25 E

City: SEATTLE State WA Zip 98112

••• COMMENTS •••

THE US POSITION ON NONPROLIFERATION WAS CLEARLY CRITIZED BY THE NZ PM IN MARCH 1995. IT WAS IGNORED BY THE USA PRESS & MEDIA. IT WAS TO PRESERVE THE RIGHT TO MAKE MORE NUKES - EVEN THOUGH WE CAN'T DEAL WITH THE "FALLOUT" OF WHAT WE HAVE. MORE WEAPONS PRODUCTION / TRADE TAKE PLACE BECAUSE THE US HAS REFUSED TO END NUKE PRODUCTION AS REQUESTED BY ART 6 AND THE MAJORITY OF CIVILIZED NATIONS. THE US IS THE FIG LEAF FOR NUCLEAR TERRORISTS COVERT AND OVERT, AS LONG AS IT REFUSES TO ADOPT UN CONVENTIONS ON NUCLEAR & WEAPONS CONTROL

THE US GOVERNMENT HAS REFUSED TO ADOPT A CODE OF CONDUCT CONVENTION ON CONVENTIONAL WEAPONS ? WHILE IT IS RESPONSIBLE FOR ½ THE WORLDS WEAPONS TRADE. 30B ? WHAT IS IT ? WHO PROFITS ? WHO PAYS

1T per year & World arm Budgets

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

40-1

RESPONSE TO COMMENT
COMMENTOR NO. 40: ZEPEDA, BARBARA

Response to Comment No. 40-1

Foreign research reactors are not used in the production of nuclear weapons. Section 1.1 of the EIS describes the research, medical, commercial, and educational applications for which foreign research reactors are utilized. The proposed action seeks to reduce international commerce in HEU and thereby reduce the threat of nuclear terrorism (Section 1.2 of the EIS).

COMMENTOR NO. 41: MACARTHUR-PANGBORN, SALLY

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Sally MacArthur-Pangborn Phone: 206 323-5980

Title and Organization: Retired teacher

Address: 221-35th ave E.

City: Seattle State Wa Zip 98112-4921

*** COMMENTS ***

It would have made us all feel better and more trusting of the nuclear establishment if you had not decided to change your practice of taping people's remarks. In the recent past when Ecology and Environment of the State the were present we were allowed to speak hoping their message would get to the right peoples to make a differences. Our opinion of the Establishment (nuclear) has been shaped by just such actions — a pretense of listening but failing to paraphrase remarks.

41-1

For order to preserve our Democracy and restore trust in our govt you and all of us must work for open govt.

I don't advocate armed rebellion; I believe in the democratic process; I believe it works if people are properly informed. What creates loonies is having people in authority who deceive and manipulate. The loonies get so frustrated they think they can correct by destroying.

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 41: MACARTHUR-PANGBORN, SALLY

Response to Comment No. 41-1

The format adopted by DOE for the public hearings held on the draft EIS is fully in compliance with the requirements of NEPA implementing regulations and DOE's requirements for conducting such hearings. This public hearing format provides opportunity for increased interaction between DOE and the public, thus serving to facilitate communication. In the large majority of cases, this public hearing format has been well received by the public. During the hearings, the facilitator recorded the major comment themes on flip charts where the audience could see what was being recorded. In addition, notetakers in the audience were recording additional information to supplement the points captured by the facilitator. Nevertheless, for those people who wished to submit their comments as individuals, or who wished to ensure that their comments were received exactly as they stated them, DOE also encouraged and welcomed the submittal of written comments, either on forms distributed during the public hearings, or in any other written form the public chose to use. Considering all of the redundant mechanisms that were provided to allow comments to be submitted, DOE considers that tapes of the hearing themselves were not necessary.

COMMENTOR NO. 42: NETRO, JENNIFER

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Jennifer Netro Phone: (206) 623 2295

Title and Organization:

Address: 1922 9th ave #203

City: Seattle State WA Zip 98101

*** COMMENTS ***

The risk to the public from importing, transporting, and storing the spent nuclear fuel rods is much greater than any risk from countries who currently have the rods. Until we have safe ways to transport and store this material, as well as deal with the waste we have made ourselves, we should not consider bringing it into the United States from other countries.

42-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 42: NETRO, JENNIFER

Response to Comment No. 42-1

Public risks due to the alternatives were evaluated and found to be low. Section 4 of the EIS describes estimated risks and environmental effects. Nevertheless, the commentor's opposition to acceptance of foreign research reactor spent nuclear fuel in the United States is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

COMMENTOR NO. 43: ROGERSON, PETE

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Pete Rogerson Phone: 285 2344 (206)

Title and Organization: Citizen

Address: 2116 10th Ave W.

City: Seattle State WA Zip 98119

••• COMMENTS •••

If shipments have to be taken, the following suggestions are offered: 43-1

Shipments should be taken Inat only HIGH Security ports. More shielding around casks is needed: smaller amounts in larger casks? Only the finest ships, cantrains, trucks, etc should be used, Not just general transport services with a little added precautions, that's not secure enough. Do not mark the shipments well. Thats a target for people who want to steal or peirce a container. Nuclear 43-2

nonproliferation is very important and in general I support the idea of this program. I feel most of the people at the meeting here at Sea-Tac Radisson are very anti-nuclear waste, at the expense of good foreign policy and effective long-term world administration. 43-3

We must STOP the generation of waste, here and all over the world. Storage or disposal solutions are inadequate and will remain so. 43-4

The Public notice in the paper that announced this meeting described it as "informal discussion". Most of the people thought they would be testifying before congress! I had no such expectation, as none was suggested by the notice. I feel that issue was blown way out of proportion. 43-5

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Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 43: ROGERSON, PETE

Response to Comment No. 43-1

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that the foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. The security provisions are summarized in the new Appendix H that has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit.

Response to Comment No. 43-2

The commentor's suggestion regarding the use of extra shielding, the number of spent nuclear fuel elements, and the size of the transportation casks are noted. All spent nuclear fuel transportation casks are built with sufficient shielding materials (Appendix B, Section B.2 of the EIS) to protect the workers and public from the radiation emanating from spent nuclear fuel that would be carried in the casks. The allowed radiation levels on a transportation cask are regulated by 10 CFR Part 71.41. No cask would be shipped if its radiation level exceeded the allowed limit. Historically, the transportation cask radiation levels were much less (one to two orders of magnitudes) than the limits allowed by the regulation. Any additional shielding other than that provided by the cask and the ISO container would be unnecessary. The amount of spent nuclear fuel in a transportation cask is a small percentage of the cask's total weight. Each cask can only accommodate a limited number of spent nuclear fuel elements. Carrying a smaller number of spent nuclear fuel elements per cask than that allowed by the cask's certificate would increase the number of shipments, and add to the overall shipping costs.

Response to Comment No. 43-3

The incident-free and accident risk calculations in the EIS cover both general transport means and dedicated carriers. The commentor's preference for dedicated carriers is noted.

DOE disagrees, however, with the commentor's preference for not marking the shipments well. Failure to mark the shipments would increase the risk to marine transport workers, port workers, ground transport workers, emergency responders, and the general public while providing only a marginal increase in security.

COMMENTOR NO. 43: ROGERSON, PETE (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 43: ROGERSON, PETE (CONT'D.)

Response to Comment No. 43-4

The support given by the commentor to the proposed policy is noted. The United States is eager to eliminate HEU from civilian commerce worldwide and to safely manage all U.S.-origin HEU.

Response to Comment No. 43-5

The commentor's opinion about generally inadequate nuclear storage and disposal solutions is noted. The analysis in Section 4.2.4 of the EIS demonstrates that the risk associated with interim storage of foreign research reactor spent nuclear fuel at the DOE management sites would be low.

The impacts of ultimate disposition of spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS). As stated in Sections 2.1 and 4.2.7 of the EIS, if a geologic repository is not prepared to accept the foreign research reactor spent nuclear fuel or its resultant stable waste forms (generated due to chemical separation or other processing technology) DOE would continue to manage the material in exisiting facilities at the DOE management site(s).

COMMENTOR NO. 44: DEROY, TIFFANY

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Tiffany Deroy Phone: 206-783-3923

Title and Organization: —

Address: 6000 Greenwood Ave N

City: Seattle State WA Zip 98103

*** COMMENTS ***

I feel that the DOE has no real interest in what citizens of Tacoma & Seattle really feel about this issue. The "paraphrasing" of citizen comments during the hearing is something I find highly objectionable - comments should be recorded word for word. 44-1

The idea that the U.S. is encouraging non-proliferation is ridiculous as is the idea that this issue concerns nonproliferation. Also, the DOE must recognize that the public has very valid reasons for mistrusting them. There has been a breach of trust in the past & the DOE needs to earn that trust back, if possible. Please do not treat skeptics as paranoids who mistrust with no reason. We do not believe your assurances of our safety. There is a risk and it may well be more than you are willing to admit. 44-2, 44-3

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 44: DEROY, TIFFANY

Response to Comment No. 44-1

The format adopted by DOE for the public hearings held on the draft EIS is fully in compliance with the requirements of NEPA implementing regulations and DOE's requirements for conducting such hearings. This public hearing format provides opportunity for increased interaction between DOE and the public, thus serving to facilitate communication. In the large majority of cases, this public hearing format has been well received by the public. During the hearings, the facilitator recorded the major comment themes on flip charts where the audience could see what was being recorded. In addition, notetakers in the audience were recording additional information to supplement the points captured by the facilitator. Nevertheless, for those people who wished to submit their comments as individuals, or who wished to ensure that their comments were received exactly as they stated them, DOE also encouraged and welcomed the submittal of written comments, either on forms distributed during the public hearings, or in any other written form the public chose to use. Considering all of the redundant mechanisms that were provided to allow comments to be submitted, DOE considers that tapes of the hearing themselves were not necessary.

Response to Comment No. 44-2

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). As discussed in Section 4 of the EIS, none of the management alternatives poses significant benefits or risks to human health or the environment.

Response to Comment No. 44-3

Assumptions used in calculations of radiological risks are described in Section 4 of the EIS. As discussed in Section 4.10 of the EIS, there are risks associated with the proposed action or any other action. Because of the conservative assumptions used in the analyses, actual risks associated with the proposed action would be expected to be lower than the conservative estimates shown in Section 4 of the EIS.

COMMENTOR NO. 47: BERGER, DAVE

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Dave Berger **Phone:** 503-977-4878

Title and Organization: Portland Community College

Address: 12000 SW 49th

City: Portland **State** OR **Zip** 97219

*** COMMENTS ***

It seems like trying to limit weapons [redacted] Expansion of terrorism is a good IDEA. But, how can we continue to: (1) [redacted] sell arms at an astronomical rate to foreign [redacted] dictators, & then fight wars with them (2) allow multinationals to continue to build reactors all over the globe & (3) allow multinationals to [redacted] dump pesticides & hazardous materials in foreign countrys & then turn around and worry about proliferation. We have no logical broad based policy to protect humanity other than fiscal profits for huge corporations

47-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 47: BERGER, DAVE

Response to Comment 47-1

Foreign research reactors are used for research, medical, commercial, and educational applications (Section 1.1 of the EIS) not for the manufacture of conventional or nuclear weapons. An objective of the proposed policy is to encourage the use of LEU in foreign research reactors (Section 1.2 of the EIS). Because of the peaceful applications and benefits which result from operation of research reactors, foreign nations are not likely to cease operation and construction of such reactors. In addition, the U.S. accrues significant benefits from the operation of foreign research reactors - including Moly-99 and other medical isotopes.

The nonproliferation of nuclear weapons is a vital policy goal of the United States (Section 1.1 of the EIS). Although the treatment of hazardous materials in foreign nations is an important environmental concern, it is outside of the scope of this EIS .

COMMENTOR NO. 48: BERGER, DAVE

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Dave Berger Phone: 977-4878

Title and Organization: ~~Instructor/engineering~~ Portland Community College

Address: 12000 SW 49th Ave. ~~Portland, OR~~

City: Portland State OR Zip 97219

*** COMMENTS ***

The risks AND costs to health AND potential damage to the ecosystem CAN simply NOT be offset by the ECONOMIC GAIN & strategic gain of storing such materials in the U.S. — 48-1

OREGON is NOT A state that benefits from Military defenses OR major chemical industries - It should not become such a state - NOR should it bare such burdens -

Why shouldn't these materials be handled closer to the site of their creation. — 48-2

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 48: BERGER, DAVE

Response to Comment No. 48-1

Radiological and non-radiological environmental risks resulting from the management alternatives were evaluated under conservative assumptions and found to be low (Section 4 of the EIS). Although adoption of Management Alternative 1 or 3 to the proposed action would not result in any economic gain for the United States, it would promote reduction in international commerce in HEU, and thereby reduce the threat of nuclear weapons proliferation.

Response to Comment No. 48-2

The commentor's preference for storing the foreign research reactor spent nuclear fuel closer to the site of its creation, is noted. At the present time, many foreign research reactor operators have no means for disposition of their spent nuclear fuel (Section 1.1 of the EIS). The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

COMMENTOR NO. 49: KLAUSMAN, STEVE

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Steve Klausman Phone: 665-3494

Title and Organization: P.H.C

Address: 1461 NE Paraga Ct

City: Gresham State OR Zip 97030

*** COMMENTS ***

I'm definately against nuclear waste coming to U.S. It causes too much radiation. My boss Sharon says that we can't handle nuclear waste. Thanks 49-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
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Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 49: KLAUSMAN, STEVE

Response to Comment 49-1

The commentor's opposition to acceptance of foreign research reactor spent nuclear fuel in the United States is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

Safe handling of radioactive material is an important concern. Because spent nuclear fuel from foreign research reactors is radioactive, it is transported in casks which shield the surroundings from harmful levels of radioactivity. In addition, the spent nuclear fuel transportation casks are constructed to withstand severe stress, such as accidents and immersion in water, without releasing their contents. Section 2.6.2 of the EIS describes the casks which would be used to transport spent nuclear fuel from foreign research reactors. Facilities for safely managing spent nuclear fuel are described in Section 2.6.5 of the EIS.

COMMENTOR NO. 50: GROVER, MIKE

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Mike Grover Phone: 233-1139

Title and Organization:

Address: 2548 SE Ankeny

City: Portland State OR Zip 97214.

*** COMMENTS ***

We need to stop making the Poison Commodity whatever you want to call it. This is a blatant disregard for life in the present and generations to come. NPT, CTB mean little to an inactive govt.

Is the money worth it. NO.

Evaluate cleanup of Maxey Flats, Beatty, Hanford, Savannah Rocky Flats....

Creation of Nuke Stuff = Destruction of Biology. Live free or DIE & Nothing is for free

50-1

50-2

50-1 (Cont'd.)

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Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

This could have been using the by the size back. CHLORINE

RESPONSE TO COMMENT
COMMENTOR NO. 50: GROVER, MIKE

Response to Comment No. 50-1

The commentor's position on these matters is noted. The EIS has discussed in detail the potential impacts associated with implementation of the proposed action and any of its management alternatives. As discussed in Section 4 of the EIS, the risks associated with implementation of the proposed action to human health or the environment would be low.

Response to Comment No. 50-2

Waste management activities at facilities such as Maxey Flats, Beatty, Hanford, Savannah River, and Rocky Flats are outside the scope of this EIS (Section 1.3 of the EIS).

COMMENTOR NO. 51: ROBINSON, BOB

DEPARTMENT OF ENERGY HEARING ON TRANSPORT OF NUCLEAR WASTE

MAY 25, 1995

The Pacific Northwest, and Oregon in particular has been proposed as the transfer site of extremely hazardous nuclear waste from other countries who are considered irresponsible and are prone to the proliferation and construction of atomic weapons if left to dispose of these waste materials on their own.

To compound this factious scheme, attempts are being made to transport these perilous and unstable materials through the Port of Portland and to continue on by land transport to a storage area. This is ***totally unacceptable***. We will continue the struggle to protect our citizens and environment from irresponsible and unnecessary transport of volatile and unstable nuclear wastes. 51-1

The organizations I belong to have ***consistently opposed*** any transfer or storage of nuclear wastes and material in or through Oregon and the Pacific Northwest. People come from all over the world to see and enjoy the beauty and splendor of Oregon. We ***must*** continue to protect this way of life. It would be nonsensical and vacuous for the Department of Energy to give this ludicrous idea any further consideration.

If the Department of Energy is truly dedicated to a fair and impartial determination of this matter, a basic common sense analysis of the issue would automatically rule out Oregon as a deposit site for Nuclear Wastes. The storage of Nuclear Wastes adjacent to the Columbia River and the irreplaceable Columbia River George is ludicrous on its face. Your assumption that "***there is already nuclear waste at Hanford so thats where we'll dump it***" flies in the face of sagacity. Just because one has a headache doesn't mean you cut your head off to solve the problem. 51-2

I would propose another more reasonable and equitable alternative. Stop the importing of Nuclear Wastes. Spend the money allocated for Nuclear Waste transfers on guaranteed, safe, reasonable storage facilities research. Looking for scapegoats to dump on is neither productive nor rational. 51-3

Whatever time it takes, take it. This is the answer to resolve this unwanted and unnecessary controversy.

Sincerely,

Bob Robinson

BOB ROBINSON
2226 S.E. 35th Place
Portland, Oregon 97214
503-235-5498

RESPONSE TO COMMENT
COMMENTOR NO. 51: ROBINSON, BOB

Response to Comment No. 51-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Portland is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Portland, or to any of the ports analyzed in the EIS, is low.

DOE would like to point out that the foreign research reactor spent nuclear fuel is neither volatile nor unstable. The spent nuclear fuel that the proposed policy deals with is a metal which contains enriched uranium clad with either aluminum or stainless steel. This type of fuel is very stable. Section 2.6.1 of the EIS presents a detailed description of the foreign research reactor spent nuclear fuel.

Response to Comment No. 51-2

The commentor's opposition to the proposed action, including storage in the States of Washington and Oregon is noted. As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site. The State of Oregon was not considered for storage of spent nuclear fuel.

Response to Comment No. 51-3

Under the No Action Alternative, as described in Section 2.5 of the EIS, the United States would not manage spent nuclear fuel from foreign research reactors, nor provide assistance or incentives for overseas management of such spent nuclear fuel. Based on the undesirable impact this alternative would have on U.S. nuclear weapons nonproliferation policy, the No Action Alternative would not be considered the most viable option for managing foreign research reactor spent nuclear fuel.

COMMENTOR NO. 53: SIMMS, LYNN

May 25, 1995

Comment upon Draft EIS on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Thank you for the opportunity to comment.

I suppose the USDOE is seeking re-comment and discussion duplicating the extensive hearings held over a year ago on the issue. Therefore, I would like you to review my previous testimony and re-enter it along with this passage as my comment, highlighting the positions that in real reality, there is no such program as "atoms for peace", because all nuclear production results in a legacy that ravages the earth and imperils the future. 53-1 53-2

Other countries must begin to manage the nuclear products they use, if they choose to participate in such an enterprise. We should supply them with monies and best current technologies to isolate the waste instead of incurring the risks of transport and further polluting our homeland. 53-3

The program is based upon a number of fallicies. A Nonproliferation Policy. This policy remains flawed. The military wants to keep nuclear bombs, as is plainly evident in the current budget requests for funding for a tritium reactor for the purpose of triggering and enhancing the destructive power of nuclear weapons ... even while we already have a 20 year supply. We can not bring ourselves yet to classify this deadly gold as a waste and are persistent in euphimistically coining phrases such as "special nuclear materials"

This country is in deep denial over the fact that the military industrial complex wants distinct advantage in the global sales of nuclear power plants and to have some position of control in the supply of nuclear fuels. Technology has not rescued us yet from our human folly or from the human failures that promote the use of nuclear bombs to accomplish our agendas. 53-4

This evolving grim scenario is one of the diastrous possibilities, described by President Eisenhower's warning concerning the assumption of power by the military industrial complex..the sacrificing of our own homeland, our economy and our people for the sake of military power and the profits of the profits of the nuclear industry.

Now we are all caught in a very sticky web. We could have an extended open house discussion until doomsday and none of us will change a word of our original testimonies or change our minds.

RESPONSE TO COMMENT
COMMENTOR NO. 53: SIMMS, LYNN

Response to Comment No. 53-1

The commentor references previous testimony given during the scoping process in November/December 1993. The testimony given during scoping meetings was solicited in order to help DOE determine the scope of the EIS and was responded to in the development of the Implementation Plan on the proposed policy on spent nuclear fuel (DOE/EIS-0218, October 1994). However, the public hearings on the proposed policy were conducted to solicit comments on a different and later document — the draft EIS. The draft EIS contains different information than contained in the Implementation Plan, so the comments made at scoping meetings were not considered in the preparation of the final EIS. Only comments made during the public hearings on the draft EIS, and those submitted to DOE in written form during the public comment period, were considered.

Response to Comment No. 53-2

The "Atoms for Peace" program was an innovative and valid initiative that was intended to promote peaceful nuclear cooperation by providing peaceful nuclear technology in exchange for a promise by recipient foreign nations that they would not pursue nuclear weapons development. An important component of the program was to encourage research reactor technology. Research reactors are important to medical, agricultural, and industrial sectors and also are helpful in scientific research (Section 1.1 of the EIS).

Response to Comment No. 53-3

This comment describes and advocates a path that is very similar to Management Alternative 2 in this EIS. DOE notes the commentor's preference for Management Alternative 2, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

Response to Comment No. 53-4

As discussed in Section 1.2 of the EIS, the intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy by seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide. Research reactors are not used to construct nuclear weapons. Section 1.1 of the EIS describes the reasearch, medical, industrial, and agricultural applications for foreign research reactors.

Weapons procurement and maintenance policies of the United States are outside the scope of this EIS. Research reactors are not used to generate commercial power and play no role in the construction of nuclear power plants or in economic impacts resulting from the sale of nuclear power plants.

COMMENTOR NO. 53: SIMMS, LYNN (CONT'D.)

Every single technically correct decision may be made as you implement these projects. But you are none the less, still on the wrong path. And it should be obvious, even to you, that the military industrial complex has no room for second opinions and that if it has its way, even the Department of Energy will be eliminated and the military budgets will increase and the clean up funds and regulations will be lessened. 53-5

Listen to us and take out your erasers and wipe out the Port of Portland from your list of targeted ports. Because the people of Portland never will participate in, aide, condone, or approve of this continuing nuclear madness. 53-6

RESPONSE TO COMMENT
COMMENTOR NO. 53: SIMMS, LYNN (CONT'D.)

Response to Comment No. 53-5

The commentor's opinions related to the military industrial complex and the future of DOE are outside the scope of the EIS.

Response to Comment No. 53-6

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Portland is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Portland, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 54: TATE, MONTIE

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Montie Tate **Phone:** no Phone
Title and Organization: American Citizen
Address: P.O. Box 4063
City: Portland **State** OR **Zip** 97208

*** COMMENTS ***

I am AGainst the Emportation of Spent Nucalar Fuel into my Home land, I Am Against this process that does not Record Electronicly mine and others statements. The Democratic Process you used to decide this did not include me - So your Process was not Democratic - 54-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 54: TATE, MONTIE

Response to Comment No. 54-1

The commentor's opposition to acceptance of spent nuclear fuel from foreign research reactors into the United States is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

The format adopted by DOE for the public hearings held on the draft EIS is fully in compliance with the requirements of NEPA implementing regulations and DOE's requirements for conducting such hearings. This public hearing format provides opportunity for increased interaction between DOE and the public, thus serving to facilitate communication. In the large majority of cases, this public hearing format has been well received by the public. During the hearings, the facilitator recorded the major comment themes on flip charts where the audience could see what was being recorded. In addition, notetakers in the audience were recording additional information to supplement the points captured by the facilitator. Nevertheless, for those people who wished to submit their comments as individuals, or who wished to ensure that their comments were received exactly as they stated them, DOE also encouraged and welcomed the submittal of written comments, either on forms distributed during the public hearings, or in any other written form the public chose to use. Considering all of the redundant mechanisms that were provided to allow comments to be submitted, DOE considers that tapes of the hearing themselves were not necessary.

COMMENTOR NO. 55: FERGUSON, KEN

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: KEN FERGUSON Phone: (503) 497-9131
Title and Organization: GREENPEACE (503) 233-1139
Address: 2021 SW 6TH
City: PORTLAND State OR Zip 97201

*** COMMENTS ***

FOR THE RECORD
CORRECTION FOR THE DRAFT EIS SNF PROGRAM HEARING AUGUST 8TH(?) 1994
VOLUME 3, COMMENT RESPONSE DOCUMENT READS ~~[illegible]~~ THAT I STATED HANFORD WOULD BE A GOOD LOCATION TO CENTRALIZE SNF REPROCESS IT AND SUPPORT PROPER RMI DISTRIBUTION OF REACTOR FUEL. MY ACTUAL COMMENT WAS TO EXPRESS MY OPPOSITION TO REPROCESS THIS FUEL FOR THIS OR ANY OTHER USE

55-1

OVER

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 55: FERGUSON, KEN

Response to Comment No. 55-1

The commentor's opposition to acceptance of spent nuclear fuel from foreign research reactors is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration. The commentor's claim that Volume 3 of the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement misquotes the commentor is also noted.

COMMENTOR NO. 55: FERGUSON, KEN (CONT'D.)

① 5/25/95

-NO ACTION-

THERE IS NOW KNOWN 100% SAFE METHOD OR TECHNOLOGY TO TRANSPORT OR STORE NUCLEAR MATERIALS. UNTIL THIS DEADLY WASTE STREAM CEASES NO DEBATE ON MANAGEMENT OF THESE MATERIALS WILL BE ENTERED BY MYSELF OR GREENPEACE. WE ARE IN COMPLETE OPPOSITION TO NUCLEAR WEAPONS, NUCLEAR ENERGY AND TRANSPORT OF ANY OF THESE MATERIALS. THIS NATION IS CURRENTLY GRAPPLING WITH THE FISCAL & ENVIRONMENTAL NIGHTMARES OF MANAGING EXISTING WASTES. RESTORATION COSTS FOR HANFORD AND INEL MAY EXCEED 6.6 BILLION DOLLARS. IN LIGHT OF CURRENT BUDGET CUTS IN THE DOE THE WISDOM OF ACCEPTING OVERSEAS WASTES TO MANAGED IN ADDITION TO EXISTING WASTES SEEMS MISGUIDED.

55-2

55-3

RESPONSE TO COMMENT
COMMENTOR NO. 55: FERGUSON, KEN (CONT'D.)

Response to Comment No. 55-2

As discussed in Section 4.10 of the EIS, every activity carries some risk. However, as described throughout Section 4 of the EIS, implementation of the proposed action would pose no significant benefits or risks to human health or the environment.

The commentor's opposition to nuclear weapons, nuclear energy, and the transport of nuclear materials is noted. Foreign research reactors are not used in the construction of nuclear weapons or for generation of commercial power. Section 1.1 of the EIS describes the research, medical, industrial, and agricultural applications for research reactors. Radiological and non-radiological risks that would result from transportation of spent nuclear fuel from foreign research reactors were found to be low (Section 4 of the EIS).

As discussed in Section 4.2.4 of the EIS, foreign research reactor spent nuclear fuel could be safely managed at one or more of the candidate management sites pending ultimate disposition. Section 2.6.5 describes storage technologies that would be used for interim management of foreign research reactor spent nuclear fuel.

United States abandonment of this program and, in fact, all civilian nuclear programs, would do nothing to eliminate nuclear research reactor or commercial nuclear power from the rest of the world. With respect to foreign research reactors, exactly the opposite is true. Adoption of the No Action Alternative would lead to a resumption of civilian commerce in HEU.

Response to Comment No. 55-3

Clean-up and restoration efforts at the Hanford Site and Idaho National Engineering Laboratory are outside the scope of this EIS (Section 1.3 of the EIS). The cost for the foreign research reactor spent nuclear fuel program, as disclosed to the public in Section 4.9 of the EIS, is estimated at roughly $1 billion to $1.5 billion. Additional costs could be incurred depending on factors outside the control of this program, such as the requirements for disposing of nuclear material at the high-level nuclear waste repository. The program costs are therefore less than one percent of the estimated costs to cleanup the DOE nuclear facilities.

As discussed in Section 2.2.1.2 and 2.2.2.3 of the EIS, several financing options have been considered, ranging from collection of fees from the research reactor operations that would pay all of the costs of the program to full subsidization of the program by DOE. One of these options would be for developed countries (which represent about 87 percent of the spent nuclear fuel total mass and about 78 percent of the spent nuclear fuel elements) to be charged a competitive fee and the costs for developing countries to be subsidized by the United States for the acceptance and management of their spent nuclear fuel.

COMMENTOR NO. 55: FERGUSON, KEN (CONT'D.)

(2)

Marriott
HOTELS · RESORTS · SUITES

DOE HAS YET TO DECIDE FINAL DISPOSITION OF THESE FUEL RODS. AND THIS DECISION IS FOR AN INTERIM PERIOD OF 40 YEARS. AT THE CURRENT RATE OF GENERATION OF ~~THESE~~ SPENT NUCLEAR FUEL WE WILL BE ATTEMPTING TO MANAGE OVER TWICE AS MANY WASTES AT THAT TIME.

CURRENTLY THE UNITED STATES IS UNDER MORATORIUM FOR REPROCESSING OF THESE MATERIALS ~~BUT~~ BUT THE DOE DOES INCLUDE REPROCESSING IN ITS ALTERNATIVES. IT SEEMS THAT WITH THE ~~PE~~ AMOUNT OF SNF ~~PROPOSED~~

For reservations call toll free 800-228-9290

55-4

55-5

RESPONSE TO COMMENT
COMMENTOR NO. 55: FERGUSON, KEN (CONT'D.)

Response to Comment No. 55-4

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. A detailed, quantitative discussion of these impacts would have to be the subject of future NEPA documentation.

The amount of spent nuclear fuel involved in this EIS is presented in Section 2.2.1.3. It is equal to less than one percent of the total mass of heavy metal that DOE currently manages, and approximately ten percent of the volume.

Response to Comment No. 55-5

Chemical separation is being considered as Implementation Alternative 6 to Management Alternative 1 and as part of Management Alternative 3 in this EIS. DOE takes note of the commentor's opposition to the chemical separation alternatives, which are discussed in Section 2.2.2.6, 2.4, 4.36 and 4.5 of the EIS.

(3) ~~DO~~ NOT STORED, THAT THAT INTENTION IS TO REPROCESS ~~THE~~ SPENT RODS INTO USABLE FUEL WHICH ~~[illegible]~~ COULD THEN BE REDISTRIBUTED TO EXISTING REACTORS.

REPROCESSING IS NOT ACCEPTABLE. WITHIN NOT ONLY BEING A VERY DANGEROUS PROCESS (EX. TOMSK-7 A FORMER SOVIET UNION REPROCESSING FACILITY ~~[illegible]~~ WHERE ~~A~~ A RADIOACTIVE EXPLOSION OCCURRED DURING CHEMICAL SEPERATION IN 1992) ~~IT~~ IT ALSO CREATES A BY-PRODUCT OF ~~[illegible]~~ HIGH-LEVEL HAND TRANSURANIC WASTES WHICH MUST THEN BE VITRIFIED ~~[illegible]~~ TO MAKE STORAGE POSSIBLE

55-5 (Cont'd.)

COMMENTOR NO. 55: FERGUSON, KEN (CONT'D.)

(4)

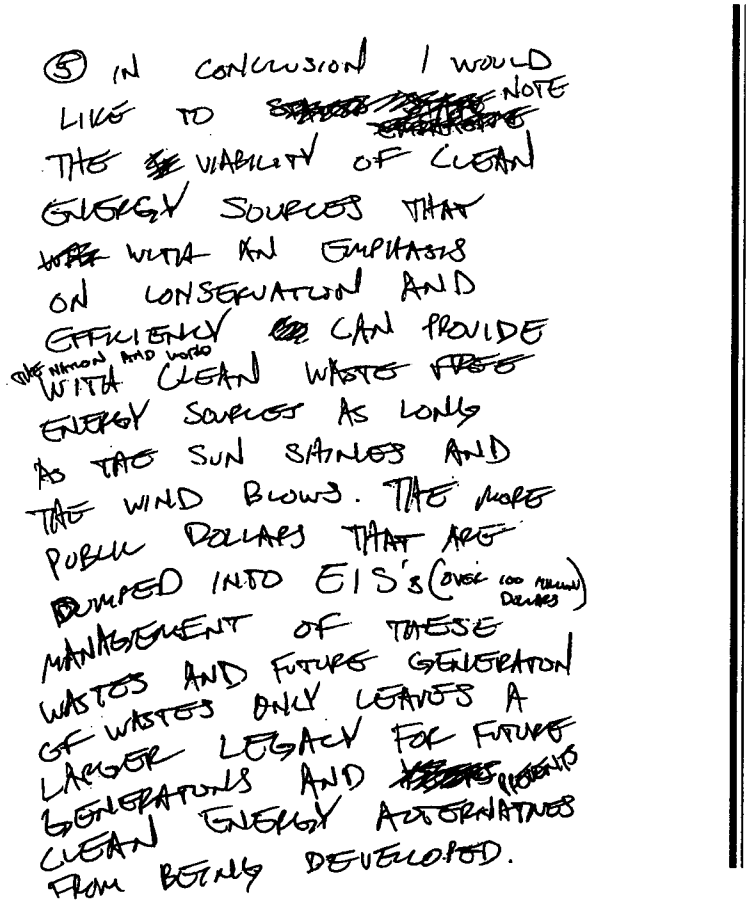
Marriott
HOTELS · RESORTS · SUITES

MAY I REMIND YOU
THAT THESE WASTES ARE
EXTREMELY TOXIC FOR HUNDREDS
~~YEARS~~ OF THOUSAND OF
YEARS AND IT SEEMS
APPARENT THAT THE
VITRIFICATION FACILITY IN
EXISTENCE AT THE SAVANNAH
RIVER SITE (WHICH I MAY
ADD IS NOT FUNCTIONING
IN ACCORDANCE
WITH DESIGN THEORY) AND
THE PLUTONIUM & URANIUM
EXTRACTION FACILITY (PUREX)
LOCATED AT HANFORD
CLEARLY ILLUMINATES THE DOE'S
PREFERRED FINAL DISPOSITION
OF THESE FUELS

For reservations call toll free 800-228-9290

55-5
(Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 55: FERGUSON, KEN (CONT'D.)

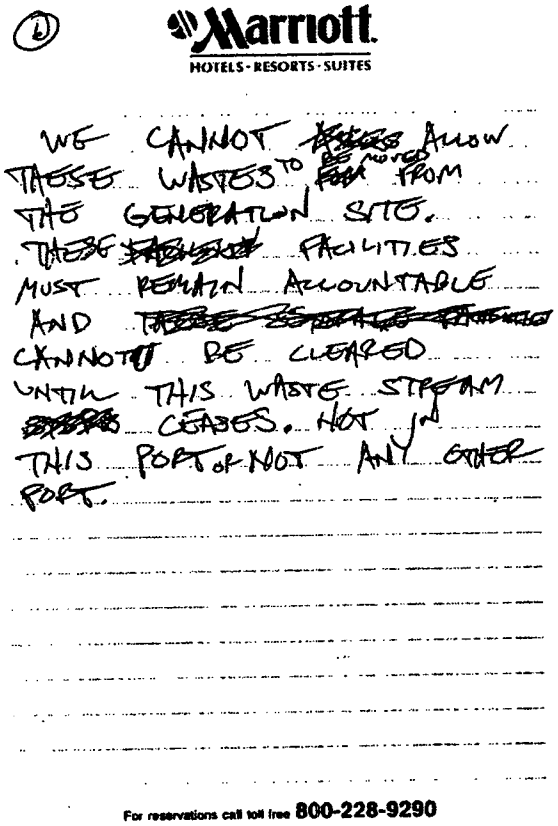

⑤ IN CONCLUSION I WOULD LIKE TO NOTE THE VIABILITY OF CLEAN ENERGY SOURCES THAT WITH AN EMPHASIS ON CONSERVATION AND EFFICIENCY CAN PROVIDE A NATION AND WORLD WITH CLEAN WASTE FREE ENERGY SOURCES AS LONG AS THE SUN SHINES AND THE WIND BLOWS. THE MORE PUBLIC DOLLARS THAT ARE DUMPED INTO EIS's (OVER 100 MILLION DOLLARS) MANAGEMENT OF THESE WASTES AND FUTURE GENERATION OF WASTES ONLY LEAVES A LARGER LEGACY FOR FUTURE GENERATIONS AND PROJECTS CLEAN ENERGY ALTERNATIVES FROM BEING DEVELOPED.

55-6

Response to Comment No. 55-6

Consideration of alternative energy sources is outside the scope of this EIS. However, it is important to note that as part of its mission, DOE currently has on-going programs that are seeking to develop and promote use of these alternative energy sources, such as solar and wind.

COMMENTOR NO. 55: FERGUSON, KEN (CONT'D.)



55-7

RESPONSE TO COMMENT
COMMENTOR NO. 55: FERGUSON, KEN (CONT'D.)

Response to Comment No. 55-7

Many foreign research reactor operators will soon run out of storage space or face safety or regulatory issues due to the presence of spent nuclear fuel at their facility (Section 1.1 of the EIS). The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

COMMENTOR NO. 61: SCHMALZ, BRUCE L.

Bruce L. Schmalz

6445 Sidehill Lane
[redacted]
Idaho Falls, Idaho 83401

Phone (208) 522-7176

April 20, 1995

United States Department of Energy
Office of Environmental Management
1000 Independence Avenue SW
Washington, D.C. 20585-0001

Attention: Mr. Charles Head

Re: "Draft Enfironmental Impact Statement, DOE/EIS 0218D
---Nonproliferation Policy —— Spent Nuclear Fuel"

Dear Sir:

Reported black market movement of plutonium out of Russia, construction of reactors in Iran by Russia and China, and nuclear efforts in North Korea and Iraq would seem to compromise or mute U.S. efforts to limit proliferation of weapons

61-1

If political matters can be construed as a part of the environment, they should be considered in an EIS. Authorities in the states in which the five proposed storage sites are to be located seem unwilling to allow fuel or waste to be stored indefinitely.

61-2

Ultimate disposal of fuel or waste is left to future decisions in all of the Alternatives. This problem has been studied for decades, with no predictable solution. The matter should be pursued vigorously, and until solutions and decisions are reached, no importation of fuel should be considered or allowed.

61-3

For these reasons the No Action Alternative seems to be the only rational or logical outcome; continued reliance on HEU notwithstanding.

61-4

Respectfully,

Bruce L. Schmalz
AEC Retired

RESPONSE TO COMMENT
COMMENTOR NO. 61: SCHMALZ, BRUCE L.

Response to Comment No. 61-1

Black market trade in fissile materials does pose a threat to nuclear weapons nonproliferation. Construction of nuclear reactors fueled by HEU are also undesirable from that viewpoint. Efforts by some nations to develop a nuclear weapons capability are an incentive to reduce the amount of weapons grade fissile material available. The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS).

Response to Comment No. 61-2

Under NEPA, political matters are not part of the environmental impacts analyzed in this EIS.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory.

Response to Comment No. 61-3

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS). As stated in Sections 2.1 and 4.2.7 of the EIS, if a geologic repository is not prepared to accept the foreign research reactor spent nuclear fuel or its resultant stable waste forms (generated due to chemical separation or other processing technology) DOE would continue to manage the material in exisiting facilities at the DOE management site(s).

DOE and the Department of State consider it is reasonable to accept more spent nuclear fuel for the purpose of supporting U.S. nuclear weapons nonproliferation policy. Acceptance of the proposed amounts of foreign research reactor spent nuclear fuel involved would increase DOE's total inventory of heavy metal less than one percent by mass and less than ten percent of the volume.

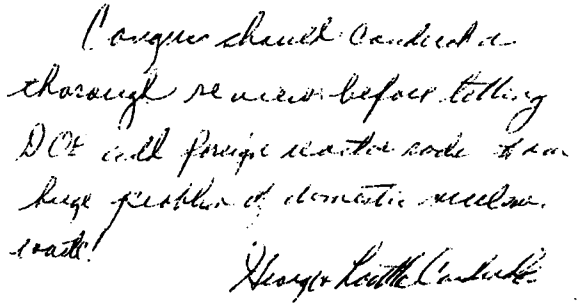
COMMENTOR NO. 61: SCHMALZ, BRUCE L. (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 61: SCHMALZ, BRUCE L. (CONT'D.)

Response to Comment No. 61-4

The No Action Alternative is one of the options under consideration. As discussed in Section 4.6 of the EIS, adoption of the No Action Alternative would have no direct impact on the environment in the United States. However, the No Action Alternative does not support U.S. nuclear weapons nonproliferation policy and may have adverse diplomatic consequences.

COMMENTOR NO. 64: CARDINALE, GEORGE



64-1

RESPONSE TO COMMENT
COMMENTOR NO. 64: CARDINALE, GEORGE

Response to Comment No. 64-1

Members of the United States Congress have been provided with copies of the draft EIS. Acceptance of spent nuclear fuel from foreign research reactors under Management Alternative 1 to the proposed action would increase DOE's inventory of heavy metal (such as uranium) less than one percent by mass and about ten percent by volume (Section 2.2.1.3 of the EIS).

COMMENTOR NO. 65: HARRILL, WILLIAM

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: William Harrill Phone: 804-340-5242

Title and Organization:

Address: 820 Bi Nmore Dr.

City: Va Beach State VA Zip 23454

*** COMMENTS ***

Enclosed is article on red mercury. Please note compound is mercury antimony oxide not mercury lithium oxide. 65-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 65: HARRILL, WILLIAM

Response to Comment No. 65-1

Commerce in red mercury is outside the scope of this EIS (Section 1.4 of the EIS). The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly-enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS).

COMMENTOR NO. 66: CHUBB, WALSTON

May 17, 1995

Mr Charles Head, Program Manager
Office of Spent Nuclear Fuel Management
Department of Energy
Washington, DC 20585

Dear Mr Head,

The dollar is falling in value relative to the yen and the mark. The national debt is rising above $45,000 per household. If we borrow more money on signature notes, the dollar will fall some more. We're BROKE! We're broke because back in 1974 we chose to be non-competitive in world trade. We could have chosen to be the lowest cost producer of goods. Instead, we created the N.R.C. and ordered it to insure that the electricity made in nuclear power plants was at least as costly as the electricity made in coal-fired plants. The Chinese aren't that stupid; and they also have plenty of coal. 66-1

Bankrupt countries must look for ways to make and save more money. They must adopt a lower standard of living, work harder, and try to become the lowest cost producer of goods.

Unless you wish to see the U.S. wallowing in debt, you must require that all spent nuclear fuel be stored and reprocessed in the U.S. Either the U.S. will plan to reprocess all of its spent nuclear fuel and dispose of its excess plutonium in MOX, or the U.S. must plan to put up our excess plutonium as collateral for loans on an increasing national debt. By promoting and signing an extension of the nuclear non-proliferation treaty, the U.S. has tacitly agreed to dispose of its excess plutonium in either domestic or foreign MOX. Hiding it won't convince the world of our peaceful intentions. 66-2

Clearly, the U.S. must plan to build facilities for reprocessing all types of spent nuclear fuel. Our creditors aren't likely to take more depreciating signature notes as payment for reprocessing our spent fuel into plutonium that we refuse to use. The U.S. cannot prosper in total isolation from the rest of the world. 66-1 (Cont'd.)

Sincerely,

Walston Chubb

Walston Chubb
3450 MacArthur Drive
Murrysville, PA 15668

412-327-8592

cc NEI
NN

RESPONSE TO COMMENT
COMMENTOR NO. 66: CHUBB, WALSTON

Response to Comment No. 66-1

The commentor's preference for the chemical separation of the foreign research reactor spent nuclear fuel is noted. However, please note that the scope of this EIS does not include power generation, either in the United States or abroad.

Response to Comment No. 66-2

This EIS covers the inventory of foreign research reactor spent nuclear fuel listed in Tables 2-1 and 2-2. The commentor's support for construction of facilities for reprocessing other types of spent nuclear fuel is noted. The reprocessing of other spent nuclear fuel is outside the scope of this EIS. Similarly, the disposition of excess plutonium is to be discussed in the Programmatic Environmental Impact Statement for Storage and Disposition of Weapons-Usable Fissile Materials (Section 1.5 of the EIS.)

The Treaty on the Non-Proliferation of Nuclear Weapons does not discuss methods for disposal of plutonium. The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS).

COMMENTOR NO. 68: LOSEY, DAVID

David C. Losey
1628 Citation Drive
Aiken, South Carolina 29803-5224

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Mr. Head;

I would like to offer these comments on the Draft EIS for *Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.*

I would urge DOE to implement a program for responsibly managing these spent nuclear fuels in a way that will reduce proliferation risks and environment impacts. The Department of State, the Nuclear Regulatory Commission, the Arms Control and Disarmament Agency, and the International Atomic Energy Agency have all similarly urged DOE to develop a responsible management plan. 68-1

It is imperative that the management plan provide for promptly bringing the radioactive waste in these fuels to a stabilized form that is suitable, by present standards, for geologic emplacement. The DOE should definitely avoid merely postponing the ultimate disposition of these wastes by planning interim storage of the fuel. This would leave the radioactive waste in a less stable form and leave the burden for future generations. 68-2 68-3

Sincerely,

David C. Losey

David Losey

RESPONSE TO COMMENT
COMMENTOR NO. 68: LOSEY, DAVID

Response to Comment No. 68-1

The basic objective of the proposed action is to adopt and implement a policy which supports the nonproliferation of nuclear weapons (Sections 1.1 and 1.2 of the EIS). The analysis in Section 4 of the EIS demonstrates that the environmental effects of the proposed action would be low.

Response to Comment No. 68-2

The commentor's emphasis on the need for prompt stabilization of the spent nuclear fuel so that it would be suitable for permanent disposal is noted. This option is covered by the EIS under Management Alternative 1, Implementation Alternative 6 and Management Alternative 2, Subalternative 1b, which are discussed in Sections 2.2.2.6, 2.3, 4.3.6, and 4.4 of the EIS. It is also part of Management Alternative 3, which is discussed in Sections 2.4 and 4.5 of the EIS.

Response to Comment No. 68-3

The commentor's opposition to interim storage is noted. Interim storage, however, would not necessarily leave the spent nuclear fuel in a less stable form if the storage is done properly.

The impacts of ultimate disposition of foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. A detailed, quantitative discussion of these impacts would have to be the subject of future NEPA documentation. As stated in Sections 2.1 and 4.2.7 of the EIS, if a geologic repository is not prepared to accept the foreign research reactor spent nuclear fuel or its resultant stable waste forms (generated due to chemical separation or other processing technology) DOE would continue to manage the material in exisiting facilities at the DOE management site(s).

COMMENTOR NO. 71: EUSON, JOHN

JOHN & ANITA EUSON
P.O. Box 340
San Ramon, CA 94583

22 May 1995

Department of Energy
ATTN: Charles Head - Project Director

re: Concord Weapons Station

We are residence of Martinez, CA, with a clear view of the Concord Weapons Station across the valley.

We recognize the importance of retrieving, storing and disposing of radio active materials from as many sources as possible, world wide, to prevent these materials from being converted into or used in the manufacturer of weapons. 71-1

We support the Federal Governments efforts to do what is necessary to achieve these goals including the use of the Concord Weapons Station. We have full confidence that the facilities and personnel will work in the best interest of the community and the national interest in transporting, storing and receiving of these radio active materials. 71-2

Our only suggestion to further implement the program, is to close Port Chicago Highway through the Concord Weapons Station. This, to prevent "nuts" from demonstrating, obstructing or otherwise impeding the operations at the facility. We do not need a repeat of the incident that occurred a few years ago. We do not need another pay off of some "nut" who gets injured while trying to block a railroad right of way. We personally resent our tax money being used to pay for a personal injury to someone who sits on a railroad track. What the hell does he expect when he hears a train coming? Only a fool would continue to sit there...now thanks to us taxpayers, a rich fool. Not one more dime of "tribute". **Secure the facility in total. No public road running through it.** 71-3

Our last comment concerns the feature story on the news last night, where in a resident of Clyde decided to move when she heard that nuclear waste would be moving through the Concord Weapons Station. We would suggest that she faces a far greater risk of health damage to herself and her family being down wind and in close proximity to the Avon refinery and Shell refinery. She should move. 71-4

The Not In My Back Yard syndrome is unfortunate. It is our responsibility to recover nuclear waste since we are the providers of the material in the first place. Even if we recover materials that the U.S. did not provide, it is our National and personal interest to recover as much as we possibly can to keep it out of the hands of those who would use it for other purposes. 71-1 (Cont'd.)

Sincerly

/s/ John Euson
John Euson
Martinez, CA

cc: George Miller, Diane Feinstein, Brabara Boxer

RESPONSE TO COMMENT
COMMENTOR NO. 71: EUSON, JOHN

Response to Comment No. 71-1

The commentor's support for acceptance of nuclear weapons-grade materials of United States origin or non-United States origin is noted.

Response to Comment No. 71-2

The commentor's support for the use of Concord NWS is noted. Concord NWS is one of ten candidate ports of entry which are determined to be acceptable in the case that foreign research reactor spent nuclear fuel is accepted into the United States. If any foreign research reactor spent nuclear fuel were to be accepted into the United States, the selection of the actual port(s) of entry to be used would be made in the Record of Decision, to be issued no sooner than 30 days after issuance of this final EIS.

Response to Comment No. 71-3

DOE does not have the authority to make a decision on closing the Port Chicago Highway, so this comment is outside the scope of the EIS.

Response to Comment No. 71-4

The commentor's opinion that living near refineries poses a far greater risk than that posed by the shipment of foreign research reactor spent nuclear fuel through Concord NWS is noted. The evaluation of the incident-free risk associated with handling the foreign research reactor spent nuclear fuel in the port is presented in Section 4.2.2.2, while the accident risk is discussed in Section 4.2.2.3. In either case the risks were found to be low.

COMMENTOR NO. 73: VANHORN, LAURI

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Lauri VanHorn Phone: 510-370-3537

Title and Organization:

Address: 2716 Oak Rd #96

City: Walnut Creek State Ca Zip 94596

*** COMMENTS ***

This area is to populated & prone to earthquakes to take such a serious risk. Maybe the fuel should be sent to Washington DC — It's their staff anyway! 73-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 73: VANHORN, LAURI

Response to Comment No. 73-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to Concord NWS, or to any of the ports analyzed in the EIS, is low.

All population within a fifty mile radius of the Concord NWS was considered when analyzing the impact of both incident-free transport and the range of hypothetical port accidents. The risks were found to be low. Appendix D, Section D.5 of the EIS provides details on accident analysis. Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident, and thus affect the probability of such accidents; however, the number of earthquake-induced ship and road accidents is small compared to other causes.

The Washington, D.C. area does not have the facilities required to safely manage the foreign research reactor spent nuclear fuel.

COMMENTOR NO. 74: JOHNSON, CANDICE L.

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Candace L. Johnson **Phone:** 510 458-9165

Title and Organization: Housewife / teacher / mother

Address: CARY/CANDICE JOHNSON
500 LISA ANN COURT

City: BAY POINT CA 94565 **State** ____ **Zip** ____

*** COMMENTS ***

Please record that I and my family are appalled that you would put us at such risk to send nuclear weapons to our vicinity and on a regular basis use Pt. Chicago Naval Weapons dept as a transport stop-over.

We already have silos over the hill of missiles, & the port you plan to use already works with dangerous materials. Placing us at higher risk is inhumane 74-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 74: JOHNSON, CANDICE L.

Response to Comment No. 74-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to Concord NWS, or to any of the ports analyzed in the EIS, is low.

The commentor's reference to foreign research reactor spent nuclear fuel as being a weapon is incorrect. While the spent nuclear fuel is weapons grade material, which means that weapons could be made from it, it is not a weapon itself and cannot explode. The process of making a weapon from the spent nuclear fuel is very difficult and likely could only be attempted by a government, or large organization with access to high technology.

COMMENTOR NO. 75: SEWELSON, BESS

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Bess Sewelson Phone: 510 937-6605

Title and Organization:

Address: 2701 Goedken Run Rd #6

City: Walnut Creek State Ca Zip

*** COMMENTS ***

There are too many dangers. I strongly believe we should not transport this spent reactor fuel.

75-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 75: SEWELSON, BESS

Response to Comment No. 75-1

The commentor's opposition to the transport of foreign research reactor spent nuclear fuel is noted. An evaluation of potential environmental effects expected during transport of spent nuclear fuel from foreign research reactors can be found in Section 4.2 of the EIS.

COMMENTOR NO. 76: DEBELLIS, TONY B.

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Tony B de Bellis Phone: 510 837 1086

Title and Organization:

Address: 231 Kuss Rd

City: Danville State CA Zip 94526

*** COMMENTS ***

Your plans are terrible... ill conceived ... politically expedient. 76-1

The Bay Area is put at risk to keep the military industrial complex in business. 76-2

Nuclear Power is a non renewable black hole. Do nothing with spent fuel rods... let the plant operators store them - the GREED HEADS 76-3

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 76: DEBELLIS, TONY B.

Response to Comment No. 76-1

DOE considers that implementation of a policy for management of foreign research reactor spent nuclear fuel in a manner that leads to the reduction and eventual elimination of the use of highly enriched (weapons grade) uranium in civil programs worldwide is in the best interests of the United States.

Response to Comment No. 76-2

Radiological and non-radiological health risks at candidate ports were evaluated (Section 4.2.2 of the EIS) and found to be very low for normal operations and in the case of accidents.

Response to Comment No. 76-3

Foreign research reactors are not used for generation of power. Research, medical, commercial, and educational applications of foreign research reactors are described in Section 1.1 of the EIS. As discussed in Section 1.2 of the EIS, many of the foreign research reactor operators are not currently able to store their spent nuclear fuel. Thus, the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). Nevertheless, the commentor's preference for the No Action Alternative (Section 2.5 of the EIS) is noted.

COMMENTOR NO. 80: GLENN, WILLIAM

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: William GLENN **Phone:** 503-254-2583
Title and Organization: Parent of 2
Address: 126 NE 86th
City: Portland **State** OR **Zip** 97220

••• COMMENTS •••

I will do everything I can to prevent useless waste from coming through the Port of Portland. I believe the people of Portland are against it. I feel a vote should be taken. I feel municipalities exposed to any possible threat should be financially paid off. I have never been in favor of any use of nuclear power and I in no way feel responsible for its storage in any form. There is no doubt in my mind that the people of Portland at a recent public hearing their feelings against this idea and their utter disgust for the proposed idea of moving nuclear waste through the Port. I volunteer to help you find other solutions. This one is not acceptable !! You need my help. →

80-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 80: GLENN, WILLIAM

Response to Comment No. 80-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Portland is noted. DOE considers that the port selection criteria successfully identify ports that can safely handle foreign research reactor spent nuclear fuel. The EIS demonstrates that the use of any of the ports identified by the port selection process, including Portland, would not pose any significant risk to either the port personnel or the population near the port (Sections 4.2.2.3 and 4.5 of the EIS).

COMMENTOR NO. 80: GLENN, WILLIAM (CONT'D.)

I am already disgusted by the fact that radiation is leaking at Hanford and I feel you don't care about the quality of life for my children and their children.

Sincerely

William E. Glenn

P.S. Even if it were deemed safe I'm against it. Categorically against it. Don't consider Portland as a Port.

80-1 (Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 80: GLENN, WILLIAM (CONT'D.)

COMMENTOR NO. 86: SCRATTISH, APRIL

Charles Head
Program Manager
Office of Spent Nuclear
Fuel Nangement (EM-37)
U.S. Dept. of Energy
1000 Ind. Ave. S.W.
Washington, D.C. 2058

May 24, 1995

April Scrattish
1418 So. Mildred #1306
Tacoma, WA 98465

Mr. Charles Head:

I am a Biology student at Tacoma Community College. I am writing in regard to the articles I have recently read in the Tacoma News Tribune (May 13 and 16, 1995) concerning the Port of Tacoma as a proposed sight for the storage of nuclear fuel elements.

I have spoken with Nick Shultz, Communications Manager at the Port of Tacoma, and he informed me of a few of the aspects of this course of action. According to the U.S. Department of Energy, the likelihood of any considerable danger resulting from these shipments is, in all probability, very low. However, I was also told that if an accident were to occur and one of the protective casks were to explode or otherwise be exposed in any certain manner, there would be soil contamination, not to mention a great amount of peril to the health and safety of humanity. I was told that any affected soil would then have to be moved away from the human population. I have but one question: Why? Why would we take potentially dangerous materials and place them in the midst of an extremely populous area, where there is even a minute possibility of such peril taking place? Why would we endanger ourselves in this manner? As I mentioned before, if soil is contaminated, it will have to be moved away from humans. So why don't we just place the nuclear elements in an area where there is no danger in the first place? 86-1 86-2 86-3

Thank you for allowing me to voice my opinion. I hope that, although I am only one lone voice, I hope that I will still be taken seriously.

Sincerely,

April Scrattish

RESPONSE TO COMMENT
COMMENTOR NO. 86: SCRATTISH, APRIL

Response to Comment No. 86-1

If the foreign research reactor spent nuclear fuel is accepted into the United States there would be no storage of this material in the Port of Tacoma, or any other port. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

The foreign research reactor spent nuclear fuel cannot explode, either in a transportation cask, or elsewhere. The worst accident that was considered possible is an accident where the ship carrying the foreign research reactor spent nuclear fuel collides with a petroleum tanker. In this case the cask was assumed to be damaged in the collision, then be immersed in the fire that resulted from the collision. In the unlikely event of a severe accident, the analysis performed for the EIS indicates that some radioactive material could be released from the cask and distributed into the environment. However, the analyses in Section 4.2.2.3 and Appendix D, Section D.5 of the EIS determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident. Close in to the accident, near the cask would likely require some cleanup, but the overall impact on the water and air quality in the port would be very small.

Response to Comment No. 86-2

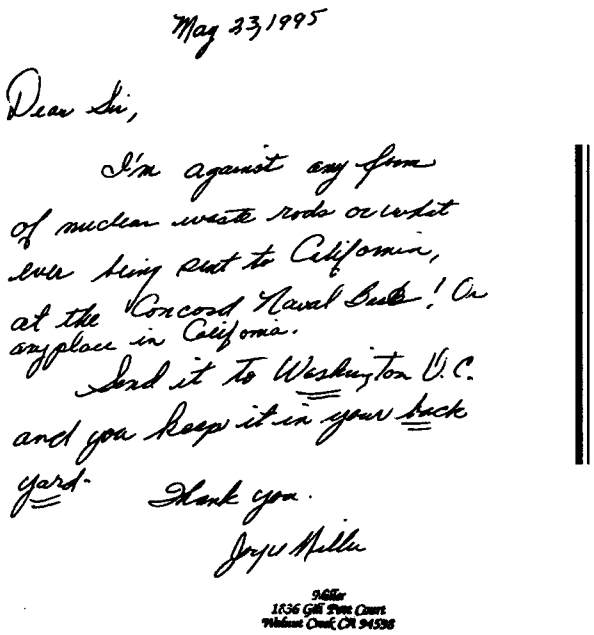
Spent nuclear fuel from foreign research reactors will not explode, but spent nuclear fuel containing HEU could be used to construct nuclear weapons. The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide. Risks to the general population and workers during transportation of spent nuclear fuel from foreign research reactors were found to be low for both normal operations and severe accidents (Section 4.2.3 of the EIS).

Response to Comment No. 86-3

As discussed in Section 4.2.2 of the EIS, the likelihood of an accident severe enough to cause the release of radioactive material from a spent nuclear fuel transportation cask is low. Even in the case of a very severe accident, the analyses in Section 4.2.2.3 and Appendix D, Section D.5 of the EIS determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident. Routine shipping, and handling of casks would not cause soil contamination.

While risks can be minimized, every activity carries some risk (Section 4.10.3 of the EIS). Management sites proposed for spent nuclear fuel from foreign research reactors are in remote locations (Sections 2.6.5 and 3.3 of the EIS).

COMMENTOR NO. 87: MILLER, JOYCE



May 23/1995

Dear Sir,

I'm against any form of nuclear waste rods or what ever being sent to California, at the Concord Naval Base! Or anyplace in California.

Send it to Washington D.C. and you keep it in your back yard. Thank you.

Joyce Miller

Miller
1836 Gill Town Court
Walnut Creek, CA 94596

87-1

RESPONSE TO COMMENT
COMMENTOR NO. 87: MILLER, JOYCE

Response to Comment No. 87-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS or elsewhere in California is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low. It should be noted that the foreign research reactor spent nuclear fuel would only pass through Concord NWS and the State of California on its way to a DOE management site.

The Washington D.C. area does not have the facilities or experience required to manage the spent nuclear fuel.

COMMENTOR NO. 88: FOSTER, GINNY

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Ginny Foster Phone: 223-0761
Title and Organization: citizen
Address: 2650 NW Upshur #20
City: Portland State OR Zip 97210

*** COMMENTS ***

Do not store nor transport spent nuclear fuel wastes. We already have enough nuclear waste in the NW than we can safely care of. (and in the U.S.) 88-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 88: FOSTER, GINNY

Response to Comment No. 88-1

The commentor's opposition to the acceptance and management of foreign research reactor spent nuclear fuel in the United States is noted. Management of foreign research reactor spent nuclear fuel in the United States is considered under Management Alternatives 1 and 3 (Sections 2.2 and 2.4 of the EIS). Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

COMMENTOR NO. 89: FULTON, THOMAS L.

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

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Name: Thomas L. Fulton Phone: (503) 788-8827

Title and Organization: USN (Ret) Concern government employee & citizen

Address: 5011 SE 87th Ave

City: Portland State OR Zip 97266

*** COMMENTS ***

I support USDOE stance that US must take the initiative in controlling HEU & LEU. But once chemical separation has been completed the by-product waste that cannot be used for weapons of nuclear nature must be stored by the country that benefited from the nuclear power generated. France & UK are justified in their stance and the US must do the same. Transporting any Hazardous material could be dangerous (Cover)

89-1

89-2

89-3

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 89: FULTON, THOMAS L.

Response to Comment No. 89-1

The commentor's support for the control of HEU and LEU by the United States is noted. Section 1.2 of the EIS discusses objectives of the proposed action and potential consequences of failure to adopt a policy for the management of spent nuclear fuel from foreign research reactors.

Response to Comment No. 89-2

DOE agrees that, in the long run, the countries that benefit from nuclear reactors should be responsible for the disposal of nuclear waste from those reactors. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

After this policy period, the United States would not accept any more foreign research reactor spent nuclear fuel and every nation that operates a research reactor would be responsible for its own nuclear waste disposal as is currently required by the United Kingdom and France. As discussed in Section 2.2.2.6 of the EIS, the United States does not conduct chemical separation to support the generation of nuclear power or production of nuclear weapons.

Response to Comment No. 89-3

An addition has been made to Section 2.2.1.5 of the EIS to describe the United States and international codes that are in place to ensure shipping safety, and the steps that would be taken to ensure that those codes would be followed.

COMMENTOR NO. 89: FULTON, THOMAS L. (CONT'D.)

if conducted in a haphazardous manner. Foreign flag vessels have below standards that any US flag commercial vessel is required. It must insist any transportation to our shores must be at our EPA standards which only can be met by US Flag Vessels.

Thomas L. Fulton

89-3 (Cont'd.)

89-4

RESPONSE TO COMMENT
COMMENTOR NO. 89: FULTON, THOMAS L. (CONT'D.)

Any ship entering U.S. territorial waters must meet U.S. safety regulations, which ensures that any ship carrying foreign research reactor spent nuclear fuel would meet the minimum U.S. safety requirements.

Response to Comment No. 89-4

In regard to requiring ships to meet Environmental Protection Agency requirements, there are few Environmental Protection Agency regulations that apply to ocean-going ships such as those that would carry foreign research reactor spent nuclear fuel. Among the Environmental Protection Agency regulations that are applicable are a prohibition of bilge and sanitary waste discharge and disposal of trash and rubbish. These requirements are imposed on all ships, not just U.S. flag vessels.

COMMENTOR NO. 90: PATRICK, DIANA L.

PO Box 1086
Martinez 94553

May 30, 1995

United States Department of Energy
Office of Environmental Management
Attn: Mr. Charles Head
1000 Independence Avenue, S.W.
Washington, DC 20585-0001

MR HEAD
- I HOPE YOU WILL PROVIDE MORE DIALOGUE FOR BAY AREA RESIDENTS. IT FEELS LIKE THIS PROJECT IS ON FAST TRACK W/OUT CONSIDERATION OF EMERGENCY ISSUES
Diana Patrick

90-1

Dear Mr. Head,

Re: DEIS comments on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Please respond to the following comments:

The DEIS appears to be a statement of purpose and outline of options that does not explore potential risks associated with moving and storing spent nuclear fuel. Since the DOE is both the applicant and the lead agency, how can the proposed project be reviewed objectively? 90-2 90-3

Alternatives: The EIS only considers continental solutions. Treatment and storage of spent nuclear fuel on an isolated island (perhaps one already radioactively contaminated) avoids risk to the continental United States and must be explored. 90-4

The DEIS does not, but must address the physical constraints and existing high risk uses of the waterway leading from the Golden Gate Bridge to the Concord Naval Weapons Station.

Harbor Conditions:

More petroleum and petroleum products pass through the San Francisco Bay Entrance than any other harbor on the West Coast. In 1992 Petroleum and Petroleum products represent 71% of all commodities passing under the Golden Gate. More gasoline exited San Francisco Bay than left the Los Angeles and Long Beach Harbors combined. Much of the 4,137,000 tons of gasoline exported was delivered to Los Angeles and 20% was exported to foreign ports. 90-5

1993 San Francisco Bay Entrance statistics[1] reveal a 50% increase in gasoline export over 1992; 8,028,000 tons of gasoline passed under the Golden Gate; with 1,567,000 tons coming in and 6,461,000 tons going out. This increase is also reflected in the Carquinez Strait region which increased gasoline transport from 2,988,000 tons shipped in 1992 to 4,173,000 in 1993 including 3,803,000 tons transported downbound (only 296,000 tons were shipped in the upbound direction).

In 1977 only 809,184 tons of gasoline moved within or through the Carquinez Strait region, increasing to 4,170,000 tons of gasoline movement in 1993. A 500% increase in less than 20 years.

[1] US Army Corps of Engineers, Waterborne Commerce Division, 1993 WCSC: Pacific Coast, Alaska and Hawaii

RESPONSE TO COMMENT
COMMENTOR NO. 90: PATRICK, DIANA L.

Response to Comment No.90-1

Seventeen public hearings were held on the draft EIS in the locations determined to be most likely to be directly affected by the EIS alternatives, specifically in the ports of entry and at the potential management sites. In addition to accepting comments from the public during these hearings, written comments were also welcomed and encouraged. DOE considers that these actions have provided ample opportunity for the public to comment on the draft EIS. DOE considers that if foreign research reactor spent nuclear fuel is managed in the United States, there is adequate regulatory and emergency preparedness infrastructure to ensure its safe acceptance and transportation to the designated management site. As discussed in Section 2.7.1 of the EIS, Federal funding to State, Tribal, and Local governments is being provided for maintaining emergency response programs. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advice and assistance to the State, Tribal, and local agencies involved with a radiological incident.

Emergency preparedness, security, and coordination of DOE with local emergency response authorities that would be involved with the acceptance and transportation of foreign research reactor spent nuclear fuel will be discussed in detail in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H which was added to the final EIS in response to public comments.

Response to Comment No. 90-2

Radiological and non-radiological risks to human health and the environment were evaluated in detail during preparation of this EIS. Section 4 of the EIS describes the results of the evaluation, and Appendices C through F provide supporting technical detail. In all cases the risks associated with acceptance, transport, and interim storage of foreign research reactor spent nuclear fuel were found to be low.

Response to Comment No. 90-3

NEPA requires that federal agencies like DOE prepare a detailed EIS on the effects of major federal actions with the potential to significantly affect the quality of the human environment. The public must be afforded an opportunity to review and to comment throughout the NEPA process, at hearings and/or in writing, on the proposed action. Also, Federal agencies must ensure that proposed actions are conducted in accordance with all applicable laws and regulations. The decision whether to implement the proposed action is therefore subject to review and governed by laws and regulations, not by the subjective judgments of an agency.

COMMENTOR NO. 90: PATRICK, DIANA L.

2

Hazardous Material activities approved but not in place, or under consideration, that could that will increase volitol shipments:

1. Wickland's Martinez Terminal recently received approval to load/unload 240 tankers with gasoline and other petroleum products. An increase from the average of 71[1] tankers/year that visited Wickland's Martinez Terminal between 1990 and 1994.

   total gasoline/petroleum transport will increase in all zones to the San Francisco Bay Entrance

   240 tanker visits equaling 480 trips requiring opening of the Benicia railroad bridge whose less than 300' wide opening has been hit by more vessels than the five other bridges.

2. Local refineries are increasing gasoline production.

3. The Army Corps of Engineers proposes deepening the San Francisco-to-Stockton Ship Channel from 35 feet at low tide to 45 feet to accommodate larger tankers. The SF Marine Exchange estimates that an average of 1,100 oil tankers enter San Francisco Bay and 2,300 tankers and barges arrive at refinery terminals annually.

The EIS must anticipate expanded marine traffic and larger tankers in order to describe risk. 90-6

Bridges: nuclear laden vessels must pass under six bridges before reaching the Naval Weapons Station. As stated, the Benicia rail bridge, with an opening width of less than three hundred feet, experiences the most accidents. 169 additional tankers will carry gasoline and other volitol material from the Wickland terminal east of the rail bridge, increasing marine trips under all bridges to about 338 additional trips.

In 1993 the tanker Miramar hit the rail bridge. The ship's hold was pierced but no product was released. Would a nuclear cask be compromised should a gasoline tanker hit the railroad bridge causing gasoline to escape and be ignited by sparks generated by the ship's hull scraping along the bridge structure? 90-7

Terrorism: through the years the Bay Area has suffered environmental terrorism. Power transformers have been bombed, Chevron's affluent was closed. Potential for terrorism compromising nuclear casks must be addressed. 90-8

About a month ago a tanker carrying anhydrous ammonia stalled and almost hit the Golden Gate bridge. We were told that a disaster, comparable to Bhopal, was averted by the quick response of the pilot who dropped anchor and reversed the engines. A release of deadly gas may not compromise the nuclear cask, but it could jeopardize the crew and safety of the cask. Review the spectrum of eclectic impacts. 90-9

Six refineries and a multitude of chemical plants line the waterway leading to the Weapons Station. Describe the variety of risks presented by transporting gasoline and other highly volitol material within the same waterway route as transporting nuclear casks. How would a cask respond to becoming engulfed within a gasoline tanker fire and explosion? If a gallon of gasoline has the explosive capability of eight sticks of dynamite, how far could a gasoline marine tanker explosion carry radioactive particles. How much of the Bay Area would be 90-10

[1] SF Marine Exchange

RESPONSE TO COMMENT
COMMENTOR NO. 90: PATRICK, DIANA L.

Response to Comment No. 90-4

Management Alternative 2, which is discussed in Sections 2.3 and 4.4.1 of the EIS, is the alternative to accepting foreign research reactor spent nuclear fuel into the United States. This alternative does not specify where the spent nuclear fuel would be stored; just that it would not enter the United States. Thus, if the comment is referring to an isolated island that belongs to another country, the commentor's alternative is covered under Management Alternative 2.

If the comment is referring to an isolated island that is part of the territory of the United States (e.g. Johnston Atoll), then the foreign research reactor spent nuclear fuel would legally be entering the United States and this subject is covered under management Alternative 1. A discussion has been inserted into Section 2.10 of the EIS to explain why this option is not feasible.

Response to Comment No. 90-5

The physical constraints of the passage from San Francisco Bay to Concord NWS were considered as part of the port selection process. The passage meets the qualitative requirements of Criterion 2 (Favorable Transit From Open Ocean) for the port selection (Appendix D, Section D.1.9.2 of the EIS).

DOE analyzed a severe accident in which a ship carrying a spent nuclear fuel transportation cask is involved in a collision with another ship, severe enough to breach the transportation cask and then subject the cask to a fire resulting from the collision (Section 4.2.2.3 of the EIS). These conditions are the same as the worst conditions that might be expected to result from the collision of a ship carrying a spent nuclear fuel cask with a petroleum tanker.

The accident analyzed does not reach the temperature required to melt foreign research reactor spent nuclear fuel (900 degrees Kelvin, or 1,160 degrees Fahrenheit). Appendix D, Section D.5.3 of the EIS presents a detailed discussion of accident probabilities and radioactive material source terms and Section D.5.4 presents the results of the analysis.

Response to Comment No. 90-6

The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research rector spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (port

COMMENTOR NO. 90: PATRICK, DIANA L.

rendered fallow? How many years would it take the area to recover? What is the worst case scenario? **90-10 (Cont'd.)**

1992 PETROLEUM MARINE TRAFFIC

(compiled from U.S. Army Corps of Engineers Waterborne Commerce statistics)
(all values are short tons; reported as 6.6 barrels per ton)
(1 barrel = 42 gallons)

	petroleum and petroleum products	gasoline
LONG BEACH HARBOR		
upbound	23,746,000	339,000
downbnd	8,798,000	89,000
Total	32,544,000	415,000
LOS ANGELES HARBOR		
upbound	13,038,000	3,346,000
downbnd	4,931,000	411,000
Total	17,969,000	3,757,000
SAN FRANCISCO BAY (oceangoing trips)		
upbound	31,474,000	1,038,000
downbnd	16,363,000	4,137,000
Total	47,838,000	5,974,000
Richmond Harbor	16,949,000	2,230,000
San Pablo Bay	18,343,000	3,888,000
Carquinez Strait	18,652,000	2,994,000
Suisun Bay Channel*	1,203,000	53,000

The EIS must forecast future hazardous material shipments by type and volume and consider the risks presented should nuclear casks share this waterway. **90-11**

Sincerely,

D. Patrick

Diana L. Patrick

RESPONSE TO COMMENT
COMMENTOR NO. 90: PATRICK, DIANA L.

selection Criterion 2; Appendix D, Section D.1.9.2 of the EIS). Appendix D, Section D.5.1.3 of the EIS presents a discussion of the determination of the probability of ship accidents used in the EIS. In regard to the size of the vessels, increased volumes of hazardous cargos, such as gasoline, would not change the accident consequences because the most severe accidents analyzed already assumed a collision with a tanker and that the resulting fire was not limited by quantity of fuel available (Attachment D5 to Appendix D).

Response to Comment No. 90-7

Appendix D, Section D.5.3.1 of the EIS describes several accident scenarios that involve fire. The results of the analysis of these accidents can be found in Section D.5.4. The analysis shows that even in the event of a severe ship fire, neither the consequences nor risks are great (Section D.5.).

Response to Comment No. 90-8

Spent nuclear fuel transportation regulations, as detailed in Section 5.4.2 of the EIS, require armed escorts in front and behind a truck (and on the train for rail) while traveling in a city. This security measure would deter most would-be terrorists from attempting an attack. Nevertheless, Appendix D, Section D.5.9 of the EIS presents an analysis of an enveloping sabotage scenario involving a cask explosion. The consequences of such a scenario indicate that the general property destruction and numerous fatalities and injuries that could result from the explosion would result in far greater harm to the general health of the public in the immediate vicinity of such an explosion than caused by the release of radioactive material from the spent nuclear fuel in the transportation cask.

Response to Comment No. 90-9

The disabling or elimination of the ship's crew in a Bhopal-type event or from any cause could be the initiator of many of the accidents that are analyzed in Section 4.2.2.3 of the EIS. However, since in evaluating the accidents no human intervention (such as fire-fighting) was assumed, the calculated consequences of the accident would not be affected by the loss of the crew. For this reason, an event like the one described by the commentor would not worsen the calculated results of any of the accidents, so the results presented in Section 4.2.2.3 are still the conservative results for any of the accidents that might be expected.

Response to Comment No. 90-10

The analyses that were performed to evaluate the impact of various accidents divided all plausible accidents into six categories (Appendix D, Section D.5.3.1.1 of the EIS). The most severe accident category, release category 6, assumes that the ship carrying the

COMMENTOR NO. 90: PATRICK, DIANA L.

RESPONSE TO COMMENT
COMMENTOR NO. 90: PATRICK, DIANA L.

foreign research reactor spent nuclear fuel transportation cask is in a collision with a tanker and that a fire occurs that engulfs the damaged transportation casks. The consequences of accidents, including category six accidents (the worst case scenario), are discussed in Appendix D, Section D.5.4.2.2.

Response to Comment No. 90-11

The calculated risk associated with the shipment of foreign research reactor spent nuclear fuel is the product of the consequences of an accident and the probability of the accident occurring. The sharing of a waterway with shipments of hazardous materials is contained within the calculated risk. Additional hazardous material shipments or increased volumes per shipment would not change the accident consequences because the most severe accidents credible have been assumed by the accident analysis. As explained in response to Comment 90-6 above, increasing the volume of ship traffic does not significantly increase the probability of an accident.

COMMENTOR NO. 92: RUBY, LAWRENCE

663 Carrera Lane
Lake Oswego, OR 97034

30 May 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585

Re: Proposed Transport of Spent Nuclear Fuel through Portland

Dear Mr. Head:

I am writing to summarize my testimony presented before you on 25 May, regarding DOE/EIS-0218D. By way of background, I am a registgered professional nuclear engineer (California) and during my career I have supervised 2 research reactors with fuel of the type described in the EIS. These activities occurred when I served as Professor of Nuclear Engineering at UC Berkeley, and as Professor of Nuclear Science at Reed College, Portland.

The EIS in Volume 2, page 63 ff, proposes to move spent nuclear fuel from overseas to Hanford or INEL by ocean freighter to the Port of Portland, where the fuel casks would be off-loaded to a warehouse. Subsequently, the casks would be reloaded to trucks or train for transport through the northern part of Portland and thence east along the south side of the Columbia River.

Both Portland, Oregon and Berkeley, California are surrounded by metropolitan areas of about 1.2 million people. However, in contrast to a situation where, a few years ago, research reactor fuel was moved through the streets of Berkeley in compliance with DOT regulations, the proposed transport through the streets of Portland is NOT in compliance with DOT regulations. DOT regulations specify, with respect to the transport of high-level radioactive materials, that a preferred route must be selected which minimizes radiological risk. In particular, "A preferred route consists of interstate system highways and bypass routes around cities, where possible, or an alternative route selected by a State routing authority." In the case of Berkeley, the move through city streets was necessary, because the reactor being decommissioned was situated in downtown Berkeley, but in the case of Portland, an alternative route is available with much lower radiological risk. The alternative is adapted from U.S. Navy methodology for moving high-level radioactivity to Hanford or INEL. In the alternative routing, ocean freighters would off-load their fuel casks onto barges at Astoria, which would then be towed up the Columbia river until they are well past the city of Portland, at which point the casks would be transferred to either truck or rail transport, headed east. 92-1 92-2

cc: Representives Furse and Wyden
Senators Hatfield and Packwood
Director, Oregon Dept. of Energy

Sincerely,

Lawrence Ruby

RESPONSE TO COMMENT
COMMENTOR NO. 92: RUBY, LAWRENCE

Response to Comment No. 92-1

DOE considers that the U.S. Department of Transportaion regulations do allow ground transport of spent nucleaur fuel from the Port of Portland. DOE has not yet selected ports, routes, or transport modes for the foreign research reactor spent nuclear fuel. A State of Oregon routing agency could designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103.

In addition, to further address this issue, individual Transportation Plans would be prepared for any shipments actually scheduled for acceptance through the Port of Portland (or any other prot of entry). These Transportation Plans would be prepared in consultation with appropriate State and/or local officials to ensure that details of the transportation process are understood, that the individuals or organizations who would perform all required activities are specified, and that these individuals and parties know what is expected of them (Section 2.7.5 and Appendix H of the Final EIS).

Response to Comment No. 92-2

The Port of Astoria, Oregon, was considered as a possible port for receiving the foreign research rector spent nuclear fuel. It was rejected because the port does not have appropriate experience (Appendix D, Section D.1.9.1 of the EIS).

There are two instances in which barge transport would be feasible as a substitute for truck or rail transport of foreign research reactor spent nuclear fuel: (1) up the Columbia River to the Hanfor Site and (2) up the Savannah River Site. New analysis on these two possible barge transport routes has been inserted into Appendix E, Section E.8.15 of the EIS. The net result of this analysis is that barge transport would present approximately the same level of risk to workers and the public as would truck or rail transport. This level of risk is low and the most likely outcome would be zero latent cancer fatalities.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE would be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel managed by DOE would be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 93: TENNANT, ELIZABETH M.

Monday, May 29, 1995

7557 28th Avenue NW
Seattle, WA 98117

Mr. Charles Head
Office of SNF Management, EM-37
U. S. Department of Energy
1000 Independence Avenue SW
Washington, D.C. 20585

Dear Mr. Head:

I am writing to comment on the Department of Energy's Environmental Impact Statement on the handling spent nuclear fuel rods. I disagree with DOE's conclusion that the "preferred alternative" for handling these high-level nuclear wastes from other nations is to import them through Puget Sound and the Port of Tacoma for possible storage at Hanford. While I support ensuring that spent high-level fuel rods do not get into the hands of those who will convert them into weapons, I strongly oppose the "preferred alternative" because of the danger it poses to the workers, people, and resources of the Puget Sound area.. I think there are other, preferable ways to address the problems posed by these spent nuclear fuel rods --ways that will address the problem without endangering the people and natural resources of Puget Sound . 93-1

- The preferred alternative in the EIS--based on the costs and risk data--should be reactor storage with international monitoring to ensure that fuel is not diverted for extraction of highly enriched uranium. 93-2

- Spent nuclear fuel rods should not be imported to the United States :

  - from nations that do not pose a proliferation risk;
  - when the rods are low enriched uranium wastes that cannot be used in bombs; and
  - where the use of dry cask storage (as done at U. S. reactors) is feasible and would allow for international inspection. 93-3

This would decrease the transportation risks involved. 93-4

RESPONSE TO COMMENT
COMMENTOR NO. 93: TENNANT, ELIZABETH M.

Response to Comment No. 93-1

DOE did not specify a "preferred alternative" in the draft EIS. DOE's preferred alternative is specified in Sections 2.9 and 4.7 of the final EIS.

The commentor's opposition to the use of Puget Sound, and the Port of Tacoma, is noted. In evaluating and selecting acceptable ports of entry, DOE developed evaluation criteria which identified ports that can safely handle foreign research reactor spent nuclear fuel. DOE considers that the use of any of the ports identified by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel or the population near the port. Risks associated with an accident would be low (Sections 4.2.2.3 and 4.5 of the EIS) and risks associated with incident-free handling of the spent nuclear fuel transportation cask would also be low (Sections 4.2.2.2 and 4.5 of the EIS).

The commentor's opposition to storage of foreign research reactor spent nuclear fuel at the Hanford Site is also noted. As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 93-2

The commentor's support for taking some action to keep the foreign research reactor spent nuclear fuel away from any weapons program is noted.

Response to Comment No. 93-3

The commentor's preference for Management Alternative 2, Subalternative 1a, (Overseas Storage) is noted. This alternative is described in Section 2.3 and the policy considerations and environmental impacts are presented in Section 4.4.1 of the EIS.

COMMENTOR NO. 93: TENNANT, ELIZABETH M. (CONT'D.)

If any spent high level nuclear fuel rods must be imported because the criteria above cannot be met, this should be done only using dedicated or military ships and Department of Defense ports, and only to destinations where DOD has fully trained and well equipped emergency response personnel. Under no circumstances should importation be done using commercial freighters or public ports in large cities. This is necessary to protect the longshore workers and the public in the event of a shipboard fire and during transportation of the rods. 93-5 93-6

If any spent fuel rods are imported, it is imperative that they be handled by fully trained personnel who would be immediately ready to respond to a problem. It would be folly to rely on the training and preparedness of the local fire and hazmat units, which vary widely in their knowledge and ability. (A recent emergency preparedness exercise here in King County gave County emergency response personnel low marks for preparedness and response.) 93-7

No spent high-level nuclear wastes should be imported for storage at Hanford which already has extensive contamination and leakage problems. The nuclear fuel cooling basins along the Columbia River (the "K" basins) already are leaking and would be subject to massive failure in the event of an earthquake. These problems are exacerbated by recent Congressional decisions to cut back funds dedicated to cleaning up Hanford. Adding new spent high-level wastes to Hanford would worsen an already unacceptable situation. It is unfair to ask Washington's citizens to bear the additional environmental burdens and health risks posed by these waste by-products from other nations. If spent nuclear wastes must be imported into this country--and I am not convinced that they must be--it should be for storage at a less contaminated and more secure site. 93-8

I hope that you will take these comments into account, and revise the Department of Energy's recommendations.

Sincerely,

Elizabeth M. Tennant

Elizabeth M. Tennant

cc: Honorable Slade Gorton, U. S. Senate
Governor Mike Lowry
Honorable Jim McDermott, U. S. House of Representatives
Honorable Patty Murray, U. S. Senate

RESPONSE TO COMMENT
COMMENTOR NO. 93: TENNANT, ELIZABETH M. (CONT'D.)

Response to Comment No. 93-4

The commentor's opposition to accepting foreign research reactor spent nuclear fuel from nations that pose no proliferation risk, where the spent nuclear fuel is LEU, and from nations where dry storage is feasible is noted.

The United States has assumed in the past, and continues to assume, a leadership role in the world community in matters of nuclear weapons nonproliferation. In this role, it initiated programs such as the RERTR program and encouraged other nations to support the program. Some of the nations which have supported it such as Britain, France, Japan, Sweden and others, may not currently present the same nuclear weapons proliferation risk as others. The reasons for considering these nations under this policy are included in Section 1.3 of the EIS.

As discussed in Section 1.1 of the EIS, the reason for including LEU in the policy is that the United States has offered LEU acceptance as an enticement for foreign research reactor operators to convert from HEU to LEU fuel use. The enticement was necessary because operation with LEU fuel is not as effective as with HEU fuel. Also, as explained in Section 2.3 of the EIS, the opportunities for expanded spent nuclear fuel storage at foreign research reactor sites are limited or nonexistent.

Response to Comment No. 93-5

DOE considers that the foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present on military ships and at military bases. The security provided for the foreign research reactor spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ships and military ports is noted.

Response to Comment No. 93-6

Based on the analysis of impacts associated with accidents and incident-free operations involving foreign research reactor spent nuclear fuel, DOE considers that commercial ports, facilities and commercial freighters represent an acceptable option for the transportation of foreign research reactor spent nuclear fuel (Section 4.2.2.3 of the EIS on consequences of port accidents and Section 4.2.2.2 for impacts of incident-free operation).

COMMENTOR NO. 93: TENNANT, ELIZABETH M. (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 93: TENNANT, ELIZABETH M. (CONT'D.)

Response to Comment No. 93-7

According to U.S. regulation, all workers who handle or come in contact with spent nuclear fuel are required to receive appropriate prior training. Details of emergency preparedness and security measures for port activities as well as ground transportation would be contained in the Transportation Plan that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders.

Response to Comment No. 93-8

See the response to Comment 93-1.

COMMENTOR NO. 95: BONDE, FREDERICK J.

4053 NE 109th
Seattle, WA 98125
June 1, 1995

Charles Head
Office of SNF Management EM-37
U.S. Dept. of Energy
1000 Independence Ave. SW
Washington, DC 20585

RE: Draft EIS for Shipment of Imported Nuclear Waste

The purpose of this letter is to comment on the above-referenced draft EIS released by DOE. I am strongly opposed to DOE's proposal to ship imported nuclear waste through the urban areas of Puget Sound or Portland, for the following reasons: 95-1

* Transporting waste using commercial freighters or public ports in large cities is very dangerous. Accidents can and do happen, putting 100s or 1000s of people at risk. In the case of a fire involving nuclear waste, large portions of cities could be permanently contaminated. If nuclear waste must be imported, it should be done using dedicated ships and Dept. of Defense ports in nonurban areas. 95-2 95-3

* I oppose importation of spent nuclear fuel from nations that do not pose a proliferation risk. Why should the US pay for this and take the risks? To take the fuel from these nations will only encourage them to keep using nuclear technology and producing yet more waste, without facing the fact that we have no way to dispose of it safely. Even for nations that may pose a proliferation risk, there is no reason why we should take LEU wastes that cannot be used to produce nuclear weapons. 95-4

* Instead of importing nuclear waste from these countries, we should encourage them to use dry cask storage on site, as done at US reactors. This would eliminate all transportation risks. 95-5

* I oppose bringing additional nuclear waste to the Hanford Reservation. Hanford has serious leakage and other safety hazards from the nuclear waste already present at the site, which DOE is having trouble enough taking care of. DOE should concentrate on fixing the serious safety problems caused by the existing nuclear waste at Hanford, not import vast quantities of additional waste that could put Washington citizens at risk. 95-6

Sincerely,

Frederick J. Bonde

Frederick J. Bonde

cc: Rep. Jim McDermott, Senators Patty Murray and Slade Gorton, Governor Mike Lowry

RESPONSE TO COMMENT
COMMENTOR NO. 95: BONDE, FREDERICK J.

Response to Comment No. 95-1

The commentor's opposition to use of the Ports of Portland or Tacoma to receive foreign research reactor spent nuclear fuel is noted. As a part of the overall evaluation of impacts, DOE is identifying ports of entry in the United States that are acceptable for the receipt and handling of foreign research reactor spent nuclear fuel. Portland and Tacoma are included in this evaluation. The analysis in the EIS indicates that the use of any of the ports indicated by the port selection process would not pose any significant risk to either the port personnel or the population near the port.

Response to Comment No. 95-2

The analysis of impacts associated with accidents and incident-free operations involving foreign research reactor spent nuclear fuel demonstrate that commercial ports and facilities represent an acceptable option for the acceptance of foreign research reactor spent nuclear fuel (Section 4.2.2.3 of the EIS on consequences of port accidents and Section 4.2.2.2 for impacts of incident-free operation). Likewise, based on the analysis of impacts associated with accidents and incident-free operations, the analysis in the EIS indicates that commercial ships represent an acceptable option for the transport of foreign research reactor spent nuclear fuel (Section 4.2.2.3 of the EIS on consequences of port accidents and Section 4.2.2.2 for impacts of incident-free operation). The analyses indicate that there would be no reduction in the risks of the proposed action associated with the use of dedicated or military ships, nor any adverse consequences to the use of the commercial ships or facilities.

In regard to fire, Appendix D, Section D.5.3.1 of the EIS describes several accident scenarios that involve fire. The results of the analysis of these accidents can be found in Section D.5.4. The analysis in Appendix D, Section D.5.5 of the EIS indicates that even in the event of a severe ship fire, neither the consequences nor risks are great. Although such a catastrophic accident would obviously impact the local environment, no significant impacts are predicted due to the presence of foreign research reactor spent nuclear fuel. In fact, the analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS)

Response to Comment No. 95-3

The analysis of impacts associated with accidents and incident-free operations involving foreign research reactor spent nuclear fuel, demonstrate that commercial ports and facilities represent an acceptable option for the transportation of foreign research reactor spent nuclear fuel (Section 4.2.2.3 on consequences of port accidents and Section 4.2.2.2 for

COMMENTOR NO. 95: BONDE, FREDERICK J. (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 95: BONDE, FREDERICK J. (CONT'D.)

Whether the shipments come as cargo on a scheduled carrier or on a chartered ship, no special precautions are expected to be required by the Coast Guard or any other authority. As such, there need be no additional requirements to use dedicated or military ships, nor any adverse consequences to the use of the commercial ships or facilities.

Response to Comment No. 95-4

The commentor's opposition to accepting foreign research reactor spent nuclear fuel from nations that pose no proliferation risk, where the spent nuclear fuel is LEU, and from nations where dry storage is feasible is noted.

The United States has assumed in the past, and continues to assume, a leadership role in the world community in matters of nuclear weapons nonproliferation. In this role it initiated programs such as the RERTR program and encouraged other nations to support this program. Some of the nations which have supported it may not currently present the same nuclear weapons proliferation risk as others. The reasons for considering these nations under this policy are included in Section 1.3 of the EIS.

As discussed in Section 1.1 of the EIS, the reason for including LEU in the policy is that the United States has offered LEU acceptance as an enticement for foreign research reactor operators to convert from HEU to LEU fuel use. The enticement was necessary because operation with LEU fuel is not as effective as with HEU fuel.

Response to Comment No. 95-5

The commentor's preference for the alternative of dry cask storage overseas is noted. This option was evaluated in the EIS as part of Management Alternative 2, Subalternative 1a (Sections 2.3 and 4.4.1 of the EIS).

Response to Comment No. 95-6

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 96: DREIZEN, DIANE

I want a record of all decisions made

96-1

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Diane Dreizen Phone: _____

Title and Organization: Citizen

Address: 4717 SW Fairhaven Drive

City: Portland, State OR Zip 97221

*** COMMENTS ***

High Level nuclear waste is exposed to added risk by transport. The safest thing is to leave waste where it is made. 96-2

The Longshoremen are not trained in nuclear waste handling. 96-3

The Port of Portland is not prepared for any nuclear accidents. 96-4

The exposure risks due to accidents are unacceptable in a city center of any size. 96-5

Management Alternative 2 is best - assist foreign nations with storage 96-6

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

We don't want any nuclear waste - stop producing it!!! 96-7

RESPONSE TO COMMENT
COMMENTOR NO. 96: DREIZEN, DIANE

Response to Comment No. 96-1

When DOE has completed the Record of Decision, as required under NEPA, the public may request copies as the information is public and notice of the availability of the Record of Decision will be provided in the Federal Register. In addition, all commentors who provided DOE with their name and proper address will be mailed a copy of the Record of Decision.

Response to Comment No. 96-2

Foreign research reactor operators cannot indefinitely store their spent nuclear fuel at the reactor site. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). Radiological and non-radiological risks during transportation were evaluated and found to be low (Section 4.2.3 of the EIS).

Response to Comment No. 96-3

The foreign research reactor spent nuclear fuel is radioactive material, however, the dose rates from the casks used to transport it would be low. No special handling or loading/unloading procedures would be required for the foreign research reactor spent nuclear fuel when it is contained in standard shipping containers; experience with handling containers is sufficient. Therefore, no special training of longshoremen is required.

Response to Comment No. 96-4

DOE considers that if foreign research reactor spent nuclear fuel is managed in the United States, there is adequate regulatory and emergency preparedness infrastructure to ensure its safe acceptance and transportation to the designated management sites. As discussed in Section 2.7.1 of the EIS, Federal funding to State, Tribal, and local governments is being provided for maintaining emergency response programs. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advice and assistance to the State, Tribal, and local agencies involved with a radiological incident.

Emergency preparedness, security, and coordination of DOE with local emergency response authorities that would be involved with the acceptance and transportation of foreign research reactor spent nuclear fuel will be discussed in detail in the DOE Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

COMMENTOR NO. 96: DREIZEN, DIANE (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 96: DREIZEN, DIANE (CONT'D.)

Response to Comment No. 96-5

The commentor's position that radiation exposure risks due to accidents are too high in cities of any size is noted. Sections 4.2.2, 4.2.3 and 4.2.4 of the EIS describe risks estimated for accidents at candidate ports, along transportation routes, and at interim management sites, respectively. Based on this analysis, the risks associated with the proposed action to health or the environment were determined to be low.

Response to Comment No. 96-6

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a which is discussed in Sections 2.3 and 4.4.1 of the EIS.

Response to Comment No. 96-7

Spent nuclear fuel is produced during operation of research or other types of nuclear reactors. It is not possible to eliminate the production of spent nuclear fuel from foreign research reactors without ceasing to operate the reactors. Section 1.2 of the EIS describes the research, medical, commercial, and educational applications for foreign research reactor.

COMMENTOR NO. 97: JOHNSTON, ANNE B.

822 31st Ave
Seattle WA 98122
Nov. 27, 1995

Dear Mgr. Head,

I wish to protest the plans to bring spent Nuclear Fuel from overseas through the ports of Washington State, either Tacoma or Seattle. 97-1

There should be no importation of this material from countries that do not threaten the U.S. Of no material that could not be accounted into stocks. A way of storage in the other countries should be developed which can be monitored by international inspections. 97-2 97-3

What is left, that the country has to take back, should not be carried on commercial freighters, or trucks over land. It is far too risky to the public. What would we gain by taking the spent fuel from an unfriendly country if it were to destroy a big portion - and population - of this country? 97-4 97-5 97-6

All these shipments should be by military ships and trucks, and go through military ports. After all, they are used to dealing with the material and are trained to do so. 97-7

Thank you for your attention to this. The other countries should pay their own costs and risks for their nuclear programs. 97-8

Sincerely yours,
Anne B. Johnston

RESPONSE TO COMMENT
COMMENTOR NO. 97: JOHNSTON, ANNE B.

Response to Comment No. 97-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Ports of Tacoma or Seattle is noted. After evaluation against the port selection criteria described in Appendix D, Section D.1.9 of the EIS, the Port of Seattle was eliminated from further consideration. The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 97-2

In order to reduce the use of highly enriched (weapons-grade) uranium in civil programs worldwide, the United States Government developed LEU fuels for foreign research reactors (Section 1.1 of the EIS). Foreign research reactor operators converted to LEU fuels with the expectation that their spent nuclear fuel would be accepted for disposition in the United States. Unless some near term action is taken, many foreign research reactor operators may be forced to cease operations before they can develop means for overseas disposition. Others might switch back to the use of HEU fuels, since these fuels can currently be disposed of by being reprocessed. It would be imprudent to publicly label selected nations as threatening to the United States (Section 2.10 of the EIS). Negative political and diplomatic reactions from nations so designated would likely preclude their cooperation in efforts to reduce international commerce in HEU.

Response to Comment No. 97-3

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a which is discussed in Sections 2.3 and 4.4.1 of the EIS.

Response to Comment No. 97-4

Based on the analysis of impacts associated with accidents and incident-free operations involving foreign research reactor spent nuclear fuel, the EIS demonstrates that commercial ships represent an acceptable option for the transport of foreign research reactor spent nuclear fuel (Section 4.2.2.3 of the EIS on consequences of port accidents and Section 4.2.2.2 for impacts of incident-free operation). The analyses demonstrate that there would be no reduction in the risks associated with the use of dedicated or military ships, nor any adverse consequences to the use of the commercial ships or facilities.

Response to Comment No. 97-5

Estimates of radiological and non-radiological risks during shipments of spent nuclear fuel from foreign research reactors over sea and land are given in Section 4 of the EIS.

COMMENTOR NO. 97: JOHNSTON, ANNE B. (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 97: JOHNSTON, ANNE B. (CONT'D.)

Very low health and other environmental effects were found to result from the transport of such spent nuclear fuel. Nevertheless, the commentor's position that the risks are too high is noted.

Response to Comment No. 97-6

An objective of the proposed action is to reduce the amount of HEU which could be diverted to nations which do not support nuclear weapons nonproliferation (Section 1.2 of the EIS). Removal of HEU from international commerce reduces the likelihood that weapons-grade nuclear materials could fall into the hands of nations or groups that advocate or support terrorism. Conversely, as demonstrated by the analysis in Section 4 of the EIS, the risks associated with implementation of the proposed action to health or the environment would be low. Estimates of risks presented in Section 4 include normal operations and severe accident conditions.

Response to Comment No. 97-7

See the response to Comment 97 - 4 above.

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without the additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all of the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ships and ports is noted.

Response to Comment No. 97-8

As discussed in Section 2.2.1.2 and 2.2.2.3 of the EIS, several financing options have been considered, ranging from collection of fees from the research reactor operators that would pay all of the costs of the program to full subsidization of the program by DOE. A compromise between these extremes would be for developed countries to be charged a competitive fee, while U.S. taxpayers would absorb the full costs of the program for developing countries and absorb the amount above a competitive fee for developed countries to accept and manage this spent nuclear fuel. Charging a competitive fee is a market-based approach to the problem. Alternative financing arrangements discussed in Section 2.2.2.3 of the EIS include full subsidization for all countries, charging all countries the full costs of management, and subsidizing developing countries, but charging developed countries a full-cost recovery fee.

COMMENTOR NO. 98:
HUTCHISON, WILLIAM T. & MARIANNE D.

292 Bampfield Drive
Mount Pleasant, SC 29464
May 29, 1995

Charles R. Head
Office of Spent Fuel Management
EM-37
US Department of Energy
1000 Independence Ave.
Washington, DC 20585-0001

Dear Mr. Head:

This is to comment on the proposal to ship used nuclear fuel rods through the Wando Terminal located near Charleston, South Carolina.

We oppose this idea.

The area in near proximity to the Wando Terminal has had explosive population growth in the past few years. Our home is located one-half mile from the Wando Terminal.

We do not want these rods in such close proximity to our home, to us, to our friends, to our neighbors, or to our relatives.

98-1

Very sincerely yours,

William T. Hutchison

William T. Hutchison

Marianne D. Hutchison

Marianne D. Hutchison

RESPONSE TO COMMENT
COMMENTOR NO. 98:
HUTCHISON, WILLIAM T. & MARIANNE D.

Response to Comment No. 98-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Charleston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Charleston, or to any of the ports analyzed in the EIS, is low.

Appendix D of the EIS has been revised to specifically note the presence of Mount Pleasant in the immediate vicinity of the Wando Terminal, and the rate of population growth of Mount Pleasant (Attachment 2 to Appendix D). The demographic data pertaining to Mount Pleasant were considered in application of the port selection criteria, but still resulted in the Port of Charleston (that is, the Wando Terminal in Mount Pleasant) being identified as one of the proposed ports of entry.

COMMENTOR NO. 100: WALKING, LEE

445 Brockway Road #1
Chehalis, WA. 98532
May 22, 1995

Mr. Charles Head
Office of SNF Management. EM-37
U.S. Department of Energy
1000 Independence Ave. SW
Washington, D.C. 20585

Dear Sir:

RE: Bringing spent nuclear wastes to Hanford from other countries & states

I don't want to live in an international dump. I don't want to live in a dump, period. I was brought up to believe the person (company, state, nation) that made the mess was responsible for cleaning it up. I still believe that. 100-1

The U.S. has enough deadly waste of its own to worry about....DON'T IMPORT MORE. The spent fuel at Hanford is already leaking. We should clean up what's there, not add to the problem. 100-2

Washington state tourism is already in danger (as well as liveability for its citizens)...clearcuts aren't pretty and increase flooding; the salmon's gone; and toxic dumpsites don't attract too many tours. 100-3

Even IF Hanford wanted more death and poison, I don't want it passing through the Port of Seattle, the Port of Tacoma or the Port of Portland...any high-density population area and their fragile water environments, where accidents can be horrendous. And there's always accidents...that's a given.

If this Contract On America is supposed to cut taxes and save money, this plan doesn't do that. Taxpayers (ME) will subsidize the importation and disposal costs of the nuclear wastes. Why should I pay for other people's garbage? 100-4

No importation of nuclear wastes of any kind!

Sincerely,

Lee Walkling

Ms. Lee Walkling

RESPONSE TO COMMENT
COMMENTOR NO. 100: WALKING, LEE

Response to Comment No. 100-1

The commentor's opposition to the acceptance of spent nuclear fuel from foreign research reactors is noted. Acceptance of foreign research reactor spent nuclear fuel is described under Management Alternative 1, Section 2.2 of the EIS.

The commentor's opposition to the involvement of the United States in management of foreign research reactor spent nuclear fuel is likewise noted. The commentor's position supports the No Action Alternative which is described in Section 2.5 of the EIS. As discussed in Section 4.6 of the EIS, adoption of the No Action Alternative would have a significant and negative impact U.S. nuclear weapons nonproliferation policy.

Response to Comment No. 100-2

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 100-3

The commentor's opposition to the use of the Ports of Portland, Seattle, or Tacoma to receive foreign research reactor spent nuclear fuel is noted. The port selection criteria discussed in Appendix D, Section D.1.9 of the EIS identify ports that can safely handle foreign research reactor spent nuclear fuel. Seattle was excluded from further consideration based on these selection criteria. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma or Portland, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Sections 4.2.2.3 and 4.5 of the EIS) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel casks are also low (Sections 4.2.2.2 and 4.5 of the EIS).

Response to Comment No. 100-4

As discussed in Section 2.2.1.2 and 2.2.2.3 of the EIS, several financing options have been considered, ranging from collection of fees from the research reactor operators that would pay all of the costs of the program to full subsidization of the program by DOE. A compromise between these extremes would be for developed countries to be charged a competitive fee, while U.S. taxpayers would absorb the full costs of the program for developing countries and absorb the amount above a competitive fee for developed countries to accept and manage their spent nuclear fuel. The reason for the United States to "pay for other people's garbage" is to reduce the risk of the spread of nuclear weapons to additional countries who might use them against the United States or our allies.

COMMENTOR NO. 101: ROOD, MARION

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: MARION ROOD Phone: Home (510) 827-9753 Work (510) 891-3102

Title and Organization: CITIZEN!

Address: 3024 WILDEWOOD DR

City: CONCORD State CA Zip 94518

*** COMMENTS ***

I am strongly opposed to this proposal! The ships would have to go under the Golden Gate Bridge (a National treasure)! - then navigate under 6 bridges, in shipping lanes containing oil & gasoline tankers, and passing large oil refineries. The roads leading out of the Concord Weapons Storage are also inadequate to handle this traffic. If there were a nuclear accident, 6 million Bay Area citizens would be effected. I currently have Leukemia (which is an environmental Cancer), and I don't need more toxic carcinogens 2 miles from my home! We must re-evaluate our entire Nuclear Development Philosophy! 101-1 101-2 101-3 101-4 101-5

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 101: ROOD, MARION

Response to Comment No. 101-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 101-2

The passage from San Francisco Bay to Concord meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9 of the EIS). The favorable transit from open ocean is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations, such as port population, population along the route to the management site, port experience with handling containers, and port facilities would be considered in making the final selection of ports of entry. Appendix D, Section D.1.9 of the EIS provides details of the port selection process.

The port selection criteria do not consider the existence of land-based facilities such as refineries because they have no direct impact on the risk associated with the shipment of foreign research reactor spent nuclear fuel. The worst case accident is considered to be the collision of the ship carrying the foreign research reactor spent nuclear fuel with a petroleum tanker. In this accident the transportation cask is damaged in the collision, then subjected to a fire that resulted from the collision (Appendix D, Section D.5). The addition of some mishap at a land-based facility would not add to the severity of this accident, and so was not considered. Section 4.2.2.3 of the EIS discusses the assumptions that went into the port accident analysis and the results of those analyses.

Response to Comment No. 101-3

DOE has not yet selected ports, routes, or transport modes for the foreign research reactor spent nuclear fuel. If Concord NWS is selected, then DOE would choose the best route to I-680 in accordance with Department of Transportation regulations (49 CFR Part 397.101 (a)(2)). That route could use Route 4, Route 24, and/or Waterfront Road. The State of California routing agency can designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103. DOE considers that the roads leading out of the Concord NWS are adequate for this task.

Response to Comment No. 101-4

In the unlikely event of a severe accident, the analysis performed for the EIS indicates that some radioactive material could be released from the cask and distributed into the

environment. However, the analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel also shows that the resultant contamination is so small that no cleanup would be required in any of the ports or surrounding areas. This result can be expected because the quantities of radioactive material present inside the cask are small, and even in the case of the worst accident, only a small part escapes the cask. Close in to the accident, near the cask would likely require some cleanup, but the overall impact on the air and water quality in the port would be very small. The analysis also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident. Section 4.2.2.3 and Appendix D, Section D.5 of the EIS detail the accident analysis and results.

Response to Comment No. 101-5

The basic purpose of this EIS is to provide an evaluation of environmental impacts that could result from management of spent nuclear fuel from foreign research reactors. An evaluation of the national nuclear development philosophy is beyond the scope of this EIS (Section 1.3 of the EIS).

COMMENTOR NO. 102: JENSEN, DAVID

May 23, 1995

Charles Head
Office of SNF Management EM-37
U.S. Department of Energy
1000 Independence Ave. SW
Washington, DC 20585

Dear Mr. Head:

I am writing to comment on the draft EIS proposing shipment of high-level nuclear waste through Puget Sound or Portland for possible storage at Hanford.

I support the "preferred" alternative of the EIS: that such waste be stored at reactor sites with international monitoring to ensure that fuel is not diverted for extraction of enriched uranium. 102-1

I strongly oppose importation of spent fuel from nations that do not pose a proliferation risk; of low enriched uranium that can't be used in bombs; and where dry cask storage is feasible and would allow international inspection. This reduces transportation risks. 102-2

I also strongly oppose using commercial freighters or public ports in large cities. This is necessary to protect longshore workers, the public on local roads and the public in event of shipboard fire. Use dedicated or military ships and DOD ports. 102-3 102-4

Finally I strongly oppose importation of high-level nuclear wastes for storage at Hanford. Hanford already has cooling basins which leak into the Columbia River and which are subject to failure in event of earthquake. The new facility proposed for Hanford's wastes should NOT be increased in size to accomodate foreign nuclear wastes--USDOE is already having trouble funding safety upgrades and fuel removal from the cooling basins. 102-5

Other nations must pay the costs of their nuclear programs. It is not for the U.S. to pay these costs and bear the environmental burden and health risks. 102-6

Sincerely,

David Jensen

RESPONSE TO COMMENT
COMMENTOR NO. 102: JENSEN, DAVID

Response to Comment No. 102-1

No "preferred" alternative was identified in the draft EIS. The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

Response to Comment No. 102-2

The commentor's opposition to accepting foreign research reactor spent nuclear fuel from nations that pose no nuclear weapons proliferation risk, where the spent nuclear fuel is LEU, and from nations where dry storage is feasible is noted.

The United States has assumed in the past, and continues to assume, a leadership role in the world community in matters of nuclear weapons nonproliferation. In this role it initiated programs such as the RERTR program and encouraged other nations to support the program. Some of the nations which have supported the program may not currently present the same nuclear weapons proliferation risk as others. The reasons for considering these nations under this policy are included in Section 1.3 of the EIS.

As discussed in Section 1.1 of the EIS, the reason for including LEU in the policy is that the United States has offered LEU acceptance as an enticement for foreign research reactor operators to convert from HEU to LEU fuel. The enticement was necessary because operation with LEU fuel is not as effective as with HEU fuel. Also, as explained in Section 2.3, the opportunities for expanded spent nuclear fuel storage at foreign research reactor sites are limited or nonexistent.

Response to Comment No. 102-3

Based on the analysis of impacts associated with accidents and incident-free operations involving foreign research reactor spent nuclear fuel, DOE considers that commercial ports, facilities and commercial freighters represent an acceptable option for the transport of foreign research reactor spent nuclear fuel (Section 4.2.2.3 of the EIS on consequences of port accidents and Section 4.2.2.2 for impacts of incident-free operation).

Response to Comment No. 102-4

The EIS demonstrates that commercial ships represent an acceptable option for the transportation of foreign research reactor spent nuclear fuel (Section 4.2.2.3 of the EIS on consequences of port accidents and Section 4.2.2.2 for impacts of incident-free operation). The analyses demonstrate that there is no reduction in the risks of the proposed action associated with the use of dedicated or military ships, nor any adverse consequences to the use of the commercial ships.

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ships and ports is noted.

Response to Comment No. 102-5

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 102-6

As discussed in Section 2.2.1.2 and 2.2.2.3 of the EIS, several financing options have been considered, ranging from collection of fees from the research reactor operators that would pay all of the costs of the program to full subsidization of the program by DOE. A compromise between these extremes would be for developed countries to be charged a competitive fee, while the U.S. taxpayers would absorb the full costs of the program for developing countries and absorb the amount above a competitive fee for developed countries to accept and manage their spent nuclear fuel. The reasons the United States would pay some of the costs for other countries are: 1) some countries would be unable to afford the costs of the proposed action and would have no safe alternative means of managing their spent nuclear fuel (i.e., the developing countries); and 2) some countries would continue to use and trade weapons-grade nuclear material indefinitely unless the United States charges a competitive fee and absorbs any cost above that fee.

COMMENTOR NO. 103: HEATH, PAMELA

May 23, 1995

Charles Head
Office of SNF Management EM-37
U.S. Department of Energy
1000 Independence Ave. SW
Washington, DC 20585

Dear Mr. Head:

I am writing to comment on the draft EIS proposing shipment of high-level nuclear waste through Puget Sound or Portland for possible storage at Hanford.

I support the "preferred" alternative of the EIS: that such waste be stored at reactor sites with international monitoring to ensure that fuel is not diverted for extraction of enriched uranium. *103-1*

I strongly oppose importation of spent fuel from nations that do not pose a proliferation risk; of low enriched uranium that can't be used in bombs; and where dry cask storage is feasible and would allow international inspection. This reduces transportation risks. *103-2*

I also strongly oppose using commercial freighters or public ports in large cities. This is necessary to protect longshore workers, the public on local raods and the public in event of shipboard fire. Use dedicated or military ships and DOD ports. *103-3* *103-4*

Finally I strongly oppose importation of high-level nuclear wastes for storage at Hanford. Hanford already has cooling basins which leak into the Columbia River and which are subject to failure in event of earthquake. The new facility proposed for Hanford's wastes should NOT be increased in size to accomodate foreign nuclear wastes--USDOE is already having trouble funding safety upgrades and fuel removal from the cooling basins. *103-5*

Other nations must pay the costs of their nuclear programs. It is not for the U.S. to pay these costs and bear the environmental burden and health risks. *103-6*

Sincerely,

Pamela Heath

RESPONSE TO COMMENT
COMMENTOR NO. 103: HEATH, PAMELA

Response to Comment No. 103-1

No "preferred" alternative was identified in the draft EIS. The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

Response to Comment No. 103-2

The commentor's opposition to accepting foreign research reactor spent nuclear fuel from nations that pose no nuclear weapons proliferation risk, where the spent nuclear fuel is LEU, and from nations where dry storage is feasible is noted.

The United States has assumed in the past, and continues to assume, a leadership role in the world community in matters of nuclear weapons nonproliferation. In this role it initiated programs such as the RERTR program and encouraged other nations to support the program. Some of the nations which have supported the program may not currently present the same nuclear weapons proliferation risk as others. The reasons for considering these nations under this policy are included in Section 1.3 of the EIS.

As discussed in Section 1.1 of the EIS, the reason for including LEU in the policy is that the United States has offered LEU acceptance as an enticement for foreign research reactor operators to convert from HEU to LEU fuel. The enticement was necessary because operation with LEU fuel is not as effective as with HEU fuel. Also, as explained in Section 2.3, the opportunities for expanded spent nuclear fuel storage at foreign research reactor sites are limited or nonexistent.

Response to Comment No. 103-3

Based on the analysis of impacts associated with accidents and incident-free operations involving foreign research reactor spent nuclear fuel, DOE considers that commercial ports, facilities and commercial freighters represent an acceptable option for the transport of foreign research reactor spent nuclear fuel (Section 4.2.2.3 of the EIS on consequences of port accidents and Section 4.2.2.2 for impacts of incident-free operation).

Response to Comment No. 103-4

The EIS demonstrates that commercial ships represent an acceptable option for the transportation of foreign research reactor spent nuclear fuel (Section 4.2.2.3 of the EIS on consequences of port accidents and Section 4.2.2.2 for impacts of incident-free operation). The analyses demonstrate that there is no reduction in the risks of the proposed action associated with the use of dedicated or military ships, nor any adverse consequences to the use of the commercial ships.

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ships and ports is noted.

Response to Comment No. 103-5

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE would be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel managed by DOE would be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 103-6

As discussed in Section 2.2.1.2 and 2.2.2.3 of the EIS, several financing options have been considered, ranging from collection of fees from the research reactor operators that would pay all of the costs of the program to full subsidization of the program by DOE. A compromise between these extremes would be for developed countries to be charged a competitive fee, while U.S. taxpayers would absorb the full costs of the program for developing countries and absorb the amount above a competitive fee for developed countries to accept and manage their spent nuclear fuel. The reasons the United States is proposing to pay some of the costs for other countries are: 1) some countries are unable to afford the costs of the proposed action and have no safe alternative means of managing their spent nuclear fuel (i.e., the developing countries), and 2) some countries would continue to use and trade weapons-grade nuclear material indefinitely unless the United States charges a competitive fee and absorbs any costs above that fee.

COMMENTOR NO. 105: KRUEGER, PAT

Received by P. Wells on 6/7/95

Pat Krueger of Tacoma, WA
Does not want it shipped
through TACOMA, WA. 105-1

RESPONSE TO COMMENT
COMMENTOR NO. 105: KRUEGER, PAT

Response to Comment No. 105-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 106: MATIN, JEAN & FRED

5 Falcon Court
Pleasant Hill, CA 94523
FAX 510-686-2162

May 26, 1995

Secretary of the U.S. Department of Energy
Hazel O'Leary
U. S. Department of Energy
H.Q.
Forrestal Bldg.
1000 Independence Ave. S.W.
Washington, D.C. 20585
FAX 202-586-0856

Dear Secretary O'Leary:

This letter is coming to you from concerned citizens and residents of Contra Costa County in Northern California. The subject that concerns us is the matter of the selection of Port Chicago Naval Weapons Station as a port of entry for the spent nuclear fuel from other countries. We understand this nuclear fuel is to be transported to temporary storage outside of California! and only God knows, when, where and how, to a final burial ground as yet unknown to the scientific community. To begin with, the concept of how to control the spent fuel should have been worked out long before original delivery to countries outside of the United States. Resorting to the excuse of lack of knowledge at that time could not be true. The matter of the hazards and perils of nuclear waste had been well documented by famous nuclear scientists as early as the 1950's. 106-1

Being where we are today in time, we cannot correct our mistakes made in the past by thoughtless or uninformed politicians, and perhaps by vested industrial interest groups. However, at this juncture, we feel the return of these highly hazardous wastes to a largely populated region through extremely busy waterways, surrounded by six busy bridges and several high production refineries which produce gasoline and other highly flammable products is a grave mistake. Furthermore, the Naval Weapons Station, geologically, is in close proximity of an earthquake fault, adding to the dangers of shipment and accidents. The record also clearly shows evidence of many serious accidents in the regions involving ships, as well as numerous accidents in the naval shipyard while transporting munitions. 106-2 106-3

During a meeting held in Concord, California in which many residents of the nearby region participated, we carefully listened to an interpretation of the interim study made by the U.S. Department of Energy, as given by Mr. Head. The explanation was pathetic and the statistics documented and published by your Department was full of errors intending to trivialize the potential for hazards and accidents. 106-4

RESPONSE TO COMMENT
COMMENTOR NO. 106: MATIN, JEAN & FRED

Response to Comment No. 106-1

The United States had addressed the issue of storage for decades by accepting spent nuclear fuel for disposition in the United States (Section 1.1 of the EIS). Passage of the National Environmental Policy Act in 1969, well after the process of providing research reactors and fuel to foreign countries had begun, led to the decision for DOE to allow the previous spent nuclear fuel acceptance policy to expire and to the decision to conduct this environmental review. Ultimate disposition of DOE's spent nuclear fuel, including the foreign research reactor spent nuclear fuel that may be accepted in the United States, is a high priority. For planning purposes, DOE has determined that its spent nuclear fuel, including foreign research reactor spent nuclear fuel, that is not otherwise dispositioned (e.g., chemically separated, with the high-level waste being converted into a vitrified glass for repository disposal) is authorized for disposal in a geologic repository. However, since the repository characterization program is in its early stages, the waste acceptance criteria for deposit of DOE's spent nuclear fuel in a repository have not been developed. Thus, a determination cannot be made at this time as to the requirements that must be met to allow placement of the foreign research reactor spent nuclear fuel in the repository. As a result, the analysis in the EIS for the time period beyond 40 years is qualitative rather than quantitative. The impacts due to ultimate disposition are discussed qualitatively in Section 4.2.7 of the EIS.

Response to Comment No. 106-2

The port selection process that determined that Concord NWS was an acceptable port considered the population of the port and surrounding areas. Appendix D, Section D.1.9.5 of the EIS provides an explanation of the "population" criterion. In regard to the amount of marine traffic and the number of refineries and bridges along the route to Concord NWS, the passage from San Francisco Bay to Concord still meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for the port selection (Appendix D, Section D.1.9.2). The population and favorable transit from open ocean are not the only considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel, if it is accepted into the United States. Other items of importance include population along the route to the management site(s), port experience with handling containers, and port facilities. Appendix D, Section D.1.9 presents details of the port selection process.

Response to Comment No. 106-3

Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident, and thus affect the probability of such accidents; however, the number of earthquake-induced ship and road accidents is small compared to other causes.

COMMENTOR NO. 106: MATIN, JEAN & FRED (CONT'D.)

Be it as it may, we would like to state our strong objection on behalf of our community, and warn you against making an unconscionable mistaken decision to select Port Chicago Naval Weapons Station as a port of entry of the spent nuclear fuel. 106-5

We and our community are determined to bring our objections, if not heeded by the Department of Energy, to the White House, the U. S. Congress and the media for discussion and debate to prohibit this catastrophic action. Considering today's political climate, we believe the present administration can ill afford to alienate the public, especially the very politically aware Californians that will play a crucial and decisive role in the future elections. We ask you to give your careful, full and personal attention to our objections and we request to either eliminate the possibility of selecting the Naval Weapons Station as an entry port, or to allow extended time for further study and Community debate on the subject. We would appreciate your timely response to this letter in advance of the decision date. 106-6

Sincerely,

Jean & Fred Matin

Jean and Fred Matin

RESPONSE TO COMMENT
COMMENTOR NO. 106: MATIN, JEAN & FRED (CONT'D.)

Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the transportation cask. Further, the analysis of impacts associated with accidents involving foreign research reactor spent nuclear fuel presented in Section 4.2.2.3 of the EIS indicate that the use of any of the selected ports would not pose any significant risk to the port personnel or the population near the ports. Concord NWS has considerable relevant experience in handling containers, and has the capability to safely handle containerized foreign research reactor spent nuclear fuel (Appendix D, Section D.1.9.1).

Response to Comment No. 106-4

The analyses performed in support of the EIS are documented along with the assumptions made and the results obtained in the EIS. This documentation provides a means of reproducing the results, if one wishes to do so. The results indicate that the consequences of implementing the policy would be low.

Response to Comment No. 106-5

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 106-6

The commentor's position on selection of Concord NWS as a candidate for acceptance of spent nuclear fuel from foreign research reactors is noted. DOE considers that the port selection criteria identify ports that can safely handle foreign research reactor spent nuclear fuel (Appendix D of the EIS). DOE further considers that the use of any of the ports identified in Section 2.2.1.6 of the EIS by the port selection process, including Concord NWS, would pose a low risk to either the port personnel or the population near the port. The acceptance period for comments on the draft EIS was extended from June 20 to July 20, 1995, for a total comment period of 90 days.

COMMENTOR NO. 107: FORM LETTER A

Charles Head, Program Manager, Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585
Phone: 202-586-9441 • Fax: 202-586-5256

re: Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

I understand that the Department of Energy (DOE) intends to return spent nuclear fuel rods through the Concord Naval Weapons Station (CNWS), and I have the following questions (to which I expect a prompt answer):

107-1 • If, as the DOE states, "the purpose of the proposed policy is to promote the U.S. nuclear weapon nonproliferation policy by seeking to reduce the amount of highly enriched uranium (HEV) used in civil programs worldwide," then why are we continuing to sell low-enriched uranium (LEV)—which, as you admitted at the hearing on May 22, in nuclear reactors generates plutonium—a primary ingredient of nuclear weapons?

107-2 • And if our policy is to remove and secure HEV, then why is the DOE offering to also accept LEV for ten years "from (foreign) reactors that have **already converted** to LEV."? (Spent Nuclear Fuels Acceptance Policy, Proposal 3.) It seems to make no sense.

107-3 • Is the purpose of this policy to enable the DOE to sell more and more nuclear fuel rods to those countries from whom we are accepting spent nuclear fuel? Is this a throughput? Does the use of more and more nuclear material increase or decrease the chances of nuclear weapons proliferation?

107-4 • If part of the benefit of this policy is what former Secretary of State Eagleburger referred to as "nuclear commerce" (letter dated 10/26/92 in the draft EIS, App. G), then how much money has been and will be received for the sale of nuclear fuel rods by the DOE to its customers in over forty foreign countries? Since we here in the Bay Area are being asked to share the risks of this commerce, is there some plan for us to share the benefits? Can we get some of this money locally? Perhaps the DOE could fund a local cancer treatment facility?

107-5 • Since all nuclear reactors create fissile materials, shouldn't the goals of nonproliferation be best served by conversion to other sources of energy? Can the DOE do ***SOLAR***?

107-6 • Why don't we focus our policy on those countries that pose an actual risk of converting their nuclear fuel into bombs (e.g., Iran)? At the hearing you responded to this question by speculating about possible changes in regime, political disruptions, etc. Why do you want to bring to the U.S. spent nuclear fuel from Briton, France, Japan, Sweden and numerous other countries whose rate of domestic terrorism is less than our own?

107-7 • In the section of the draft EIS that refers to Concord, references are made to non-existent places: "Clydes," "Britzly Bay," and "San Suisun Bay." Port Chicago is said to be 10 miles north of the city of Concord. Do these errors reflect how much the DOE cares about us? Are they an indication of the DOE's competency? Perhaps they reveal a master plan for the massive transformation of our geography?

107-8 • In the same section, mention is made of "the unlikely event of an explosion" at Port Chicago. True, any accident is, in a way, unlikely—as your statistics assume throughout the EIS. But you may have heard that, unlikely or not, we *had* a huge explosion there in 1944. What would be the consequences *if* such an explosion were to occur again, but not with just high explosives (HE)—but with **HE *and*** HEV?

107-9 • Again, in that same section, the rather truncated map of the CNWS contains some of the area occupied by our very busy Buchanan Airfield. Even though the airfield symbol appears in the map's legend, it does not appear on the map itself. Nor is the airfield mentioned in any of the text. Does this mean the DOE believes heavy local air traffic does not increase the risk of a terrible nuclear accident? Or maybe it just wasn't taken into consideration?

107-10 • Likewise, no mention is made of the six oil refineries, fifteen cities and six bridges that the nuclear casks, borne on merchant vessels, would encounter en route to CNWS. What would happen if such a ship collided with one of the hundreds of tankers loaded with gasoline that pass through the narrow channels of the Carquinez Straits? Is the DOE aware that over 9 million tons of petroleum and petroleum products passed through the Straits last year? Why are there no worst-case scenarios mentioned in the draft EIS? Is the DOE afraid to consider such possibilities—or is it afraid that we will?

107-11 We live here, Mr. Head—it is necessary for us to consider threats to our physical security, no matter how frightening. Nuclear nonproliferation is not only a general principle we believe in, but also a specific condition we will strive to create in our neighborhoods. Unless—and until—you can answer our questions satisfactorily, let's not move these incredibly dangerous materials. Why tempt fate and not be prudent until *after* the inevitable accident has occurred?

Sincerely,

Rolando Destrukto

A Concerned Citizen

RESPONSE TO COMMENT
COMMENTOR NO. 107: FORM LETTER A

Response to Comment No. 107-1

HEU could be used to make nuclear weapons if it were to fall into the hands of nations that do not support the nonproliferation of nuclear weapons. LEU is preferred as fuel for foreign research reactors because it cannot be used to make nuclear weapons (Section 1.1 of the EIS). In addition, due to the design of the LEU fuels and the research reactors in which they are used, only a minuscule amount of plutonium is produced (See Appendix B, Table B-6 of the EIS).

Response to Comment No. 107-2

As discussed in Section 1.1 of the EIS, the reason for including LEU in the policy is that the United States has offered LEU acceptance as an enticement for foreign research reactor operators to convert from HEU to LEU fuel use. The enticement was necessary to offset the considerable expenses of conversion and the reduction in reactor capabilities and increased operating costs that generally accompany conversion to LEU fuel.

Response to Comment No. 107-3

The purpose of the proposed action is not to enable DOE to sell more nuclear fuel; DOE does not sell nuclear fuel. The purpose of the proposed action is to reduce international commerce in HEU (Section 1.2 of the EIS). One method of accomplishing this objective is to encourage the use of LEU fuel in foreign research reactors. Use of LEU fuel offers the advantage of increased national security because LEU fuel cannot be used to make nuclear weapons (Section 1.1 of the EIS).

Response to Comment No. 107-4

The sale of fresh fuel for foreign research reactors is outside of the scope of this EIS (Section 1.3 of the EIS). The Energy Policy Act of 1992 places severe restrictions on the export of HEU. Since passage of that act, no new export licenses for HEU have been issued by the United States. No sales of fuel for foreign research reactors are included in the proposed action. Environmental effects of the proposed action were evaluated and found to result in no significant environmental risks or benefits (Section 4 of the EIS), including economic benefits.

Response to Comment No. 107-5

Conversion to other sources of energy is not feasible in the case of research reactors. Foreign research reactors are not used to produce commercial electric power, and the fission process is required to produce the neutrons which are necessary for medical, industrial, and educational applications of research reactors (Section 1.1 of the EIS describes applications). The use of LEU in foreign research reactors does not pose a proliferation threat because LEU cannot be used to make nuclear weapons.

COMMENTOR NO. 107: FORM LETTER A (CONT'D.)

Individuals submitting this form letter:

Finsilver, E.J.

O'Connor, Tim

Oestrukto, Roland

Reeves, Florence P.

RESPONSE TO COMMENT
COMMENTOR NO. 107: FORM LETTER A (CONT'D.)

Response to Comment No. 107-6

The United States has in the past, and continues to play, a leadership role within the world community in matters of nuclear weapons nonproliferation. In this role, it initiated programs such as the RERTR program and encouraged other nations to support the program. Some of the nations which have supported the program such as Britain, France, Japan, Sweden and others may not currently present the same nuclear weapons proliferation risk as other nations. The reasons for considering these nations under this policy are included in Section 1.3 of the EIS.

Response to Comment No. 107-7

The corrections identified by the commentor have been incorporated into the EIS.

Response to Comment No. 107-8

The worst accident analyzed involves the foreign research reactor spent nuclear fuel cask being damaged, then engulfed to a long-duration fire. A scenario that includes high explosives was not considered. Rather, administrative controls would be in place to preclude the handling of high explosives while the foreign research reactor spent nuclear fuel was on Concord NWS or in a ship near Concord NWS. While there would be high explosives in Concord NWS's bunkers while the foreign research reactor spent nuclear fuel was being handled, as long as the high explosives were not handled concurrently, there is little danger of explosion.

Response to Comment No. 107-9

Appendix D, Section D.5 of the EIS discusses the potential impacts and risks associated with low probability events such as ship crashes followed by severe fires. Given that Buchanan Field is a general aviation field located about 6 miles from the piers which could receive spent nuclear fuel shipments at Concord, and the air traffic near Concord NWS is controlled by the Federal Aviation Administration such that air traffic into and out of Buchanan Field is not over Concord NWS, it is unlikely that the probability of or consequences from a small aircraft crash are as large as the probabilities and risks of ship crashes and fires in the ship channel or at the pier. The crash of an aircraft into a ship carrying one or more casks of spent nuclear fuel is a low probability event which might initiate a severe accident. Therefore, based on the low probability of this accident scenario, it is not necessary to consider additional risk analysis since this scenario falls within the range of accident analysis already performed for the EIS and would not significantly affect the total risks already analyzed.

Response to Comment No. 107-10

CEQ regulations and guidance do not require a worst case analysis of accidents in an EIS. For the purpose of analysis in the EIS, there is no such thing as a worst case scenario because for any worst case that is postulated, a still more severe accident can be postulated by adding one more drum of gasoline, one more wrecked rail car, one more terrorist, etc. In addition, for each assumption that is made to make a postulated accident more severe, the probability of the accident becomes more remote. Nevertheless, DOE did analyze the severe accident in which a ship carrying a spent nuclear fuel transportation cask is involved in a collision with another ship, severe enough to breach the transportation cask and then subject the cask to a fire resulting from the collision (Section 4.2.2.3 of the EIS). These conditions are the same as the worst conditions that might be expected to result from the collision of a ship carrying a spent nuclear fuel transportation cask with a petroleum tanker. The EIS does not explicitly consider the existence of land-based facilities such as refineries because the addition of some mishap at a land-based facility would not add to the severity of the worst plausible accident. Instead, the port selection process considered whether a favorable transit to and from open water exists considering parameters such as navigation hazards and the distance from the port to the open ocean or large bay (Appendix D, Section D.1.9.2 of the EIS).

Response to Comment No. 107-11

The commentor's concerns are noted. The analyses presented in Section 4 of the EIS demonstrate that there would be no significant adverse or beneficial impacts on human health, wildlife, or the environment due to implementation of the proposed action. In addition, the analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3) and that the risks associated with incident-free handling of foreign research reactor spent nuclear fuel are also low (Section 4.2.2.2).

COMMENTOR NO. 108: POSEY, JEANNE & CHARLES

Hazel O'Leary
Department of Energy
1000 Independence Ave.
Washington, D.C., 20585

May 25, 1995

Dear Ms. O'Leary:

This letter is written to protest the decision to send all NUCLEAR WASTE through the San Francisco Bay to the CONCORD NAVAL WEAPONS STAION for further distribution along our State and Federal highways to places to contain such waste. 108-1

What is our government thinking of? Don't they realize the congested areas that they will be puting in jeopardy? Just one little leak in the San Francisco Bay could contaminate the whole bay and affect millions of people! 108-2

Why can't this waste be initially sent to a port of entry that is more remote? The Concord Naval Weapons Station is enough of a threat to the greater Bay Area without the addition of NUCLEAR WASTE within its' boundaries! 108-3

Please respond in writing as to why this decision cannot be changed and another location utilized.

PLEASE RECONSIDER THIS DECISION.

Sincerely,

A L Posey
1327 Santa Fe
Martinez Ca
94553

cc: President William Clinton
Rep. John Doolittle
Senator Barbara Boxer
Senator Diane Feinstein
Governor Pete Wilson
State Leg. David Knowles

RESPONSE TO COMMENT
COMMENTOR NO. 108: POSEY, JEANNE & CHARLES

Response to Comment No. 108-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk of bringing foreign research reactor spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 108-2

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. As stated in Section 2.6.2 of the EIS, in over four decades of spent nuclear fuel shipments, no transportation cask has ever released any of its contents (radioactive material) as a result of an accident. Spent nuclear fuel transportation casks passing through the Bay area to Concord NWS, or in any other port or waterway, cannot leak because the metallic fuel is transported dry. Based on past experience, DOE considers that the foreign research reactor spent nuclear fuel transportation casks would not release their radioactive contents, and would thus not affect the quality of the water. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

Response to Comment No. 108-3

Use of a remote port could slightly reduce the consequences of an accident which are low (Section 4.2.2 of the EIS), however, there are other considerations that also must be made when making port selection. Appendix D, Section D.1.9 of the EIS presents a complete discussion of the port selection process.

COMMENTOR NO. 109: PERKINS, SUSAN J.

7731 14th Avenue
Seattle, WA 98117
May 30, 1995

Charles Head
Office of SNF Management EM-37
U.S. Dept. of Energy
1000 Independence Ave. SW
Washington, DC 20585

RE: **Draft EIS for Shipment of Imported Nuclear Waste**

The purpose of this letter is to comment on the above-referenced draft EIS released by DOE. I am strongly opposed to DOE's proposal to ship imported nuclear waste through the urban areas of Puget Sound or Portland, for the following reasons: 109-1

* Transporting waste using commercial freighters or public ports in large cities is very dangerous. Accidents can and do happen, putting 100s or 1000s of people at risk. In the case of a fire involving nuclear waste, large portions of cities could be permanently contaminated. If nuclear waste must be imported, it should be done using dedicated ships and Dept. of Defense ports in nonurban areas. 109-2 109-3

* I oppose importation of spent nuclear fuel from nations that do not pose a proliferation risk. Why should the US pay for this and take the risks? To take the fuel from these nations will only encourage them to keep using nuclear technology and producing yet more waste, without facing the fact that we have no way to dispose of it safely. Even for nations that may pose a proliferation risk, there is no reason why we should take LEU wastes that cannot be used to produce nuclear weapons. 109-4

* Instead of importing nuclear waste from these countries, we should encourage them to use dry cask storage on site, as done at US reactors. This would eliminate all transportation risks. 109-5

* I oppose bringing additional nuclear waste to the Hanford Reservation. Hanford has serious leakage and other safety hazards from the nuclear waste already present at the site, which DOE is having trouble enough taking care of. DOE should concentrate on fixing the serious safety problems caused by the existing nuclear waste at Hanford, not import vast quantities of additional waste that could put Washington citizens at risk. 109-6

Sincerely,

Susan J. Perkins

cc: Rep. Jim McDermott, Senators Patty Murray and Slade Gorton, Governor Mike Lowry

RESPONSE TO COMMENT
COMMENTOR NO. 109: PERKINS, SUSAN J.

Response to Comment No. 109-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Ports of Tacoma and Portland is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, the Port of Portland, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 109-2

The analysis of impacts associated with accidents and incident-free operations involving foreign research reactor spent nuclear fuel presented in Sections 4.2.1 and 4.2.2 demonstrate that the use of either commercial or military ports and either commercial or dedicated ships would not pose any significant risk to the port personnel, the population near the ports, or the ships' crew. See also the response to comment 102-4.

Response to Comment No. 109-3

The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3, "Consequences of Port Accidents"). The worst plausible accident involves the foreign research reactor spent nuclear fuel cask being damaged, then exposed to a long-duration fire. The use of dedicated ships and/or military ports does not significantly alter the already low risk (Sections 4.2.1 and 4.2.2).

Response to Comment No. 109-4

The commentor's opposition to accepting foreign research reactor spent nuclear fuel from nations that pose no proliferation risk is noted. The United States has played in the past, and continues to play, a leadership role in the world community in matters of nuclear weapons nonproliferation. In this role, it initiated programs such as the Reduced Enrichment for Research and Test Reactors (RERTR) program and encouraged other nations to support it. Some of the nations which have supported it such as Britain, France, Japan, Sweden and others may not currently present the same nuclear weapons proliferation risk as other nations. The reasons for considering these nations under this policy are included in Section 1.3 of the EIS.

As discussed in Section 1.1 of the EIS, the reason for including LEU in the policy is that the United States has offered LEU acceptance as an enticement for foreign research reactor operators to convert from HEU to LEU fuel use. The enticement was necessary because operation with LEU fuel is not as effective as with HEU fuel.

COMMENTOR NO. 109: PERKINS, SUSAN J. (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 109: PERKINS, SUSAN J. (CONT'D.)

Response to Comment No. 109-5

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS. The commentor's preference for dry cask storage at the research reactor site is likewise noted.

Response to Comment No. 109-6

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 110: CROWLEY, SUSAN GARRETT

Susan Garrett Crowley
P.O. Box 963
Hood River, OR 97031
(503) 386-2686

June 1, 1995

Charles Head
Office of SNF Management, EM-37
U.S. Dept. of Energy
1000 Independence Ave. SW
Washington, D.C. 20585

RE: WRITTEN COMMENTS; DEIS proposing importation of high-level nuclear waste through Northwest ports for possible storage at Hanford

Dear Mr. Head:

This letter is to express my chagrin and anger that importation of high-level nuclear waste from foreign countries for storage at Hanford is being considered. 110-1

I live in Hood River, on the Columbia. Many citizens who live on the river are fearful that an entire national treasure--the Columbia River Gorge--is going to be sacrificed, ultimately, to the aftereffects of past nuclear storage. Please do all you can to avoid adding to an already painful burden that hangs over our heads. 110-2

Countries that want to develop nuclear weapons will do so. The genie is out of the bottle; we have only ourselves to blame for that. Our accepting the waste of other countries will merely relieve them of the burden of dealing with it themselves. It will not keep them from pursuing weapons researches if they so choose. It is naive to believe otherwise. 110-3

They should store it at their reactor sites, as we in the U.S. are now sadly forced to do. The solution is not to make ourselves a dump for the ultimate in garbage; it is to take diplomatic measures to assure that the nuclear number is written out of the international problem-solving equation as unworkable. 110-4

If the nation insists, nonetheless, on adding even more to our already unconscionable load of nuclear garbage, it should be the burden of *another* part of the country. The Northwest and the Columbia River Gorge have already taken their share of this devil's residue. Please do not allow it to run it down our rivers and roads. Enough.

Very sincerely yours,

Susan Garrett Crowley
XC: Senators Hatfield and Packwood
Rep. Wes Cooley

RESPONSE TO COMMENT
COMMENTOR NO. 110: CROWLEY, SUSAN GARRETT

Response to Comment No. 110-1

The commentor's opposition to the importation of foreign research reactor spent nuclear fuel, or the use of the Hanford Site as an interim storage site for spent nuclear fuel from foreign research reactors is noted.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 110-2

DOE appreciates the commentor's concern for the water quality in the Columbia River Gorge. The EIS demonstrates that there would be no significant adverse impacts to any of the ports, bays, or waterways that the foreign research reactor spent nuclear fuel might pass through or near. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Transportation casks passing through the Columbia River cannot leak (the spent nuclear fuel would be shipped dry), and would thereby not affect the quality of the water. As stated in Section 2.6.2 of the EIS, to date no spent nuclear fuel transportation cask has ever released any of its contents (radioactive material), even in actual accidents. A paragraph has been added to Section 4.2.2.2 of the EIS to emphasize the no-impact nature of these shipments on air and water quality.

Effects of past nuclear storage, presumably from the Hanford Site, are beyond the scope of this EIS. See also the response to comment 110-1, above.

As to the commentor's statement that Tacoma is tired of being considered a waste facility, if foreign research reactor spent nuclear fuel is accepted into the U.S., it should be noted that it would only pass through the port on its way to a management site, remaining in the Tacoma area for no longer than twenty four hours. Thus, neither Tacoma, nor any of the other nine potential receipt ports would be used as a waste facility.

COMMENTOR NO. 110: CROWLEY, SUSAN GARRETT (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 110: CROWLEY, SUSAN GARRETT (CONT'D.)

Response to Comment No. 110-3

An objective of the proposed action is to keep weapons-grade nuclear materials out of the hands of nations that wish to develop a nuclear weapons capability (Section 1.2 of the EIS). While sovereign nations can pursue nuclear weapons capability if they wish, United States' policy is to deny those nations both the required materials and technology necessary for a successful pursuit (Sections 1.1 and 1.2 of the EIS).

Response to Comment No. 110-4

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in (Sections 2.3 and 4.4.1 of the EIS). The commentor's preference for dry cask storage at the research reactor sites is likewise noted.

COMMENTOR NO. 115: HAMMER, BRUCE

Public Opinion Survey

The Port of Tacoma Commission is seeking citizen input on the issue of potential shipments of spent nuclear fuel elements through the Port of Tacoma.

We appreciate your comments and concerns on this important issue. We will forward your comments to the Department of Energy. To have your opinion count, please fill out his form and mail it to the Port of Tacoma, P.O. Box 1837, Tacoma WA 98401 by June 19, 1995. You may also send it by facsimile to (206) 593-4570.

SURVEY: NUCLEAR FUEL ELEMENT SHIPMENTS THROUGH TACOMA

- [X] I oppose spent nuclear elements being shipped through the Port of Tacoma. — *115-1*
- [ ] I am in favor of spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am undecided. *

COMMENTS: ~~Please~~ If this project must ~~go~~ be implemented then there needs to be fairness: all ports (including population centers) need to be involved with shipments. Otherwise, I totally oppose this nucleus waste shipment plan. — *115-2*

Name: Bruce HAMMER Telephone: (206) 471-9153

Address: 3816 South "A" City/State/Zip Code: Tacoma, WA 98418

* For more information, contact the Office of Spent Fuel Management (EM-37), Office of Environmental Management, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

RESPONSE TO COMMENT
COMMENTOR NO. 115: HAMMER, BRUCE

Response to Comment No. 115-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 115-2

As a part of the overall evaluation of environmental impacts associated with the shipment of foreign research reactor spent nuclear fuel, the EIS identifies ports of entry in the United States that are acceptable for the receipt and handling of foreign research reactor spent nuclear fuel. In evaluating and selecting acceptable ports of entry, evaluation criteria were developed to use in selecting ports of entry (Appendix D, Sections D.1.8 and D.1.9). The criteria include such factors as transit from open ocean, port population, population along the route to the management site, port experience with handling containers, and port facilities. While 153 commercial and eight military ports were initially considered, only the ports which are determined to be acceptable might be used in the case that foreign research reactor spent nuclear fuel is accepted into the United States.

COMMENTOR NO. 116: HAMMER, STAN

Public Opinion Survey

The Port of Tacoma Commission is seeking citizen input on the issue of potential shipments of spent nuclear fuel elements through the Port of Tacoma.

We appreciate your comments and concerns on this important issue. We will forward your comments to the Department of Energy. To have your opinion count, please fill out his form and mail it to the **Port of Tacoma, P.O. Box 1837, Tacoma WA 98401 by June 19, 1995.** You may also send it by facsimile to (206) 593-4570.

SURVEY: NUCLEAR FUEL ELEMENT SHIPMENTS THROUGH TACOMA

- [X] I oppose spent nuclear elements being shipped through the Port of Tacoma. — *116-1*
- [ ] I am in favor of spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am undecided. *

COMMENTS: There is a strong element of favoritism in this decision — Ports of Seattle, Long Beach, Oakland, & Los Angeles are absent from this list. We urge the Port of Tacoma Comissioners to vigorously oppose this decison with all the resources at your command. Make us proud, gentlemen. — *116-2*

Name: Stan. Hammer Telephone: 272-5224

Address: 901 E. Wright City/State/Zip Code: Tacoma, WA. 98404

* For more information, contact the Office of Spent Fuel Management (EM-37), Office of Environmental Management, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

RESPONSE TO COMMENT
COMMENTOR NO. 116: HAMMER, STAN

Response to Comment No. 116-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 116-2

Tacoma was one of 161 ports (153 commercial and eight military ports) considered. These ports were evaluated against selection criteria, resulting in 10 ports that met all of the criteria. Appendix D, Sections D.1.8 and D.1.9 of the EIS present a detailed discussion of the selection process and results.

Public Opinion Survey

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We appreciate your comments and concerns on this important issue. We will forward your comments to the Department of Energy. To have your opinion count, please fill out his form and mail it to the Port of Tacoma, P.O. Box 1837, Tacoma WA 98401 by June 19, 1995. You may also send it by facsimile to (206) 593-4570.

SURVEY: NUCLEAR FUEL ELEMENT SHIPMENTS THROUGH TACOMA

☐ I oppose spent nuclear elements being shipped through the Port of Tacoma.

☐ I am in favor of spent nuclear elements being shipped through the Port of Tacoma.

☐ I am undecided. *

COMMENTS: Thanks, Port officials, for arranging the meeting. I would like to see the several questions not adequately answered get a response from DOE. To avoid adding to the worst-case-scenario issue in a forthright manner only continues public question about the credibility of DOE activities.

Although I believe the risk of harm to people + the environment is very small, it makes more sense to me to use military facilities for these shipments — security + trained personnel can be more controlled more easily. And people in Tacoma are tired of being considered a waste facility.

117-1

117-2

Name: Nancy Pearson Telephone: _____

Address: 6708 Bridgeport City/State/Zip Code: Tacoma WA 98467

* For more information, contact the Office of Spent Fuel Management (EM-37), Office of Environmental Management, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

Response to Comment No. 117-1

There is no such thing as a worst case scenario because for any worst case that is postulated, a still more severe accident can be postulated by adding one more drum of gasoline, one more wrecked rail car, one more terrorist, etc. In addition, for each assumption that is made to make a postulated accident more severe, the probability of the accident becomes smaller. The EIS does not contain a worst-case scenario, but a broad range of port accident scenarios, including severe accidents, is discussed in Section 4.2.2.3 of the EIS. Appendix D, Section D.5.4.3.2 of the EIS presents the risks of a very high temperature fire that engulfs a cask, which was part of a sensitivity study on release fractions.

Response to Comment No. 117-2

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present on military ships and at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military facilities is noted.

Two paragraphs have been added to Section 2.6.3.1 of the EIS to discuss why special security is not needed for the receipt of foreign research reactor spent nuclear fuel.

In regard to needing to use military facilities because of special training, spent nuclear fuel from foreign research reactors is shipped in standard ISO containers, and does not require special training of workers (Section 2.6.3.2.2 of the EIS); experience in handling of ISO containers, which all of the candidate ports have, is all that is necessary.

As to the commentor's statement that Tacoma is tired of being considered a waste facility, if foreign research reactor spent nuclear fuel is accepted into the U.S., it would only pass through the port on its way to a DOE management site, remaining in the Tacoma area for no longer than twenty four hours. Thus, neither Tacoma nor any of the other nine potential receipt ports would be used as a waste facility.

COMMENTOR NO. 118: GRAHAM, AMIE-RUTH K.

Public Opinion Survey

The Port of Tacoma Commission is seeking citizen input on the issue of potential shipments of spent nuclear fuel elements through the Port of Tacoma.

We appreciate your comments and concerns on this important issue. We will forward your comments to the Department of Energy. To have your opinion count, please fill out his form and mail it to the Port of Tacoma, P.O. Box 1837, Tacoma WA 98401 by June 19, 1995. You may also send it by facsimile to (206) 593-4570.

SURVEY: NUCLEAR FUEL ELEMENT SHIPMENTS THROUGH TACOMA

- [X] I oppose spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am in favor of spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am undecided. *

COMMENTS: I feel that the possable risks are by far out weighed by the short term benafits the risk involved, as "slight" as it is; I feel is not worth the few jobs that it would create. I would personally at risk. I and many people in my aquantiance have discussed this and would consider moving. I am strongly against these products/ items/fuels through port of tacoma & our City streets and rail systems. →

Name: Amie-Ruth K. GRAHAM Telephone: 561-3770

Address: 601 N. Jackson #5 City/State/Zip Code: Tacoma WA. 98405

* For more information, contact the Office of Spent Fuel Management (EM-37), Office of Environmental Management, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

118-1

118-2

RESPONSE TO COMMENT
COMMENTOR NO. 118: GRAHAM, AMIE-RUTH K.

Response to Comment No. 118-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 118-2

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). The analysis in Section 4.2 of the EIS demonstrates that, the risks associated with implementation of the proposed action to human health or the environment would be low.

COMMENTOR NO. 119: BLOSE, CHARLENE J.

Public Opinion Survey

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We appreciate your comments and concerns on this important issue. We will forward your comments to the Department of Energy. To have your opinion count, please fill out his form and mail it to the Port of Tacoma, P.O. Box 1837, Tacoma WA 98401 by June 19, 1995. You may also send it by facsimile to (206) 593-4570.

SURVEY: NUCLEAR FUEL ELEMENT SHIPMENTS THROUGH TACOMA

- [X] I oppose spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am in favor of spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am undecided. *

COMMENTS: I understand about prospect Job opportunities realated to this shipping activity, but on personal Knowledge about Commencement Bay Health it would benefit TACOMA Not to accept Shipment. Also additional research should be sought IN finding other ports of Entry that would be better handling procedures For Nuclear elements.

Name: Charlene J. Blose Telephone: (206) 383-2429

Address: 771 Broadway City/State/Zip Code: TACOMA, WA 98403

* For more information, contact the Office of Spent Fuel Management (EM-37), Office of Environmental Management, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

119-1

119-2

RESPONSE TO COMMENT
COMMENTOR NO. 119: BLOSE, CHARLENE J.

Response to Comment No. 119-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 119-2

DOE initially considered 161 ports (153 commercial and eight military ports) as ports of entry for foreign research reactor spent nuclear fuel. These ports were evaluated against the selection criteria (Appendix D, Section D.1.9 of the EIS), resulting in 10 ports that met all of the criteria as being acceptable for the receipt and handling of foreign research reactor spent nuclear fuel. The results of the application of these criteria to the initial 161 ports is set forth in Appendix D, Section D.1.9 of the EIS.

The experience criterion used in the port selection process evaluates the port's experience in handling containerized cargo, not necessarily for dealing with nuclear or radioactive material (Appendix D, Section D.1.9.1 of the EIS). Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the transportation casks used to transport it would be low, so no special handling would be required; experience with handling containers is sufficient. The Port of Tacoma has significant experience handling containers, so it met the experience selection criterion.

COMMENTOR NO. 120: ANDERSON, S.A.

Public Opinion Survey

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SURVEY: NUCLEAR FUEL ELEMENT SHIPMENTS THROUGH TACOMA

☐ I oppose spent nuclear elements being shipped through the Port of Tacoma.

☒ I am in favor of spent nuclear elements being shipped through the Port of Tacoma.

☐ I am undecided. *

COMMENTS: While I am personally convinced this could be done safely through the Port of Tacoma, or any port, the level of preparation by the DOE panel was so poor that no one could be convinced

120-1

Name: S. A. ANDERSON Telephone: (206) 857-3157

Address: 12111 102ND AVE CT NW City/State/Zip Code: GIG HARBOR WA 98329

* For more information, contact the Office of Spent Fuel Management (EM-37), Office of Environmental Management, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

RESPONSE TO COMMENT
COMMENTOR NO. 120: ANDERSON, S.A.

Response to Comment No. 120-1

The commentor's favorable statement on the use of the Port of Tacoma as the port of entry for foreign research reactor spent nuclear fuel is noted. The commentor's concerns about the preparation of the panel are noted. The Port of Tacoma is one of ten candidate ports of entry which are determined to be acceptable in the case that foreign research reactor spent nuclear fuel is accepted into the United States.

Commentor No. 121: Blakeslee, Elizabeth E.

Public Opinion Survey

The Port of Tacoma Commission is seeking citizen input on the issue of potential shipments of spent nuclear fuel elements through the Port of Tacoma.

We appreciate your comments and concerns on this important issue. We will forward your comments to the Department of Energy. To have your opinion count, please fill out his form and mail it to the Port of Tacoma, P.O. Box 1837, Tacoma WA 98401 by June 19, 1995. You may also send it by facsimile to (206) 593-4570.

SURVEY: NUCLEAR FUEL ELEMENT SHIPMENTS THROUGH TACOMA

- [x] I oppose spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am in favor of spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am undecided. *

COMMENTS: _____

Name: Elizabeth E. Blakeslee Telephone: 531-8880

Address: 112-127th St. So. #2 City/State/Zip Code: Tacoma, WA 98444

* For more information, contact the Office of Spent Fuel Management (EM-37), Office of Environmental Management, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

121-1

Response to Comment
Commentor No. 121: Blakeslee, Elizabeth E.

Response to Comment No. 121-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 122: SUTHERLAND, MARTIN A.

Public Opinion Survey

The Port of Tacoma Commission is seeking citizen input on the issue of potential shipments of spent nuclear fuel elements through the Port of Tacoma.

We appreciate your comments and concerns on this important issue. We will forward your comments to the Department of Energy. To have your opinion count, please fill out his form and mail it to the **Port of Tacoma, P.O. Box 1837, Tacoma WA 98401 by June 19, 1995.** You may also send it by facsimile to (206) 593-4570.

SURVEY: NUCLEAR FUEL ELEMENT SHIPMENTS THROUGH TACOMA

☐ I oppose spent nuclear elements being shipped through the Port of Tacoma.

☒ I am in favor of spent nuclear elements being shipped through the Port of Tacoma. — 122-1

☐ I am undecided. *

COMMENTS: This is a twofold situation of spread of Nuclear Weapons — 122-2

1ST - We must do all that we can to eliminate Nuclear - (High Enrich Uranium) to Countries that do not follow the Guidelines set forth.

2ND - The Benifits in the long term of Having High Grade Uranium through the ports would be an opportunity for people in Education, Jobs, etc. — 122-3

Name: Martin A. Sutherland Telephone: 272-0530

Address: 2032 East Morton City/State/Zip Code: Tacoma/WA/ 98404

* For more information, contact the Office of Spent Fuel Management (EM-37), Office of Environmental Management, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

RESPONSE TO COMMENT
COMMENTOR NO. 122: SUTHERLAND, MARTIN A.

Response to Comment No. 122-1

The commentor's favorable statement on the use of the Port of Tacoma as the port of entry for foreign research reactor spent nuclear fuel is noted. The Port of Tacoma is one of ten candidate ports of entry which are determined to be acceptable in the case that foreign research reactor spent nuclear fuel is accepted into the United States.

Response to Comment No. 122-2

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). HEU can be used to produce nuclear weapons.

Response to Comment No. 122-3

The commentor's position that acceptance of spent nuclear fuel from foreign research reactors would provide economic benefits at ports of entry is noted. Impacts of the proposed action are discussed in Section 4 of the EIS.

Public Opinion Survey

The Port of Tacoma Commission is seeking citizen input on the issue of potential shipments of spent nuclear fuel elements through the Port of Tacoma.

We appreciate your comments and concerns on this important issue. We will forward your comments to the Department of Energy. To have your opinion count, please fill out his form and mail it to the Port of Tacoma, P.O. Box 1837, Tacoma WA 98401 by June 19, 1995. You may also send it by facsimile to (206) 593-4570.

SURVEY: NUCLEAR FUEL ELEMENT SHIPMENTS THROUGH TACOMA

- ☐ I oppose spent nuclear elements being shipped through the Port of Tacoma.
- ☑ I am in favor of spent nuclear elements being shipped through the Port of Tacoma.
- ☐ I am undecided. *

123-1

COMMENTS: _____

Name: John Philbrick Telephone: 438 1055

Address: 1237 Dearborn SE City/State/Zip Code: Olympia

* For more information, contact the Office of Spent Fuel Management (EM-37), Office of Environmental Management, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

Response to Comment No. 123-1

The commentor's favorable statement on the use of the Port of Tacoma as the port of entry for foreign research reactor spent nuclear fuel is noted. The Port of Tacoma is one of ten candidate ports of entry which are determined to be acceptable in the case that foreign research reactor spent nuclear fuel is accepted into the United States. If any foreign research reactor spent nuclear fuel were to be accepted into the United States, the selection of the actual port(s) of entry to be used would be made in the Record of Decision, subsequent to completion of this final EIS.

COMMENTOR NO. 124: WRIGHT, CURTIS

Public Opinion Survey

The Port of Tacoma Commission is seeking citizen input on the issue of potential shipments of spent nuclear fuel elements through the Port of Tacoma.

We appreciate your comments and concerns on this important issue. We will forward your comments to the Department of Energy. To have your opinion count, please fill out his form and mail it to the **Port of Tacoma, P.O. Box 1837, Tacoma WA 98401 by June 19, 1995.** You may also send it by facsimile to (206) 593-4570.

SURVEY: NUCLEAR FUEL ELEMENT SHIPMENTS THROUGH TACOMA

- [X] I oppose spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am in favor of spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am undecided. *

COMMENTS: MAIN REASON I OPPOSE IS SAFETY. BECAUSE OF RISK DUE TO RECENT GEOLOGICAL STUDY RELEASED REGARDING THE MUD FLOW CAUSED IF MT. RAINIER SHOULD BLOW.

Name: CURTIS WRIGHT Telephone: 206 566-0526

Address: 7623 27 ST. W. #A2 City/State/Zip Code: TACOMA WA 98466

* For more information, contact the Office of Spent Fuel Management (EM-37), Office of Environmental Management, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

124-1

RESPONSE TO COMMENT
COMMENTOR NO. 124: WRIGHT, CURTIS

Response to Comment No. 124-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a volcanic event and possible subsequent mud slides would be low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a mud slide, even if it buried the cask or caused structures to fall on top of the cask, would not be expected to compromise the transportation cask.

The evaluation of accident probabilities, both marine and land, were based on national accident rates, which include locale-specific conditions only as they impact the national statistics. However, local hazards such as mud slides, while they might be the event that might cause an accident such as those analyzed in the EIS, would not increase the consequences of the accident, which were found to be minor for both marine and land transportation accidents.

Public Opinion Survey

The Port of Tacoma Commission is seeking citizen input on the issue of potential shipments of spent nuclear fuel elements through the Port of Tacoma.

We appreciate your comments and concerns on this important issue. We will forward your comments to the Department of Energy. To have your opinion count, please fill out his form and mail it to the Port of Tacoma, P.O. Box 1837, Tacoma WA 98401 by June 19, 1995. You may also send it by facsimile to (206) 593-4570.

SURVEY: NUCLEAR FUEL ELEMENT SHIPMENTS THROUGH TACOMA

- [X] I oppose spent nuclear elements being shipped through the Port of Tacoma. — 125-1
- [ ] I am in favor of spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am undecided. *

COMMENTS: The risks involved in handling these materials outweigh any possible benefit the Spent Fuel Management Program offer Tacoma, Wa and the Puget Sound region. — 125-2
Public safety and preservation of our area's natural resources demand optimum priority; — 125-3
followed by active de-proliferation of Foreign Research Reactors and down scaling of nuclear energy dependent projects domestically and abroad. Thank you for allowing the public to voice their concerns. — 125-4

Name: RICHARD MARK BRAUCHER Telephone: 206-272-8941

Address: 819 N. 5th St #301 City/State/Zip Code: TAC. WA. 98403

* For more information, contact the Office of Spent Fuel Management (EM-37), Office of Environmental Management, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

Response to Comment No. 125-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 125-2

See response to comment 125-1, above.

Response to Comment No. 125-3

Health and safety were primary considerations during the evaluation of environmental effects of the proposed action (Section 4 of the EIS). The risks to human health and the environmental effects associated with accepting foreign research reactor spent nuclear fuel would be low.

Response to Comment No. 125-4

The United States can influence, but not dictate, the development and application of nuclear technology in foreign nations through diplomacy and cooperative agreements. Long-standing policies of the United States support peaceful applications of nuclear technology for nations that agree not to develop nuclear weaponry (Sections 1.1 and 1.2 of the EIS). The proposed action does not require deactivation of foreign research reactors. It does encourage the use of LEU fuel in foreign research reactors. Research, medical, industrial, and agricultural applications of foreign research reactors are described in Section 1.1 of the EIS. Deactivation of domestic reactors is outside of the scope of this EIS (Section 1.3 of the EIS).

COMMENTOR NO. 127: GRANGER, MARK & ROCHELLE

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Mark + Rochelle Granger Phone: (510) 439-7210

Title and Organization: _____

Address: 2131 Debra ct

City: Pittsburg State Ca Zip 94565

*** COMMENTS ***

C.C.C. has been confronted with a very serious decision. A decision that the D.O.E. has asked us, the people of C.C.C. to consider, evaluate, and comment on in 21 days. This seems to be a critically short period of time considering the D.O.E. has been allowed 7 years to address this issue. I am concerned, along with many of my neighbors, with the haste in which this report has been prepared. This is apparent through obvious name errors in the draft E.I.S. section on Concord, referring to some non-existent places such as" Clydes"," Brizzly Bay", and "San Suison Bay." If this is any indication of the thoroughness of this report, we are in trouble.

I am also concerned with other issues not address adequately in the E.I.S. The following is only a brief summary of a few of those concerns:

1. Why is the D.O.E. really accepting high enriched uranium from 28 different countries, many of which we have maintained friend relationships for years. With no permanent storage site designated, is it that we want to recycle it and sell it back to those countries for profit. It seems we are willing to expose our people to the results of nuclear handling catastrophes for profit. — 127-3
2. Why are we handing and transferring highly toxic uranium from ships, to our highway 1/2 mile from a major earthquake fault that has predicted high activity level. — 127-4
3. How do we, the citizens of C.C.C. benefit in any way to this very serious risk to our lives. — 127-5
4. Why is a port that is surrounded by 4 million people being considered over less densely populated areas in Oregon and Washington. — 127-6
5. No mention is made of the six oil refineries cities, six bridges, the proposal of six new coke burning domes along the route to the Concord Naval Weapons Station. — 127-7
6. Why are you considering a transporting nuclear fuel in such a busy, steadily growing port with such a risk of ship collision and fire? — 127-8
7. No provisions have been made to improve the doc performance of the men employed to off load the cargo. It was stated in the meeting that the same employees would be used as are employed now. A scary thought when one considers that from 1987-1992, 93-100 accidents have occurred on that site. Not to mention the lack of substance abuse testing and improperly labeled containers. — 127-9
8. Why no worse case scenarios? Would it show the devastation that one accident would create? — 127-10

In short I feel this report has been hastily prepared and puts our county at risk for nuclear disaster.

Rochelle Granger

Rochelle Granger
citizen of Pittsburg

RESPONSE TO COMMENT
COMMENTOR NO. 127: GRANGER, MARK & ROCHELLE

Response to Comment No. 127-1

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 days total) to be sufficient for public comment.

Response to Comment No. 127-2

Appendix D, Section D.2.1.6 of the EIS has been revised to incorporate the corrections identified by the commentor.

Response to Comment No. 127-3

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). Acceptance or other management of the spent nuclear fuel from our stable, developed allies is required because the actions taken by these countries (i.e., whether they cease the use of HEU in their civil programs) is a powerful example for the rest of the world, including many less developed, less stable countries.

In addition, the United States is currently attempting to convince Russia and China to implement programs to encourage their client states to also phase out use of HEU in their research reactors. If the United States cannot convince its own allies to stop the use of HEU, we would stand little chance of convincing Russia and China to cooperate in this effort.

Even in cases where DOE might use chemical separation as a means of preparing the spent nuclear fuel for disposition, any sale of separated uranium would only offset a portion of the costs that would be borne by the United States. DOE would not make a profit.

Response to Comment No. 127-4

The possibility of earthquakes in the Concord area was taken into account in the calculations in Section 4.2.2.3 and Appendix D of the EIS. Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident, and thus affect the probability of such accidents; however, the number of earthquakes-induced ship and road accidents is small compared to other causes.

COMMENTOR NO. 127:
GRANGER, MARK & ROCHELLE (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 127:
GRANGER, MARK & ROCHELLE (CONT'D.)

Response to Comment No. 127-5

The benefit to the citizens of the United States from the proposed action, including those in potential ports of entry, along transportation routes, or near potential management sites, is a reduction in the risk that weapons grade uranium from civil programs could be diverted into production of nuclear weapons that might be used against us or our allies. On the other hand, the analyses recorded in Section 4 of the EIS demonstrate that the risks associated with the proposed action are low.

Response to Comment No. 127-6

The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk of bringing foreign research reactor spent nuclear fuel through the Concord NWS, or any other port, is low. The use of a remote port could slightly reduce the already low consequences of an accident, however there are other considerations that also must be made when making port selection. Appendix D, Section D.1.9 of the EIS presents a complete discussion the port selection process.

Response to Comment No. 127-7

The physical constraints of the passage from San Francisco Bay to Concord NWS were considered as part of the port selection process. The passage does meet the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). Also, the port selection criteria do not consider the existence of land-based facilities such as refineries because the addition of some mishap at a land-based facility would not add to the severity of the worst plausible accident, which is considered to be the collision of the ship carrying the foreign research reactor spent nuclear fuel with a petroleum tanker.

Response to Comment No. 127-8

The EIS contains the results of analysis of a severe accident in which a ship carrying foreign research reactor spent fuel is involved in a collision with another ship, severe enough to breach the spent nuclear fuel transportation cask and subject the cask to a fire resulting form the collision (Section 4.2.2.3). The results of this analysis show that the risk is low.

COMMENTOR NO. 127: GRANGER, MARK & ROCHELLE (CONT'D.)

RESPONSE TO COMMENT COMMENTOR NO. 127: GRANGER, MARK & ROCHELLE (CONT'D.)

Response to Comment No. 127-9

As the result of public concern borne from a September, 1993 television report, the Contra Costa County Board of Supervisors initiated an investigation of the safety at Concord NWS. Their report on the subject, *Safety at the Concord Naval Weapons Station*, dated November 2, 1993, concluded in part that, "There were no incidents involving explosions or radiation exposure. Many of the reported incidents were not accidents caused by Weapons Station employees but, rather, were discoveries by employees that materials being received had been damaged during loading or transit. In some cases the shipments had not been properly blocked, braced or banded."

In fact, the safety record at Concord NWS is significantly better than that of similar activities in ports in the private sector. According to the Department of Labor statistics, for the category of marine cargo handling, the number of lost workday cases per 100 full-time workers for 1993 was 7.1 nationwide (1994 data not available), which is typical. The number of lost workday cases per 100 workers at Concord NWS for the first three quarters of fiscal year 1995 was 5.3, which is also typical for Concord.

Response to Comment No. 127-10

CEQ regulations and guidance do not require a worst case analysis of accidents in an EIS. For the purpose of analysis in the EIS, there is no such thing as a worst case scenario because for any worst case that is postulated, a still more severe accident can be postulated by adding one more drum of gasoline, one more wrecked rail car, one more terrorist, etc. In addition, for each assumption that is made to make a postulated accident more severe, the probability of the accident becomes more remote.

The analyses that were performed to evaluate the impact of various accidents divided all accidents into six categories (Appendix D, Section D.5.3.1.1). The most severe accident category, release category 6, assumes that the ship carrying the foreign research reactor spent nuclear fuel transportation cask is in a collision with a tanker and that a fire occurs that engulfs the transportation cask. The consequences of accidents, including category six accidents (the worst case scenario), are discussed in Appendix D, Section D.5.4.2.2.

COMMENTOR NO. 128: SEENO, C.M.

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: C.M. Seeno Phone: _____

Title and Organization: concerned citizen

Address: P.O. Box 977

City: Clayton State CA Zip 94517

*** COMMENTS ***

I and my family are very much opposed to the proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. 128-1

We feel that this area is much too densely populated to allow such a possible hazard. 128-2

We feel this material should be stored in a remote area away from towns + citiesm [redacted] and people. 128-3

We fear what would happen, if these reactors somehow were damaged - via an accident while transporting - terrorism or who knows what else 128-4

We do not want this in our area. It is too dangerous

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 128: SEENO, C.M.

Response to Comment No. 128-1

The commentor's opposition to the proposed action as described in Section 2.1 of the EIS is noted. Sections 2.2, 2.3 and 2.4 of the EIS describe each of the proposed management alternatives.

Response to Comment No. 128-2

The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk of bringing foreign research reactor spent nuclear fuel through the Concord NWS, or any other of the ten ports selected, is low. The use of a remote port might slightly reduce the already low consequences of an accident, however, there are other considerations that also must be made when making port selection. Appendix D, Section D.1.9 of the EIS presents a complete discussion of the port selection process.

Response to Comment No. 128-3

The commentor's preference for storage only in remote areas is noted. The populations surrounding the five potential management sites under are listed in Table A-6 in Appendix A of the EIS.

Response to Comment No. 128-4

The commentor's opposition to any nuclear material being transported through the Concord area is noted. Sections 4.2.2 and 4.2.3 of the EIS, however, show that the risks of receiving the foreign research reactor spent nuclear fuel at Concord and transporting it by truck or rail would be low. Section D.5.9 has been added to Appendix D of the EIS to address the issue of attack by disgruntled persons or terrorists.

COMMENTOR NO. 129: KIRKLAND, KIRK

2601 70th Avenue W, Suite E, Tacoma WA 98466

May 31, 1995

Charles Head
U.S. Department of Energy (EM-37)
1000 Independence Ave. S.W.
Washington D.C. 20686

Dear Mr. Head,

The Tahoma Audubon Society is opposed to the importing of high level spent fuled rods from 41 nations through Portland or the Puget Sound and the Port of Tacoma. We are appaled at the selection of Handford as a Phase II destination and storage facility. The local Audubon chapter represents more than 1600 members. 129-1

If Alternative I is selected and the the United States is going to clean up other nation's nuclear wastes, then the importation should be done aboard miliatry ships and through military ports. No commercial freighters or public ports in large cities should be used. Without USDOE agreeing to pay for monitory, training or equipping local emergency personnel to respond when an accident occurs, this proposal is unfair to port workers and residents in Tacoma or Portland in the event of a truck, train, or a ship board fire accident. 129-2 129-3 129-4

Using the Port of Tacoma as a transhipment point is out of the question. Today the movement of oil tankers in Puget Sound is carefully restricted. A ship wreck involving nuclear fuel puts the hundreds of thousands of people who live along the shores of Puget Sound at risk. Without extreme precautions in place to provide for such an emergency, shipping nuclear fuel is just another Valdez oil spill waiting to happen -- with more distarous consequences. 129-5

The history of USDOE funding and commitment to clean up Hanford is a good indication of USDOE ineffectiveness. After years of cleanup "studies" Handford still has nuclear fuel cooling basins along the Columbia River that are leaking. The new facility proposed for Hanford should not be increased until USDOE can solve it's current problems with safety upgrades and fuel removal form K-Basin. 129-6

Shipping nuclear wastes in uninspected containers through populated ports and cities is a gross disregard for the health safety and welfare of the people of these communities by their government. 129-7

We insist that the Alternative 2 be chosen. The nuclear material should be stored at the reactor and in the country where it was created with proper international monitoring and U.S. technical aid. 129-8

Sincerely,

Kirk Kirkland
Co President

RESPONSE TO COMMENT
COMMENTOR NO. 129: KIRKLAND, KIRK

Response to Comment No. 129-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Ports of Tacoma and Portland or Puget Sound is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk of bringing spent nuclear fuel to the Ports of Tacoma or Portland, or to any of the ports analyzed in the EIS, is low.

With respect to commentor's opposition to the use of the Hanford Site, see response to comment 129-6, below.

Response to Comment No. 129-2

As discussed in Appendix D, Section D.1 of the EIS, both commercial and military ports were evaluated. Environmental effects of Management Alternative 1 and 3 at candidate commercial and military ports were evaluated and found to be insignificant (Sections 4.2.2 and 4.5). There is no reason to prefer commercial or military ports based on environmental consequences. As discussed in Appendix D of the EIS, there is no environmental basis for preferring military vessels to commercial vessels.

Response to Comment No. 129-3

Based on the analysis of impacts associated with accidents and incident-free operations involving foreign research reactor spent nuclear fuel, the EIS demonstrates that commercial ships and facilities represent an acceptable option for the transportation of foreign research reactor spent nuclear fuel. Section 4.2.2.3 of the EIS describes consequences of port accidents and Section 4.2.2.2 presents the impacts of incident-free operation.

Response to Comment No. 129-4

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through

DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and interface.

Response to Comment No. 129-5

The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 and Appendix D, Section D.5 of the EIS).

Response to Comment No. 129-6

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE would be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel managed by DOE would be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 129: KIRKLAND, KIRK (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 129: KIRKLAND, KIRK (CONT'D.)

Response to Comment No. 129-7

The commentor's statement that suggests that the foreign research reactor spent nuclear fuel elements are shipped in "uninspected containers" is incorrect. The spent nuclear fuel transportation casks are maintained and inspected according to the regulations and requirements dictated in the casks' certificate of compliance issued by the U.S. Department of Transportation. The shipper is responsible to ensure compliance with all requirements. In addition, the loading of the spent nuclear fuel elements in the transportation cask would be performed according to an inspection procedure detailed in a TransportationPlan provided by DOE and the process would be observed by a DOE representative. General provisions of the Transportation Plan are given in Appendix H of the EIS.

Response to Comment No. 129-8

The commentor's preference for Management Alternative 2, Subalternative 1a is noted. At-reactor storage for long periods of time, however, is often not feasible (Sections 2.3 and 4.4.1 of the EIS).

COMMENTOR NO. 132: HERBERT, PAT

United States Department of Energy
Office of Environmental Management (EM-37)
Attn: Mr. Charles Head
1000 Independence Avenue, S. W.
Washington, D.C. 20585-0001

June 6, 1995

Dear Mr. Head:

This is my comment upon the Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

My choice, which is not really an option, is to process and store all waste from other countries somewhere on their continent. That means a receiving and storage station, wet and dry storage, and permanent storage facilities would need to be built perferably in a secluded area acceptable to those countries involved in producing the fuel and other wastes connected with their reactors and research facilities. 132-1

I am very much against shipping long distances by truck, rail, ship, or plane any nuclear or hazardous waste materials. I support this viewpoint in this country as well as in other countries. I think it is very dangerous to even consider shipping all the fuel and wastes that have been produced in other countries to this one. And, I don't think it compromises our stand on safety. We have for years trusted these countries with this material why shouldn't we let them, with our expertise, learn about cleanup, treatment, and storage? 132-2 132-3 132-4

What's wrong with using certain areas in Russia? There are vast amounts of land that are unpopulated and could serve as the facility for international fuel and wastes. It seems the most practicable to me and with the end of the Cold War what is the problem? Why do the people of the United States have to live with the wastes from other countries? Responsiblity must come with technological innovation and these countries must accept theirs which probably they don't mind doing if we would just allow them to proceed. 132-5

Thank you for allowing me to comment.

Sincerely,

Pat Herbert

Pat Herbert
P.O. Box 95966
Seattle, WA 98145

RESPONSE TO COMMENT
COMMENTOR NO. 132: HERBERT, PAT

Response to Comment No. 132-1

The option described in this comment is equivalent to Management Alternative 2. The alternative is described in more detail in Section 2.3 and the policy considerations and environmental impacts are presented in Section 4.4 of the EIS.

Response to Comment No. 132-2

The commentor's opposition to all forms of transport of all nuclear or hazardous waste materials is noted. However, DOE would also like to point out that spent nuclear fuel shipments have been carried out for over 40 years. During that period, there has never been an accident that has resulted in the breach of a spent nuclear fuel transportation cask or the release of radiological material from such a transportation cask. The EIS demonstrates that the risks from such activities are low (Sections 4.2.1, 4.2.2, and 4.2.3).

Response to Comment No. 132-3

See the response to comment 132-2, above.

Response to Comment No. 132-4

As explained in Section 1.1 of the EIS, the United States has not been leaving spent nuclear fuel from foreign research reactors in foreign countries for years. Starting in the early 1960s, the United States began accepting spent nuclear fuel from foreign research reactors specifically to prevent stockpiles of weapons-grade uranium abroad. It has only been since the policy for acceptance of HEU spent nuclear fuel expired in 1988 that spent nuclear fuel has been left at the research reactors sites while DOE developed a new policy for management of this spent nuclear fuel.

Nevertheless, the EIS specifically addresses the option of leaving the spent nuclear fuel in foreign countries (Management Alternative 2, Section 2.3 of the EIS). The EIS also explains the advantages and disadvantages that would follow from implementation of this alternative.

Response to Comment No. 132-5

At the end of the cold war, Russia and other members of the former Soviet Union were left with a large inventory of weapons-grade fissionable material. The United States is concerned over potential diversions of these materials to nuclear weapons programs and is taking actions to reduce this inventory. Shipping spent nuclear fuel from foreign research reactors to Russia would increase this concern. In any case, overseas management of spent nuclear fuel from foreign research reactors is discussed in Section 2.3 of the EIS.

COMMENTOR NO. 134: PAWLOSKI, BERNA J.

Hazel O'Leary
Department of Energy
1000 Independence Ave.
Washington, D.C. 20585

Dear Ms. O'Leary:

This letter is written to protest the decision to send all NUCLEAR WASTE through the San Francisco Bay to the CONCORD NAVAL WEAPONS STATION for further distribution along our State and Federal highways to places to contain such waste. 134-1

What is our government thinking of? Don't they realize the congestion areas that they will be puting in jeopardy? Just one little leak in the San Francisco Bay could contaminate the whole bay and effect millions of people! 134-2

Why can't this waste be initially sent to a port of entry that is more remote? The Concord Naval Weapons Station is enough of a threat to the greater Bay Area without the addition of NUCLEAR WASTE within its' boundaries! 134-3

Please respond in writing as to why this decision cannot be changed and another location utilized.

PLEASE RECONSIDER THIS DECISION.

Sincerely,

Berna J. Pawloski
P.O. Box 457
Sutter Creek, CA
95685

cc: President William Clinton
Rep. John Doolittle
Senator Barbara Boxer
Senator Diane Feinstein
Governor Pete Wilson
State Leg. David Knowles

RESPONSE TO COMMENT
COMMENTOR NO. 134: PAWLOSKI, BERNA J.

Response to Comment No. 134-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 134-2

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. As stated in Section 2.6.2 of the EIS, in over four decades of shipments, no spent nuclear fuel transportation cask has ever released any of its contents (radioactive material) as the result of an accident. Spent nuclear fuel transportation casks passing through the Bay area to Concord NWS, or any other port or waterway, would not release their contents, because the foreign research reactor spent nuclear fuel is a solid metal fuel and it would be transported dry. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

Response to Comment No. 134-3

The use of a remote port could slightly reduce the consequences of an accident which would be low, however, there are other considerations that also must be made when selecting a port. Appendix D, Section D.1.9 of the EIS presents a complete discussion of the port selection process.

* This is the best available copy of this comment document.

COMMENTOR NO. 136: FORM LETTER B

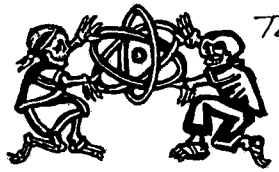
DANGER! RADIOACTIVE WASTE *Coming soon to a town near you!*

From: DeSirey-Dodge Peace Post
Chris Dodge/Jan DeSirey
4645 Columbus Ave. S.
Minneapolis, MN 55407 U.S.

Dear Mr. Head:

Thanks for the offer, but we don't want your toxic garbage in the San Francisco Bay Area. The DOE, and the DOD, invented nuclear waste, peddled uranium all over the world, and now want the taxpayers to clean it up. No thanks!
The corporations who profitted should bear the cost and the responsibility of cleaning up their own mess.

136-1



To:

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-7)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington DC 20585

RESPONSE TO COMMENT
COMMENTOR NO. 136: FORM LETTER B

Response to Comment No. 136-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk of bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Commentor No. 136: Form Letter B

Individuals submitting this form letter:

Anonymous
Anonymous
Anonymous
Anonymous
Anonymous
Anonymous
Anonymous
Anonymous
Anonymous
Axford, Roger W.
Baltzo, Andy
Berrean, Gina
Boehny, G. E. Martre
Burkhardt, Leonard B.
Demi, R.
Detwiler, Winifred
Dodge, Chris
Fletcher, Sonia
Goldberg, Ethel E.
Gray, Jerri
Gray, Walter
Hall, Freya
Harcott, Edita
Hollander, Leonore D.
Johnston, Candice
Lvx, Orland
Norton, Kurt
Perry, Suzanne
Rehm, Rush
Rose, J.
Scheritz, Andrei
Strickland
Yurma, R.H.
Zwickel, Abe
Zwickel, Jean

Response to Comment
Commentor No. 136: Form Letter B

COMMENTOR NO. 142: ROGERS, ELEANOR

June 7, 1995

Charles Head
U.S. Dept of Energy

Dear Sir,

I would like to object to the shipment of spent nuclear fuel to the Concord Naval Weapons station in California. I feel it is a health risk and the thousands of people in this area should not be exposed to any accidental exposure

142-1

Sincerely
Eleanor Rogers
1236 Walker #313
Walnut Creek Ca
94596

RESPONSE TO COMMENT
COMMENTOR NO. 142: ROGERS, ELEANOR

Response to Comment No. 142-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 144: MINTON, MARY

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Mary Minton Phone: 458-3009
Title and Organization: Ca Co County Assessor's Clerical
Address: 740 Malhurn St.
City: Clyde State CA Zip 94520

*** COMMENTS ***

I guess my main question is why should this be in the United States at all? Every place that is picked will be objected to by the citizens of that place. Clyde is a small isolated town now. Why subject it to more hazards? With the Bay Port Chicago Highway we are a one exit town. Please — fight this with all your powers.

Sincerely,
Mary Minton

144-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 144: MINTON, MARY

Response to Comment No. 144-1

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons grade) uranium in civil programs worldwide (Section 1.2 of the EIS). Thus, the intent of the resultant proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their spent nuclear fuel (Section 1.2 of the EIS). The commentor's opposition to the use of Concord NWS as a port of entry is noted.

COMMENTOR NO. 145: GANIO, EMILY

June 7, 1995

Dear Mr. Head,

As a citizen of Contra Costa county I wish to voice my opposition to the DOE proposal to transport spent nuclear materials to and from the Concord Naval Weapons Station. 145-1

I wish I had an alternative solution - I feel they should be stored "safely" where they are presently located rather than further jeapordizing humanity by moving them all over the place. 145-2

We already have enough trouble with what's already stored at Concord and what is going on at the Livermore Lab.

Register my "no" vote on further transportation of this dangerous material. 145-1 (Cont'd.)

Sincerely,
Emily Ganio
2571 San Miguel Dr.
Walnut Creek, Ca. 94546

RESPONSE TO COMMENT
COMMENTOR NO. 145: GANIO, EMILY

Response to Comment No. 145-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 145-2

Overseas storage is addressed in the EIS as Management Alternative 2, Subalternative 1a. The commentor's preference for this alternative is noted. This alternative is discussed in Sections 2.3 and 4.4.1 of the EIS.

COMMENTOR NO. 146: MURRAY, MARGARET L.

671 St Joes Ct
Walnut Creek Ct
94598

Mr. Charles Head
1000 Independence Ave SW
Washington DC.

Dear Mr. Head
I would like to know the Department of Energy provide details on health risks to the people who live near the Concord Weapons Station.
How long would the spent fuel remain in Concord and how it would be taken away.
Is there an island in the South Pacific?

Sincerely
Mrs Margaret L Murray

146-1

146-2

146-3

RESPONSE TO COMMENT
COMMENTOR NO. 146: MURRAY, MARGARET L.

Response to Comment No. 146-1

The estimated health risks to the people who live near Concord NWS are presented in Sections 4.2.2 and 4.2.3 of the EIS. Further details are available in Appendices D and E.

Response to Comment No. 146-2

Under normal circumstances, the foreign research reactor spent nuclear fuel would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to it's destination as quickly as possible.

Response to Comment No. 146-3

Management Alternative 2, which is discussed in Sections 2.3 and 4.4.1 of the EIS, is the alternative to accepting foreign research reactor spent nuclear fuel into the United States. This alternative does not specify where the spent nuclear fuel would be stored; just that it would not enter the United States. Thus, if the comment is referring to an isolated island that belongs to another country, the commentor's alternative is covered under Management Alternative 2.

If the comment is referring to an isolated island that is part of the territory of the United States (e.g. Johnston Atoll), then the foreign research reactor spent nuclear fuel would legally be entering the United States and this subject is covered under Management Alternative 1. A discussion has been inserted into Section 2.10 of the EIS to explain why this option is not feasible.

COMMENTOR NO. 147: SLUSER, BETSY

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Betsy Sluser Phone: 510-825-0344

Title and Organization:

Address: 1525 Criquet Ct.

City: Concord State Ca Zip 94804

*** COMMENTS ***

We are new parents and new residents of Concord. Had we known that spent nuclear fuel would be proposed to be stored in Concord, we would never have considered moving here. There is no safe place to store this fuel. To consider exposing hundreds of thousands of residents to this extremely dangerous radioactive material is reckless. I propose you find another community better able to handle this material. 147-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 147: SLUSER, BETSY

Response to Comment No. 147-1

As explained in Section 2.6.5 of the EIS, the only sites considered in the EIS as candidate management sites for the foreign research reactor spent nuclear fuel were the Savannah River Site, the Idaho National Engineering Laboratory, the Hanford Site, the Nevada Test Site, and the Oak Ridge National Laboratory. Concord NWS is only being considered as a potential port of entry.

The potential impacts of managing the spent nuclear fuel are discussed in Section 4.2.4 of the EIS. The data presented demonstrate that the risk associated with spent nuclear fuel management is low.

COMMENTOR NO. 148: JENSEN, KURT & CAROL

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: KURT & CAROL JENSEN **Phone:** 510 748-0515

Title and Organization:

Address: 2044 WELLINGTON CT

City: CLYDE **State** CA **Zip** 94520

*** COMMENTS ***

I can't believe we are taking foreign reactor fuel and storing it for them. We've had enough of this stuff already. NO emergency plans have been developed. Apparently this material will be traveling thru a very densely populated area. It will most likely adversely affect property values in this area. What about a threat of terrorism? Has this been addressed? WHAT ABOUT OUR HEALTH - ISN'T URANIUM CANCER CAUSING?!!? WHAT ABOUT THE MEDICAL STUDIES DONE TO ENSURE OUR HEALTH WILL NOT BE COMPROMISED DUE TO THIS MATERIAL TRAVELING THROUGH OUR AREA?!!?GUESS WE'LL HAVE TO START REMINDING OUR ELECTED OFFICIALS THAT THEY ARE SUPPOSED TO BE LOOKING OUT FOR OUR INTERESTS.... I THINK THERE IS AN ELECTION COMING UP— OUR EMAIL WILL BE FULL COMIN

148-1
148-2
148-3
148-4
148-5

Signed,
Extremely Unhappy!

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 148: JENSEN, KURT & CAROL

Response to Comment No. 148-1

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States is noted. Section 2.3 of the EIS demonstrates other alternatives considered for the implementation of the proposed action.

Response to Comment No. 148-2

Each port considered in the EIS has developed an Area Contingency Plan. This plan outlines response capabilities, procedures and authorities for responding to and recovering from hazardous material incidents. Additionally, DOE would provide assistance to local authorities to ensure that appropriate measures would be taken in the unlikely event of an accident. As part of this assistance, DOE's Radiological Assistance Program teams, from eight offices strategically located throughout the country, would be used to coordinate and to provide remediation assistance. This type of assistance and coordination would be specified in the Transportation Plan that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected.

Response to Comment No. 148-3

Estimates of radiological health effects presented in Section 4.2.3 of the EIS are based on conservative assumptions using representative truck and rail transportation routes from candidate ports to interim management sites, including consideration of traffic volumes and surrounding populations. Supporting detail for the calculations is given in Appendix E of the EIS. Radiological and non-radiological health effects were found to be low (Section 4.2 of the EIS).

Response to Comment No. 148-4

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk of such actions. The security provisions are summarized in the new Appendix H of the EIS. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit.

Response to Comment No. 148-5

General radiological health effects are discussed in Section 4.1.3 and the specific health effects of the proposed action and alternatives are presented throughout Section 4 of the EIS.

COMMENTOR NO. 149: GARDNER, EDWARD

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: EDWARD GARDNER Phone: 510-686-1837

Title and Organization: U.S. Citizen, Honorably Discharged Vet-USN, POW/MIA (1965)

Address: 120 NORMAN AVENUE

City: CLYDE State CALIF. Zip 94520-7105

*** COMMENTS ***

Dear Sir; I have lived in the town of Clyde for ten years & Contra Costa Co. for forty five. In recent years accidents at Concord Naval Weapons Sta. have increased, although the Navy will tell you different - I live across street from main entrance & hear & see ambulances, fire trucks heading towards the river - (Some of ammo ships) At the time: Why would one want to ship spent nuclear waste under the Golden Gate up the waterways to an unloading area sitting squarely on top of an active & ready to pop Earthquake Fault. Should it same thought be given to the citizens of S.F. Bay Area. Also since the only way out of Clyde by road vehicle other than helicopter is By Train Ft. Chicago Navy - or when the Navy has blocked one end of the end of town - So Now we have a medical, Fire, Life threatening emergency, I need to leave - OOPS Can't There's a train all of Bombs across the only road out of Clyde over.

149-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 149: GARDNER, EDWARD

Response to Comment No. 149-1

As the result of public concern borne from a September 1993 television report, the Contra Costa County Board of Supervisors initiated an investigation of the safety at Concord NWS. Their report on the subject, "Safety at the Concord NWS" dated November 2, 1993, concluded in part that: "There were no incidents involving explosions or radiation exposure. Many of the reported incidents were not accidents caused by Weapons Station employees but, rather, were discoveries by employees that materials being received had been damaged during loading or transit. In some cases the shipments had not been properly blocked, braced or banded."

In fact, the safety record at Concord NWS is significantly better than that of similar activities in ports in the private sector. According to the Department of Labor statistics, for the category of marine cargo handling, the number of lost workday cases per 100 full-time workers for 1993 was 7.1 nationwide (1994 data not available), which is typical. The number of lost workday cases per 100 workers at Concord NWS for the first three quarters of fiscal year 1995 was 5.3, which is also typical for Concord.

Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the spent nuclear fuel transportation cask.

Overall, the analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 149: GARDNER, EDWARD (CONT'D.)

The Navy has no contingency plan for such Emergency. If you believe they do, ask to see it in writing — Fat Chance!

Just Another Taxpayer —

149-2

RESPONSE TO COMMENT
COMMENTOR NO. 149: GARDNER, EDWARD (CONT'D.)

Response to Comment No. 149-2

DOE is aware of agreements between the Concord NWS and Contra Costa County which would be followed in the case of an accident. The Station has a Disaster Preparedness Plan which includes a Mutual Aid Agreement between the Naval Weapons Station and Contra Costa County. Under the terms of the agreement each party is to immediately notify the other of any emergency which presents an imminent danger. A similar mutual aid agreement also exists between the Station and the County Fire Protection District.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

COMMENTOR NO. 150: HOEKWATER, TRICIA

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: TRICIA Hoekwater Phone: 510/370-3472 Work OAK

Title and Organization: Admin. Asst./Discovery Toys

Address: 2131 CARQUINEZ PLACE

City: PITTSBURG State CA Zip 94565

*** COMMENTS ***

I do NOT WANT nuclear fuel of any type housed in the AREA IN or SURROUNDING CONTRA COSTA COUNTY, PARTICULARLY, the city of CONCORD. CONCORD IS A growing family city AND this poses A REAL threat TO OURSELVES AND our children. As A RESIDENT of PITTSBURG, I spend A lot of TIME IN CONCORD As well As daily TRAVEL to/FROM WORK via highway 4 - right past the NAVAL WEAPONS STATION. I will fight this PROPOSAL AND I have the support of my community AND CO-WORKERS

150-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 150: HOEKWATER, TRICIA

Response to Comment No. 150-1

As explained in Section 2.6.5 of the EIS, the only sites which DOE is considering as locations for management of the foreign research reactor spent nuclear fuel are the Savannah River Site, the Idaho National Engineering Laboratory, the Hanford Site, the Nevada Test Site, and the Oak Ridge National Laboratory. Concord NWS is only being considered as a potential port of entry.

The potential impacts of managing the spent nuclear fuel are discussed in Section 4.2.4 of the EIS. The data presented demonstrate that the risk associated with the spent nuclear fuel management is low.

COMMENTOR NO. 151: GARDNER, W.B.

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: W. B. Gardner **Phone:** 510-674-1940

Title and Organization:

Address: 2624 Trofalgar Ct

City: Clyde **State** Ca **Zip** 94520

*** COMMENTS ***

This type 1) operation should be conducted in a less populated area. As a minimum Clyde should be leveled as was Port Chicago. This would pose a great risk to a small populated area although Bay Point and Concord do share in the risk.

151-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 151: GARDNER, W.B.

Response to Comment No. 151-1

The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel through the Concord NWS, or any other port analyzed in the EIS, is low. The use of a remote port might slightly reduce the already low consequences of an accident, however there are other considerations that also must be made when making port selection. Appendix D, Section D.1.9 of the EIS presents a complete discussion of the port selection process.

COMMENTOR NO. 152: ANDERSON, DOLORES E.

2763 Dos Rios Drive
San Ramon CA 94583
6 June 1995

Charles R. Heid
U.S. Department of Energy
1000 Independence Ave SW
Washington DC 20585-0001

Dear Mr Heid,

As a resident in Contra Costa County, California, I am aware that the DOE is considering potential ports to receive spent nuclear fuel returned from other nations.

Please be sure to provide our local officials with all details on potential hazards which may arise in conjunction with the shipments so that we may be forewarned. I know we have a moral obligation to dispose of these materials safely and I think our local citizens would agree if they are given sufficient facts. Thank you.

Yours truly,
Dolores E Anderson

152-1

152-2

RESPONSE TO COMMENT
COMMENTOR NO. 152: ANDERSON, DOLORES E.

Response to Comment No. 152-1

The estimated health risks to the people who live near Concord NWS are presented in Sections 4.2.2 and 4.2.3 of the EIS. Further details are available in Appendices D and E. DOE is required to inform the Governor of each State and any Tribal chair, or their designee, along a transportation route at least seven days before each shipment of hazardous cargoes, including radioactive materials (10 CFR Part 73). It would be the responsibility of the Governor to provide any further notification to State and local officials.

In addition, to further address this issue, individual Transportation Plans would be prepared for any shipments actually scheduled for acceptance through the Concord NWS (or any other port of entry). These Transportation Plans would be prepared in consultation with appropriate State and/or local officials to ensure that details of the transportation process are understood, that the individuals or organizations who would perform all required activities are specified and that these individuals and parties know what is expected of them (Section 2.7.5 and Appendix H of the EIS).

Response to Comment No. 152-2

The commentor's support for the purpose of the proposed action as described in Section 2.1, is noted. DOE considers that the EIS provides sufficient information and analysis to allow a reasonable decision.

COMMENTOR NO. 153: CLARK, LOUISE H.

Louise Harvey Clark
6 Blackthorn Road
Lafayette, CA 94549
(510) 299-0900

June 6, 1995

Charles Head, Program Manager
Office of spent Nuclear Fuel Management (EM-37)
FAX: 202-586-5256

Dear Mr. Head,

I understand that the Department of Energy intends to return spent nuclear fuel rods through the Concord Naval Weapons Station. I understand that these toxic materials will be moved along our city streets and freeways. Have you experienced these freeways? Has anyone ever told you that they were safe for our local drivers much less, proposed drivers of highly toxic materials? 153-1

I would like you to address the traffic count and accident rates on these freeways before you consider adding to them, trucks with highly toxic cargo.

I live a stone's throw from one of these freeways. My grandchildren live three miles away, also a stone's throw from one of those freeways. Would you want your grandchildren exposed to such potential hazards? 153-2

I look forward to hearing your answers to my questions.

Sincerely,

Louise H Clark

Louise H. Clark

RESPONSE TO COMMENT
COMMENTOR NO. 153: CLARK, LOUISE H.

Response to Comment No. 153-1

The frequency of accidents on highways has been taken into account in all ground transport risk estimates in the EIS. As discussed in Section 4.2.3 and Appendix E of the EIS, spent nuclear fuel has been transported along highways, railways, and waterways for over four decades without release of the radioactive contents from the spent nuclear fuel transportation cask, even as a result of an accident.

Response to Comment No. 153-2

Sections 4.2 and 4.5 of the EIS discuss the risks and consequences of transporting foreign research reactor spent nuclear fuel, and demonstrate that the risks would be low to persons located near a port, transportation route, or a management site.

COMMENTOR NO. 154: CUTTER, BETTY LOU

June 5, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management
U.S. Dept. of Energy
1000 Independence Avenue SW
Washington, D.C. 20585

Dear Mr. Head:

I understand the Dept of Energy intends to return spent nuclear fuel rods through the Concord Naval Weapons Station. I understand this is in an effort to reduce the amount of enriched uranium in civil programs worldwide.

It would seem our intention would be better served if we first stopped selling uranium to other countries and worked on conversion to other sources of energy. 154-1

This plan seems like a terrible thing to do. An accident would be far more than serious. There's Buchanan airfield, oil refineries, fifteen cities, and six bridges. 154-2

I don't think the matter has been carefully considered.

Sincerely,
Betty Lou Cutter
2500 Ivy Lane #108
Walnut Creek, Calif.
94595

RESPONSE TO COMMENT
COMMENTOR NO. 154: CUTTER, BETTY LOU

Response to Comment No. 154-1

The current inventory of HEU at foreign research reactors is a concern because portions of it could be diverted to weapons programs. The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). Conversion of foreign research reactors to other sources of energy such as solar or wind power is not feasible because the alternate sources of energy cannot provide the neutrons required for the research, medical, commercial, and educational benefits of these reactors (Section 1.1 of the EIS).

Response to Comment No. 154-2

The analysis in Section 4.2.2.3 of the EIS on impacts associated with an accident involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident.

See the response to comment 107-9 for a discussion of the impacts of Buchanan Field upon the receipt of foreign research reactor spent nuclear fuel at Concord NWS.

The physical constraints of the passage from San Francisco Bay to Concord NWS were considered as part of the port selection process. The passage, although it passes near bridges and refineries, does meet the requirements of Criterion 2 (Favorable Transit From Open Ocean) for the port selection (Appendix D, Section D.1.9.2 of the EIS).

Population of the port and surrounding areas is also a consideration of the port selection criteria. The population criterion for port selection (Criterion 5) is discussed in more detail in Appendix D, Section D.1.9.5 of the EIS.

COMMENTOR NO. 155: GANIO, MARIO

1521 San Miguel Dr.
Walnut Creek, CA 94596
June 7, 1995

Dear Mr. Head

Speaking for my wife and my self, our children and their children, we oppose your use storing, even on a temporary basis, nuclear waste materials in the San Francisco/Oakland bay area.

Sincerely,

Mario Ganio
(510) 935-2263
marzy@aol.com

155-1

RESPONSE TO COMMENT
COMMENTOR NO. 155: GANIO, MARIO

Response to Comment No. 155-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS and the San Francisco Bay area is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS and the San Francisco Bay area, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 156: GANDY, STEVE

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: STEVE GANDY **Phone:** 510 682-9522
Title and Organization: PRIVATE US CITIZEN
Address: 225 SUSSEX ST.
City: CLYDE **State** CA **Zip** 94520

*** COMMENTS ***

THIS AREA SHOULD NOT BE CONSIDERED FOR THIS PROGRAM. IT IS A FAR TOO POPULATED REGION TO RISK SAFTEY OF A GREAT NUMBER OF PEOPLE SHOULD THERE ARISE PROBLEMS IN THE FUTURE. ALSO THERE ARE NEIGHBORHOOD HOUSES TOO CLOSE TO THIS PROPOSED ACTIVITY. 156-1

IF THIS PROGRAM MUST BE ADMINISTERED A REMOTE LESS POPULATED REGION NOT NEAR HOMES CAN BE FOUND. MY RECOMMENDATION IS TOO SPEND AS MUCH TIME AS POSSIBLE INVESTIGATING THE PROPER SITE. THERE SHOULD BE NO RUSH TO FIND A SITE, AND THAT THIS IS NOT THE APPROPRIATE LOCATION! 156-2

To Mail in Comment, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 156: GANDY, STEVE

Response to Comment No. 156-1

Concord NWS was one of ten ports that was determined to be acceptable to receive the foreign research reactor spent nuclear fuel, if the material is to be accepted by the United States. Population of the port, surrounding areas to a radius of 10 miles, and the population along the transportation routes were considered in the port selection criteria. The population around Concord and on the routes to the management sites was low enough to qualify Concord NWS as an acceptable port. The population criterion for port selection (Criterion 5) is discussed in more detail in Appendix D, Section D.1.9.5 of the EIS.

Response to Comment No. 156-2

The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel through the Concord NWS, or any other port analyzed in the EIS, is low. The use of a remote port might slightly reduce the already low consequences of an accident, however there are other considerations that also must be made when making port selection. Appendix D, Section D.1.9 of the EIS presents a complete discussion of the port selection process. DOE considered 161 ports (153 commercial and eight military ports) as ports of entry for foreign research reactor spent nuclear fuel. These ports were evaluated against selection criteria, resulting in 10 ports that met all of the criteria as being acceptable for the receipt and handling of foreign research reactor spent nuclear fuel. Appendix D, Sections D.1.8 and D.1.9 present a detailed discussion of the process and results.

COMMENTOR NO. 157: STENNICK, JOHN

157-1

we don't want this happ...

A dangerous plan

The U. S. Department of Energy has proposed the importation of high-level nuclear waste from 41 nations throughout the world, which would be routed through Portland or Puget Sound and destined for the "K-Basin" area at our own Hanford on the Columbia River. This is a part of the proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

The spirit of this plan is noble in trying to curtail the production of nuclear bombs by Third World nations. However, when one looks more closely at the specifics, one realizes that the DOE is planning to import the high-level radioactive waste from countries like Japan, Australia, Canada, Sweden, Switzerland, etc.

In my opinion, these countries are not exactly part of the Third World. These nations should be held accountable for their own spent fuel and should plan for the safe storage of this highly toxic waste within their own borders.

The DOE is planning to use normal shipping lanes for the transportation of this imported waste. Traffic and shipping accidents are likely and could result in fires. The storage casks are our only protection from this waste that may be headed up our rivers and down our highways very soon.

Hanford is not an acceptable sight for the storage of even more high-level waste. In fact, Hanford already has a leaking storage pool alongside the Columbia River. This river is the lifeblood of our region and must not be ruined by nuclear contamination.

I urge all citizens to write a letter to the Department of Energy, C/O Charles B. Head, at the office of Spent Fuel Management, EM-37, 1000 Independence Ave. SW, Washington, D.C. 20585-0001. He will only accept correspondence on this issue until the cutoff date of June 20.

Stop this disgrace...!

RESPONSE TO COMMENT
COMMENTOR NO. 157: STENNICK, JOHN

Response to Comment No. 157-1

The commentor's opposition to the following alternatives is noted: a) acceptance of spent nuclear fuel from countries other than third world countries, b) use of normal shipping lanes, highways, and rail lines for transportation of spent nuclear fuel, and c) use of the Hanford Site for management of spent nuclear fuel from foreign research reactors. As discussed in Sections 1.2 and 2.2 of the EIS, one alternative under consideration is to accept such spent nuclear fuel from developed and developing countries for a limited period of time. The intent of this proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). The analysis given in Section 4 of the EIS indicates that radiological health risks and environmental effects resulting from the proposed action and management alternatives would be low.

The selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 163: WHITING, MARCUS

TO: Mr. Ivan Selin
Chairman
Nuclear Regulatory Commission
Washington, D.C. 20555

FROM: Marcus Whiting
340 - 4th Avenue
San Francisco, CA 94118

RE: NO! to Foreign Nuclear Waste Storage at Hanford, Washington

Dear Chairman Selin,

I am writing in opposition to plans being made to store nuclear waste from foreign countries (e.g., North Korea) at the Hanford Nuclear Reservation in Washington State. 163-1

I reiterate. It is entirely unacceptable to import radioactive nuclear waste products from a foreign country and bury them under the ground at Hanford, Washington.

I have summarized my thoughts on this subject into two categories:

a) Political
b) Environmental

Political

The thought of "bargaining" with North Korean officials to acquire (buy?) their nuclear waste and store it in the United States in order to further persuade them to reduce their nuclear arms program is, in my opinion, a far-fetched, unrealistic policy. I imagine this concept is being implemented in conjunction with other avenues of negotiation in a broad attempt to make the North Koreans conform to international concerns, but I believe it is ill-conceived and unconscionable. 163-2

To address the concept of a potential threat of North Korean nuclear proliferation and, through a skewed type of political metamorphosis, transcribe the ownership and custodianship of that nation's nuclear waste over to *us* and literally deposit it at the feet of your constituents here in the United States is unreasonable in the least! We certainly didn't ask for this nor do we have the technology or ability to deal with it safely, efficiently or permanently. 163-3

To manifest and dictate policies which propagate the use of nuclear energy, and thusly exasperate the huge problem of nuclear waste, is irresponsible and unkeeping with the safety and survival needs of all living things on this planet.

RESPONSE TO COMMENT
COMMENTOR NO. 163: WHITING, MARCUS

Response to Comment No. 163-1

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 163-2

DOE is not negotiating with North Korea to accept its spent nuclear fuel. If foreign research reactor spent nuclear fuel is accepted into the U.S., then aluminum-based and TRIGA reactor spent nuclear fuel elements from South Korean research reactors would be accepted for disposition (Tables 2-1 and 2-2 of the EIS).

Response to Comment No. 163-3

The proposed action is to adopt a policy to manage spent nuclear fuel from foreign research reactors in 41 foreign nations, which includes South Korea, but not North Korea (Section 2.2.1.3 of the EIS). Section 2.6.5 describes storage technologies for spent nuclear fuel.

COMMENTOR NO. 163: WHITING, MARCUS (CONT'D.)

NO! to Foreign Nuclear Waste Storage at Hanford, Washington

Environmental

We all know one of the biggest problems surrounding nuclear technology is the inability to transport and dispose of the waste safely and efficiently.

Having been raised in the Seattle, Washington-area, I have been aware of the impact that the nuclear industry has had on the environment in the Columbia River basin and surrounding areas.

Although there exists safety procedures and protocols at Hanford that some consider to be the best in the world, there is no safe and fully-efficient waste disposal program, regardless of claims from the nuclear industry.

The proposed route is:

- By ship to Concord Naval Weapons Station, CA
  - across the Pacific Ocean - obviously subject to major storms
  - through the Golden Gate, negotiating through San Francisco Bay and the Carquinez Strait - an area where approximately 4.5 million people live and work
- By rail to Hanford Nuclear Reservation in Washington State
  - a journey of approximately 600-700 miles complete with its own set of hazards (we all remember Southern Pacific Railroad's disastrous de-railment into the American River at Dunsmuir, CA just a short time ago)

163-4

The risk of exposure to the atmosphere, the ocean, the groundwaters, the plants and animals, not to mention humans, during transport alone(!) cannot be justified by any one person, corporate entity, political image, lobbying effort or perceived need for consumable power.

The long-lasting effects of storing nuclear waste anywhere on this planet are, to-date, largely unknown and without precedent. But we *do* know some of the short-term effects...

- It is a matter of public, common knowledge that seepage from the nuclear wastes currently being stored at the Hanford Nuclear Reservation has entered the atmosphere and ground.
- The radioactivity is swept by the groundwater into the Columbia River where it travels downstream, impacting wildlife and humans.

These are indisputable facts which have been proven, documented and published in the media and scientific journals throughout the State of Washington and the nation.

I have 2 children and I STOP the shipment of foreign nuclear waste to be stored at Hanford Nuclear Reservation in Washington State.

THIS ABHORRENT IDEA IS WRONG!

Thank you

Marcus Whiting

RESPONSE TO COMMENT
COMMENTOR NO. 163: WHITING, MARCUS (CONT'D.)

Response to Comment No. 163-4

As discussed in Section 4.2.3 and Appendix E of the EIS, spent nuclear fuel has been transported safely along highways, railways, and waterways for over four decades.

The impacts of ultimate disposition of spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1 of the EIS). As stated in Sections 2.1 and 4.2.7 of the EIS, if a geologic repository is not prepared to accept the foreign research reactor spent nuclear fuel or its resultant stable waste forms (generated due to chemical separation or other processing technology) DOE would continue to manage the material in exisiting facilities at the DOE management site(s).

COMMENTOR NO. 169: FORM LETTER C

June 7, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management
U.S. Department of Energy
1000 Independence Avenue SW
Washington, D.C. 20585

Dear Mr. Head:

I am writing to oppose the federal government's plan to ship nuclear waste through the San Francisco Bay area and store this waste at the Concord Naval Weapons Station. 169-1

Nuclear shipments to the Concord Naval Weapons Station would pass through the heavily populated and seismically active San Francisco Bay area and be stored near active earthquake faults, six oil refineries, many chemical plants and the Concord High School. The freeways along which the nuclear waste would be carried, 680, I-80 and 5, are major commuter routes which run through the heart of the Bay's dense population. 169-2 169-3

I strongly oppose the Department of Energy's proposal on this matter and urge you to delete the San Francisco Bay area from your list of proposed sites for the storage of nuclear waste. Thank you.

Sincerely,

Nicholas Yount

RESPONSE TO COMMENT
COMMENTOR NO. 169: FORM LETTER C

Response to Comment No. 169-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 169-2

The port selection process that determined that Concord NWS was an acceptable port considered the population of the port and surrounding areas. Appendix D, Section D.1.9.5 provides an explanation of the "population" criterion. In regard to the number of refineries and chemical plants along the route to Concord NWS, the passage from San Francisco Bay to Concord NWS meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). The population and favorable transit from open ocean are not the only considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel, if it is accepted into the United States. Other considerations such as population along the route to the management site, port experience with handling containers, and port facilities would also be considered in making the final selection of ports of entry. Appendix D, Section D.1.9 of the EIS presents details of the port selection process.

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the transportation cask. Further, the analyses of impacts associated with accidents involving foreign research reactor spent nuclear fuel presented in Section 4.2.2.3 of the EIS demonstrates that the use of any of the selected ports would not pose significant risk to port personnel or the population near the ports. Concord NWS has considerable relevant experience in handling containers, and has the capability to safely handle containerized foreign research reactor spent nuclear fuel (Appendix D, Section D.1.9.1 of the EIS).

Response to Comment No. 169-3

Estimates of radiological health effects presented in Section 4.2.3 of the EIS are based on conservative assumptions using representative truck and rail transportation routes from candidate ports to interim management sites, including consideration of traffic volumes and surrounding populations. Supporting detail for the calculations is given in Appendix E of the EIS. Radiological and non-radiological health effects of the proposed action and management alternatives were found to be low.

COMMENTOR NO. 169: FORM LETTER C (CONT'D.)

Individuals submitting this form letter:

Dippo, Rosemary

Famcureaux, Norma P.

Foust, Nicholas

Mosley, Raechael Ann

Nieser, Collen

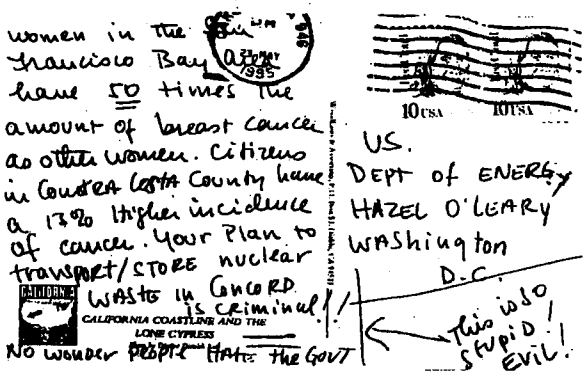
Smith, Janie V.

The Spillane Family

Sungar, Virginia

Ullman, Beverly R.

RESPONSE TO COMMENT
COMMENTOR NO. 169: FORM LETTER C (CONT'D.)


women in the San Francisco Bay have 50 times the amount of breast cancer as other women. Citizens in Contra Costa County have a 13% higher incidence of cancer. Your plan to transport/STORE nuclear WASTE in CONCORD is criminal!!
CALIFORNIA COASTLINE AND THE LONE CYPRESS
NO WONDER PEOPLE HATE the GOVT
10 USA 10 USA
US.
DEPT of ENERGY
HAZEL O'LEARY
WASHington
D.C.
This is so STUPID! EVIL!

196-1

Response to Comment No. 196-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 201: TURNER, DOUG

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Doug Turner **Phone:** _____

Title and Organization: _____

Address: 1201 Tuskegee Dr

City: Oak Ridge **State** TN **Zip** 37830

*** COMMENTS ***

I support the policy of returning the highly enriched research reactor fuel, as much as economically practical. Any fuel returned to the U.S. should be managed as determined in the ROD for the DEIS for Spent Nuclear Fuel. The fuel that is returned, should be processed and the fissile material should be recovered

201-1

201-2

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

All comments are due by June 20, 1995, and those received by that date will be considered by DOE in preparation of the final EIS. Comments received after the close of the comment period will be considered to the extent practicable.

RESPONSE TO COMMENT
COMMENTOR NO. 201: TURNER, DOUG

Response to Comment No. 201-1

The commentor's support for accepting and managing foreign research reactor spent nuclear fuel in the United States (Management Alternative 1 or 3; Sections 2.2 and 2.4 of the EIS, respectively) is noted.

Response to Comment No. 201-2

The commentor's support for the chemical separation alternative is noted. This is Implementation Alternative 6 to Management Alternative 1, which is discussed in Sections 2.2.2.6 and 4.3.6 of the EIS.

COMMENTOR NO. 202: WORTHINGTON, MARJORIE

1947 Clovercrest Street
Enumclaw, WA 98022
May 12, 1995

Charles Head
Office of SNF Mngmt. EM-37
U.S. Dept. of Energy
1000 Independence Ave. SW
Washington, D.C.

Dear Sir:

May I urge you to listen carefully to the concerns of citizens in the Pacific Northwest regarding shipment of High -Level Nuclear Wastes using commercial freighters and public ports, where there is a very real danger to the public in the handling of such wastes? (Shipboard fires, offloading, transport on highways or waterways, etc.)

USDOE policy should be changed in the following areas:

a. No importation
   -of Spent Nuclear Fuel from nations that do not pose a proliferation risk.
   -of Low Enriched Uranium wastes that can not be used in bombs
   -where the use of dry cask storage is feasible and would allow for international inspection.

202-1

b. No importation using commercial freighters or public ports (instead dedicated or military ships and DOD ports), to protect longshore workers, the public on local roads, and the public in the event of shipboard fire.

202-2

c. No importation of High-Level Nuclear Wastes for storage at Hanford!
   Continuing to even consider Hanford as a viable storage area is totally unacceptable policy. Nuclear fuel cooling basins along the Columbia River are already leaking and subject to massive failure in case of an earthquake. Foreign reactor wastes should not be accepted here when we cannot even keep up with funding of proper safety measures for removal of fuel from the Hanford K-Basin. Other nations must pay the cost of their own programs and bear responsibility for environmental and health risks within their own borders.

202-3

Thank you for your attention to these requests.
Marjorie Worthington

RESPONSE TO COMMENT
COMMENTOR NO. 202: WORTHINGTON, MARJORIE

Response to Comment No. 202-1

The commentor's opposition to accepting foreign research reactor spent nuclear fuel from nations that pose no proliferation risk, where the spent nuclear fuel is LEU, and from nations where dry storage is feasible, is noted.

The United States has played in the past, and continues to play, a leadership role in the world community in matters of nuclear weapons nonproliferation. In this role it initiated programs such as the Reduced Enrichment for Research and Test Reactors (RERTR) program and encouraged other nations to support it. Some of the nations which have supported it such as Britain, France, Japan, Sweden and others may not currently present the nuclear weapons proliferation risk as others. The reasons for considering these nations under this policy are included in Section 1.3 of the EIS.

As discussed in Section 1.1 of the EIS, the reason for including LEU in the policy is that the United States has offered LEU acceptance as an enticement for foreign research reactor operators to convert from HEU to LEU fuel use. The enticement was necessary because operation with LEU fuel is not as effective as with HEU fuel. Also, as explained in Section 2.3 of the EIS, the opportunities for expanded spent nuclear fuel storage at foreign research reactor sites are limited or nonexistent.

Response to Comment No. 202-2

The commentor's opposition to the use of commercial freighters and public ports is noted. Estimated risks during marine transport and at candidate ports were found to be low (Sections 4.2.1 and 4.2.2 of the EIS).

Response to Comment No. 202-3

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 203: THOMAS, TAMLYN

To: Charles Head
Office of SNF Mngment
EM-37

Dear Sir -

Unfortunately I am unable to make an appearance at the public hearing May 24 in Seattle regarding the planned transportation + storage of other nation's nuclear waste to Hanford. Your department's plans for use of Washington State, it's highways and citizens for such a potentially dangerous role appears so irresponsible + inconsiderate of those who live here that I can only assume you have no one you know and care for who lives in the Northwest. Hanford has a long history of difficulty handling nuclear waste; the volume the DOE is proposing it is only a matter of time before significant accidents and exposure would happen. If you were to implement such a plan it would be absolutely essential that the countries whose waste we are storing foot the bill for extensive training of all areas possibly effected by contam-

203-1

203-2

RESPONSE TO COMMENT
COMMENTOR NO. 203: THOMAS, TAMLYN

Response to Comment No. 203-1

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 203-2

As discussed in Section 2.2.1.2 and 2.2.2.3 of the EIS, several financing options have been considered, ranging from collection of fees from the research reactor operators that would pay all of the costs of the program to full subsidization of the program by DOE. One of these options would be for developed countries (which represent about 87 percent of the spent nuclear fuel total mass and about 78 percent of the spent nuclear fuel elements) to pay a competitive fee for U.S. management of their spent nuclear fuel. This fee would be based on, among other things, the charges these countries would incur for the most realistic alternatives available to them, e.g., reprocessing at a facility in Dounreay, Scotland. Also, under the basic implementation, DOE would subsidize the costs of managing the spent nuclear fuel from developing countries. The United States does not believe the developing countries can afford to pay the expense for spent nuclear fuel management either in the United States or in the host country. Additionally, many countries accepted U.S. supplies of HEU (and avoided developing their own enrichment or reprocessing programs) specifically because they expected the United States to accept the spent nuclear fuel.

ination ~~[illegible]~~ & emergency training in handling accidents, spills and evacuation. They should also pay for specialized areas of Port not part of the public port system to receive these shipments. All shipments should be transported through the absolutely least populated areas and tightly regulated.

All of the above is in case this ludicrous plan should actually see the light of day. Truly it should not happen at all - it is only too easy for other countries to continue or even increase their production of nuclear waste when there is no cost to them in terms of having to find a place within their own borders to store the waste & when they do not have to deal with their own citizen's' protests over the safety of such nuclear waste storage.

Furthermore, if this is meant as a deterrant to immoral characters gaining access to fuel for nuclear weapons your department is a sad

203-2 (Cont'd.)

203-3

203-4

203-5

Response to Comment No. 203-3

The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel through the Port of Tacoma, or any of the other selected ports, is low. The use of a remote port might slightly reduce the consequences of an accident which would be low (Section 4.2.2 of the EIS), however, there are other considerations that also must be made when making port selection. Appendix D, Section D.1.9 of the EIS presents a complete discussion of the port selection process.

All shipments of radioactive material are tightly regulated. Internationally the International Atomic Energy Agency (part of the United Nations) and the International Maritime Organization regulate such shipments. In the United States, the U.S. Department of Transportation, DOE, and the NRC all have regulations and rules that apply to these shipments. Section 5 of the EIS provides a detailed description of the applicable laws, regulations and other requirements.

Response to Comment No. 203-4

If foreign research reactor spent nuclear fuel were accepted into the United States, it would only be done for a limited period of time. The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide. The intent of the resultant proposed policy, therefore, is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). Foreign research reactors are on notice that once the acceptance policy has lapsed, their spent nuclear fuel would no longer be accepted for disposition in the United States (final paragraph of Section 1.2).

Response to Comment No. 203-5

Spent nuclear fuel from foreign research reactors has been accepted into the United States for over three decades without incident (Section 4.3.2 of the EIS). Several thousand transcontinental shipments of spent nuclear fuel have been conducted during that time. No transportation cask containing spent nuclear fuel has ever been stolen or released its radioactive contents, including casks involved in traffic accidents.

COMMENTOR NO. 203: THOMAS, TAMLYN (CONT'D.)

study in human nature. If someone wants this waste somewhere along the long route from production to Hanford they will find a way of obtaining it. Our money would be much better spent investing in other forms of energy production. If we as a nation had put a strong effort into alternative energy production in the 1960's by now, 30 years later, we would have had high tech, highly feasible solar, wind + who-knows-what-else energy sources. Please reconsider this ill [redacted] conceived plan as if your very close family lived in Tacoma or Portland, down river on the Columbia, anywhere in the Northwest.

Thank you,

Tamlyn Thomas

1543 NE 89th

Seattle 98115

203-5 (Cont'd.)

203-6

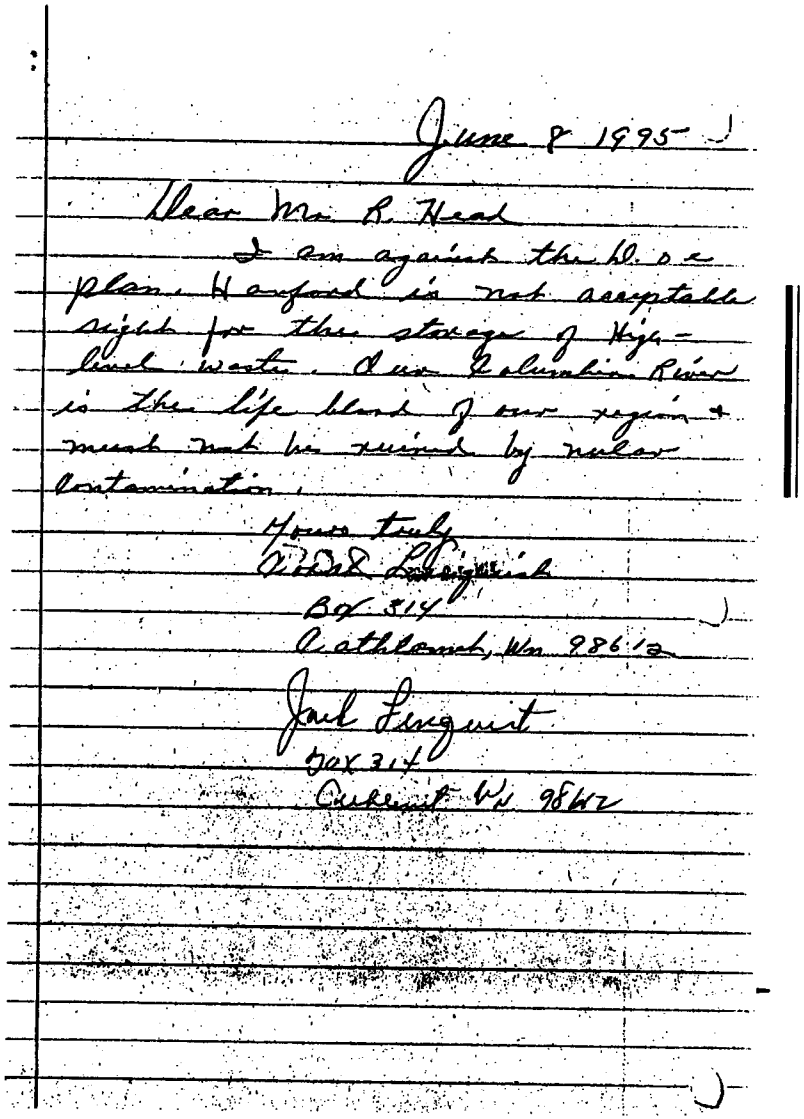
203-1 (Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 203: THOMAS, TAMLYN (CONT'D.)

Response to Comment No. 203-6

Consideration of solar and wind power are outside the scope of this EIS. However, it should be noted that as part of its mission, DOE currently has on-going programs that are seeking to develop and promote use of these alternative energy sources.

COMMENTOR NO. 205: LINQUIST, JACK



June 8 1995

Dear Mr R. Head

I am against the D.O.E plan. Hanford is not acceptable sight for the storage of High-level waste. Our Columbia River is the life blood of our region + must not be ruined by nuclear contamination.

Yours truly
Jack Linquist
Box 314
Cathlamet, Wn 98612

Jack Linquist
Box 314
Cathlamet Wn 98612

205-1

RESPONSE TO COMMENT
COMMENTOR NO. 205: LINQUIST, JACK

Response to Comment No. 205-1

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 206: WADE, MARIANNE

June 1, 1995

Honorable Hazel O'Leary
Department of Energy
1000 Independence Ave SE
Washington D.C. 20583

Hello H. Hazel O'Leary:

I have spent most of the last thirteen years in Washington state. Raised in California through the sixties and seventies I witnessed unbearable insults to the environment. I spent most of my childhood rationing water that was already so treated there could very well have been more fluoride than hydrogen. I thought everybody flushed their toilets only twice a day. And despite the beauty of San Francisco and the love I have for it, let's face it the city has only two seasons.

Needless to say, I have marveled at the Northwest. It has a wonderful ecosystem. Diversity of nature ranging from rainforest to desert, ocean to mountain. Even though much of the land has been decimated by logging, challenged by Mt. St. Helens, and abused by the ignorant, nature prevails here. Despite a busy port, here in Tacoma I have witnessed days of such clarity I could see the rooftops of houses miles away across the sound. Most of the residents here focus on the beauty and try to support the environment. Perhaps you are familiar with the recycling statistics from the Puget Sound, specifically the efforts of Tacomans? 206-1

I don't mean to drip with civic pride because frankly most of the local policies and politicians make me cringe. But the Department of Energy's proposal to utilize Tacoma as a point of entry for spent nuclear waste sickens me more. Even though I drive by the Port of Tacoma with a slight shrug and a grimace, I understand it brings in much needed revenue. The billows above the port are a constant visual reminder of how greatly humans threaten the environment. Ship traffic is heavy enough here. I don't want to see any enter loaded down with spent fuel rods.

Please reconsider the proposal. I understand Mick Shultz of the Port of Tacoma has been organizing a fact-finding action the results of which should have been held at the last DEIS meeting. I also understand the Port of Tacoma Commission officially registered its opposition to this proposal May 12. Have they received a response? I have to agree with Port Commission president Patrick O'Malley, this state has had its share of waste issues. Perhaps you followed the closure and current destruction of the Asarco smelter in the tiny arsenic-laden town of Ruston, nestled in the north-end of Tacoma. I witnessed the explosion of the stack myself from a distance reported as "safe from the arsenic cloud". Tacoma has enough to deal with. 206-2

I respect your position as Secretary, but I don't envy it. I realize the disposal of nuclear waste is a real issue that needs to be addressed. I know there are no easy answers. I just don't believe there are "acceptable levels" of nuclear waste. I believe the Earth to be one entity and in that sense it doesn't matter where nuclear waste is stored, we all share it and we'll all be affected by it. True, Tacoma is a smaller urban district than Seattle but it is still heavily populated with residents very near the port. Please reconsider this proposal. Have Tacoma removed as a possible point of entry. I wish you much luck in this endeavor and hope a creative alternative can be found. 206-1 (Cont'd.)

Thank you for your time and consideration.

Sincerely,

Marianne Wade
302 N. Yakima #B3
Tacoma, WA 98403

RESPONSE TO COMMENT
COMMENTOR NO. 206: WADE, MARIANNE

Response to Comment No. 206-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

In regard to Tacoma's ship traffic, if the foreign research reactor spent nuclear fuel is accepted by the United States, it could arrive either in commercial or chartered ships (discounting that coming from Canada, which would come overland). If commercial ships were used, the ship traffic into Tacoma would be unchanged because the commercial ships that would be used to transport the spent nuclear fuel would call at Tacoma whether or not they were carrying foreign research reactor spent nuclear fuel. If chartered ships were utilized, and all the West Coast-bound ships came to Tacoma, Tacoma's ship traffic would increase by no more than about one ship a month (186 shipments spread over 13 years under Management Alternative 1) and could be as low as one ship every four months.

Response to Comment No. 206-2

DOE has responded to public comments on the draft EIS, including comments received from the Port of Tacoma Commission, in preparing the final EIS.

Nuclear waste is a by-product of using research reactors. Research reactors play a vital role in important medical, agricultural, and industrial applications, and also provide a tool for fundamental scientific research. These reactors are a vital tool in cancer therapy and radioimmunoassay blood testing. Research reactors have also been used in the environmental sciences (Section 1.1 of the EIS).

COMMENTOR NO. 208: RAMUS, EVELYN

Ridgefield, Wa.

June 12, 1995

Mr. Charles Head

Office of Spent Fuel Management

Dear Sir:

What in the world can you be thinking of to accept nuclear waste from foreign countries when our own is not adequately stored? These countries should take of their own waste. 208-1 208-2

Hanford has leaks already which are a great concern to people in this area. At least find somewhere other than Hanford.please. 208-3

Why should this country always be the one to pay??? We are already so far in debt it is a disgrace. 208-4

I strongly object to disposing further nuclear waste at Hanford.

Very Sincerely Yours,

Evelyn Ramus

RESPONSE TO COMMENT
COMMENTOR NO. 208: RAMUS, EVELYN

Response to Comment No. 208-1

The commentor's opposition to the acceptance and management of foreign research reactor spent nuclear fuel in the United States is noted. The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS).

Response to Comment No.208-2

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

Response to Comment No. 208-3

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 208-4

Sections 2.2.1.2 and 2.2.2.3 of the EIS discuss alternative financing arrangements that range from charging the foreign research reactor operators a fee that would cover all the costs of the proposed action, to having DOE subsidize all of the reactor operators' costs. One compromise position that is evaluated is to charge developed countries a competitive fee, while developing countries would be subsidized. If less than the full cost of the proposed action is charged to the foreign reactor operators, the difference would be the cost to the United States of gaining participation by other countries in our nuclear weapons nonproliferation programs.

COMMENTOR NO. 209: BICKETT, GARY

June 9, 1995

Charles E. Head
U.S. Department of Energy
Office of Spent Fuel Management
EM-37
1000 Independence Ave. SW
Washington, D.C. 20585-0001

Re: High Level Nuclear Waste Importation Proposal

Dear Mr. Head:

The Hanford Nuclear Reservation is already the most contaminated place on this planet. Your Department's proposal to store even more high level radioactive waste at this site is preposterous! We must not be the recipient of other country's waste problems. We have enough of our own. Where is your common sense thinking? 209-1

And then I understand your not only contemplating acceptance of this waste from third world countries, but also countries like Australia, Japan, Canada, Sweden and so on. They are suppose to be our allies - not some immediate threat. They are responsible for their own problems. I most strongly oppose any consideration of importing high level nuclear materials from any outside country. 209-2

Further more, Hanford should never be considered for long or short term storage of spent nuclear fuels as it is not a safe place and already has enormous problems that you don't know how to resolve. 209-1 (Cont'd.)

Try taking care of our own problems rather than running around appeasing other countries at U.S. Tax payers expense. 209-2 (Cont'd.)

Sincerely,

Gary Bickett

Gary Bickett
15105 Twin Fir Road
Lake Oswego, OR 97035

c: Representative Elizabeth Furse
Senator Mark Hatfield

RESPONSE TO COMMENT
COMMENTOR NO. 209: BICKETT, GARY

Response to Comment No. 209-1

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 209-2

The commentor's opposition to accepting foreign research reactor spent nuclear fuel from nations that pose no proliferation risk is noted. The United States has played in the past, and continues to play, a leadership role within the world community in matters of nuclear weapons nonproliferation. In this role, it initiated programs such as the Reduced Enrichment for Research and Test Reactors (RERTR) program and encouraged other nations to support it. Some of the nations which have supported it such as Britain, France, Japan, Sweden and others may not currently present the same nuclear weapons proliferation risk as other nations. The reasons for considering these nations under this policy are included in Section 1.3 of the EIS.

COMMENTOR No. 211: QUINN, PATRICIA

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: PATRICIA QUINN Phone: (510) 944-5476

Title and Organization:

Address: 1313 CORTE DE LOS VECINOS

City: WALNUT CREEK State CA Zip 94598-2901

*** COMMENTS ***

I wish to voice my support of the leaders here in Contra Costa County who have voted to oppose the federal government plan to ship nuclear waste through the Concord Naval Weapons Station. As they have argued, this is a well-populated and very seismically active area. Nuclear waste shipments would have to pass six oil refineries, chemical plants, and oil tankers.

In fact, I heartily support the proposal to make Contra Costa County a nuclear-free zone. Enclosed is a clipping from this week's Contra Costa Times.

211-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR No. 211: QUINN, PATRICIA

Response to Comment No. 211-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

The port selection process that determined that Concord NWS was an acceptable port considered the population of the port and surrounding areas. Appendix D, Section D.1.9.5 of the EIS provides an explanation of the "population" criterion. Despite the presence of refineries along the route to Concord NWS, the passage from San Francisco Bay to Concord does meet the requirements of Criterion 2 (Favorable Transit From Open Ocean) for the port selection (Appendix D, Section D.1.9.2 of the EIS). The population and favorable transit from open ocean are not the only considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel, if it is accepted into the United States. Other items include population along the route to the management site, port experience with handling containers, and port facilities. Appendix D, Section D.1.9 of the EIS provides details of the port selection process.

The risk of releasing radioactive material from a spent nuclear fuel transportation cask as the result of a seismic event is low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the transportation cask.

COMMENTOR NO. 212: THOMAS FAMILY

50% unbleached pulp and 50% post-consumer fibre paper

June 5, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management
Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Mr. Head,

We are opposed to any shipment of nuclear material through the San Francisco Bay area into CNWS for the following reasons.

-There is no data to show that a fuel cask can survive a prolonged fire such as in an oil fire or cargo ship fire. 212-1

-There is no permanent storage site in the US. The temporarily stored material will have to be moved again. 212-2

-There is no guarantee that fuel in these rods will not be separated for bomb use by the US. 212-3

-The DOE does not have a consistent policy in regards to nonproliferation. Nonproliferation is achieved when no nuclear material is being produced. This means no HEU, LEU or nuclear power. All have the potential for diversion to weapons or terrorism. We do not want to live with the continued threat of nuclear material being produced and moved around. STOP THE PRODUCTION. 212-4

Require the countries that are producing this material to properly store it. Most of the countries especially our western allies can do this. Take special precautions with those countries with which there is concern of theft or diversion. 212-5

Sincerely,

Thomas Family
147 St. Germain Lane
Pleasant Hill, CA. 94523

RESPONSE TO COMMENT
COMMENTOR NO. 212: THOMAS FAMILY

Response to Comment No. 212-1

The regulations governing the design and construction of "Type B" casks such as would be used to transport the foreign research reactor spent nuclear fuel requires them to withstand a high intensity, engineered fire for 30 minutes (Appendix B, Section B.2). Real life tests have been conducted to determine the accuracy of the techniques used to demonstrate compliance with this regulatory requirement. Further, examinations of real life fires on land and at sea, and fire tests have demonstrated that high intensity fires are very unlikely to be sustained for lengthy periods, and even then not in a single location.

In respect to the impact a ship fire might have on a spent nuclear fuel transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship fires intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it would be almost impossible for the spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of research reactor spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ships structure buckles at around 700 degrees Kelvin (800 degrees F).

Nevertheless, in spite of the improbability of such fires, the EIS contains the results of an analysis of such a fire (Section 4.2.1.3 of the EIS). The results of the analyses are given in Appendix D of the EIS.

Response to Comment No. 212-2

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. A detailed, quantitative discussion of these impacts would have to be the subject of future NEPA documentation.

Response to Comment No. 212-3

As stated in Section 2.2.2.6 of the EIS, the United States does not conduct chemical separation in support of nuclear weapons construction. If a policy to use chemical separation is adopted, the preferred option would be to blend HEU down to LEU to

COMMENTOR NO. 212: THOMAS FAMILY (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 212: THOMAS FAMILY (CONT'D.)

Response to Comment No. 212-4

The commentor's opposition to nuclear technology is noted. The use of LEU fuel in foreign research reactors is advocated by the United States because it cannot be used to make nuclear weapons. Policies which encourage the use of LEU instead of HEU for civilian programs were developed by the United States and other nations in order to satisfy the aspirations of foreign nations to participate in the peaceful benefits of nuclear technology, while reducing the risk of nuclear weapons proliferation (Section 1.1 of the EIS).

Response to Comment No. 212-5

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

As discussed in Sections 1.1 and 1.2 of the EIS, the Reduced Enrichment for Research and Test Reactors (RERTR) program has been very successful, and many foreign research reactors have been modified to operate with high-density LEU fuel instead of HEU fuel. This success was due to the acceptance of the spent nuclear fuel from these foreign research reactors into the U.S. Without this incentive, many of the research reactor operators would not have decided to use LEU fuel in their reactors.

If some foreign research reactor operators were to withdraw from the RERTR program now and rely instead on HEU fuel, with its attendant lower costs and enhanced performance, other research reactor operators would be under pressure to convert to the use of HEU for competitive reasons. Management of the spent nuclear fuel from stable, developed allies is important because the actions taken by these countries is a powerful example for the rest of the world, including many less developed, less stable countries.

COMMENTOR NO. 217: RAINWATER, DAN

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: DAN Rainwater Phone: 510 6895297

Title and Organization: Resident

Address: 158 Norman Ave

City: Clyde State CA. Zip 94520

*** COMMENTS ***

I do NOT want your Nuclear waste Transported by my home! 217-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 217: RAINWATER, DAN

Response to Comment No. 217-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Denise Jacobson Phone: (503) 281-9594

Title and Organization:

Address: 3346 NE 12th Ave

City: Portland State OR Zip 97212

*** COMMENTS ***

I am unequivocably opposed to the plan to ship spent fuel rods from research reactors to the U.S. for processing and storage. The U.S. promises under the Nuclear Non-proliferation treaty are far better served by cooperating with the host countries interested in storing & storing in "dry casks" their own spent fuel rods. We in the U.S. have not yet found a way to deal with the Hanford, Nevada, and other sites where nuclear contamination threatens and in fact has already made life undesirable for human and natural populations. Please focus your attention on clean up of existing waste and stop promoting further nuclear development for peace or war. 218-1 218-2 218-3

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

Response to Comment No. 218-1

The commentor's opposition to the acceptance and management of foreign research reactor spent nuclear fuel in the United States is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

Response to Comment No. 218-2

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Section 2.3 and 4.4.1 of the EIS.

Response to Comment No. 218-3

As discussed in Section 2.1, the intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly-enriched (weapons grade) uranium in civil programs worldwide (Section 1.2 of the EIS). DOE does not consider that these objectives promote further nuclear development. The cleanup of contamination at certain sites which resulted from nuclear weapons development is independent from the proposed action in this EIS. The environmental impacts from management of foreign research reactor spent nuclear fuel at the proposed management sites are discussed in Sections 4.2 and 4.4 and Appendix F, Section F.4 of the EIS.

COMMENTOR NO. 219: PEELLE, ROBERT

130 Oklahoma Avenue
Oak Ridge, TN 37830
June 10, 1995

United States Department of Energy
Office of Environmental Management (EM-37)
Attn. Mr. Charles Head
1000 Independence Avenue, S.W.
Washington, D.C. 20585-0001

Dear Sir:

Subject: Comment on DEIS concerning foreign research reactor SNF.

I agree with the main line of the preferred alternatives in the EIS (DOE/EIS-0218D). That is, in the case the uranium was enriched in the US, we should participate in the spent fuel handling and have the material brought to this country. I thought that was the original understanding, even if the agreements were not explicit. If so, we must be reliable partners. 219-1

We should avoid fueling additional foreign reactors with HEU. Apparently, that policy issue is not involved in this EIS.

A doubtful part of the plan is the 10- year time frame. That time interval passes very rapidly, so we should try for 15-20 years, with a review of some features scheduled after 10 years. 219-2

We should not consider reprocessing returned fuel unless our own fuel of similar design is reprocessed. In the case of Al-clad fuel, reprocessing might be preferable to wet storage because of likely cladding degradation. Generally, dry storage should be preferred using sealed containers. Realistically, permanent storage is far away in time. 219-3 219-4

I doubt that plans should be considered that would require 10-yr storage at INL or SRL followed by a move to Oak Ridge or elsewhere. Extra handling is bad policy, and people are more worried about road transport of spent fuel than risk estimates suggest is warranted. Minimize handling. 219-5

If the West Bear Creek site is further considered in Oak Ridge, the site as drawn may be too close to the 219-6

RESPONSE TO COMMENT
COMMENTOR NO. 219: PEELLE, ROBERT

Response to Comment No. 219-1

The DOE did not specify a "preferred alternative" in the draft EIS. DOE's preferred alternative is specified in this final version of the EIS (Sections 2.9 and 4.7). The commentator's support for Management Alternative 1 as described in Section 2.2 is noted.

The Energy Policy Act of 1992 established stringent limitations on the export of HEU from the United States. Since enactment of this Act into law, no new export licenses have been issued by the United States.

Response to Comment No. 219-2

As discussed in Section 2.2.1.1, the 10-year policy refers to the period of generation of foreign research reactor spent nuclear fuel, the amount of which can be reasonably approximated. Actual shipments could be made for a period of 13 years. The additional three years would allow for the cooling of the fuel generated towards the end of the policy period and other contingencies. The commentor's preference for an even longer acceptance period is noted.

Response to Comment No. 219-3

The commentor's position on domestic chemical separation is noted. This alternative is discussed in Sections 2.2.2.6 and 4.3.6 of the EIS. It is also part of Management Alternative 3, which is discussed in Section 2.4 and 5.5 of the EIS.

Response to Comment No. 219-4

As described in Section 2.2.1.9 of the EIS, the storage technology identified for the basic implementation of Management Alternative 1 is dry storage. The commentor's support for dry storage technology is noted.

Response to Comment No. 219-5

The commentor's suggestion that foreign research reactor spent nuclear fuel should not be managed on an interim basis at the Idaho National Engineering Laboratory or the Savannah River Site and then transported to another site is noted.

Response to Comment No. 219-6

The commentor's suggestion concerning the West Bear Creek site at Oak Ridge is noted.

COMMENTOR NO. 219: PEELLE, ROBERT (CONT'D.)

ORR boundary. I think the adjacent site is controlled by TVA and presently unused, so a buffer could likely be arranged. 219-6 (Cont'd.)

There is a little too much emphasis on the number of fuel elements to be returned, and the number of kg of heavy metal. For hazards analysis, it would seem the decay power per element is the simplest pertinent quantity, and I suggest this be estimated, tabulated, and summed at five year intervals for each overseas facility of concern. 219-7

I did not find a clear statement, but I gained an impression that source terms for spent fuel batches were estimated assuming the fuel had been used constantly at full power. If so, all the dose tabulations are considerably in error though conservative. I suggest a better approximation be used. For example, I assume every facility has fuel element burnup estimates. If this were used along with fuel loading and discharge dates, an adequate approximation of decay power could be made for various dates in the future. For dose calculations, this would be quite conservative because of self shielding. 219-8

I found a minor error in the discussion of school systems in the Oak Ridge area. At least Clinton High, Harriman, and Oak Ridge have independent school systems. Perhaps there are others. There are also some private schools. I did not check to learn if the totals were correct. 219-9

The above does not mean that I accept all of our non-proliferation policy, for it does not seem self consistent. As concerns the foreign research reactor fuels of concern, the policy seems wise and should be implemented. 219-10

Sincerely
Bob Peelle
Robert Peelle
phone or fax (615)483-8974

RESPONSE TO COMMENT
COMMENTOR NO. 219: PEELLE, ROBERT (CONT'D.)

Response to Comment No. 219-7

The use of decay power is an alternative approach, but does not provide a clear indication of what is involved in spent nuclear fuel management or, especially, the transport of the fuel. The commentor's approach would not respond to public concerns over the number of elements, the amount of HEU removed from civilian commerce, or the number of shipments to and through the United States.

Response to Comment No. 219-8

Although the approach that the commentor has suggested is a real life evaluation, it would not change the results of the impact analysis and its accuracy would depend upon the quality of reactor specific information. The commentor's interpretation of the EIS's approach is correct. Appendix B of the EIS clearly states the assumptions and reasons that were used for the estimation of radionuclide inventories in different types of fuel. For impact analysis purposes, one can not use the average or actual values from one reactor to another, but rather needs to determine the maximum values in order to bound the consequences. DOE agrees with the commentor that the approach used in the EIS produces very conservative results.

Response to Comment No. 219-9

Section 3.3.4.9 of the EIS has been corrected. The correction does not influence the socioeconomic analysis in the EIS.

Response to Comment No. 219-10

The commentor's support for management of spent nuclear fuel from foreign research reactor's in the United States is noted.

COMMENTOR NO. 220: BUTLER, JOEL

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: JOEL BUTLER Phone: 510-689-3224

Title and Organization: CONCORD RESIDENT

Address: 4395 N. CANOE BIRCH CT

City: CONCORD State CA Zip 94521

*** COMMENTS ***

A COPY OF MY LETTER OF 4 JUNE 1995 ADDRESSED TO THE CONCORD CITY COUNCIL IS ATTACHED.

I ATTENDED THE MAY FORUM AT CONCORD CENTRE BUT THE OPPOSITION WAS FORCEFULLY VOCAL AND OPPORTUNITY TO COMMENT WAS NOT EASY — AT LEAST FOR ANY SUPPORTIVE VIEWS.

ALL OF US MUST BECOME INFORMED, INVOLVED AND SEEK THE BEST WAYS TO SUPPORT OUR GOVERNMENT IN ANY PEACE RELATED ENDEAVORS.

GOOD LUCK WITH THIS PROPOSAL.

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 220: BUTLER, JOEL

COMMENTOR NO. 220: BUTLER, JOEL (CONT'D.)

4 June 1995

Concord City Council
1950 Parkside Drive
Concord, Calif 94520

Honorable Council Members:

I have been a resident of Concord since January 1965. I have seen our city grow, diversify, adjust, strive to meet and accept the challenges of change. Our record has been remarkable to date.

Now we are concerned about a proposal for a new and different activity at our neighboring Naval Weapons Station.

NWSConcord has been a busy, sometimes secretive, but a very good contributing neighbor. We have Park acreage, Highway 4 passage, and I believe BART passage. NWS personnel have consistently contributed talent on schools and community projects. Some local citizens are employed by the Station. 220-1

It would seem that shipping "spent nuclear fuel" into the Station, off loading, and transshipping it, would mean improving the port facilities which should mean positive projections for the Concord area.

Any industrial/military activity can pose hazards when mismanaged. The proposed activity is being brought before us in the sunlight. We have been asked to hear about it, question it, share our concerns and provide input for consideration in the decision making process.

I see this proposal for NWSConcord as a non military process with potential benefits for the Concord area.

I have concerns for possible shipping accidents at locations such as the Richmond-San Rafael, Carqinez and Benicia bridges. I would expect extreme caution would be excercised at those bridges, as well as at the port site. In addition, railroads to be used would receive regular critical inspection and maintenance. Highway transit would use escort essentially as that now employed for wide/high loads. 220-2 220-3 220-4

It is my feeling that rejection of the battleship Missouri from our general area, contributed to the current status of our local military bases.

Our NWSConcord essentially stands alone as the remaining military base not yet earmarked for closure. Is this proposal a direction for change and for possible port capability improvements? 220-1 (Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 220: BUTLER, JOEL (CONT'D.)

Response to Comment No. 220-1

The commentor's support for the use of the Concord NWS as the port of entry for foreign research reactor spent nuclear fuel is noted. The Concord NWS is one of ten candidate ports of entry which were determined to be acceptable in the case that foreign research reactor spent nuclear fuel is accepted into the United States. If any foreign research reactor spent nuclear fuel is to be accepted into the United States, the selection of the actual port(s) of entry to be used will be in the Record of Decision, subsequent to completion of this final EIS.

Response to Comment No. 220-2

In regard to the number of bridges and navigational hazards along the route to Concord NWS, commentor's recommendation for exercising caution would be followed to the maximum extent possible. If foreign research reactor spent nuclear fuel is accepted by the United States, responsibility for shipping would be with the foreign research reactor operators. However, DOE would insist that only reputable shipping firms, United States or foreign flag, be used for the marine transport.

Response to Comment No. 220-3

The railroad tracks, engines, and cars would receive normal inspection and maintenance. No special inspection or maintenance would be required for rail transportation of foreign research reactor spent nuclear fuel.

Response to Comment No. 220-4

The requirements for physical protection of foreign research reactor spent nuclear fuel shipments during shipments are specified in 10 CFR Part 73.37. The principal points are (1) cooperation with local law enforcement agencies, (2) armed escorts, and (3) communications with a communications center that is staffed 24 hours per day. (Section 5.4.2 of the EIS.)

For truck shipments in heavily populated areas, one escort vehicle containing an armed guard would lead the truck and another escort vehicle containing another armed guard would follow the truck. In less populated areas, there would be only one escort vehicle instead of two. For rail shipments, the escort would ride on the train in a location that permits observation of the shipment car while the train is in motion.

COMMENTOR NO. 220: BUTLER, JOEL (CONT'D.)

It seems to me to be the trend and if it is, I urge the Council to look favorably on this proposal. 220-1 (Cont'd.)

I urge you to hear all concerns, to weigh them carefully as you consider your position on this matter.

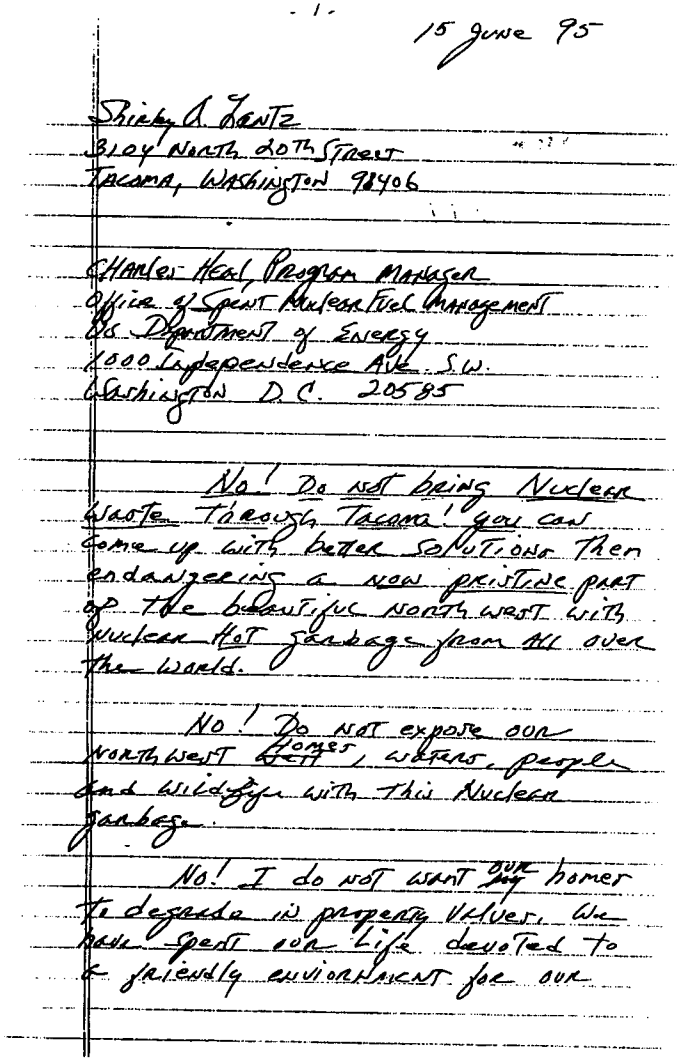
Thank you for reading my concerns.

Sincerely,

Joel Butler

RESPONSE TO COMMENT
COMMENTOR NO. 220: BUTLER, JOEL (CONT'D.)

COMMENTOR NO. 237: LANTZ, SHIRLEY A.



- 1 -

15 June 95

Shirley A. Lantz
3104 North 20th Street
Tacoma, Washington 98406

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management
US Department of Energy
1000 Independence Ave. SW.
Washington D.C. 20585

No! Do not bring Nuclear Waste Through Tacoma! you can come up with better solutions then endangering a non pristine part of the beautiful North West with Nuclear Hot Garbage from All over the World.

No! Do not expose our North West Homes, waters, people and Wildlife with this Nuclear Garbage.

No! I do not want our homes to degrade in property values. We have spent our life devoted to a friendly environment for our

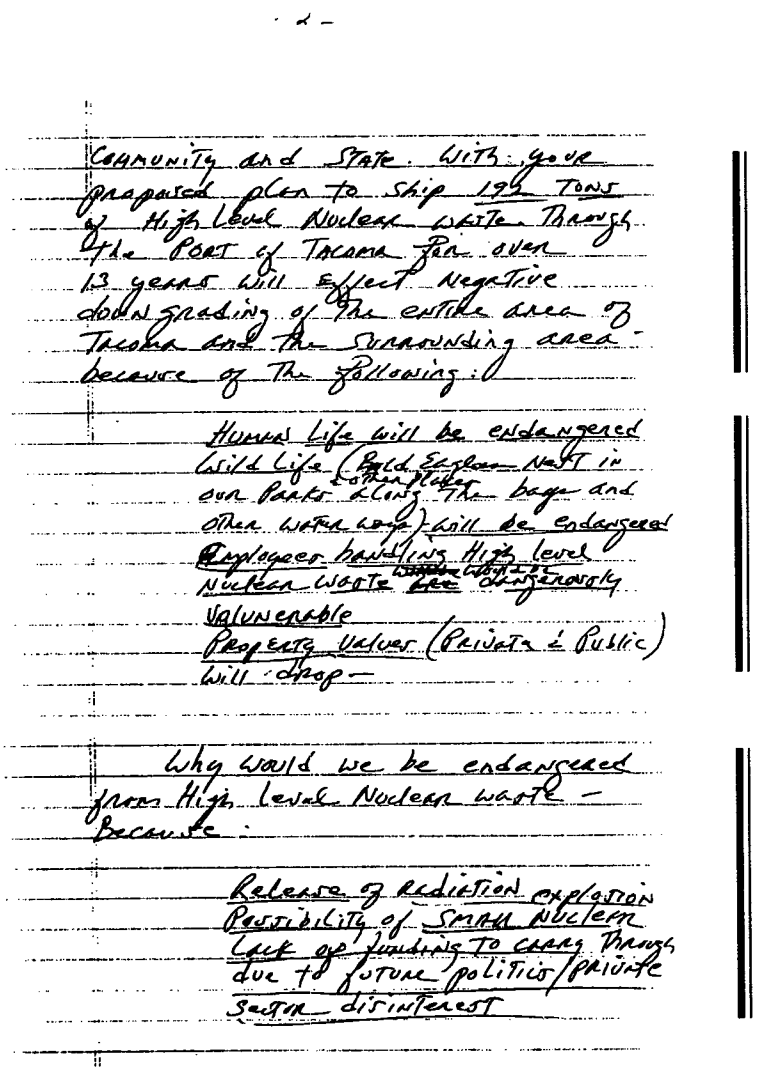
237-1

RESPONSE TO COMMENT
COMMENTOR NO. 237: LANTZ, SHIRLEY A.

Response to Comment No. 237-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. Also, the environmental effects evaluated in the EIS determined that there would be no adverse ecological impacts to any of the ports that might be used to receive the material (Section 4.2.2). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive materials have ever been released from a spent nuclear fuel transportation cask as a result of an accident (Section 2.6.2 of the EIS).

COMMENTOR NO. 237: LANTZ, SHIRLEY A. (CONT'D.)



- 2 -

Community and State. With your proposed plan to ship 19½ TONS of High level Nuclear waste Through the Port of Tacoma For over 13 years will Effect Negative down grading of the entire area of Tacoma and the surrounding area because of the following:

Human Life will be endangered
Wild Life (Bald Eagles - NEST in our Parks along the bays and other water ways) will be endangered
Employees handling High level Nuclear waste are dangerously Valuenable
Property Values (Private & Public) will drop -

Why would we be endangered from High level Nuclear waste - Because:

Release of Radiation explosion
Possibility of SMALL NUCLEAR
Lack of funding To carry Through due to future politics/PRIVATE Sector disinterest

237-2

237-3

237-4

RESPONSE TO COMMENT
COMMENTOR NO. 237: LANTZ, SHIRLEY A. (CONT'D.)

Response to Comment No. 237-2

The analysis in Sections 4.2.2 and 4.5 of the EIS indicates the risk to humans and wildlife associated with the shipment of foreign research reactor spent nuclear fuel through any of the ports, is low.

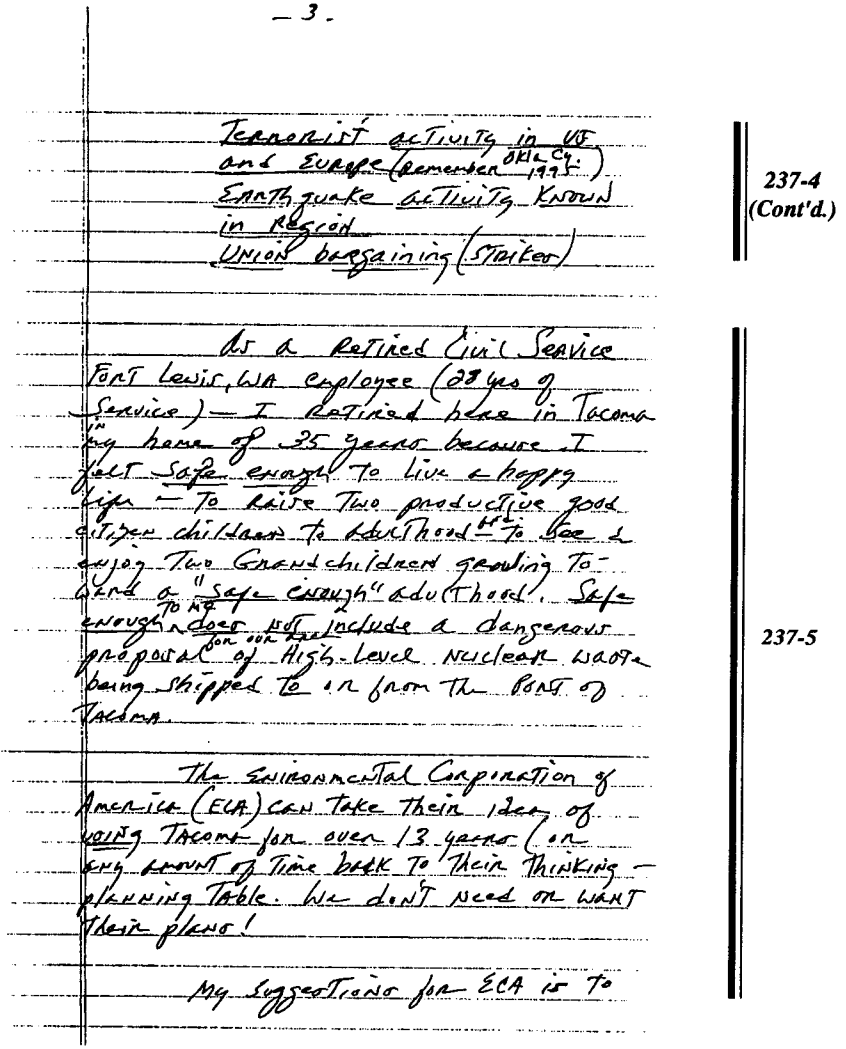
Response to Comment No. 237-3

In many instances, the perception by the public of the risk associated with acceptance of foreign research reactor spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, such adverse impacts have not been observed during the almost 30 years over which foreign research reactor spent nuclear fuel was accepted into the United States in the past. Under NEPA regulations, the socioeconomic effects evaluated for this EIS do not include those associated with psychological fear of receiving foreign research reactor spent nuclear fuel.

Response to Comment No. 237-4

The risk of radiation releases is low, as shown in Section 4 of the EIS; there is no possibility of a nuclear explosion from the proposed action; the potential for lack of funding is outside the scope of this EIS; the threat from terrorists would be reduced by accepting this material into the U.S. because in this case the terrorists could not make a bomb out of it; the possibility of earthquakes was taken into account in the EIS; and the subject of union bargaining is also outside the scope of this EIS.

COMMENTOR NO. 237: LANTZ, SHIRLEY A. (CONT'D.)



– 3 –

Terrorist activity in US and Europe (remember Okla Cy 1995)
Earthquake activity known in Region
Union bargaining (Strikes)

237-4 (Cont'd.)

As a Retired Civil Service Fort Lewis, WA employee (28 yrs of Service) – I retired here in Tacoma by choice of 35 years because I felt safe enough to live a happy life – To raise Two productive good citizen children to adulthood – To see & enjoy Two Grandchildren growing To-ward a "Safe enough" adulthood. Safe enough does not include a dangerous proposal of High-Level Nuclear Waste being Shipped to or from the Port of Tacoma.

237-5

The Environmental Corporation of America (ECA) can take their idea of using Tacoma for over 13 years (or any amount of time) back To their thinking – planning Table. We don't need or want their plans!

My Suggestions for ECA is To

RESPONSE TO COMMENT
COMMENTOR NO. 237: LANTZ, SHIRLEY A. (CONT'D.)

Response to Comment No. 237-5

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5 of the EIS, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

COMMENTOR NO. 237: LANTZ, SHIRLEY A. (CONT'D.)

Resolve The High-Level Nuclear problem
by letting all Those European Countries
(Who have more money Now Then The US
such as Japan, Switzerland etc etc
do Their own dirty HOT Nuclear
deactivating in Their own Countries.

Shirley A. Lantz

237-5
(Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 237: LANTZ, SHIRLEY A. (CONT'D.)

COMMENTOR NO. 238: REDLER, JAY & VIRGINIA

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Jay Redler + Virginia Redler Phone: 682-5916
Title and Organization: Former Member of CCLA Board
Address: 356 Highland Place
City: Clyde State Ca. Zip 94520

*** COMMENTS ***

My Wife and I feel that we do not want nuclear waste in our back yard. You can find another Storage to take it to.

Jay Redler

238-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 238: REDLER, JAY & VIRGINIA

Response to Comment No. 238-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternative 1 or 3) there would be no storage of this material at Concord NWS, any other port, or anyplace except for DOE management sites. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

COMMENTOR NO. 239: BLOMBERG, CRAIG

Craig Blomberg, RN, BSN
Box 1094
Davis, CA 95617
Phone: 916-756-4493

Comments on the draft FRR SNF EIS
Attention: Charles R. Head
Office of Spent Fuel Management (EM-37)
1000 Independence Ave., S.W.
Washington, DC 20585-0001

Dear Mr. Head,

I have learned of possible plans to bring HEU and LEU back to the U.S. via various ports of entry through-out the country to "temporary" storage and feel such action would be unsafe and inappropriate. The countries to whom we "leased" that uranium have every bit of storage technology available to them that we do. Moving such waste could have catastrophic effects if spilled at sea...it should be moved as little as possible. When we develop a "permanent" storage system in this country we could then consider such a policy. But for now, let's deal with our own soil and let other countries deal with theirs. 239-1 239-2 239-3 239-4

Incidentally, I am quite interested in progress made for the long-term management of LEU and HEU. If you have some type of executive summary outlining such progress I would be quite interested in receiving a copy. 239-5

Respectfully,

Craig Blomberg, RN BSN

RESPONSE TO COMMENT
COMMENTOR NO. 239: BLOMBERG, CRAIG

Response to Comment No. 239-1

The commentor's opposition to the acceptance and management of foreign research reactor spent nuclear fuel in the United States, is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration. Based on the environmental impact assessment presented in Section 4.2 of the EIS, the risk to the environment and the health and safety of the public associated with acceptance and management of foreign research reactor spent nuclear fuel in the United States is low.

Response to Comment No. 239-2

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5 of the EIS, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

Response to Comment No. 239-3

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radioactive contents have ever been released from a transportation cask as a result of an accident. The probability of an accident at sea is discussed in Appendix C, Section C.5.5 of the EIS, while the port accident probabilities are found in Appendix D, Section D.5.3.1.3. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3).

Response to Comment No. 239-4

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS).

Response to Comment No. 239-5

The Congress has mandated in the Nuclear Waste Policy Act, as amended, that DOE develop geologic repository(s) for permanent disposal of spent nuclear fuel and high-level waste to ensure that this and future generations are protected from any hazards. Accordingly, DOE is proceeding to characterize the Yucca Mountain Site to determine if it is a suitable site for a repository. Regarding the commentor's request for an executive summary outlining progress in this area, an information packet "Nevada and the Yucca Mountain Project" has been forwarded to your address.

COMMENTOR NO. 242: CLARK, BARBARA

P.O. Box 1222
Walla Walla, WA 99362
June 13, 1995

Charles Head
Office of SNF Management EM-37
USDOE
1000 Independence Ave SW
Washington DC 20585

RE: DOE/EIS - 0218D

Dear Mr. Head:

I am unable to attend any of the hearings on the DEIS and ask that my written comments be included in the record.

I urge the Department to select Alternative 3, the combination, for dealing with wastes generated by foreign "research" reactors. Any choice to use nuclear technology requires acceptance of responsibility for extremely dangerous wastes which are part of the technology. 242-1

There should be no importing of wastes from those countries which do not pose a proliferation risk. There should be no importing of LEU waste from any country. And there should be no importing of high level waste where it is feasible to provide dry cask storage with international inspection. Those who use the technology should bear the costs and risks. Further, it is in no one's interest to increase the inherent risks associated with nuclear products by adding the risks of transportation accidents. 242-2

In the remaining circumstances, where importing to the US appears necessary, this should not be done through public ports or on commercial vehicles. (This presumably leaves military transport and ports.) Civilian dock workers and the public need to be protected. We taxpayers have subsidized the nuclear industry sufficiently with our money*; it is wrong that we be further required to submit to safety risks above what we already endure for the benefit of the industry. 242-3

Finally, with Hanford cleanup of the wastes already on the site being as problematic and questionable as it is, it would be irresponsible to add more high-level waste to the site. Hanford is far from Washington DC, but it's not far from those of us who live here. We also want a safe life for our children. 242-4

I hope the Department of Energy will soon recognize that the costs and risks to taxpayers are much less with solar and other renewable technologies than they are with nuclear and will begin a rapid phase-out of its subsidy of the nuclear industry. 242-5

Barbara Clark
Barbara Clark

*and our health

RESPONSE TO COMMENT
COMMENTOR NO. 242: CLARK, BARBARA

Response to Comment No. 242-1

The commentor's qualified support for Management Alternative 3, the hybrid alternative, is noted. Management Alternative 3 is described in Section 2.4 of the EIS.

Response to Comment No. 242-2

The commentor's opposition to accepting foreign research reactor spent nuclear fuel from nations that pose no proliferation risk, where the spent nuclear fuel is LEU, and from nations where dry storage is feasible is noted.

The United States has in the past, and continues to play a leadership role in the world community in matters of nuclear weapons nonproliferation. In this role it initiated programs such as the Reduced Enrichment for Research and Test Reactors (RERTR) program and encouraged other nations to support it. Some of the nations which have supported it such as Britain, France, Japan, Sweden and others may not currently present the nuclear weapons proliferation risk as others. The reasons for considering these nations under this policy are included in Section 1.2 of the EIS.

As discussed in Section 1.1 of the EIS, the reason for including LEU in the policy is that the United States has offered LEU acceptance as an enticement for foreign research reactor operators to convert from HEU to LEU fuel use. The enticement was necessary because operation with LEU fuel is not as effective as with HEU fuel. Also, as explained in Section 2.3 of the EIS, the opportunities for expanded spent nuclear fuel storage at foreign research reactor sites are limited or nonexistent.

Response to Comment No. 242-3

The commentor's opposition to the use of commercial transport and public ports is noted. Estimated risks for marine transport, at candidate ports and along transportation routes were found to be low (Sections 4.2.1, 4.2.2, and 4.2.3 of the EIS, respectively).

Response to Comment No. 242-4

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent

COMMENTOR NO. 242: CLARK, BARBARA (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 242: CLARK, BARBARA (CONT'D.)

nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 242-5

Costs and risks of solar and other renewable technologies are outside the scope of this EIS. However, as part of its mission, DOE currently has on-going programs that are seeking to develop and promote use of these alternative energy sources, such as solar and wind.

COMMENTOR NO. 243: CRUZ, EDWIN C.

June 15, 1995

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

Dear Mr. Head,

I writing to you my concerns regarding the Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel.

We are a family of three residing in Clyde, California which neighbors the Concord Naval Weapons Station. I am deeply concerned that the U.S. Government has in its proposal to transport and/or store nuclear wastes in our neighborhood. I firmly believe that the potential for catastrophic accidents and sabotage is a definite possibility. 243-1

We have lived in our community for over 5 years now. Should the government proceed with their proposed policy, my family and I will immediately vacate and move elsewhere. The welfare and well-being of my family cannot be guaranteed by the U.S. Government's assurances that transport of nuclear waste poses no danger.

Sincerely,

Edwin C. Cruz

RESPONSE TO COMMENT
COMMENTOR NO. 243: CRUZ, EDWIN C.

Response to Comment No. 243-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternative 1 or 3) there would be no storage of this material in the Port of Concord NWS, any other port, or anyplace except management sites. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS). The worst consequence of a sabotage event would be the violation of the transportation cask. However, since the worst case accident analyzed assumes that the cask is violated and further assumes the presence of a large engulfing fire (which would not be present in the sabotage case), the analyzed worst case accident is more severe than the sabotage case. For this reason neither a severe accident nor an act of sabotage would jeopardize the health or safety of the public.

COMMENTOR NO. 244: MCSPADDEN, CAROLYNN

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Carolyn McSpadden Phone: 702-656-7705
Title and Organization: member of the public, retired teacher
Address: 4722 Antelope Wells Dr
City: Las Vegas State Nev Zip 89129

*** COMMENTS ***

As a member of the general public, I have not read the E.I.S., but based upon what I understand of the issue, as stated in the title of this page, I want to make it known that I would like to have the HEU returned to the United States. I feel this is preferable to leaving it in foreign countries, where it so easily could fall into the wrong hands, and be used against us. I certainly trust the D.O.E. to handle this material, and prefer they do so over foreign governments. 244-1

Sincerely,
Carolyn McSpadden

P.S. I appreciate the opportunity to enter my views on this matter.

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

All comments are due by June 20, 1995, and those received by that date will be considered by DOE in preparation of the final EIS. Comments received after the close of the comment period will be considered to the extent practicable.

RESPONSE TO COMMENT
COMMENTOR NO. 244: MCSPADDEN, CAROLYNN

Response to Comment No. 244-1

The commentor's support for Management Alternative 1, as described in Section 2.2 of the EIS, is noted.

COMMENTOR NO. 245: CHRISTWITZ, BARBARA

6/15/95

7700 Kelsey Creek Dr
Kelseyville CA 95451

Mr. Chas. Head
Office Spent Nuclear Fuel (EM-77)
U.S. DOE
1000 Independence Ave., SW
Washington, DC, 20585

Dear Mr. Head:

Please carefully consider my comments regarding DOE's plan to bring spent nuclear fuel from foreign reactors into the U.S. for storage at/through Concord Naval Weapons Base. CNWB is a very poor choice for many reasons, but chiefly because of its high population, numerous bridges, and 7 oil refineries in the Carquinez Straits alone, with 240 ship-loads of petroleum products a year in the Bay. An accident would be catastrophic.

Thank you for your attention to this matter.

Sincerely,
Barbara Christwitz

245-1

RESPONSE TO COMMENT
COMMENTOR NO. 245: CHRISTWITZ, BARBARA

Response to Comment No. 245-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

The port selection process that determined that Concord NWS was an acceptable port considered the population of the port and surrounding areas. Appendix D, Section D.1.9.5 presents an explanation of the "population" criterion. Despite the existence of refineries and bridges along the route to Concord NWS, the passage from San Francisco Bay to Concord does meet the qualitative requirements of Criterion 2 (Favorable Transit From Open Ocean) for the port selection (Appendix D, Section D.1.9.2 of the EIS). The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (port selection Criterion 2; Appendix D, Section D.1.9.2 of the EIS). Appendix D, Section D.5.3.1.3 of the EIS presents a discussion of the determination of the probability of ship accidents used in the EIS. The population and favorable transit from open ocean are not the only considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel, if it is accepted into the United States. Other items of importance include population along the route to the management site, port experience with handling containers, and port facilities. Appendix D, Section D.1.9 of the EIS presents details of the port selection process.

COMMENTOR NO. 246: SEABROOK, MARY C.

6/14/95

US Department of Energy
Office of Environmental Management (EM-37)
Att: Charles Head
1000 Independence Ave., SW
Washington DC 20585

This is a response to the comment period which is open through June 20 regarding the Department's proposal to ship spent nuclear fuel rods through Wando Terminal in Charleston SC. 246-1

I object to this proposal.

The expressway east of the Wando River which serves the terminal passes immediately adjacent to three schools and numerous residential subdivisions which were established prior to the construction of the terminal. I believe that there is risk involved and that such shipments should be directed to more remote terminals. 246-2

Mary C. Seabrook
685 Linns Point
Mount Pleasant SC 29464

copies: Senator J. Strom Thurmond
Senator Ernest F. Hollings
Representative Mark Stanford

RESPONSE TO COMMENT
COMMENTOR NO. 246: SEABROOK, MARY C.

Response to Comment No. 246-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Charleston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Charleston, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 246-2

The population along representative truck transport routes was taken into account in the calculations of ground transport risks. In all cases the risk was found to be low. This subject is discussed in detail in Section 4.2.3 and Appendix E of the EIS.

COMMENTOR NO. 247: PAUL, CLARENCE L.

June 14, 1995

Department of Energy
c/o Charles E. Head
Office of Spent Fuel Management, EM-37
1000 Independence Ave.SW
Washington, D.C. 20585 - 0001

It seems that the attempt to find a repository for OUR nuclear waste repositories dwindled from two, then to one and now to NONE. This is a long line of broken promises. Now the cleanup of Hanford has been put into reverse. I was appalled to learn that WE are allowing more waste to accumulate at Hanford by accepting 41 foreign nations problems. This seems to be causing the accumulated materials to exceed our capabilities to ever clean up , which puts the Columbia River and all those downstream of Hanford "IN HARMS WAY". We are spending $$$$$$$$ in an attempt to save the salmon. Lets also try to save the people who trusted you to protect them. 247-1

Since IWO JIMA was won at a terrible cost of American lives - why can it not be used to save lives all over the world by making it THE WORLD'S NUCLEAR REPOSITORY ?! 247-2
Why must we try to solve the world's ill's when we can't even solve our own. 247-3

Clarence L. Paul
4312 N.E. 40 street
Vancouver, Wa. 98661-3535
Phone (360) 695 - 2777

Clarence L. Paul

cc: Wa. State DOE Nuclear Waste Program
Hanford Advisory Board-Portland, Or
Heart of America NW
Vancouver Columbian
Vancouver Audubon Society
Nat'l Audubon Soc.Wa. State Office

RESPONSE TO COMMENT
COMMENTOR NO. 247: PAUL, CLARENCE L.

Response to Comment No. 247-1

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. A detailed, quantitative discussion of these impacts would have to be the subject of future NEPA documentation. As stated in Sections 2.1 and 4.2.7 of the EIS, if a geologic repository is not prepared to accept the foreign research reactor spent nuclear fuel or its resultant stable waste forms (generated due to chemical separation or other processing technology) DOE would continue to manage the material in exisiting facilities at the DOE management site(s).

Response to Comment No. 247-2

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 247-3

The commentor's preference for overseas storage in a remote location is noted. Under Management Alternative 2, Subalternative 1a (Section 2.3 of the EIS), the United States would assist foreign research reactor operators in storing their spent nuclear fuel in their own country or some other location outside of the United States. The disadvantages of storage in remote locations include costs of constructing suitable storage facilities and the difficulty of providing security in remote areas. This option would leave a concentrated quantity of highly enriched (weapons-grade) uranium outside of the United States. From the viewpoint of nuclear weapons nonproliferation, it is less risky to provide for disposition of these materials in the United States. As demonstrated by the analysis in Section 4 of the EIS, the risks associated with implementation of the proposed action to human health or the environment would be low.

COMMENTOR NO. 249: PENCE, ALISON

Alison Pence
282 20th Street
San Francisco, CA 94131

Mr. Charles Head
Office of Spent Nuclear Fuel Mgt. (EM-37)
U.S. DOE
1000 Independence Ave., SW
Washington DC 20585

June 12, 1995

Dear Mr. Head:

I am responding to the proposal that would transport nuclear waste through Concord. I attended the hearing held in Concord on May 22, 1995 and join in the chorus of residents and bay area citizens who think, for many reasons, radioactive material should be transported and stored elsewhere. My primary concern is that the Bay Area is heavily populated and seismically active. If, as you said, "a container just fell off a truck", getting it back on the truck and through passable roads would not be a high priority after an earthquake. It has been six years since the '89 quake and some freeways are still closed! 249-1

You yourself said that in the big EIR (not just for foreign fuels), the recommendation is to have waste received either in South Carolina or in Washington state. 249-2

I think that if you ship to this side of the U.S. at all, you should send shipments to Washington. They are closer to Idaho than we are, they have experience with nuclear elements and they might welcome the work. As you know, the community here is hostile towards your proposal. 242-3

Sincerely,

Alison Pence

Alison Pence

RESPONSE TO COMMENT
COMMENTOR NO. 249: PENCE, ALISON

Response to Comment No. 249-1

The population within a 50-mile radius of the Concord NWS was considered when analyzing the potential impact of a range of hypothetical port accidents. The risks were found to be low (Appendix D, Section D.5 of the EIS). Earthquakes were not analyzed seperately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident, and thus affect the probability of such accidents; however, the number of earthquake-induced ship and road accidents is small compared to other causes.

Response to Comment No. 249-2

As stated in the May 30, 1995 Record of Decision for the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement, aluminum-based foreign research reactor spent nuclear fuel will be managed at the Savannah River Site. Any other foreign research reactor spent nuclear fuel will be managed at the Idaho National Engineering Laboratory.

Response to Comment No. 249-3

The distance from the port to the management site is only one of the considerations in selecting potential ports of entry for the foreign research reactor spent nuclear fuel. Other considerations such as port population, route population, port experience with handling containers, and access to the ocean would be considered in making the final selection of port of entry. Appendix D, Section D.1.9 of the EIS presents details of the port selection process.

COMMENTOR NO. 250: FITZSIMMONS, JAMES & COLLEEN

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: James E./Colleen A. Fitzsimmons **Phone:** (510) 685-0581

Title and Organization: Citizens of the United States/U.S. Taxpayers

Address: 2090 Smith Lane

City: Concord **State** CA **Zip** 94518-3515

*** COMMENTS *** June 14, 1995

We strongly object to this proposal regarding shipping, handling and "temporary" storage of spent nuclear fuel rods from foreign countries through the Naval Weapons Station at Concord, California. 250-1

We feel that the D.O.E. should halt this plan and have our government re-examine the present U.S. position on INTERNATIONAL responsibility regarding the treatment of nuclear waste. 250-2 Foreign countries must be told that one of the prices of acquiring nuclear technology from our country will be the setting aside of areas within their own countries for disposal of the wastes they create - all costs to be borne by that country. The safety of our citizens should be your paramount concern. A secondary factor would be the cost to be paid by those same citizens. 250-3

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

The dollar costs to the U.S. of monitoring a program such as one described above certainly would not exceed what is presently burdening our taxpayers. 250-4

RESPONSE TO COMMENT
COMMENTOR NO. 250: FITZSIMMONS, JAMES & COLLEEN

Response to Comment No. 250-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternative 1 or 3) there would be no storage of this material at Concord NWS, any other port, or anyplace except for management sites. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

Response to Comment No. 250-2

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States is noted. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

Response to Comment No. 250-3

The commentor's preference for the No Action Alternative is noted. This alternative is discussed in Sections 2.5 and 4.6 of the EIS.

Response to Comment No. 250-4

The cost of storing and disposing of the spent nuclear fuel within each of the 41 countries participating in this program would greatly exceed the cost of any action (storage, reprocessing, processing without separation of the uranium, geologic disposal, etc.) at only one or two sites. To ensure security and safety, U.S. monitoring would require development of independent spent nuclear fuel storage installations in many countries that have no nuclear infrastructure (excluding the research reactor). In some countries, there is little industrial or security infrastructure. Concentrating the spent nuclear fuel in only one or two locations for management (regardless of the approach) is less costly and more secure than any distributed alternative.

COMMENTOR NO. 251: O'BRIEN, RAYMOND J.

ÓB

June 13, 1995

Mr. Charles Head, Program Manager
Office of Spent Fuel Management (EM-37)
United States Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585-0001

Dear Mr. Head:

By way of this letter, I would like to raise the following concerns regarding the Draft Environmental Impact Statement for the receipt and transport of spent nuclear fuel through the Concord Naval Weapons Station, Concord, California:

1.) **The Draft Environmental Impact Statement makes no mention of specific proposed trucking/rail routes for the transshipment of spent nuclear fuel rods.** In fact, the final Environmental Impact Statement for this project should only be issued after the permanent storage sites have definitively been approved. Only after that action is taken should the nearest ports of receipt be considered and specific transshipment routes proposed. 251-1

2.) **The Draft Environmental Impacts Statement draws an arbitrary effected zone of ten miles around the Concord Naval Weapons Station.** Yet many municipalities along possible truck and rail routes have not even been notified of your proposed project, even though they may be expected to shoulder the emergency management response in the event of an accident. Likewise, the arbitrary demographics zone of ten miles surrounding the Concord Naval Weapons Station camouflages the disproportionate environmental burden and risk that a community like Bay Point (1 ½ miles from the proposed loading dock at Concord Naval Weapons Station) will have to bear. Environmental Justice policy declares that low income communities should not be saddled with potentially hazardous environmental projects. Bay Point, the community with the lowest demographics of any community within your effected zone, will be unfairly burdened by this proposed project 251-2 251-3

Caisleán Beag an Sceith an Chnuic
813 Caskey Street/Bay Point, California/94565-6766

RESPONSE TO COMMENT
COMMENTOR NO. 251: O'BRIEN, RAYMOND J.

Response to Comment No. 251-1

The ground transport route options and identification process are discussed in Section 2.6.4. Over a hundred representative ground transport route options were analyzed in Appendix E including routes to all of the potential foreign research reactor spent nuclear fuel management sites. The results are presented in Section 4.2.3 of the EIS. In all cases the risks were found to be low.

Response to Comment No. 251-2

For the purposes of the port selection criterion associated with population (Criterion 5), a 10-mile (16 km) radius from the port was used (Appendix D, Section D.1.9.5 of the EIS). However, the impact evaluation covered a 50-mile radius around the port. The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS). Regardless of the radius of consideration used, communities closer to the port would bear a disproportionate amount of risk. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low, even for the most-affected individuals.

In regard to informing the public, the draft EIS was mailed to more than 1,500 people and an official DOE announcement of the meeting location and purpose was advertised in local newspapers. Public service announcements were also provided to local radio stations and to cable-access television. The meeting announcement was included in the Federal Register concerning the EIS. In addition, 1-800 numbers were provided for preregistration and for requesting copies of the draft EIS.

Response to Comment No. 251-3

Appendix A of the EIS responds to Executive Order 12898 which directs federal agencies to identify and address disproportionately high and adverse environmental effects of their policies and activities on minority populations and low-income populations. Environmental effects of Management Alternative 1 and 3 were evaluated and found to have no significant beneficial or adverse effects on the general population, including minority populations and low-income populations, surrounding Concord NWS or other candidate ports of entry (Sections 4.2 and 4.5 of the EIS). Section 3.2.1 of the EIS identifies low-income households and describes the racial and ethnic composition of resident minority populations surrounding each of the candidate ports. Environmental justice at candidate ports, along ground transportation routes, and at interim management sites is discussed in Sections 4.2.2.6, 4.2.3.7, and 4.2.4.5, respectively, of the EIS.

COMMENTOR NO. 251: O'BRIEN, RAYMOND J. (CONT'D.)

page 2
To: Mr. C. Head
6/13/95

I hope that you will find these concerns relevant, and trust that they will be addressed in your Final Environmental Impact Statement.

Sincerely,

Raymond J. O'Brien

Raymond J. O'Brien

RESPONSE TO COMMENT
COMMENTOR NO. 251: O'BRIEN, RAYMOND J. (CONT'D.)

COMMENTOR NO. 252: MCGOWAN, TOM

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: TOM MC GOWAN Phone: (702) 382-9745 (msg).

Title and Organization: INDIVIDUAL MEMBER OF THE PUBLIC

Address: 720 So. CASINO CENTER BLVD., #5

City: LAS VEGAS State NEV. Zip 89101

(0) IN PREFACE:--(SEE OTHER SIDE)-- *** COMMENTS ***

(1). THE FACILITATOR AND BOTH DOE/HQ-ASSIGNED SPEAKERS WERE PROFESSIONAL, DEDICATED, EXPERTISED, PUBLIC-ASSISTIVE AND RESPONSIVE, COURTEOUS AND EXTREMELY EFFECTIVE PURSUANT TO THEIR ASSIGNED PURPOSE.

(2). THE MODIFIED 'ROUND-TABLE' MEETING AND DISCUSSION FORMAT WAS AN IMPROVEMENT UPON DOE's (NON-UNIQUE) TRADITIONAL 'AUDIENCE' (NOT 'MEETING') POLICY, BUT FALLS FAR SHORT OF AN OPTIMALLY OMNI-PARTICIPANT AND PRODUCTIVE GENUINE OPEN PUBLIC MEETING AND/OR GENUINE PUBLIC CONSENSUS DEVELOPMENT PROCESS. 252-1

(3). THE ENSURED EFFECTIVE ALTERNATIVE SOLUTION TO THE ENTIRE FRR/SNF ISSUES COMPLEX, EXPRESSLY INCLUSIVE OF ENSURED NUCLEAR NON-PROLIFERATION, IS READILY AVAILABLE IN RECOMMENDATION AND PROPOSAL. IF SERIOUSLY INTERESTED, YOU MAY SO INDICATE, VIA NOTIFICATION, AT YOUR EARLIEST CONVENIENCE, OF THE SCHEDULING OF A ONE(1) HOUR MEETING, PRESENTATION, QUERY AND DISCUSSION OF THE FULLY-DETAILED PROPOSAL, IN FURTHERANCE OF ITS ADOPTION AND IMPLEMENTATION IN THE GENUINE BEST PUBLIC INTEREST.

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

All comments are due by June 20, 1995, and those received by that date will be considered by DOE in preparation of the final EIS. Comments received after the close of the comment period will be considered to the extent practicable.

(4). THANKS FOR THE COFFEE, THE COOKIES, THE CONVIVIAL COMRADERIE, AND YOUR SINCERELY DEDICATED EFFORTS IN THE NATIONAL PUBLIC-INTEREST.

TOM MC GOWAN

RESPONSE TO COMMENT
COMMENTOR NO. 252: MCGOWAN, TOM

Response to Comment No. 252-1

The commentor's support concerning the format used by DOE for the public hearings, the professionalism, responsiveness and courtesy of the facilitator and DOE representatives, and the United States nuclear weapons nonproliferation goals, is noted.

COMMENTOR NO. 253: RAYMER, TERESA L.

JUNE 14, 95

DEAR U.S. DEPARTMENT OF ENERGY,
I AM VERY UP SET ABOUT YOUR NUCLEAR NUKE STORAGE PLAN. IT WOULD BE A TRAGIC END TO THAN "GOD'S COUNTRY" THE GREAT NORTHWEST INTO A NUCLEAR DUMP! WHY USE US TAX PAYERS TO PAY FOR THIS? 253-1

WASHINGTON STATE HAS ENOUGH PROBLEMS WITH PULLUTION PROBLEMS WITH OUT ADDING NUCLEAR WASTE TO IT. PLEASE ~~DON'T~~ DO THIS TO ARE BEAUTIFUL GREEN STATE!!! 253-2

SINCERELY

MRS. TERESA L. RAYMER
P.O. BOX 4244
VANCOUVER, WA
98662-0244

RESPONSE TO COMMENT
COMMENTOR NO. 253: RAYMER, TERESA L.

Response to Comment No. 253-1

Sections 2.2.1.2 and 2.2.2.3 of the EIS discuss alternative financing arrangements that range from charging the reactor operators a fee that would cover all the costs of the proposed action, to having DOE subsidize all of the reactor operators' costs. One compromise position that is evaluated is to charge developed countries a competitive fee, while developing countries would be subsidized. If less than the full cost of the proposed action is charged to the reactor operators, the difference would be the cost to the United States of gaining participation by other countries in our nuclear weapons nonproliferation programs.

Response to Comment No. 253-2

The commentor's opposition to the use of Washington State is noted. However, it should be noted that the analyses provided in Section 4.2 of the EIS demonstrate that there would be no significant adverse impacts to any of the water ways, ports, or highways that the material might pass through or near. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. As stated in Section 2.6.2 of the EIS, to date, after more than 30 years experience in shipping, no spent nuclear fuel transportation cask has ever released any of its contents (radioactive material), even in actual highway accidents. Based on this experience, DOE considers that spent nuclear fuel transportation casks passing through the Port of Tacoma, Washington State, or any other port or state, would not release their radioactive contents.

COMMENTOR NO. 254: HERRMANN, ELIZABETH

June 16, 1995

Department of Energy
c/o Mr Charles R Head
Office of Spent Fuel Management
EM-57 1000 Independence Ave S.W.
Washington D.C. 20585-0001

Dear Sir

I urge you to deny access to our country as a storage space for nuclear waste from other countries. 254-1

Yours truly,

Elizabeth Herrmann
1015 NE 86th Ave
Vancouver, WA 98664

RESPONSE TO COMMENT
COMMENTOR NO. 254: HERRMANN, ELIZABETH

Response to Comment No. 254-1

The commentor's opposition to the management of foreign research reactor spent nuclear fuel in the United States is noted. In assessing the environmental and policy impacts of the proposed action, DOE has also considered and evaluated Management Alternative 2 which involves management of foreign research reactor spent nuclear fuel overseas. Management Alternative 2 is discussed in Section 2.3 of the EIS.

COMMENTOR NO. 256: YURMAN, RICH

June 13 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management
DOE
WASHINGTON DC

Dear Mr. Head:

As a resident of the San Francisco Bay Area I am deeply concerned by DOE's plans to transship spent nuclear fuel from other countries via the Concord Naval Weapons Station to various sites in the U.S. This means truckloads of the most dangerous toxic materials known will pass through one of the most highly populated areas of our country where an accident or derailment could put all of us in this area at grave risk. And this danger is compounded by CNWS's long history of mishandling shipments and having major accidents. To top off all this, the contaminated material, toxic for 250,000 years, cannot be stored safely anywhere on the planet. 256-1 256-2

Therefore I urge you, as the responsible official, to reconsider this project and cancel the use of CNWS as a receiving station for overseas nuclear wastes in the form of spent nuclear fuel. 256-1 (Cont'd.)

Thank you for your time & attention

Yours,
Rich Yurman

RESPONSE TO COMMENT
COMMENTOR NO. 256: YURMAN, RICH

Response to Comment No. 256-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low. Not only is the risk low, but the analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS).

Regarding the commentor's concern about the population of the area, the port selection process that determined that Concord NWS was an acceptable port considered the population of the port and surrounding areas. Appendix D, Section D.1.9.5 of the EIS presents an explanation of the "population" criterion.

As the result of public concern borne from a September, 1993 television report, the Contra Costa County Board of Supervisors initiated an investigation of the safety at Concord NWS. Their report on the subject, "Safety at the Concord NWS" dated November 2, 1993, concluded in part, "There were no incidents involving explosions or radiation exposure. Many of the reported incidents were not accidents caused by Weapons Station employees but, rather, were discoveries by employees that materials being received had been damaged during loading or transit. In some cases the shipments had not been properly blocked, braced or banded."

In fact, the safety record at Concord NWS is significantly better than that of ports in the private sector with similar activities. According to the Department of Labor statistics, for the category of marine cargo handling, the number of lost workday cases per 100 full-time workers for 1993 was 7.1 nationwide (current data not available), which is typical. The number of lost workday cases per 100 workers at Concord NWS for the first three quarters of fiscal year 1995 was 5.3, which is also typical for Concord.

Response to Comment No. 256-2

It is true that some of the man-made nuclide in the spent nuclear fuel would be toxic for a long time (more than 250,000 years) similar to those found naturally in our environment. Both the man-made and naturally present toxic materials have been stored safely without undue harm to the public or the environment. In the case of man-made material, experience at the Savannah River Site has shown an excellent storage capability of foreign research reactor spent nuclear fuel type for more than 20 years. The research reactors, with the lifetime cores, keep the same fuel in the reactor pool for approximately 40 years. Others, as indicated in Appendix F, Section F.2.9 of the EIS, have experience in safe storage of spent nuclear fuel in dry storage for more than 30 years. DOE proposes to store the foreign research reactor spent nuclear fuel in dry storage after receipt and characterization of the spent nuclear fuel. The EIS concluded that the risks of storing the foreign research reactor spent nuclear fuel in dry storage at only of the potential management sites are low (Section 4.2.4, and Appendix F, Section F.4).

COMMENTOR NO. 257: WINCHESTER, ELLEN & JOHN

Ellen M. Winchester
John W. Winchester
2405 Delgado Drive
Tallahassee, FL 32304
Phone 904-578-0954

June 15, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Dept. of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Mr. Head:

As interested citizens we wish to make the following comments on DOE EIS 02180, March 21995, Foreign Research Reactor Spent Nuclear Fuel (FRRSNF). We believe that only the spent fuel from research reactors in unstable countries should be accepted for management by the United States in view of (1) the immense amount of US domestic spent fuel awaiting disposal, (2) the scientific uncertainties regarding the security from contamination of future or current ecosystems of all storage methods so far proposed, (3) the resistance of states and communities to selection as sites of either interim or permanent storage, (4) the possibility that no method of permanent storage will be established for many decades, (5) the likelihood that states and communities will strongly resist establishment of interim storage facilities within their boundaries, and (6) the probable strong resistance of communities through which the FRRSNF would be transported en route to interim storage and the resultant civic unrest. 257-1

We realize that all of these objections to US acceptance of FRRSNF from stable countries also apply to acceptance of FRRSNF from unstable countries, but we believe the proliferation risks of leaving this dangerous but commercially valuable material in unstable political environments outweigh the risks attached to receiving it, as these risks are described above. With regard to claims of U.S. failure to live up to its original commitment to accept FRRSNF produced from U.S. origin HEU, we believe the governments of stable countries realize that the problems involved in establishing the perpetual guardianship of the plutonium and highly enriched uranium in spent fuel--or the high level wastes resulting from reprocessing--are much more difficult to solve than they appeared to be at the time the original "Atoms for Peace" agreements were signed. Further, we believe that these generally prosperous countries should be willing to manage their own share of this global burden. So far as trusting stable governments to manage their spent fuel responsibly under I.A.E.A. safeguards is concerned, the quantity of research reactor spent fuel overflowing their storage pools is small compared to their burden of commercial spent fuel, which we have no alternative to trusting them to manage without increasing commerce in weapons grade uranium or plutonium. 257-2

An additional reason for accepting the FRRSNF from politically unstable countries that seems reasonable to us is the lack abroad of LEU reprocessing facilities, mentioned in the EIS, and the resulting incentive to use HEU. 257-3

Finally, however, we are puzzled by the emphasis in this EIS on reprocessing as an acceptable alternative to unreprocessed spent fuel management. We thought that alternative was ruled out in the U.S. more than a decade ago. Since reprocessing produces difficult to store high level and other kinds of toxic wastes which are greater in bulk than spent fuel, as well as weapons grade uranium and plutonium, we doubt it protects health and safety, can be stored more safely, provides cost savings, etc. The fact that DOE is obliged to place HEU under UN safeguards is a recognition that reprocessing creates more problems than it solves. 257-4

Sincerely,

Ellen M. Winchester
John W. Winchester
Professor of Oceanography, Florida State University

RESPONSE TO COMMENT
COMMENTOR NO. 257: WINCHESTER, ELLEN & JOHN

Response to Comment No. 257-1

The United States has in the past and continues to play a leadership role in the world community in matters of nuclear weapons nonproliferation. In this role, it initiated programs such as the Reduced Enrichment for Research and Test Reactors (RERTR) program and encouraged other nations to support it. Some of the nations which have supported it such as Britain, France, Japan, Sweden and others may not currently present the same nuclear weapons proliferation risk as other nations. The reasons for considering these nations under this policy are included in Section 1.3 of the EIS.

Response to Comment No. 257-2

Management Alternative 3, described in Section 2.4 of the EIS, considers management of the spent nuclear fuel from foreign research reactors in the United States and overseas. As discussed in Section 2.10 of the EIS, it would be imprudent to publicly label selected nations as a proliferation risk because such designations are subjective and would likely lead to adverse political and diplomatic consequences. Many research reactor operators located in nations which are closely allied with the United States cannot, at this time, dispose of their own spent nuclear fuel in their country (Sections 1.1 and 1.2 of the EIS). Thus, the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

Response to Comment No. 257-3

The current lack of LEU reprocessing capability abroad applies to the new high-density LEU fuel which is made of a uranium-silicon-aluminum alloy. The commentor's emphasis on this reason for preferring the acceptance of foreign research reactor spent nuclear fuel into the U.S. is noted.

Response to Comment No. 257-4

The advantages and disadvantages of domestic chemical separation are discussed in Sections 2.2.2.6 and 4.3.6 of the EIS. It is included in the EIS because it is a reasonable alternative. Furthermore, it would not be necessary to store HEU under United Nations safeguards if it is blended down to LEU.

COMMENTOR NO. 259: HOWE, DOROTHY

875 12th Street
Washougal Wa., 98671
June 12, 1995

Dear Mr. Head,

I have just read a very disturbing article saying the Dept. of Energy has proposed to import high-level nuclear waste from 41 nations. If this is true, I am very much opposed to this plan. 259-1

Our own country already has more nuclear waste than we know what to do with so why should we import it from other countries?. Hanford already has more waste than it can handle so why should more waste be stored there? Besides the expense to our country and danger of accidents in transporting it, I am very much opposed to this plan. 259-2 259-3

Yours truly,
Mrs. Dorothy Howe

RESPONSE TO COMMENT
COMMENTOR NO. 259: HOWE, DOROTHY

Response to Comment No. 259-1

The commentor's opposition to the acceptance and management of foreign research reactor spent nuclear fuel in the United States, is noted. Based on the environmental impact assessment presented in Section 4.2 of the EIS, the risk to the environment and the health and safety of the public from the acceptance and management of foreign research reactor spent nuclear fuel in the United States would be low.

Response to Comment No. 259-2

Management of spent nuclear fuel from foreign research reactors in the United States is one of three management alternatives evaluated in the EIS (Sections 2.2 through 2.4). The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS).

If the decision made after completion of this EIS is for the United States to implement a new policy for management of spent nuclear fuel from foreign research reactors (the proposed action, Section 2 of the EIS), the United States would assist with management of this spent nuclear fuel for a limited time (see last paragraph of Section 1.2 of the EIS) to provide foreign research reactor operators with an incentive to complete their conversion to LEU fuel, and give them time to develop their own means for dealing with their spent nuclear fuel.

Response to Comment No. 259-3

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 260: CALL, BETH

102 Otis
Walla Walla, WA 99362
June 13, 1995

Dear Mr. Head,

I am writing in regard to DOE-EIS-0218D. The thought of importing nuclear waste from other nations when we are so far from having a safe way of disposing of our own waste is appalling. Storage at Hanford which is so close to the Columbia whose storage facilities are already leaking and complet ely incapable of sustaining the shocks of an earthquake is even more terrifying. The risks of shipping these highly hazardous wastes through what would necessarily be be some highly populated areas like Puget Sound, Seattle, and Portland is unthinkable. 260-1 260-2 260-3

I do understand that there is a risk that unstable or hostile nations may use their waste to produce nuclear weapons and thus that some compromise may be necessary. In future no nuclear fuel except low enriched uranium should be made available. Then we would not have to worry about disposing of these wastes; the nations using it could do so themselves, accepting the responsibility for disposing of the hazardous wastes they choose to produce. 260-4

There is no need for the U.S. to accept Spent Nuclear Fuel from nations that do not pose a proliferation risk. As explained above, we should not accept Low Enriched Uranium wastes that can not be used in bombs. Where dry cask storage is feasible and subject to international inspection, storage should take place in the producing country, thus eliminating all transportation risks. 260-5 260-6

Where importation is unavoidable, namely enriched uranium from unstable or unfriendly governments, it should not use commerial freighters or public ports in large cities. This would protect longshore workers, the public on local roads, and the public if there should be a shipboard fire. 260-7

Hanford should be completely ruled out as a possible storage facility for High-level Nuclear Wastes. The USDOE is already having trouble funding safety upgrades and fuel removal from K-Basin. Nations that choose to use nuclear power must accept the environmental, health and financial costs which come with it. The U.S. and all the other countries must realize that it is time to further develop the non-polluting, infinitely renewable sources of sun and wind power that free us being enslaved to means of power production whose wastes ultimately threaten our very existence. 260-2 (Cont'd) 260-8

Thank you,

Beth Call

Beth Call

RESPONSE TO COMMENT
COMMENTOR NO. 260: CALL, BETH

Response to Comment No. 260-1

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States, is noted. Spent nuclear fuel from foreign research reactors has been safely managed in the United States for nearly four decades (Section 1.1 of the EIS). Sections 2.3, 2.5, and 4.5 of the EIS describe other alternatives under consideration.

Response to Comment No. 260-2

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 260-3

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through Puget Sound, Seattle, Tacoma, or Portland is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to Puget Sound, Seattle, Tacoma or Portland, or to any of the ports analyzed in the EIS, is low. The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS, "Consequences of Port Accidents).

Response to Comment No. 260-4

The Energy Policy Act of 1992 contains provisions that bar essentially all exportation of HEU by the United States (See Section 1.1 of the EIS). Since passage of this Act, no new export licenses for HEU have been issued by the United States.

Response to Comment No. 260-5

The United States has assumed in the past and continues to assume a leadership role in the world community in matters of nuclear weapons nonproliferation. In this role it initiated programs such as the Reduced Enrichment for Research and Test Reactors (RERTR) program and encouraged other nations to support it. Some of the nations which have supported it may not currently present the nuclear weapons proliferation risk as others. The reasons for considering these nations under this policy are included in Section 1.3 of the EIS.

As discussed in Section 1.1 of the EIS, the reason for including LEU in the policy is that the United States has offered LEU acceptance as an enticement for foreign research reactor operators to convert from HEU to LEU fuel use. The enticement was necessary because operation with LEU fuel is not as effective as with HEU fuel.

Response to Comment No. 260-6

Overseas storage is addressed in Management Alternative 2, Subalternative 1a. The commentor's preference for this alternative is noted. This alternative is discussed in Sections 2.3 and 4.4.1 of the EIS.

Response to Comment No. 260-7

The analyses of impacts associated with accidents and incident-free operations involving foreign research reactor spent nuclear fuel, which are presented in Sections 4.2.1 and 4.2.2 of the EIS, demonstrate that the use of commercial ships would not pose any significant risk to the port personnel or the population near the port for any of the ten selected ports. One port selection criteria (Criterion 5) evaluates the population of ports, removing the largest-population ports (Appendix D, Section D.1.9.5 of the EIS), as the commentor suggests.

Response to Comment No. 260-8

Consideration of solar and wind power are outside the scope of this EIS. However, it should be noted that as part of its mission, DOE currently has on-going programs that are seeking to develop and promote use of these alternative energy sources.

COMMENTOR NO. 267: BERGER, HEDY

Re: Concord Naval Weapons Station; Nuclear Fuel Plan

From Hedy Berger
1557 Franklin
SF CA 94109
(concerned citizen)

June 16, 1995

Phone/Fax
(415)292-5554

Dear U.S. Department of Energy:

As a response for your environmental report I hope you include my concern for the underlying reasons the plan to appropriate nuclear fuel from the world suggests. One simply doesn't see why one branch of government supports the creation of poison while another branch is required to hide it. One logically concludes that the poison is worth more to create and hide than not to create and not to hide. In all fairness, one might consider it correct to hide poisons in and of itself as an absolute principal; with the purpose of preventing it from those who would administer it to an innocent life form. On the other hand one would conclude that this is not the principal which is being made sacred, in fact, it is this principal which is being desecrated, since it is the same body hiding it which has dished it out. It is in a similar way that one might conclude how there has been the desecration of the principal of the environment, or what one might call the harmony of indigenous life forms. Certainly this principal cannot be nourished by the same mouth which says a monotony of laws rewarding biological decadence, one might further conclude that letters such as the one one has been asked to write for the purpose of the environmental report is going to be useless towards its proposed purpose. Contrary to trust, this decision technology builds suspician. One finds the request of the commentary perverse, like being asked by the perpetrators to write a list of the risks between the death sentence of the world and the death sentence of a place within that world, as if the list would be long enough, eventually, to call a wrong a right, having forgotten the eradication of contamination creators, and having forgotten the common knowledge of it meaning anything to anyone exposed, because any thing can be exposed, so long as it's worth it (supposedly) to condone poisonous methods. But whether it's worth it to proceed in this negative direction is questionable to the extent that more irreversable destruction means less happy terrorists, and more angry everyday citizens of the world... an all around miserable stew. If you don't know how to stop making poison how are you going to convince anyone you know where it goes? And even if you don't make it yourself, but tell everyone else to make it, isn't that all the more reason to suspect your motives in high security collections of it? Until there is a strong message for the earth maintained with integrity and sacrifice in every way, until a real care is established, I cannot support an establishment, a process, or a people, or a person, saying one thing and doing another.

Hedy Berger

267-1

RESPONSE TO COMMENT
COMMENTOR NO. 267: BERGER, HEDY

Response to Comment No. 267-1

The commentor's opposition to the proposed policy is noted.

COMMENTOR NO. 269: TETERS, DARLENE

June 15, 1995

TO: DEPARTMENT OF ENERGY - the Office of Spent Fuel Management (Fax# 202-586-4073)
C/O MR. CHARLES R. HEAD

First, of all I don't feel it is up to our Nation to house HIGH-LEVEL RADIOACTIVE NUCLEAR WASTE FROM 41 NATIONS. Waste from countries like Japan, Australia, Canada, Sweden & Switzerland etc. In my opinion these countries are not exactly part of the third world. These nations should be held accountable for their oun spent fuel and should plan for the safe storage of this highly toxic waste within their own borders. 269-1

Second, I don't want this high-level nuclear waste from 41 nations throughout the world which will be routed through Portland Oregon or Puget Sound destined for the "K BASIN" area at or own HANFORD, WASHINGTON on the Columbian river. Hanford is not an acceptable site for average or even more high-level waste, in fact, Hanford already has a leaking storage pool alongside the columbian River. this river is the lifeblood of our region and must not be ruined by nuclear contamination. Right now our government has not found a sure and safe way to store radioactive waste. We must remember that the dangers from this waste will not go away for hundreds or even thousands of years. The first several years of the operation is expected to cost UNITED STATES CITIZENS about 1 Billion, like all bids the cost will be more as usual. Our longshoremen have refused to handle these extremely toxic materials becaise they would be exposed to up to 200 Millirems of radioactivety per hour. Even children stuck in traffic jam could be exposed to a significant dose. 269-2 269-3 269-4 269-5 269-6

Third, I don't trust our general or foreign shipping line to handle this HIGH-LEVEL RADIOACTIVE WASTE on our rivers & highways. In our own country we have had oil spills that has caused alot of damaged. The ships are differential not design to handle this deadly cargo, accidents do happen under the best of plans. Our President don't want the high-level radioactive waste to get in the wrong hands, so bomgs can't be made. In the best of foreign countries corruption can happen. MONEY DOES TALK, this radioactive waste can be sold and the rest ship to the United States. As you can tell I don't support this proposed importation of high-level nuclear waste from the 41 nations to the UNITED STATES. 269-7 269-8

Sincerely,
Darlene Teters

Darlene Teters
2845 Lewis River Road
Woodalnd, Washington 98674

RESPONSE TO COMMENT
COMMENTOR NO. 269: TETERS, DARLENE

Response to Comment No. 269-1

The United States has assumed in the past, and continues to assume, a leadership role in the world community in matters of nuclear weapons nonproliferation. In this role, it initiated programs such as the Reduced Enrichment for Research and Test Reactors (RERTR) program and encouraged other nations to support it. Some of the nations which have supported it such as Britain, France, Japan, Sweden and others may not currently present the same nuclear weapons proliferation risk as other nations. The reasons for considering these nations under this policy are included in Section 1.3 of the EIS.

Response to Comment No. 269-2

The commentor's objection to bringing foreign research reactor spent nuclear fuel through the Ports of Portland and Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through either port, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 269-3

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 269-4

Costs for the complete program (40 years) could approach or exceed $1 billion. Costs to the United States taxpayers would likely be in the low to middle hundreds of millions, depending on which countries participate, how the spent nuclear fuel is handled, when the fees are collected, and other factors. Costs could go much higher, depending on risks relating to geologic disposal. The reason for even considering these expenses is the importance of removing weapons-grade nuclear material from civilian commerce and supporting a conversion of all the world's research reactors to non-weapons-grade material.

COMMENTOR NO. 269: TETERS, DARLENE (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 269: TETERS, DARLENE (CONT'D.)

Response to Comment No. 269-5

There is a maximum allowable radiation dose rate of 200 mrem per hour however, this limit is on the dose rate at the surface of the transportation cask, which would be inside of the container. The maximum radiation dose rate limit of interest to those that would be near the container, such as longshoremen, is 10 mrem per hour at a distance of 2 meters from the surface of the container (both dose rate limits come from regulation 49 CFR Part 173). The actual total dose that a longshoreman would get handling a cask is quite small due to the fact that a handler would not be present at the surface of the container for long and the total time near the cask is quite short. Appendix D, Section D.4.3.2.1 of the EIS presents the time/distance analysis of cask handling, Section D.4.5 of the EIS presents the resulting doses and risks, and Appendix F, Section F.5 of the EIS presents an evaluation of the dose rates from a transportation cask containing foreign research reactor spent nuclear fuel. The maximum allowable exposure for port workers would be 100 mrem per year, the same radiation dose limit established by the NRC to protect individual members of the public (Section 4.2.2.2 of the EIS). As the analysis in the EIS indicates, both the dose and dose rate for the port workers are low.

Response to Comment No. 269-6

DOE considers that the risk estimates in the EIS are conservative. That is, the actual risks would likely be even lower than those presented in Section 4.2.1 of the EIS.

Response to Comment No. 269-7

If foreign research reactor spent nuclear fuel is accepted into the United States, responsibility for shipping would be with the foreign research reactor operators. However, DOE would insist that only reputable shipping firms, United States or foreign flag, be used for the marine transport. The EIS evaluated the use of four types of ships, including purpose-built ship, for use in transporting foreign research reactor spent nuclear fuel (Section 2.6.3.2.1). No significant difference in the incident-free or accident risk was found between any of the types of ships (Sections 4.2.1 and 4.2.2), so DOE sees no need to restrict the types of vessels that might be used to transport the foreign research reactor spent nuclear fuel.

Response to Comment No. 269-8

The commentor's opposition to the acceptance of foreign research reactor spent nuclear fuel from the 41 nations listed in Section 1.3 of the EIS is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

COMMENTOR NO. 271: GUMM , JULIA

6-16-95
DEPARTMENT OF ENERGY
C/O MR. CHARLES R. HEAD
MR. FRANK COLE
OFFICE OF SPENT FUEL MANAGEMENT, EH. 37
1000 INDEPENDENCE AVE. SW
WASHINGTON, DC 20585-0001

THIS IS TRULY UNBELIEVEABLE! WHAT WE HAVE BEEN READING IN THE PAPERS....PLEASE TELL US SOMEONE HAS GOTTEN THE WRONG INFORMATION.

"U.S.DEPARTMENT OF ENERGY HAS PROPOSED TO IMPORT HIGH-LEVEL NUCLEAR WASTE FOR 41 NATIONS THROUGHOUT THE WORLD"!.

HANFORD NUCLEAR RESERVATION CLEAN UP HAS COST BILLIONS A YEAR.....WHEN WILL IT EVER BE FINISHED? NOT TO MENTION THE MANY DANGERS OF TRANSPORTING TOXIC WASTE. ALSO, THIS WASTE WILL NOT GO AWAY FOR THOUSANDS OF YEARS.

WHAT THIS PROPOSAL WILL DO TO THE FUTURE GENERATIONS... WILL BE DEVESTATING...FINANCIALLY AND PHISICALLY.

SINERELY.

JULIA GUMM

271-1

RESPONSE TO COMMENT
COMMENTOR NO. 271: GUMM, JULIA

Response to Comment No. 271-1

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 273: CLEAVELAND, ROBERT G.

ROBERT G. CLEAVELAND
3716 North 39th Street
Tacoma, Washington 98407-5720
(206) 752-4090

VIA FAX TO 202/586-5256

June 19, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management
U.S. Department of Energy
1000 Independence Ave S.W.
Washington, D. C. 20585

Dear Mr. Head:

As a 27-year resident of Tacoma, I am writing in opposition to your plan to use the Port of Tacoma as one of three potential west coast ports for shipping high level nuclear waste. I oppose your plan for two reasons:

1. Beyond all the obvious NIMBY (Not In My Back Yard) reasons of security and safety you have already heard, I am not aware that Tacoma or any other regional community has requested the use of the Port of Tacoma. Why Tacoma? More than direct proximity to destination dumps sites inland, is it the path of least political resistance to Seattle or Portland ports? 273-1

2. Other than money and management, why is the U.S. choosing to become the nuclear waste site for spent uranium from research reactors in 41 countries? Given recent publicity from Hanford, I don't believe the Department of Energy has yet demonstrated its ability to manage nuclear waste from our own military and civilian nuclear sources. I believe the U.S. needs to adequately manage its own spent nuclear waste before seeking waste internationally. 273-2

I would appreciate hearing your perspective. I will be attending tonight's hearing in Tacoma. I look forward to your reply to my inquiry. Thank you for your consideration.

Sincerely,

Bob Cleaveland

RESPONSE TO COMMENT
COMMENTOR NO. 273: CLEAVELAND, ROBERT G.

Response to Comment No. 273-1

As a part of the overall evaluation of environmental impacts, the EIS identifies ports of entry in the United States that would be acceptable for the receipt and handling of foreign research reactor spent nuclear fuel. In evaluating and selecting acceptable ports of entry, the EIS developed evaluation criteria (Appendix D, Section D.1.9 of the EIS). DOE considers that the port selection criteria successfully identify ports that can safely handle foreign research reactor spent nuclear fuel. The Port of Tacoma is currently included in this evaluation. The decision as to which port(s) would be used in the case that foreign research reactor spent nuclear fuel is accepted into the United States, will be made in the Record of Decision.

Response to Comment No. 273-2

Spent nuclear fuel from foreign research reactors has been safely managed in the United States for nearly four decades (Section 1.1 of the EIS). Storage technologies and site management options are discussed in Sections 2.6.5.1 and 2.6.5.3 of the EIS, respectively.

6/19/95

We do not want nuclear waste to come through, around or near Tacoma, Puyallup, Graham, Fife, Federal Way or any towns or communities near them. We do not want to store it, process it or in any way be associated with nuclear waste in our Counties.

285-1

1. Barbara Turosik - 4605 - 91st STREET Court E.;
2. [illegible] - 2717-145th St Ct, Tacoma 9844
3. [illegible] Turosik 9716 Portland Ave. Tacoma
4. [illegible] 5501 N 23 98406
5. [illegible] 10101 40th Ave E, Tacoma, WA 9844
6. [illegible] 3415 - 28th St. Ct. E. Tacoma
7. Sam Smith 2906 35th ave East tacoma Wa 98443
8. Marie R. Saylor 5307 So. Oakes Tacoma Wa. 98409
9. [illegible] 5307 So. Oakes Tacoma, Wa. 98409
10. [illegible]
11. [illegible] Nesbitt 4324 No 8th Tac. Wa 98406
12. Joan Healey P.O. Box 98432 Tacoma, Wa. 98498
13. Evelyn Rapp 3719-N Vassault " " 98407
14. Laura Roberts 17805 84th Ave E Puyallup, WA 98373
15. Donna Shusara 3827 So G St Tacoma Wa 984
16. Earl R. Hill 3827 So. G St Tacoma Wa 984
17. Diane & Robert Harris, 2316-46th Ave. E, Fife, WA 9838
18. Clifton & Lynn Hanby, P.O. Box 98432 Tacoma, WA 98498
19. Jerkovich Valerie 12529 Ave Dubois S.W. Tacoma WA 98
20. D. Hermansen 5310 Vaeco Rd NE Tac 9842
21. H. I. Peterson 411 So. 61st St. Tac. 98408

Response to Comment No. 285-1

The commentor's opposition to all actions that would involve bringing foreign research reactor spent nuclear fuel through or near the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or any other port analyzed in the EIS, is low.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 285: AGAINST NUCLEAR WASTE PETITION (CONT'D.)

22. Patty Spunkel 7004-32nd St. Ct. W #103 Tac. 9846
23 ROBERT E. HAWES 804 N. M ST. APT. 6 TACOMA, WA 98403 (206) 572-14
24 ROBERT G. CLEARLAND 3716 N 39th St Tacoma 98407 206/752-4
25 Robert E. Trufter 1320 Broadway Plaza Tacoma 984
26 Frances Arteaga 2121 S. Alaska St. Tacoma 9840
27. Dick Marzano 6402 Gregory St. W. Tacoma. 98466
28 Kirk Egan 3535 55th AVE NE TACOMA 984
Craig Hittle 905 PIERCE LN NE TACOMA 98422
Jackie Haught 1836 N. Baltimore " 98407
Joyce Fairbanks 1620 S. Mildred Ste 328 Tacoma 9846
29. Henry Yates Port of Seattle P.O. Box 1209 Sea 9811
30 [illegible] 3114 N Alder 87 Tacoma 98407
31 Arden E. Gordine 29802 26th Ave S Federal Way, WA 98003-4.
32. JEFF R EVENS 1436 S. MASON AVE TACOMA WA 9840
33. Wendy Isenhart 2605 North Warner Tacoma 9840
34. DOUG BREWER 2809 NORTH PUGET SOUND TACOMA 98407
35. Harold H. Noble 3320 Locust Ave. W. University Pl. Wash. 98466
36. Jeannie M. Noble " " " " " " " "
37. Lyle Fenton 6207 So. Montgomery St. Tacoma/WA 984
38 Gerald Pollet 1305-4th #208 Seattle WA 98101
39 Claude MacMahon 405 6th Ave Tacoma, WA 98402

RESPONSE TO COMMENT
COMMENTOR NO. 285: AGAINST NUCLEAR WASTE PETITION (CONT'D.)

Lochburn Jr High

Dear US Department of energy,
My name is Robin Shaughnessy
I am 13 years old and I
go to Lochburn Jr. High. You may
think I am not old enough to
understand what this is about, but I
do. and I don't want you to
ship nuclear waste in our waters.
I know enough to know that if
the nuclear waste spills it can kill
humans as well as animals. What
I want to know is if nuclear waste
is so hazardous, why do we make
it? I have enclosed a list of names
of people who agree with me.

1 Robin Shaughnessy 13
2 Nanette Quirk
3 Rocky Aquinde 15 age
4 Melissa Gallant 14 age
5 Kristy Kay 14 age
6 Elizabeth McRae Wage
7 Roni Boi
8 Sonja Roberton
9 Mel Solis
10 Laurel A. Hamer
11 Jayme Mutton 14
12 Heather M
13 Angela M. Poulin
14 Randy Kaon
15 Sirina Denton
16 Kathy Kim
17
18 Chris Lidgett
19

286-1

Response to Comment No. 286-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel into the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Foreign research reactor spent nuclear fuel in a transportation cask cannot "spill" because it is solid metallic fuel and is shipped dry. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, with over 40 years of experience, no radioactive material has ever been release from a spent nuclear fuel transportation cask as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

The spent nuclear fuel considered in this EIS is a by-product of using research reactors. Research reactors play a vital role in important medical, agricultural, and industrial applications, and also provide a tool for fundamental scientific research. These reactors are a vital tool in medical and environmental testing and research (Section 1.1 of the EIS).

COMMENTOR NO. 286: LOCHBURN JUNIOR HIGH PETITION (CONT'D.)

20 [illegible] 14 yrs.
21 [illegible]
22 [illegible] 14 yrs.
23 [illegible] 15 yrs.
24 [illegible] 14 yrs.
25 [illegible] 14 yrs.
26 [illegible] 15 yrs.
27 [illegible]
28 [illegible] 14 yrs. yet it was
29 [illegible] 14 yrs.
30 [illegible] 14 yrs.
31 [illegible] 14 yrs.
32 [illegible] 14 yrs.
33 [illegible] 14 yrs.
34 [illegible] 14 yrs.
35 [illegible] 14 yrs.
36 [illegible] 14 yrs.
37 [illegible] 43
38 [illegible] 14
39 [illegible] 15
40 [illegible] 14
41 [illegible] 14
42 [illegible] 15
43 [illegible] 13
44 [illegible] 15
45 [illegible] 15
46 [illegible] 15

RESPONSE TO COMMENT COMMENTOR NO. 286: LOCHBURN JUNIOR HIGH PETITION (CONT'D.)

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Kathryn & Jim Whitacre Phone: 752-2296

Title and Organization: —

Address: 3317 Nova #9

City: Tacoma State WA Zip 98407

*** COMMENTS ***

The Sound is a sensitive environment that could NOT tolerate any accident. Shipping traffic is substantial & becoming more dense. Having a carrier of nuclear waste does not seem viable to us. The rigors of navigating in the sound seem contra indicate it as a viable. Once the ship is berthed then transporting it through the densely populated area of the Puget Sound - whose highway infra structure is aging & being taxed by a rapidly increasing population - is very threatening to the people & entire environmental structures. Don't do it! Our region is also earthquake prone. Of all the arguments against this - "mother Nature" offers one of the best. Need to also argue our watershed is used from Canada to S. Cal. — NO.

288-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

Response to Comment No. 288-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. The EIS did evaluate and consider the environmental impacts (Appendix D, Section 4.2.4.2.8), the population of the area around the port and along transit routes (Section D.1.9.5), the health and safety impacts (Section 4.2), and earthquakes (Appendix D, Section D.1.9.6).

Of the concerns mentioned, only the volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (port selection Criterion 2; Appendix D, Section D.1.9.2 of the EIS). Appendix D, Section D.5.3.1.3 of the EIS presents a discussion of the determination of the probability of ship accidents used in the EIS.

COMMENTOR NO. 289: RYAN, RICHARD P.

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: RICHARD P. RYAN Phone: (206) 927-3203

Title and Organization: NETACOMA HOMEOWNER

Address: 3535 55TH AVE NE

City: TACOMA State WA Zip 98422-3128

*** COMMENTS ***

① THIS EIS PUTS THE BURDEN OF NUCLEAR CLEAN UP ON THE CITY WHERE THE ACCIDENT OCCURS. 289-1

② ~~THESE SHIPS ARE~~

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 289: RYAN, RICHARD P.

Response to Comment No. 289-1

Under the Price-Anderson Act, DOE would indemnify contractors for public liability with respect to spent nuclear fuel if there is a "nuclear incident," as defined under law. In pertinent part, a "nuclear incident" is one that causes, for example, injury or sickness or property damage, resulting from radioactive, toxic, explosive, or other hazardous properties of the material.

Several accident scenarios including a breach of the cask and fire sufficient to oxidize the contents were analyzed during preparation of the EIS. Results of the accident analysis at the ports are given in Section 4.2.2 of the EIS with supporting detail in Appendix D, Section D.5. No catastrophic effects were found to result from severe accidents involving foreign research reactor spent nuclear fuel.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

COMMENTOR NO. 289: RYAN, RICHARD P. (CONT'D.)

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: RICHARD P. RYAN Phone: (206) 922-3703
Title and Organization: NE TACOMA HOMEOWNER
Address: 3535 35TH AVE NE
City: TACOMA State WA Zip 98422-3123

*** COMMENTS ***

ACCORDING TO THIS EIS SECURITY IS NOT AN ISSUE UNTIL THE SPENT FUEL REACHES EITHER SAVANNAH RIVER OR IDAHO. I THINK THE DOE IS NEGLECTING THE POSSIBILITY THAT TERRORIST COULD NOT ATTEMPT TO PILFER A SHIPMENT. YOUR BELIEF THAT THE CONTAINERS ARE TOO LARGE IS A FARCE. ANY NATION WILLING WILL BE ABLE TO REMOVE A CANISTER CONTAINER OR HOLD SHIP FOR RANSOM ONCE INSIDE THE PUGET SOUND.

289-2

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 289: RYAN, RICHARD P. (CONT'D.)

Response to Comment No. 289-2

As discussed in Section 2.7 and Appendix H of the EIS, DOE considers security to be a serious issue all along the transport route.

The requirements for physical protection of spent nuclear fuel shipments are specified in 10 CFR Part 73.37. The principal points are (1) cooperation with local law enforcement agencies, (2) armed escorts, and (3) communications with a communications center that is staffed 24 hours per day. (Section 5.4.2 of the EIS.) For truck shipments in heavily populated areas, one escort vehicle containing an armed guard would lead the truck and another escort vehicle containing another armed guard would follow the truck. In less populated areas, there would be only one escort vehicle instead of two. For rail shipments, the escort would ride on the train in a location that permits observation of the shipment car while the train is in motion.

COMMENTOR NO. 289: RYAN, RICHARD P. (CONT'D.)

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: RICHARD P. RYAN Phone: (206) 927-3303

Title and Organization: NE TACOMA HOME OWNER

Address: 3535 58TH AVE NE

City: TACOMA State WA Zip 98422-3123

*** COMMENTS ***

TACOMA WA IS NOT ACCESSIBLE TO OPEN WATER, "DIRECTLY". THERE IS AN APPROXIMATELY 10 HR TRANSIT THROUGH THE PUGET SOUND (200 miles OF INLAND COASTLY) IN ORDER TO REACH OPEN WATER. 289-3

THIS TRANSIET WILL BE ADJACENT TO MANY HIGH POPULATION AREAS.

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 289: RYAN, RICHARD P. (CONT'D.)

Response to Comment No. 289-3

The passage from the Straight of Juan de Fuca to Tacoma meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). Favorable transit from open ocean is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations, such as port experience with handling containers, port facilities, access to land transportation, and population in the port and along the route to the management site, have also been considered in making the final selection of ports of entry. Appendix D, Section D.1.9 of the EIS presents details of the port selection process. In evaluating the risk associated with accidents, the population along the Sound as well as in the Port of Tacoma itself were considered. Appendix D, Section D.5.3.2 of the EIS presents a discussion of population distribution.

COMMENTOR NO. 289: RYAN, RICHARD P. (CONT'D.)

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: RICHARD P. RYAN Phone: (206) 927-3703
Title and Organization: NE TACOMA HOMEOWNER
Address: 3535 55TH AVE NE
City: TACOMA State WA Zip 98422-3123

*** COMMENTS ***

THE MORE THE FUEL IS MOVED THE MORE LIKELY THE CASE OF AN ACCIDENT OCCURING. THE HEU SHOULD REMAIN AT ITS FOREIGN SITES. 289-4

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 289: RYAN, RICHARD P. (CONT'D.)

Response to Comment No. 289-4

The commentor's preference for storing spent nuclear fuel at foreign research reactor sites is noted (Management Alternative 2, Section 2.3 of the EIS). Risks to human health and the environment which could result from transportation of spent nuclear fuel from foreign research reactors were evaluated and found to be low (Section 4 of the EIS).

COMMENTOR NO. 289: RYAN, RICHARD P. (CONT'D.)

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: LAURA RICHARD P. RYAN Phone: (206) 927-3203

Title and Organization: NE TACOMA HOMEOWNER

Address: 3535 55TH AVE NE

City: TACOMA State WA Zip 98422-3123

*** COMMENTS ***

EXPOSURE TO A TEMPERATURES OF 475°F FOR 30 MINUTES IS NOT EXCEEDABLE, SHIP BOARD FIRES EXCEED 1975° AND WILL LAST MUCH LONGER THAN 30 MINUTES. 289-5

DO NOT SHIP HEU TO US STORAGE SITES, MAINTAIN ON LOCATION, THE MORE HEU IS MOVED AND RE PACKAGE THE MORE LIKELY IT WILL BE COMPROMISED. 289-6

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 289: RYAN, RICHARD P. (CONT'D.)

Response to Comment No. 289-5

The transportation casks that would be used for the foreign research reactor spent nuclear fuel are certified if their design meets certain tests, including a fire test, and if the individual casks pass periodic inspections (Section 2.6.2 of the EIS). These certification standards were developed for use of the transportation casks on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. The duration of a ship fire is directly related to the amount of combustibles carried on board. In spite of this potential, the number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicates that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures.

In respect to the impact a ship fire might have on a spent nuclear fuel transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship fire's intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it would be almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of research reactor spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).

The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt research reactor nuclear fuel. Appendix D, Sections D.5.3 and D.5.4 present a detailed discussion of accident probabilities and radioactive material source terms and the results of the analyses, respectively.

In conclusion, although long duration ship fires are possible, and have occurred, they are uncommon events. Analyses in the EIS indicate that even in the event of a severe ship fire involving a transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5 of the EIS).

COMMENTOR NO. 289: RYAN, RICHARD P. (CONT'D.)

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: RICHARD P. RYAN Phone: (206) 927-3103

Title and Organization: NE TACOMA HOMEOWNER

Address: 3535 55TH AVE NE

City: TACOMA State WA Zip 98422-3123

*** COMMENTS ***

SINCE HEU WAS ENRICHED IN THE UNITED STATES AND TRANSPORTED OUT OF CONUS IT SHOULD BE RETURNED THROUGH THE SAME PORTS IT WAS PREVIOUSLY TRANSPORTED THROUGH. 289-7

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 289: RYAN, RICHARD P. (CONT'D.)

Response to Comment No. 289-6

The commentor's position that foreign research reactor spent nuclear fuel should remain at the locations where it is generated is noted. Overseas management is Management Alternative 2, and is discussed in Sections 2.3 and 4.4 of the EIS.

Response to Comment No. 289-7

Accepting the foreign research reactor spent nuclear fuel through the same port by which the enriched uranium left is not practical, partially because some of the enriched uranium was shipped out by airplane, an option not available for the foreign research reactor spent nuclear fuel. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 289: RYAN, RICHARD P. (CONT'D.)

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: RICHARD P. RYAN Phone: (206) 927-3703

Title and Organization: NE TACOMA HOMEOWNER

Address: 3555 35TH AVE NE

City: TACOMA State WA Zip 98422-3123

*** COMMENTS ***

IF HEU IS TO BE TRANSPORTED TO TACOMA THERE SHOULD BE A PROVISION MADE TO INSPECT THE CARGO PRIOR TO ENTERING THE PUGET SOUND TO ENSURE COMPLIANCE TO TRANSPORTATION REQUIREMENTS HAVE NOT BEEN COMPROMISED. 289-8

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 289: RYAN, RICHARD P. (CONT'D.)

Response to Comment No. 289-8

The foreign research reactor spent nuclear fuel containers would be inspected many times during their trip to the United States. First, the transportation cask and the container that carries the cask would be inspected for integrity at the foreign research reactor site. Next, the container would be inspected prior to loading it on the ship in the foreign port. During the time that the container would be onboard the ship, it would be inspected daily to ensure the container's integrity and to verify that the container was properly secured to the ship (Appendix C, Section C.4.1 of the EIS). Then the container would be inspected in the U.S. port of entry prior to overland transport (Appendix D, Section D.4.4 of the EIS). This inspection schedule exceeds the regulatory requirements and has proven sufficiently thorough during over 40 years of previous shipments.

COMMENTOR NO. 290: RYAN, LAURA

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: LAURA RYAN **Phone:** (206) 927-3703

Title and Organization: NE TACOMA HOMEOWNER

Address: 3535 55TH AVE NE

City: TACOMA **State** WA **Zip** 98422-3123

*** COMMENTS ***

THE EIS DOES NOT CONTAIN PROVISIONS FOR LIMITING THE NUMBER OF HEU CONTAINERS (CASKS) THAT CAN BE SHIPPED.

THERE IS NO PROVISION FOR HOW CLOSE HAZARDOUS MAT'L CAN BE SHIPPED IN PROXIMITY OF HEU CONTAINERS (CASKS)

290-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 290: RYAN, LAURA

Response to Comment No. 290-1

As described in detail in Sections 5.3 and 5.4 of the EIS, in addition to a series of applicable domestic regulations, international transportation of hazardous material is governed by the International Movement of Dangerous Goods (IMDG) Code, which is associated with the International Maritime Organization. This code essentially establishes the international rules for shipping hazardous cargos, which includes foreign research reactor spent nuclear fuel. Included are regulations that deal with carriage of radioactive material (Class 7 materials). They are based on the International Atomic Energy Agency regulations and deal with segregation of radioactive materials packages from other dangerous goods and other aspects of stowage, including the quantity of radioactive material to be shipped. To ensure that the IMDG Code and all other safety requirements, such as the Safety of Life at Sea (SOLAS), are followed, DOE would contractually require that only reputable shipping firms be used to ship the foreign research reactor spent nuclear fuel covered by this proposed action.

COMMENTOR NO. 291: BARNES, MARGARETE

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Margarete Barnes Phone: _____

Title and Organization: _____

Address: 611 So. 78th St

City: Tacoma State WA Zip 98408

*** COMMENTS ***

I am against any nuclear shipments through Tacoma or the Puget Sound. Keep our area safe for people to live. **291-1**

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 291: BARNES, MARGARETE

Response to Comment No. 291-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through either the Port of Tacoma or Puget Sound is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through Puget Sound and into the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 292: SLUSARZ, DONNA

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Donna Slusarz **Phone:** 475 6977

Title and Organization:

Address: 3827 So. G. St

City: Tacoma **State** Wa **Zip** 98408

*** COMMENTS ***

lets tell the world we dont want nuclear power, we dont want want nuclear wastes. 292-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 292: SLUSARZ, DONNA

Response to Comment No. 292-1

The commentor's opposition to nuclear power or nuclear waste is noted.

COMMENTOR NO. 293: OTIS, GLENN

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Glenn Otis Phone: 564-0805

Title and Organization:

Address: 3921 Boise St W

City: Tacoma State Wa Zip 98466

*** COMMENTS ***

NO

293-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 293: OTIS, GLENN

Response to Comment No. 293-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 294: FORM LETTER D

June 19, 1995

U S Department of Energy
Washington DC

Attn: Committee for locating port to dispose of nuclear waste

I am opposed to your proposal to bring weapons grade nuclear waste through the Port of Tacoma.

Although I understand the need to dispose of nuclear waste somewhere, I do not believe it is appropriate to transport this level of radioactive waste through densely populated areas. The Port of Tacoma is a busy port, the I-5 corridor is one of the most congested traffic areas in the country, and there are suburban communities all around the major roads in the Puget Sound area. Putting the safety of thousands of families at risk for expediency is not a sound policy. 294-1

In addition, I have concerns about the level of safety provided for container freight in the event of an on-board ship fire. I understand that there are not adequate precautions to avoid spillage of nuclear waste into the water, whether it be in the ocean or in Puget Sound, in the event of a fire. 294-2

Our Port does not support your proposal. Our elected city officials do not support your proposal. The Port's union does not support your proposal. Other concerned groups do not support your proposal. My family and I do not support your proposal.

Sincerely,

Signature

Lauren Burlison
Name

8612 23rd ST CT W
Address

Tacoma 98466
City, State Zip

RESPONSE TO COMMENT
COMMENTOR NO. 294: FORM LETTER D

Response to Comment No. 294-1

The commentor's opposition to the use of the Port of Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. Populations surrounding candidate ports and along transportation routes to management sites were a factor in the selection of candidate ports (Appendix D, Section D.1.9 of the EIS). The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 294-2

Sections 4.2.1 and 4.2.2 of the EIS provide an evaluation of consequences and risks of onboard ship fires. Supporting details are given Appendix D. If a policy to accept foreign research reactor spent nuclear fuel is adopted, fuel elements would be shipped in casks which are resistant to destruction by collision and fire (Section 2.6.2 of the EIS). In the unlikely event that a cask was breached by collision and/or fire, the radiological consequences have been demonstrated to be low and the associated risks would also be low (Section 4 of the EIS).

COMMENTOR NO. 294: FORM LETTER D (CONT'D.)

Individuals submitting this form letter:

Burlison, Lauren

Eannarino, Tim

Greenheck, William T.

Hoffman, Linda R.

Jennings, Sally

Jonker, Janie

Pennington, Valerie

Salter, Annie

RESPONSE TO COMMENT
COMMENTOR NO. 294: FORM LETTER D (CONT'D.)

COMMENTOR NO. 302: GIDDINGS, ROXY

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping [illegible] Waste Through Tacoma.

Comments: [illegible] Do Not do option #1 [illegible] | 302-1 | 302-2
[illegible] anywhere. | 302-3
Clean up nuclear waste [illegible] | 302-4
[illegible] anyway) | 302-5
The people in Washington have [illegible] office
of Marine Safety [illegible]
of shipping [illegible] waste.
I am a [illegible] | 302-6

Name: Roxy Gidd[illegible] Telep[illegible] [illegible]
Address: [illegible] City/Sta[illegible] Tacoma, WA [illegible]

Send To: Charles Head, Off[illegible] Spent Fuel Management (EM-37), Off[illegible] Environmental Management, U.S. Department of [illegible] 1000 Independence Ave. [illegible] Washington, DC 20585

DEAD[illegible] 30, 1995

The strongest weapon against nuclear waste is right at your fingertips.

Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste.

For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Ruston, Federal Way; Tacoma—Pierce County Visitor & Convention Bureau, Tacoma—Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

RESPONSE TO COMMENT
COMMENTOR NO. 302: GIDDINGS, ROXY

Response to Comment No. 302-1

The commentor's preference for Management Alternative 2 is noted. This alternative is discussed in Sections 2.3 and 4.4 of the EIS.

Response to Comment No. 302-2

The commentor's opposition to Management Alternative 1 as described in Section 2.2 of the EIS is noted.

Response to Comment No. 302-3

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1000 feet). Appendix C, Section C.5.5 of the EIS provides information on the probability of a cask sinking in coastal and deep ocean waters.

Response to Comment No. 302-4

The commentor's request that nuclear wastes at Bremerton be cleaned up is outside the scope of this EIS.

Response to Comment No. 302-5

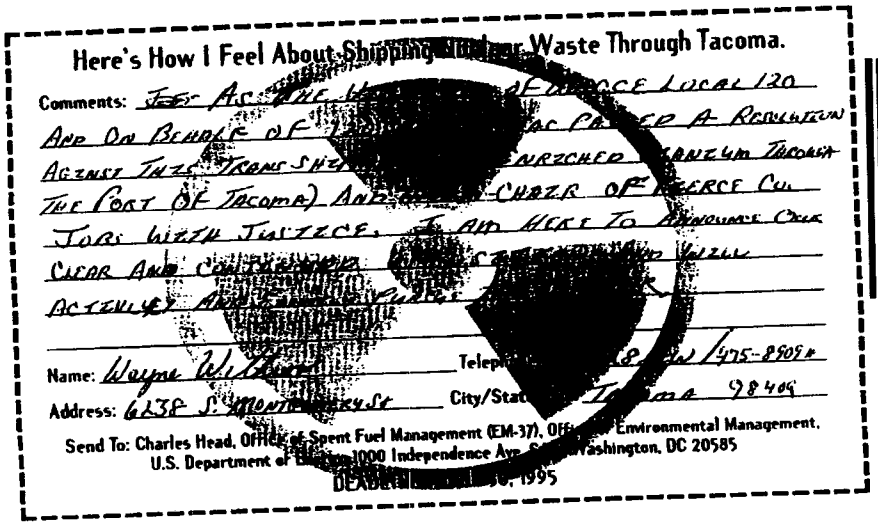
The Energy Policy Act of 1992 placed strict limitations on the export of HEU by the United States (Section 1.1 of the EIS). Since passage of this Act, no new export licenses for HEU have been issued by the United States. As described in Section 1.1 of the EIS, research reactors are used for research, medical, commercial, and educational applications.

Response to Comment No. 302-6

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. The elimination of the Office of Marine Safety is outside the scope of this EIS.

COMMENTOR NO. 303: WITHROW, WAYNE

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: JOIN AS THE [illegible] OF FORCE LOCAL 120 AND ON BEHALF OF [illegible] PASSED A RESOLUTION AGAINST THE TRANSSHI[illegible] ENRICHED [illegible] THE PORT OF TACOMA) AND [illegible] CHAIR OF PIERCE CO. JOBS WITH JUSTICE. [illegible] AND HERE TO ANNOUNCE OUR CLEAR AND CONTINUING [illegible] ACTIVITIES AT [illegible]

Name: Wayne Withrow Telep[illegible] (W) 475-8509

Address: 6238 S. Monte[illegible] City/Stat[illegible] 98409

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of [illegible] 1000 Independence Ave. S[illegible] Washington, DC 20585

DEADL[illegible] 30, 1995

303-1

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Ruston, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

RESPONSE TO COMMENT
COMMENTOR NO. 303: WITHROW, WAYNE

Response to Comment No. 303-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

PORT of TACOMA U.S.A.

June 19, 1995

Dear Concerned Citizen,

Thank you for inquiring about the nuclear fuel shipments that could move through the Port of Tacoma. The Port of Tacoma is one of 10 possible ports of entry listed in the Draft Environmental Impact Statement.

Enclosed are a Port of Tacoma fact sheet on the nuclear fuel shipments, a form for your opinion, and a list of risk issues that the Department of Energy has overlooked.

The best way to voice your opinion and have an impact upon the nuclear fuel shipments is to write the Department of Energy. The DOE does not record verbal comments at public hearings and the only record will be written responses. The public comment period closes June 30, 1995. The Port of Tacoma urges you to write the DOE at the following address:

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue SW
Washington DC, 20585
Phone Number (202) 586-9441
Fax Number (202) 586-5256

P.O. Box 1837 • Tacoma, Washington 98401-1837 • Telephone: (206) 383-5841
Commissioners: Stephen R. Anderson • Jack A. Fabulich • Mike Fletcher • Patrick O'Malley • Jerry M. Thorpe
Executive Director: John J. Terpstra

COMMENTOR NO. 303: WITHROW, WAYNE (CONT'D.)

Port of Tacoma and City of Tacoma Risk Issues

DOE USED OUTDATED INFORMATION ON THE PORT - - The Department of Energy (DOE) used outdated information on the Port of Tacoma. The DEIS lists only one terminal through where these shipments would potentially be shipped. The Port of Tacoma has 6 Container Terminals. The map displayed in the DEIS is incorrect in that the configuration of these terminals is shown in a state in existence in the year 1980 or before. On-dock rail yard configurations are not shown at all and waterways are shown incorrectly. Similar mistakes are made for the Port of Seattle map.
Given these errors in analyzing facilities for handling these shipments there certainly is no guarantee that the nearby population centers were shown correctly and evaluated correctly. In addition transport routes in the Port area may also be incorrect. 303-2

DOE DID NOT CONSIDER THE DEEP WATER DEPTH IN PUGET SOUND – DOE described in the DEIS that it would be very difficult or impossible to recover fuel casks from depth greater than 200 meters in case of an accident. The DEIS states that those depths are only found in the ocean. DOE did not correctly research this matter since there are several areas in the Puget Sound region showing water depth of over 200 meters in major shipping lanes to and from the Port of Tacoma. 303-3

DOE DID NOT RECOGNIZE THEIR CONTRIBUTING TO THE "DIRTY PORT" STIGMA - -Commencement Bay and the Port of Tacoma are located in a federally designated Superfund site. This site is on the National Priority list for cleanup under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Over two hundred million dollars have and will be spent in efforts to clean up this environmentally sensitive area. DOE did not recognize that the shipment of nuclear materials would contribute to the "Dirty Port " stigma. 303-4

DOE DID NOT ADEQUATELY CONSIDER SEVERE FIRES/EXPLOSIONS – DOE did not properly evaluate and determine the impact of a severe fire or explosion involving a shipping cask of nuclear spent fuel, which would cause severe damage and have long-term effects on a large area near the disaster site. Further more the effects of— crippling many businesses in the area effected was also not determined. 303-5

DOE DID NOT ADEQUATELY CONSIDER SECURITY ISSUES--DOE did not adequately address the security requirements for these shipments. This material is useable in nuclear weapons and therefore highly attractive to terrorists. Proper security measures to counter possible acts by terrorists were not provided for in the DEIS. 303-6

DOE DID NOT ADEQUATELY RECOGNIZE CRIPPLING BUSINESS ISSUES - - DOE did not properly address first response capability of the local fire and emergency agencies in case of a shipping cask breach and the spread of radiation from the accident 303-7

RESPONSE TO COMMENT
COMMENTOR NO. 303: WITHROW, WAYNE (CONT'D.)

Response to Comment No. 303-2

Updated information on the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS. A review of the map of Seattle and transport routes found no outdated or inaccurate information. The data on populations that are presented, and used in the analyses, are from the 1990 census.

Response to Comment No. 303-3

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1000 feet). Appendix C, Section C.5.5 of the EIS provides information on the probability of a cask sinking in coastal and deep ocean waters. Section 4.2.1.3 of the EIS has been rewritten to more clearly state DOE's intentions in cask recovery.

Response to Comment No. 303-4

Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma as noted by the commentor. Nor should it contribute to any "dirty port" stigma because the analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2 of the EIS). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Based on over 30 years of experience in shipping spent nuclear fuel, DOE considers that spent nuclear fuel transportation casks passing through the Port of Tacoma, Commencement Bay, or any other port or waterway would not release their radioactive contents, and thus would not affect air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and emphasize the no-impact nature of these shipments on air and water quality.

Response to Comment No. 303-5

Appendix D, Section D.5.3.1 of the EIS describes several accident scenarios that involve fire. The results of the analysis of these accidents can be found in Section D.5.4. The analysis shows that even in the event of a severe ship fire, neither the consequences nor risks are great (Appendix D, Section D.5.5). Although such a catastrophic accident would obviously impact the local environment and also the local businesses, no impacts are predicted due to the presence of foreign research reactor spent nuclear fuel. In fact, the analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 and Appendix D, Section D.5 of the EIS).

In addition to evaluating the worst case plausible fire, the EIS also evaluated the impacts of a ship fire so severe that it is considered not plausible. These results are discussed in Appendix D, Section D.5.4.3.2 and Attachment D5 to Appendix D.

COMMENTOR NO. 303: WITHROW, WAYNE (CONT'D.)

site. No provision were made in the DEIS for upgrading and training of local first response teams. In addition long-term effects on loss of business, infrastructure and long-term-effect on the aquisition of future business was completely ignored by DOE. ! 303-7 (Cont'd)

DOE DID NOT ADEQUATELY CONCISER LIFE CYCLE COSTS, BENEFITS AND GENERAL RISK AS WELL AS FULLY IGNORING FAIRNESS/EQUITY ISSUES IN SELECTING SMALLER PORTS – DOE did not analyze the effects of an accident classified as a disaster on the local area infrastructure and population. DOE did not address effects and costs incurred in the local area should an accident occur. 303-8

Note: These two pages constitute pages 17-25 on the page of contents.

RESPONSE TO COMMENT
COMMENTOR NO. 303: WITHROW, WAYNE (CONT'D.)

The effects of a severe explosion on a foreign research reactor spent nuclear fuel transportation cask were not evaluated because the radiological impacts of the fire discussed above would be worse, or "bound" the results of an explosion. With a severe fire not only is the cask violated, as it might be by a large explosion, but the heat of the fire would lift what is released from the cask, spreading the radioactive material farther, affecting more people.

Response to Comment No. 303-6

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Response to Comment No. 303-7

Under NEPA, the socioeconomic effects evaluated for this EIS do not include those associated with psychological fear of receiving spent nuclear fuel at the Port of Tacoma. Foreign research reactor spent nuclear fuel shipments are subject to the same types of potential hazards as those of other ships carrying nonradiological hazardous materials.

Each port considered in the EIS has developed an Area Contingency Plan. This plan outlines response capabilities, procedures and authorities for responding to and recovering from hazardous material incidents. Additionally, DOE would provide assistance to local authorities to ensure that appropriate measures would be taken in the unlikely event of an accident. As part of this assistance, DOE's Radiological Assistance Program teams, from eight offices strategically located throughout the country, would be used to coordinate and to provide remediation assistance. This type of assistance and coordination would be specified in the Transportation Plan to be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H of the EIS. The provisions include an interface between DOE and State, Tribal, and local authorities

Response to Comment No. 303-8

Several accident scenarios including a breach of the cask and fire sufficient to oxidize the contents were analyzed during preparation of the EIS. Results of the accident analysis at the ports are given in Section 4.2.2 of the EIS with supporting detail in Appendix D, Section D.5. No catastrophic effects were found to result from severe accidents involving foreign research reactor spent nuclear fuel.

COMMENTOR NO. 306: PORTER, CHRISTINE

June 18, 1995

U.S. Department Of Energy
Washington, D.C.

Dear Sirs:

I am opposed to nuclear shipments through the Port of Tacoma.

I feel it is a threat to our environment, both by having nuclear storage in our state, as well as the potential for accidents that could happen during shipment which would affect both the ocean, off Washington State, and the waters in Puget Sound. 306-1

Sincerely,

Christine Porter
Signature

Christine Porter
Name (Print)

2623-204th Ave ct E
Address

Sumner WA 98390
City/State/Zip

RESPONSE TO COMMENT
COMMENTOR NO. 306: PORTER, CHRISTINE

Response to Comment No. 306-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma and to storage in the State of Washington is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 308: SQUYRES, DEANNA

June 19. 1995

U.S. Department of Energy
Washington DC

Attn: Committee for locating port to dispose of nuclear waste

I am opposed to your proposal to bring weapons grade nuclear waste through the Port of Tacoma. I am unable to attend the community hearing and would like it noted that my voice is in this written form. 308-1

I am also concerned about the lack of publicity regarding and advertising of the second public meeting, as well as the decision to not include comments made by concerned citizens as part of the public record. 308-2

I recognize the difficulty in effectively transporting nuclear waste for disposal. I also recognize the need for sound judgment in the decision making for that process. Sound judgement should not ignore the fact that accidents do happen; and should an accident occur in or near the Port of Tacoma the lives of thousands could be impacted not to mention the environmental impact. I strongly believe that this needs to occur in an area less densely populated, and where there would be minimal environmental impact should an accident occur. 308-3

My family and I have lived in Tacoma all of our lives and travel through the port area on a regular basis. This unsafe use of the port not only puts the personal safety of me and my family at risk, but the lives of thousands of others.

Our Port does not support your proposal. Our elected city officials do not support your proposal. The Port's union does not support your proposal. Other concerned groups do not support your proposal. My family and I do not support your proposal. 308-1 (Cont'd.)

Sincerely,

Deanna Squyres

Deanna Squyres
4532 South 52nd Street
Tacoma, Wa. 98409

RESPONSE TO COMMENT
COMMENTOR NO. 308: SQUYRES, DEANNA

Response to Comment No. 308-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 308-2

DOE placed advertisements for the June 19, 1995 hearing in the Tacoma Tribune on June 12 and 18, 1995. In addition, interest groups placed advertisements in the same paper. As for the commentor's concern that DOE would not include comments made "by concerned citizens as part of the public record," this is untrue. While DOE did request that comments be submitted in writing, all oral comments presented at each hearing were summarized and have been addressed in this Volume 3 of the final EIS. All comments, written and oral, are part of the public record.

Response to Comment No. 308-3

The analysis in Sections 4.2.2 and 4.5 of the EIS indicate that the risk associated with bringing foreign research reactor spent nuclear fuel through the Port of Tacoma, or any other port analyzed in the EIS, is low. The use of a remote port might slightly reduce the already low consequences of an accident, however there are other considerations that also must be made when making port selection. Appendix D, Section D.1.9 of the EIS presents a complete discussion of the port selection process.

COMMENTOR NO. 309: AMDAHL, ONETA

June 19, 1995

U.S. Department of Energy
Washington DC

Attn: Committee for locating port to dispose of nuclear waste

I am opposed to your proposal to bring weapons grade nuclear waste through the Port of Tacoma. My husband attended the second hearing that was held in Seattle, and we are both very concerned about the lack of publicity involved in advertising the meeting, as well as the decision not to make comments made by concerned citizens part of the public record. 309-1 309-2

I commute from North East Tacoma, through the Tacoma Tide Flats, to my place of employment in Tacoma every day with my young son. I am extremely concerned about my family's personal safety as well as the impact on the environment if any accidents were to occur in the shipment and ground transfer of the nuclear waste (via I-5 and through the mountain passes). It was disclosed at the second hearing that the on-board fire precautions were not adequate to contain nuclear waste from spilling into the water in the event of a fire. 309-3 309-4

Recent terrorist activities lend yet another cause for concern. The tragedy that occurred in Oklahoma City shows the unexpected will happen anywhere in America, and I do not want to provide the opportunity to have that occur in Tacoma. Allowing weapons grade nuclear waste to go through a densely populated area puts a lot of citizens at risk. 309-5

Our Port does not support your proposal. Our elected city officials do not support your proposal. The Port's union does not support your proposal. Other concerned groups do not support your proposal. My family and I do not support your proposal. 309-1 (Cont'd.)

I understand this is a difficult situation in that the nuclear waste has to go somewhere. However, I do feel strongly that it does not need to go through a densely populated area and putting citizens at risk. 309-6

Sincerely,

Oneta Amdahl

Oneta Amdahl
5301 Port View Place NE
Tacoma, WA 98422-1551

RESPONSE TO COMMENT
COMMENTOR NO. 309: AMDAHL, ONETA

Response to Comment No. 309-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 309-2

DOE did request that comments be submitted in writing, however, all oral comments presented at each hearing were summarized and have been addressed along with the written comments, in this Volume 3 of the final EIS. All comments, written and oral, are part of the public record. As to advertising for the public hearings, advertisements were placed in the Tacoma Tribune on June 12 and 18, 1995. In addition, the meeting was further publicized by interest groups who placed their own ads in the Tacoma Tribune.

Response to Comment No. 309-3

The risks of ground transport are discussed in Section 4.2.3 and Appendix E of the EIS. In all cases, the risks are shown to be low.

Response to Comment No. 309-4

The EIS does not address marine spills in Puget Sound or elsewhere because the solid metal fuel is transported dry inside a transportation cask, so there is nothing to spill. However the maximum impacts of a sunken cask, both recovered and unrecovered, are evaluated in Section 4.2.1.3 of the EIS. Should an accident occur in Puget Sound that resulted in a cask containing foreign research reactor spent nuclear fuel sinking, the cask would be recovered, regardless of the depth.

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radiative contents have ever been released from a spent nuclear fuel transportation cask as a result of an accident.

Response to Comment No. 309-5

The analysis of the consequences and risk associated with an accident in port involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 and Appendix D, Section D.5 of the EIS) and that the risk associated with accidents in port for the entire proposed action, was low (Section 4.2.2.3 of the EIS). Likewise the consequences and risks associated with marine transport were found to be low (Section 4.2.1.3 of the EIS).

Section D.5.9 has been added to Appendix D of the EIS to address terrorism and sabotage. DOE considers that the foreign research reactor spent nuclear fuel could safely be transported to the management site(s), if any foreign research reactor spent nuclear fuel is accepted into the United States. The security measures employed would meet or exceed all the security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. DOE supports these regulations as being adequate to protect the foreign research reactor spent nuclear fuel.

Appendix H has been also added to the final EIS in response to public comments, to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

Response to Comment No. 309-6

The commentor's opposition to the use of densely populated areas as ports of entry for foreign research reactor spent nuclear fuel is noted. The port selection criteria discussed in Appendix D, Section D.1.9 of the EIS identify ports that can safely handle foreign research reactor spent nuclear fuel. The analyses provided in the EIS indicate that the use of any of the ports identified by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis demonstrates that the risks associated with an accident would be low (Sections 4.2.2.3 and 4.5 of the EIS) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel casks would also be low (Sections 4.2.2.2 and 4.5 of the EIS).

COMMENTOR NO. 313: POWERS, MARY SHEILA

Tacoma 19 June 1995

Concern: Mr. Charles Head ①

The information re: risks of cancer are inaccurate. Please see studies by the Monroe, MI IHM Sisters on the incidence of cancer in the downriver Detroit area after the Fermi incident until today. The Physicians for Social Responsibility need to be consulted. Outside Physicians (not just physicists) need to be included as experts - eg. Canadians. 313-1

Mary Sheila Powers
Tacoma, WA
① response to talk 6/20/95

RESPONSE TO COMMENT
COMMENTOR NO. 313: POWERS, MARY SHEILA

Response to Comment No. 313-1

The methods used in this EIS to estimate risks of cancer due to radiation exposure are endorsed and accepted by the U.S. Nuclear Regulatory Commission and the International Commission on Radiological Protection. These bodies developed these standards in consultation with physicians.

COMMENTOR NO. 314: BERG, ARILL & JANE

6/19/95

Nuclear Waste in Tacoma Meeting

As a citizen of NE Tacoma (on the hill North of Port of Tacoma) I am against shipping waste through populated port in this country and especially in the ct Sound Area. This is for several reasons ① I t trust to DOE to handle this waste properly based their Hanford track record ② this is an area with h seismic potential - an accident could be deadly ③ n against using Hanford as a National depository for er wastes from throughout the world - its not a good t we (in the other Washington) have paid our dues! Tacoma is trying hard to change its reputation for pollution Simpson leading the way and ASARCO gone. ⑤ Property es will go down because of the fear of nuclear amination since this area will not be associated with rable quality of life. ⑥ People live here and these nents may put people at risk w/o their knowledge, on water, near railroad tracks, and in the port. ⑦ have, mountain avalanches on the raillines & extreme winds at s. ⑧ Find a remote, stable, permanent depository if want to accept this permanently dangerous material.

314-1

314-2

RESPONSE TO COMMENT
COMMENTOR NO. 314: BERG, ARILL & JANE

Response to Comment No. 314-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

As discussed in Section 4 of the EIS, foreign and domestic spent nuclear fuel has been transported in the United States for over 40 years by DOE without a single radiological incident. As discussed in Section 4 and Appendix F, this spent nuclear fuel could be safely stored at one or more of the candidate management sites pending ultimate disposition.

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Spent nuclear fuel transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, an avalanche or a seismic event, even if it caused structures at the Port of Tacoma to fail, is not expected to compromise the spent nuclear fuel transportation cask. Further, the analyses of impacts associated with accidents involving foreign research reactor spent nuclear fuel presented in Section 4.2.2.3 of the EIS demonstrate that the use of any of the selected ports would not pose any significant risk to the port personnel or the population near the ports. The Port of Tacoma has considerable relevant experience in handling containers, and has the capability to safely handle containerized foreign research reactor spent nuclear fuel (Appendix D, Section D.1.9.1 of the EIS).

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford site.

DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' status with respect to their clients. This is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions. As

COMMENTOR NO. 314: BERG, ARILL & JANE (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 314: BERG, ARILL & JANE (CONT'D.)

such, there should be no adverse commercial or economic reaction to the use of the port. Historically, there were no adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

Response to Comment No. 314-2

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS). As stated in Sections 2.1 and 4.2.7 of the EIS, if a geologic repository is not prepared to accept the foreign research reactor spent nuclear fuel or its resultant stable waste forms (generated due to chemical separation or other processing technology) DOE would continue to manage the material in exisiting facilities at the DOE management site(s).

COMMENTOR NO. 315: PORTER, JOANNE C.

JO ANNE PORTER
2623 - 204TH AVE. COURT EAST
SUMNER, WA 98390

June 18, 1995

U.S. Department Of Energy
Washington, D.C.

Dear Sirs:

I **am opposed** to nuclear shipments through the Port of Tacoma.

I feel it is a threat to our environment, both by having nuclear storage in our state, as well as the potential for accidents that could happen during shipment which would affect both the ocean, off Washington State, and the waters in Puget Sound. *315-1*

Recent terriorist activities lend yet another cause for concern. There is really no valid reason for using our densely populated area for the shipment of nuclear waste. **Any** incident or accident would have a long lasting effect on the environment where we live.

Find another location, but **not here in Puget Sound.**

Sincerely,

JoAnne C. Porter

RESPONSE TO COMMENT
COMMENTOR NO. 315: PORTER, JOANNE C.

Response to Comment No. 315-1

The commentor's opposition to the use of the Port of Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Sections 4.2.2.3 and 4.5 of the EIS) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Sections 4.2.2.2 and 4.5 of the EIS).

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

The analysis of the consequences and risk associated with an accident in port involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 and Appendix D, Section D.5 of the EIS) and that the risk associated with accidents in port for the entire proposed action, was low (Section 4.2.2.3 of the EIS). Likewise the consequences and risks associated with marine transport were found to be low (Section 4.2.1.3 of the EIS).

Section D.5.9 has been added to Appendix D of the EIS to address terrorism and sabotage. DOE considers that the foreign research reactor spent nuclear fuel can safely be transported to the management sites, if the foreign research reactor spent nuclear fuel is accepted into the United States The security measures employed would meet or exceed all the security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. DOE supports these regulations as being adequate to protect the foreign research reactor spent nuclear fuel.

COMMENTOR NO. 315: PORTER, JOANNE C. (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 315: PORTER, JOANNE C. (CONT'D.)

Appendix H has been added to the final EIS in response to public comments, to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

COMMENTOR NO. 316: HEALEY, JOAN M.

P.O. Box 98432
Tacoma, Wa. 98498
June 19, 1995

Hello council members;

My name is Joan M. Healey a past member of the medical community and a present student of Tacoma Community College and a third generation Pacific Northwesterner. As a Washingtonian born individual I am opposed to all nuclear waste going through the Port of Tacoma for several reasons; 316-1

1. Traveling by rail and the handling and containment of nuclear waste is always risky. This state has experienced one severe rail accident that cost people their lives, it could happen again. 316-2

2. Washington State is known for its beauty and clean environment. Let's keep it that way. 316-3

3. The possibilities of nuclear contamination to the general population is definitely not worth the danger. 316-4

The risk of placing Pierce county as another 3 Mile Island or a Nuclear Russian mistake is not a joke and traveling by rail to a final destination is a problem waiting to happen. 316-5 316-2 (Cont'd.)

Can you assure us that some fanatic would not use the Port of Tacoma as a political statement like Oklahoma City. I want the future generations to be healthy and happy people. Don't open Pandora's box and jeopardize this population and the beauty of this state to a nuclear holocaust. This is my home and shelter, my state, don't allow the monetary rewards to this area to influence and seduce good peoples judgments. Do what is best for the community and the people, don't listen to Wahington D.C. politics. 316-6 316-1 (Cont'd.)

Thank you.

Joan M. Healey

RESPONSE TO COMMENT
COMMENTOR NO. 316: HEALEY, JOAN M.

Response to Comment No. 316-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 316-2

The risk of transporting the foreign research reactor spent nuclear fuel by rail is presented in Section 4.2.3 of the EIS, and the risk is shown to be low.

Response to Comment No. 316-3

The commentor's desire to maintain the beauty and cleanliness of the State of Washington is noted. As discussed in Section 4.2 of the EIS, the risk of adverse impacts to the environment associated with marine transport, ground transport, and interim management of the foreign research reactor spent nuclear fuel at any of the geographical locations considered in this EIS, would be low.

Response to Comment No. 316-4

Section 4.2.2.3 of the EIS demonstrates that the risk of contamination to the general population near Tacoma would be low.

Response to Comment No. 316-5

See response to Comment No. 316-4 above.

Response to Comment No. 316-6

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk. All shipments of foreign research reactor spent nuclear fuel would be conducted meeting, or exceeding, all the security requirements in the Code of Federal Regulations (10 CFR part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. To better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel, Appendix H has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

COMMENTOR NO. 317: HESS, GEORGE H., M.D.

4437 Soundview Dr. W.
Tacoma, WA. 98466
June 19, 1995

Statement of George H. Hess, M.D.
Re: Shipment of Nuclear Waste through Port of Tacoma.

My wife and I have been long-time members of Physicians for Social Responsibility. This organization has always insisted that nuclear benefits be ballanced against possible risks. Certainly, even a slight miscalculation in handling can result in lethal effects lasting hundreds of centuries. 317-1

Initially splitting of the atom was intended only for military distructive purposes. Atoms for peace was a secondary spinoff which has left the unsolved problem of disposal of nuclear waste. Foreign nuclear waste is being returned to the U.S. because of its explosive potential in the hands of terrorists or foreign goverments. So basically this is a military rather than a civilian problem. My question therefore is: Why should this cargo travel through the Port of Tacoma or any other westcoast city? 317-2

May I suggest that The Naval Submarine Base at Bangor on Hood Canal is the proper transfer port. In addition to the security afforded by a military base, the personel are accustomed to handling nuclear material used both as fuel and weapons.

George H. Hess, M.D.

George H. Hess, M.D.

RESPONSE TO COMMENT
COMMENTOR NO. 317: HESS, GEORGE H., M.D.

Response to Comment No. 317-1

DOE agrees that nuclear benefits should be balanced against risks. The risks associated with the proposed action are presented in Section 4 of the EIS, and they are shown to be low.

Response to Comment No. 317-2

Commentor's recommendation of the use of the naval facility at Bangor, Washington for the receipt of foreign research reactor spent nuclear fuel is noted. As recommended by the Military Traffic Management Command, a total of eight military ports were evaluated as candidates given their experience with dry containerized cargoes. The naval facility at Bangor was determined to have inappropriate experience with transshipping containerized dry cargoes. Appendix D, Sections D.1.8 and D.1.9 of the EIS present a detailed discussion of the process and results.

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security provided for the spent nuclear fuel shipments is required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted.

COMMENTOR NO. 320: WRIGHT, CURTIS

6-19-95

TO D.O.E.

FROM CURTIS WRIGHT
3719 91 AVE CT E, PUYALLUP, WA 98371
PH: 206-566-0516

RE: NUCLEAR WASTE COMING THROUGH PORT OF TACOMA, WA

I HAVE 3 MAJOR REASONS NOT TO SHIP NUCLEAR WAS THROUGH THE PORT OF TACOMA.

FIRST, A MILITARY POINT OF ENTRY SHOULD BE USED FOR SECURITY REASONS. ALSO, UNDER THE PROPOSED CONGRESSIONAL CUTBACKS, THE DOE's FUNCTION WOULD PRIMARILY BE TAKEN OVER BY THE MILITARY. 320-1

SECOND, IN THIS PUGET SOUND (TACOMA) AREA WE HAVE HAD AN INCREASE IN SEISMICE ACTIVITY. IN ABOUT THE LAST 6 MONTHS WE HAVE HAD 2 NOTICEABLE EARTHQUAKES THE MOST RECENT BEING ON 5-20-95. A POINT OF CONTACT REGARDING THIS WOULD BE THE SEISMALIG LAB AT THE UNIVERSITY OF WASHINGTON (SEATTLE 320-2

RESPONSE TO COMMENT
COMMENTOR NO. 320: WRIGHT, CURTIS

Response to Comment No. 320-1

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted. Sections 4.2.2.2 and 4.2.2.3 of the EIS provide the analysis on impacts of incident-free operation and consequences of port accidents, respectively.

Response to Comment No. 320-2

The EIS evaluates the risk associated with port activities in Section 4.2.2. The port impacts are evaluated for both incident-free and accident conditions. The seismicity of the Port of Tacoma or the stability of the land of Mt. Rainier does not affect the risk associated with incident-free operations. Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident, and thus affect the probability of such accidents; however, the number of earthquake-induced ship and road accidents is small compared to other causes.

COMMENTOR NO. 320: WRIGHT, CURTIS (CONT'D.)

THIRD, A STUDY THAT I BELEIVE WAS DONE FOR THE STATE OF WASHINGTON REGARDING THE UNSTABLE LAND ON MT. RAINER IF IT SHOULD LET OF STEAM. THE GEOLOGICAL TYPE REPORT WAS W THE LOCAL SEATTLE-TACOMA NEW THE FIRST PART OF MAY, 1995. THIS REPORT SAID THAT MUD WOULD FLOW DOWN THE PUMALLUP VALLEY AND WOULD BE AS HIGH AS 30 FEET IN ORTING, WA. THIS IS OF GREAT CONCERN TO ME BECAUSE THE PUMALLUP VALLEY ENDS AT THE PORT OF TACOMA. AS YOU MAY KNOW, MT. ST. HELENS IS IN WASHINGTON STATE AND HAD AN EXPLOSION/MUD FLOW A FEW YEARS AGO. 320-3

ALSO, A MAP AT THE BACK ROOM OF THIS HEARING SHOWS A SHIPPING ROUTE THAT GOES THROUGH THE PUGET SOUND. THIS ROUTE ON THE MAP GOES BY SEATTLE, WA, WHICH IS A VERY POPULATED AREA, AS IS THE REST OF THE PUGET SOUND AREA. 320-4

Curtis Wright

RESPONSE TO COMMENT
COMMENTOR NO. 320: WRIGHT, CURTIS (CONT'D.)

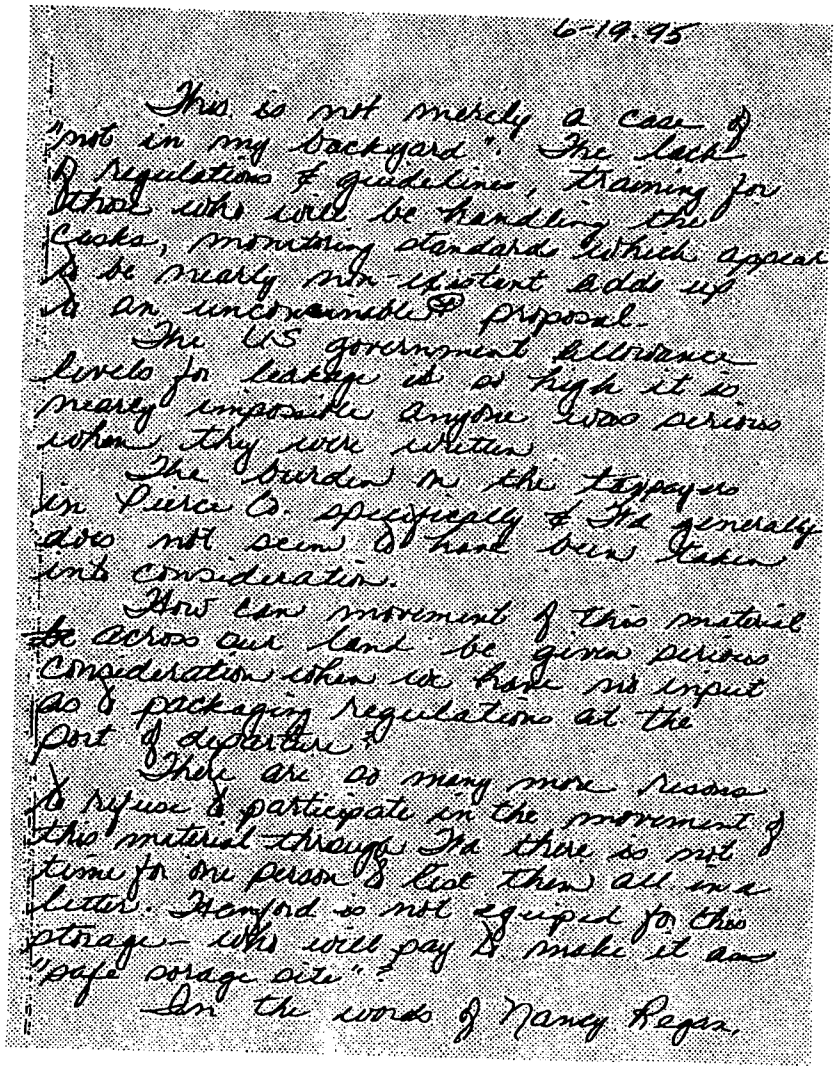
Response to Comment No. 320-3

The commentor's concern associated with the geological characteristics of the Tacoma region is noted.

Response to Comment No. 320-4

The commentor states that the population of the Puget Sound area and surrounding communities is large, hence it is not appropriate to use the Port of Tacoma to bring in the foreign research reactor spent nuclear fuel. Section 4.2.2 of the EIS evaluates the impacts of the proposed action on ports. The results of these analyses, which take into account population, indicate that the risk associated with this activity at any of the assessed ports is low, including that to nearby areas such as Seattle.

COMMENTOR NO. 321: VARNER, PAULA



6-19-95

This is not merely a case of "not in my backyard". The lack of regulations & guidelines, training for those who will be handling the casks, monitoring standards & methods appear to be nearly non-existent adds up to an unreasonable proposal.

The US government's allowance levels for leakage is as high it is nearly impossible anymore to pass serious when they were written.

The burden on the taxpayers in Pierce Co. specifically & the generally does not seem to have been taken into consideration.

How can movement of this material be across our land be given serious consideration when we have no input as to packaging regulations at the port of departure?

There are so many more reasons to refuse & participate in the movement of this material through. We have no not time for one person's list then all one letter. Hanford is not equipped for this storage - who will pay & make it a "safe storage site"?

In the words of Nancy Regan.

321-1

321-2

321-3

321-4

321-5

RESPONSE TO COMMENT
COMMENTOR NO. 321: VARNER, PAULA

Response to Comment No. 321-1

The laws, regulations, and other requirements applicable to transportation and storage of foreign research reactor spent nuclear fuel are described in Section 5 of the EIS. As discussed in Section 2.6.3.2.2 of the EIS, foreign research reactor spent nuclear fuel transportation casks would usually be transported in standard shipping containers. Cranes would be used to unload the containers or transportation casks from the vessel and onto trucks or rail cars. No special training would be required for dock workers. Standard shipping containers are usually unloaded in less than two minutes per container, while unloading non-containerized casks would require several minutes longer. Shipments of spent nuclear fuel are inspected throughout transportation and handling (Sections 2.6.3 and 2.6.5 of the EIS).

Response to Comment No. 321-2

Radiation risk factors used in the analysis are endorsed and accepted by the U.S. Nuclear Regulatory Commission and the International Commission on Radiological Protection. Everyone receives some radiation from natural sources. As discussed in Section 4.10.2 of the EIS, measured variations in this background radiation dose are larger than the increase that could occur under the proposed action.

Response to Comment No. 321-3

The impact to the health and safety of the public in the vicinity of the ports of entry and the ground transportation routes has been assessed in Section 4.2 of the EIS and found to be low. DOE has not identified a financial burden to the taxpayers of the vicinity that would result from the transportation of foreign research reactor spent nuclear fuel through the Port of Tacoma.

Response to Comment No. 321-4

The regulatory requirements applicable to the transportation casks that would be used to transport the foreign research reactor spent nuclear fuel are discussed in Appendix B, Section B.2 of the EIS. These requirements include regulations established by the U.S. Department of Transportation and the NRC. In addition, a DOE representative would be present at the foreign research reactor site prior to the loading of the spent nuclear fuel in the transportation cask. Further, a Transportation Plan detailing inspection procedures for the loading of the spent nuclear fuel at the foreign research reactor site would be provided by DOE prior to policy implementation. General provisions of the Transportation Plan are provided in Appendix H, which was added to the final EIS in response to public comments.

COMMENTOR NO. 321: VARNER, PAULA (CONT'D.)

"Just Say NO!"

Paula Varner
3315 N 27th St
Tacoma WA 98407

RESPONSE TO COMMENT
COMMENTOR NO. 321: VARNER, PAULA (CONT'D.)

Response to Comment No. 321-5

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

...ven comment for the public record:

(2) ~~Those~~ We need to dispose of the nuclear waste that we create. ~~I~~ We need to "clean up our own garbage." However, each group of nations must clean up its own garbage (nuclear waste). The U.S.A. should not be considered the only "safe place" to dispose of dangerous materials since Japan and France also have the capacity to "safely" store nuclear waste. 322-1

(3) Please explore other options for Asian countries to dispose of nuclear waste in Japan; and European & African countries to dispose of nuclear waste in France. The U.S.A. should consider the interests of its own ~~stores~~ people in terms of safety and a liveable environment.

(1) The D.O.E. ~~uses~~ users a risk factor in ~~the way they~~ what it considers "safe" in transporting and handling nuclear waste that most American would not consider safe. There should be zero tolerance for radiation leakage. All handlers of nuclear radiation should be expertly prepared for any eventuality. Such is not the case in Tacoma. Firefighters, longshore workers & railroad personnel are not prepared for a → 322-2 322-3

Response to Comment No. 322-1

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5 of the EIS, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

Response to Comment No. 322-2

Radiation risk factors used in the analysis are endorsed and accepted by the U.S. Nuclear Regulatory Commission and the International Commission on Radiological Protection.

Everyone receives some radiation from natural sources. As discussed in Section 4.10.2 of the EIS, measured variations in this background radiation dose are larger than the increase that could occur under the proposed action.

Response to Comment No. 322-3

Foreign research reactor spent nuclear fuel shipments are subject to the same types of potential hazards as those of other ships carrying nonradiological hazardous materials.

Each port considered in the EIS has developed an Area Contingency Plan. This plan outlines response capabilities, procedures and authorities for responding to and recovering from hazardous material incidents. Additionally, DOE would provide assistance to local authorities to ensure that appropriate measures would be taken in the unlikely event of an accident. As part of this assistance, DOE's Radiological Assistance Program teams, from eight offices strategically located throughout the country, would be used to coordinate and to provide remediation assistance. This type of assistance and coordination would be specified in the Transportation Plan that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS

COMMENTOR NO. 322: POWERS, M. SHEILA (CONT'D.)

nuclear accident. No
transporting should be done, even
within the U.S. until there is a
rigorous standard of safety.
(4) more exploration must be done
about nuclear waste containment & abatement

322-3 (Cont'd.)

322-4

M. Sheila Powers
4538 Tacoma Blvd.
Tacoma, WA 98424

RESPONSE TO COMMENT
COMMENTOR NO. 322: POWERS, M. SHEILA (CONT'D.)

in response to public comments. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected.

Response to Comment No. 322-4

The commentor's request to conduct additional study into nuclear waste containment and abatement is outside the scope of this EIS.

COMMENTOR NO. 323: KUEBER, MARY E.

(Page 1 of 5 Pages)

2405 S. Star Lake Rd 70-101
Federal Way,WA 98003

May 26, 1995

MEMO TO: U.S. Dept. of Energy
RE: PROPOSED NUCLEAR WEAPONS NONPROLIFERATION POLICY CONCERNING FOREIGN RESEARCH REACTOR SPENT NUCLEAR FUEL----PORT OF TACOMA PUBLIC MEETING, WA.

FROM: Mary E. Kueber-U.S. Citizen, Envir. Scientist

Dear DOE:

The United States' plan to control the availability of nuclear materials globally, is ambitious, admirable and necessary. The campaign and achievement of Nuclear Weapons Nonproliferation Policy is perhaps, the most important step humankind has made ensuring health and safety for the next Century and beyond. Along with monitoring of nuclear nations, and prodding of rogue nuclear nations into compliance, the clean up from the Cold War period is critical. 323-1

I have read the Draft Environmental Impact Statement for the above proposed project. The concern here is the proposed use of the Port of Tacoma, Wa., and Hanford, WA., site. The Port of Seattle has previously rejected the proposed use of that port for reasons, in addition to interference with international economic commerce. The Port of Tacoma, positioned even deeper inward along an enclosed waterway, of high population density, and an active earthquake zone, shares the same concerns. The proposed Hanford, WA., site has the largest and most complex volume of untreated Plutonium waste in the United States, with continuing technological problems affecting processing. 323-2 323-3

As the intention of final geologic disposal is in the State of Arizona, the most expeditious route would appear to be NWS Concord, CA., then to E-MAD Nevada for processing, and finally the Arizona site. An Eastern route, serving adjacent Nations, would include the Galveston Texas Port, and/or the Savannah River Port(GA). Vitrification overseas, with use of facilities in Scotland and France, with title transference, and final disposal in the United States, would be optimal. The country of utilization should take a good portion of responsibility in peaceful use and processing of nuclear material. The U.S. could share its technology in spent nuclear fuel processing at one or more overseas sites, where adequate security provisions could be ensured. The final vitrified product could then be secured by the U.S. in geological internment. 323-4 323-5 323-6

Obviously, most of humankind are pleased to see control and processing of spent radioactive fuel. Many want it done, but, "not in my backyard". What the concern should be is, selection of the most expeditious, safest, most prudent and fair modus operandi. My mother always told my sister and me, "Bake something 323-7

RESPONSE TO COMMENT
COMMENTOR NO. 323: KUEBER, MARY E.

Response to Comment No. 323-1

The commentor's support for the nonproliferation of nuclear weapons is noted.

Response to Comment No. 323-2

DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' status with respect to their clients. This position is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions. As such, there should be no adverse commercial or economic reaction to the use of the port. Historically, there were no adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

The passage from the Straight of Juan de Fuca to Tacoma, meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection. (Appendix D, Section D.1.9.2 of the EIS). Likewise, the Port of Tacoma meets the requirements of Criterion 5 (Human Population). Appendix D, Section D.1.9.5 of the EIS provides details of this criterion and how it is applied. Favorable transit from open ocean and human population are only two of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations, such as port experience with handling containers, port facilities, and access to land transportation, would also be considered in making the final selection of ports of entry. Appendix D, Section D.1.9 of the EIS presents details of the port selection process.

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Spent nuclear fuel transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at the Port of Tacoma or elsewhere to fail, is not expected to compromise the transportation cask. While local hazards, such as earthquakes, may slightly increase the probability of an accident, they would not increase the consequences of the accident, which were found to be very minor for both marine and land transportation accidents (Section 4.2.2.3 of the EIS).

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at

COMMENTOR NO. 323: KUEBER, MARY E. (CONT'D.)

(2)

-if you want to. But, clean up your mess in the kitchen, when you are through". Whoever is cooking in the nuclear kitchen should clean up their respective mess. 323-7 (Cont'd.)

The State of Washington has historically cooperated, if not, welcomed the U.S. Governmental programs in the Nuclear Defense of Democracy. The fact, previously given, that Hanford, WA., contains the largest most complex volume of Plutonium in the U.S., with current problems in processing the spent fuel is given as evidence. Billions of dollars have already been spent on research and development, with vitrification, remaining a process on paper. Deteriorating storage sites have been documented at Hanford. This situation should give good reason to pause the importation of unprocessed spent nuclear fuel from overseas locations. It seems,that the United States has made promises to other Nations concerning this matter, before first cleaning up the serious nuclear mess in its own kitchen. The U.S. is not, and should not be viewed by the global community as a nuclear dump site. The Treaty On Non-Proliferation of Nuclear Weapons should be permanent cornerstone legislation. Responsibility in peaceful use of nuclear materials, must be shared by those who choose to use them. The mess left in the nuclear kitchen must be cleaned up by those who choose to "bake" there. Hopefully, LEU fuel will become the primary source for research reactors and medical use, lessening the danger and costs of reprocessing spent fuel. Decentralization of sites, with vitrification occuring overseas, and burial in the United States would be the optimum route for safety and security 323-8 323-9 323-10

Thank you for the opportunity to render comment on the Nuclear Waste Handling Project, and for U.S. Government participation in this project ensuring the safer world for present and future generations. Thankyou to the Department of Energy, and DOE Secretary O'Leary for investigative work regarding nuclear waste management problems, and for sharing this information with citizens. This memo closes with quotations from DOE Officials in a published article on this subject.

> Now that nuclear testing has ended, at least in the U.S., the government is left with a vast, pulsating landscape of atomic waste dumps to clean up. The people who developed nuclear reactors and weapons were no more prescient about future environmental hazards than they were about health risks. The storage of spent fuel and other nuclear materials was shockingly sloppy. "Every time you turn over a new document, there's a $5 billion problem," says Dan Reicher, a special assistant to O'Leary.
>
> The DOE's nuclear-weapons complex spread over 4,000 square miles in 13 states appears to be particularly hazardous. The secretary bucked her own bureaucracy by insisting that the DOE release a report on deteriorating storage sites for spent nuclear fuel. Aides warned that disclosure could cause liability problems. O'Leary insisted, "I want this done," she said. But there's a lot more to do. "It's as if you had a party for 45 years, and you never cleaned it up," says

RESPONSE TO COMMENT
COMMENTOR NO. 323: KUEBER, MARY E. (CONT'D.)

the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford site.

Response to Comment No. 323-3

See last paragraph of response to comment 323-2, above.

Response to Comment No. 323-4

The distance from the port to the DOE management site is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations such as port population, route population, port experience with handling containers, and access to the ocean would also be considered in making the final selection of port of entry. Appendix D, Section D.1.9 of the EIS presents details of the port selection process.

Actually, prior to its deposition in the geologic repository, the foreign research reactor spent nuclear fuel (if it is accepted by the United States), would first be stored at a DOE management site. As stated in the last paragraph of the response to Comment 323-2, the foreign research reactor spent nuclear fuel will be managed at the Savannah River Site (aluminum-based fuels) or the Idaho National Engineering Laboratory (all other type fuels). Thus, no foreign research reactor spent nuclear fuel will be either managed or reprocessed at the Nevada Test Site.

It should also be noted that the Yucca Mountain site in Nevada is currently being studied for potential use as the final geologic repository, not a site in Arizona.

Response to Comment No. 323-5

The commentor's preference for using Galveston, Texas, or Savannah, Georgia for the eastern ports of entry, and Concord NWS for the western port of entry is noted. Section 4.2.2 of the EIS demonstrates that the risk associated with bringing foreign research reactor spent nuclear fuel through these ports, or through any of the ports analyzed in the EIS, is low.

Response to Comment No. 323-6

The commentor's preference for overseas reprocessing with disposal in the United States is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 323: KUEBER, MARY E. (CONT'D.)

(3)

-Thomas Grumbly, DOE assistant secretary for environmental restoration and waste management. Grumbly is a worrier. He predicts that figures currently quoted for the total cost of the cleanup-from $200 billion to $300 billion-may not even be close. "It could be a couple of times larger than that," he says. He frets about the notorious storage tanks at Hanford, where so many different wastes have been dumped that no one knows exactly what kind of witches' brew is in them. "Every time the phone rings after 10 o'clock, I think, 'This is it, we've had an event," says Grumbly. Like his boss, he thinks the time has come for "throwing open the blinds" to shed some light on the nuclear-waste crisis. The by-products(nuclear) of the cold war has left us with "the single largest environmental and health risk in the nation," he says. (NEWSWEEK, "National Affairs-America's Nuclear Secrets", December 27, 1993, pages 14 &18.)

Thankyou.

Sincerely,

Mary E. Kueber, Ph.D.

Mary E. Kueber, B.S., M.A., Ph.D.
Environmental Science

RESPONSE TO COMMENT
COMMENTOR NO. 323: KUEBER, MARY E. (CONT'D.)

Response to Comment No. 323-7

The commentor's position that foreign research reactor operators should manage their spent nuclear fuel is noted. However, many foreign research reactor operators have no means for disposition of their spent nuclear fuel (Section 1.1 of the EIS). Thus the intent of the proposed policy is to give them a limited period of time to arrange for disposition of their spent nuclear fuel, and to encourage conversion to LEU fuel in foreign research reactors.

Response to Comment No. 323-8

See last paragraph of the response to comment 323-2, above.

Response to Comment No. 323-9

The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

Response to Comment No. 323-10

The commentor's preference for overseas reprocessing with disposal in the United States is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 324: HAZLETON, DEANNE

Tacoma, WA 98405
Deanne Hazleton

Nuclear technology is not adequately engineered and developed for safety. We cannot guarantee the safety of our selves our children or our children's children. Hasn't ASCARCO, (a fly weight in the hazardous department) taught us enough?) NO NUCLEAR WASTE ANYWHERE!!

324-1

RESPONSE TO COMMENT
COMMENTOR NO. 324: HAZLETON, DEANNE

Response to Comment No. 324-1

The commentor's opposition to nuclear technology is noted. Section 4 of the EIS demonstrates that the risks of the proposed action would be low.

COMMENTOR NO. 326: ROTH, LAUREEN

TACOMA, WA 4/19/95

I AM OPPOSE THE transportation
OF NUCLEAR MATERIAL THRU THE port
OF TACOMA, THRU OUR STATE & IN
OUR NATION, I support proposition 2
I QUESTION OUR ability TO STORE
pointing TO THE DEBACKLE AT HANFORD
I QUESTION THE CREDIBILITY OF THE
INFORMATION/STATISTICS WE HAVE BEEN
given Pointing AGAIN TO THE MIS-
INFORMATION WE HAVE BEEN
given ABOUT THE DANGERS-
LEAKS, CONTAMINATING OUR
CITIZENS, PREVARICATING ABOUT
THE DANGER TO THE CHILDREN,
LIVESTOCK, ELDERS, IN OUR HOMES
PIERCE COUNTY DOES NOT DESERVE
THIS - WE WILL FIGHT IT TO THE
LAST DROP LAUREEN ROTH
Lauren Roth 219 SO 96TH ST.
TACOMA, WA - 98409

326-1

326-2

326-3

326-4

RESPONSE TO COMMENT
COMMENTOR NO. 326: ROTH, LAUREEN

Response to Comment No. 326-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 326-2

The commentor's preference for Management Alternative 2 is noted. This alternative is discussed in Sections 2.3 and 4.4 of the EIS.

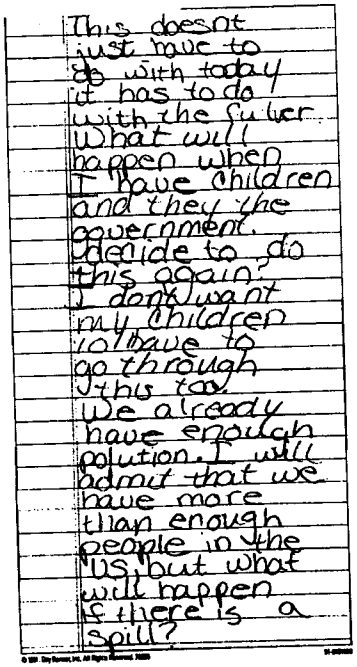
Response to Comment No. 326-3

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 326-4

As discussed in Section 4 of the EIS, estimates of risks are based on conservative assumptions. Actual risks are likely to be even lower than those presented in Section 4.

COMMENTOR NO. 327: ANONYMOUS


This doesn't just have to do with today it has to do with the future What will happen when I have children and they the government decide to do this again. I don't want my children to have to go through this too We already have enough pollution. I will admit that we have more than enough people in the US but what will happen if there is a spill?

327-1

327-2

RESPONSE TO COMMENT
COMMENTOR NO. 327: ANONYMOUS

Response to Comment No. 327-1

The commentor's opposition to the proposed policy, and the commentor's concerns for future generations are noted. Many foreign research reactor operators have no means for disposition of their spent nuclear fuel (Section 1.1 of the EIS). Thus the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). After expiration of the policy period and the associated acceptance period, if any, (Section 1.2 of the EIS), foreign research reactor operators would be responsible for disposition of their spent nuclear fuel.

Response to Comment No. 327-2

Foreign research reactor spent nuclear fuel in a transportation cask cannot "spill" because it is solid metallic fuel and is shipped dry. Spent nuclear fuel shipments have been conducted for over 40 years. In all that time, there has never been an incident in which the spent nuclear fuel transportation cask was breached or in which it released any of its contents. Nevertheless, the consequences of some radioactive material being released from a spent nuclear fuel transportation cask during an accident are discussed in Sections 4.2.1.3, 4.2.2.3, 4.2.3.3, and 4.2.4.1 of the EIS. In all cases, the consequences would be low.

I know I don't want any people or animals to die. We have enough endangered species. We don't need more, we don't kneed more graves. Think about the Futer.

327-3

Response to Comment No. 327-3

The effects of radiation on plants and animals is discussed in Section 4.1.6 of the EIS. The impacts to people are discussed throughout Section 4 of the EIS. In all cases the impacts are demonstrated to be low.

COMMENTOR NO. 328: PRESTON, ANITA W.

Public Opinion Survey

The Port of Tacoma Commission is seeking citizen input on the issue of potential shipments of spent nuclear fuel elements through the Port of Tacoma.

We appreciate your comments and concerns on this important issue. We will forward your comments to the Department of Energy. To have your opinion count, please fill out his form and mail it to the **Port of Tacoma, P.O. Box 1837, Tacoma WA 98401 by June 19, 1995.** You may also send it by facsimile to (206) 593-4570.

SURVEY: NUCLEAR FUEL ELEMENT SHIPMENTS THROUGH TACOMA

- [X] I oppose spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am in favor of spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am undecided. *

COMMENTS: The no action selection is my preferred choice. However, as this may be unacceptable to D.O.E., my next choice would be "Management Alternative 2" to keep the nuclear fuel overseas. Primarily for public safety, I strongly oppose the nuclear fuels from being transported through the Port of Tacoma. In addition, I oppose storage of the fuels at Hanford, WA. The state of Washington has done more than it's share in dealing with nuclear waste, we don't need anymore. If Congress me also that the D.O.E. has not provided funding for the local implementation of safety training, monitoring Cover

328-1

328-2

328-3

328-1 (Cont'd.)

328-4

328-5

Name: Ms Anita W. PRESTON Telephone: (206) 759-8968

Anita W Preston

Address: 2611 N. 30th St City/State/Zip Code: Tacoma, Wa 98407-6929

(mail me the outcome please.)

* For more information, contact the Office of Spent Fuel Management (EM-37), Office of Environmental Management, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

RESPONSE TO COMMENT
COMMENTOR NO. 328: PRESTON, ANITA W.

Response to Comment No. 328-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 328-2

The commentor's preference for the No Action Alternative, as discussed in Sections 2.5 and 4.6 of the EIS, is noted.

Response to Comment No. 328-3

Management Alternative 2 is the alternative in which no foreign research reactor spent nuclear fuel is accepted into the United States, and the commentor's preference for this alternative (as a second choice) is noted. This alternative is discussed in Sections 2.3 and 4.4 of the EIS.

Response to Comment No. 328-4

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 328-5

Each port considered in the EIS has developed an Area Contingency Plan. This plan outlines response capabilities, procedures and authorities for responding to and recovering from hazardous material incidents. Additionally, DOE would provide assistance to local authorities to ensure that appropriate measures would be taken in the unlikely event of an accident. As part of this assistance, DOE's Radiological Assistance Program teams, from eight offices strategically located throughout the country, would be used to coordinate and to provide remediation assistance. This type of assistance and coordination would be

and providing necessary equipment for emergency personnel. There is also a concern of tarnishing the image of Tacoma which we have been improving steadily.

328-5 (Cont'd.)

328-6

specified in the Transportation Plan that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected.

Response to Comment No. 328-6

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE agrees that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor fuel was accepted into the United States in the past. Under NEPA, the socioeconomic effects evaluated for this EIS do not include those associated with psychological fear of receiving spent nuclear fuel. Based on past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Tacoma would not adversely affect the image of the port.

COMMENTOR NO. 329: HUDSON, ROGENE

Public Opinion Survey

The Port of Tacoma Commission is seeking citizen input on the issue of potential shipments of spent nuclear fuel elements through the Port of Tacoma.

We appreciate your comments and concerns on this important issue. We will forward your comments to the Department of Energy. To have your opinion count, please fill out his form and mail it to the **Port of Tacoma, P.O. Box 1837, Tacoma WA 98401 by June 19, 1995.** You may also send it by facsimile to (206) 593-4570.

SURVEY: NUCLEAR FUEL ELEMENT SHIPMENTS THROUGH TACOMA

- [x] I oppose spent nuclear elements being shipped through the Port of Tacoma. — 329-1
- [ ] I am in favor of spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am undecided. *

COMMENTS: (Why should we take waste from other countries — 329-2

Name: Rogene Hudson Telephone: (206) 759-6173

Address: 4107 N. 24 City/State/Zip Code: Tacoma Wa 98406

* For more information, contact the Office of Spent Fuel Management (EM-37), Office of Environmental Management, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

RESPONSE TO COMMENT
COMMENTOR NO. 329: HUDSON, ROGENE

Response to Comment No. 329-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 329-2

The commentor's opposition to acceptance of spent nuclear fuel from foreign research reactors is noted. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

DOE is proposing this action to provide foreign research reactor operators with an incentive to continue the conversion of their reactors to the use of LEU fuel, and to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS).

Public Opinion Survey

The Port of Tacoma Commission is seeking citizen input on the issue of potential shipments of spent nuclear fuel elements through the Port of Tacoma.

We appreciate your comments and concerns on this important issue. We will forward your comments to the Department of Energy. To have your opinion count, please fill out his form and mail it to the **Port of Tacoma, P.O. Box 1837, Tacoma WA 98401 by June 19, 1995.** You may also send it by facsimile to (206) 593-4570.

SURVEY: NUCLEAR FUEL ELEMENT SHIPMENTS THROUGH TACOMA

- [X] I oppose spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am in favor of spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am undecided. *

COMMENTS: We are in the process of cleaning Tacoma up. Why would we want nuclear trash to pass thru our water and land? I want my kids to enjoy the beauty of our area. I don't want to have to worry about nuclear spills and health problems.

NO WAY TO Nuclear Trash in our town!

Name: Carrie Vollmer Telephone: 759-4651

Address: 4101 N. 24th City/State/Zip Code: Tacoma WA 98406

* For more information, contact the Office of Spent Fuel Management (EM-37), Office of Environmental Management, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

330-1

Response to Comment No. 330-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 331: LAMENDOLA, ROBERTA

Public Opinion Survey

The Port of Tacoma Commission is seeking citizen input on the issue of potential shipments of spent nuclear fuel elements through the Port of Tacoma.

We appreciate your comments and concerns on this important issue. We will forward your comments to the Department of Energy. To have your opinion count, please fill out his form and mail it to the Port of Tacoma, P.O. Box 1837, Tacoma WA 98401 by June 19, 1995. You may also send it by facsimile to (206) 593-4570.

SURVEY: NUCLEAR FUEL ELEMENT SHIPMENTS THROUGH TACOMA

- [x] I oppose spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am in favor of spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am undecided. *

COMMENTS: I Think it unconscionable to even consider shipping spent nuclear waste through the Port of Tacoma, or Anywhere else. Find a way to store the waste where it now Resides

Name: Roberta LaMendola Telephone: 759-3654

Address: 2220 N. Tyler City/State/Zip Code: Tacoma WA 98406

* For more information, contact the Office of Spent Fuel Management (EM-37), Office of Environmental Management, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

331-1

331-2

RESPONSE TO COMMENT
COMMENTOR NO. 331: LAMENDOLA, ROBERTA

Response to Comment No. 331-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or other ports is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 331-2

Overseas storage is Management Alternative 2, Subalternative 1a, and the commentor's preference for this alternative is noted. This alternative is discussed in Sections 2.3 and 4.4.1 of the EIS.

COMMENTOR NO. 332: HETTICK, OLIVER C.

Public Opinion Survey

The Port of Tacoma Commission is seeking citizen input on the issue of potential shipments of spent nuclear fuel elements through the Port of Tacoma.

We appreciate your comments and concerns on this important issue. We will forward your comments to the Department of Energy. To have your opinion count, please fill out his form and mail it to the **Port of Tacoma, P.O. Box 1837, Tacoma WA 98401 by June 19, 1995.** You may also send it by facsimile to (206) 593-4570.

SURVEY: NUCLEAR FUEL ELEMENT SHIPMENTS THROUGH TACOMA

- [x] I oppose spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am in favor of spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am undecided. *

COMMENTS: Much resources are being used to clean-up Commencement Bay (a Super-Fund) project. Potentially, Nuclear transhipment of foreign waste could close our harbor and subsequent stopping activity & stop recreational use.

332-1

Name: Oliver C. Hettick Telephone: 206-759-2917

Address: 4202 N 24th St Tacoma, Wa. 98406 City/State/Zip Code: 98406

* For more information, contact the Office of Spent Fuel Management (EM-37), Office of Environmental Management, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

RESPONSE TO COMMENT
COMMENTOR NO. 332: HETTICK, OLIVER C.

Response to Comment No. 332-1

The acceptance of foreign research reactor spent nuclear fuel through the Port of Tacoma would neither affect the activities being conducted in Commencement Bay as a result of being a Superfund Site, nor would it jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma. The analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or to the quality of water or air (Sections 4.2.1.1 and 4.5, and Appendix C, Section C.2 of the EIS). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Based on over 30 years of experience, DOE considers that foreign research reactor spent nuclear fuel transportation casks passing through the Port of Tacoma, Commencement Bay, or any other port or waterway, would not release their radioactive contents, and thus would not affect air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality. Also, a sentence has been added to Appendix D, Section D.2.1.9 of the EIS recognizing the designation of the Commencement Bay as a Superfund Site.

COMMENTOR NO. 333: HETTICK, REGINA

Public Opinion Survey

The Port of Tacoma Commission is seeking citizen input on the issue of potential shipments of spent nuclear fuel elements through the Port of Tacoma.

We appreciate your comments and concerns on this important issue. We will forward your comments to the Department of Energy. To have your opinion count, please fill out his form and mail it to the **Port of Tacoma, P.O. Box 1837, Tacoma WA 98401 by June 19, 1995.** You may also send it by facsimile to (206) 593-4570.

SURVEY: NUCLEAR FUEL ELEMENT SHIPMENTS THROUGH TACOMA

- [X] I oppose spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am in favor of spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am undecided. *

COMMENTS: _____

Name: Regina Hettick Telephone: (206) 759-2917

Address: 4202 N. 24th St. City/State/Zip Code: Tacoma, Wa. 98406

* For more information, contact the Office of Spent Fuel Management (EM-37), Office of Environmental Management, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

333-1

RESPONSE TO COMMENT
COMMENTOR NO. 333: HETTICK, REGINA

Response to Comment No. 333-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 334: ELLS, S.

Public Opinion Survey

The Port of Tacoma Commission is seeking citizen input on the issue of potential shipments of spent nuclear fuel elements through the Port of Tacoma.

We appreciate your comments and concerns on this important issue. We will forward your comments to the Department of Energy. To have your opinion count, please fill out his form and mail it to the **Port of Tacoma, P.O. Box 1837, Tacoma WA 98401 by June 19, 1995.** You may also send it by facsimile to (206) 593-4570.

SURVEY: NUCLEAR FUEL ELEMENT SHIPMENTS THROUGH TACOMA

- [X] I oppose spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am in favor of spent nuclear elements being shipped through the Port of Tacoma.
- [ ] I am undecided. *

COMMENTS: 4% of their supply is not going to help them. Develop A way to store 100% of the waste in their country.

Name: S. Ells Telephone: 206 759 7605

Address: 2220 N. Tyler City/State/Zip Code: Tac 98407

* For more information, contact the Office of Spent Fuel Management (EM-37), Office of Environmental Management, United States Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585

334-1

334-2

RESPONSE TO COMMENT
COMMENTOR NO. 334: ELLS, S.

Response to Comment No. 334-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 334-2

The commentor's reference to "4% of their supply" is not clear to DOE. The alternative amounts of spent nuclear fuel that DOE is considering are discussed in Sections 2.2.1.3 and 2.2.2.1 of the EIS. One of the alternatives considered is to assist with management of 100% of the foreign research reactor spent nuclear fuel.

Overseas storage is Management Alternative 2, Subalternative 1a, and the commentor's preference for this alternative is noted. This alternative is discussed in Sections 2.3 and 4.4.1 of the EIS.

COMMENTOR NO. 338: JOHNSON, ANITA

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

The Titanic was safe, the second hand smoke was safe, Abortion was safe, Chernobal was safe, Lead paint was safe, Breast implants were safe, Nuclear waste is safe? NO Nuclear Waste in Tacoma.

Name and Address: Anita Johnson
5919 6th K St.
Tacoma, WA 98404

338-1

RESPONSE TO COMMENT
COMMENTOR NO. 338: JOHNSON, ANITA

Response to Comment No. 338-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 339: MORFEE, TOM

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Our Association of some 500 families residing in Western Pierce County opposes this concept. This is a highly populated area, vulnerable to nuclear accident. Commencement Bay is already a Superfund toxic sink. Washington (at Hanford) has already paid its nuclear dues!

Name and Address: Tom Morfee, President
Peninsula Neighborhood Assoc.
P.O. Box 507 Gig Harbor, Wa. 98335
Phone (206) 858-3400. FAX (206) 858-3586

339-1

RESPONSE TO COMMENT
COMMENTOR NO. 339: MORFEE, TOM

Response to Comment No. 339-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

The Port of Tacoma was one of ten ports that was indicated to be acceptable to receive the foreign research reactor spent nuclear fuel, if the material were to be accepted into the United States. Population of the port and surrounding areas to a radius of ten miles is one of the considerations of the port selection criteria. The population criterion for port selection (Criterion 5) is discussed in more detail in Appendix D, Section D.1.9.5 of the EIS.

The acceptance of foreign research reactor spent nuclear fuel through the Port of Tacoma would neither affect the activities being conducted in Commencement Bay as a result of being a Superfund Site, nor would it add any additional burden to this designation. The transport of the spent nuclear fuel on the Bay would not add any hazardous material to the Bay or the environment. DOE has added a sentence to the EIS (Appendix D, Section D.2.1.9) recognizing the designation of the Commencement Bay as a Superfund Site. The analysis of impacts, as documented in Section 4 of the EIS, shows that there would be no significant adverse impacts on the port, people, or natural environment from shipments of foreign research reactor spent nuclear fuel through any of the ports of entry.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford site.

COMMENTOR NO. 340: OMERO, HELGA

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I am very much against importing transporting or shipping nuclear waste thru this port or any port

340-1

Name and Address:

Helga Omero
1501 S. Winnifred
Tacoma Wash. 98465

RESPONSE TO COMMENT
COMMENTOR NO. 340: OMERO, HELGA

Response to Comment No. 340-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or any port is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Commentor No. 341: Sullivan, Maura E.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Mr. Head, 6/15/05

It is 9:42 pm. You are cleaning your fingernails. At least act interested. You are our government's spokesman. Be a leader. Tell the truth. I am 26. How can I change our government when people like you make the public distrust it?

Name and Address: Maura E. Sullivan
4440 Memory Ln. W.
Tacoma, WA 98466

341-1

Response to Comment
Commentor No. 341: Sullivan, Maura E.

Response to Comment No. 341-1

The commentor's observations are noted. As required by NEPA, the public hearings held for this EIS provided an opportunity for interested individuals, or organizations and governmental representations, to voice concerns, raise questions, or provide support for the proposed action. DOE considers the analyses and conclusions presented in the EIS are a complete and accurate representation of the risks and potential environmental impacts that could occur as a result of implementation of the proposed action.

COMMENTOR NO. 342: HILEEN, J. LOUISE

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I feel very strongly about the necessity of keeping nuclear waste out of Tacoma and environs. If the waste is to be stored in Nevada it would seem there are ports nearer that area which would require a shorter route from the existing area in a less populated area.

Name and Address: J. Louise Hileen
1909 No. L St. #207
Tacoma, WA. 98403

342-1

RESPONSE TO COMMENT
COMMENTOR NO. 342: HILEEN, J. LOUISE

Response to Comment No. 342-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 343: ALLEN, ROGER E.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I AM OPPOSED TO IT. It seems to me that SEA shipment (A MONTH TRANSIT TIME ???) Transfer to docks, then to trucks or RAIL CARS ETC - gives maximum exposure and maximum opportunity for accidents in highly populated areas. Why not ship by air? Can avoid highly populated areas - maximum flexibility in scheduling + routes. US Govt planes could be used to increase security + safety -

Name and Address: ROGER E. ALLEN
2809 N. GARFIELD Rd.
TACOMA, WA 98403

343-1

343-2

RESPONSE TO COMMENT
COMMENTOR NO. 343: ALLEN, ROGER E.

Response to Comment No. 343-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. The incident-free exposures and risks of accidents in transit are presented in Appendices C, D, and E and Section 4.2 of the EIS. In all cases the risks were shown to be low.

Response to Comment No. 343-2

DOE appreciates the commentor's suggestion. The option of air transport was considered, but dismissed for the reasons given in Section 2.10 of the EIS.

COMMENTOR NO. 344: GEORGES, GRACE

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

The Pacific N.W. is one of the most beautiful areas in the world and Tacoma is quite central. I think the idea of shipping nuclear waste through here is completely within bible and unacceptable. It borders on the criminal. If this is not stopped - what will be the destiny of the City of Destiny?

Name and Address: Grace Georges
1108 53rd St Ct E
Puyallup 98371

344-1

RESPONSE TO COMMENT
COMMENTOR NO. 344: GEORGES, GRACE

Response to Comment No. 344-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 345: TYLER, VALERIE

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I don't Think it should come through such a populated area. There is too much chance of an accident with vessel, truck and Train.

Name and Address: Valerie Tyler
14320 200th Ave SE
Renton, WA 98059

345-1

RESPONSE TO COMMENT
COMMENTOR NO. 345: TYLER, VALERIE

Response to Comment No. 345-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 346: PETERSON, H.J.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I THOUGHT AT FIRST NOTICE THIS WAS A BAD JOKE, AND SO DIDN'T ATTEND THE INITIAL HEARINGS. NUKES (WASTE) through A SUPERFUND SITE? ABSOLUTELY NOT! Not to mention the FACT DOE is especially subject to MURPHY'S LAW

Name and Address: H.J. PETERSON
411 SO. 61ST ST.
TACOMA, WA 98408

346-1

RESPONSE TO COMMENT
COMMENTOR NO. 346: PETERSON, H.J.

Response to Comment No. 346-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 347:
LANDER, MR. & MRS. LEONARD VANDER

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

We are very much against any Nuclear Waste coming into the U.S. Each Country should care for their own in their Country. We are Certainly against it coming into The City of Tacoma — does more do.

Name and Address: Mr & Mrs Leonard Vander Linden
7020 E. Tonia Tacoma WA 98404

347-1

347-2

RESPONSE TO COMMENT
COMMENTOR NO. 347:
LANDER, MR. & MRS. LEONARD VANDER

Response to Comment No. 347-1

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

Response to Comment No. 347-2

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 348: HILL, EARL R.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

We need to improve our local environment. A dramatic change to the way we think and act starts here. Setting an example of high standards will come back on us 10 fold in the future, benefiting our, your Children. Lets not take a giant step backwards. Lets take risks to improve not destroy or harm

Name and Address: Earl R Hill

3827 So. G Tacoma Wa 98408

348-1

RESPONSE TO COMMENT
COMMENTOR NO. 348: HILL, EARL R.

Response to Comment No. 348-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 349: FARM, JERRY

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

The nuclear waste created in America, or by America should be "taken care of" by America. That waste created should be handled by the government of the country responsible. My children and grandchildren should not be endangered so America can be the "waste" collector of the world. Don't bring it here.

Name and Address: Jerry Farm
2801 Rainier Road L-23
Steilacoom, Wa 98388

349-1

RESPONSE TO COMMENT
COMMENTOR NO. 349: FARM, JERRY

Response to Comment No. 349-1

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

COMMENTOR NO. 350: FARM, CLIFFORD L.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I THINK THIS PROPOSAL IS VERY IRRESPONSIBLE AND POSES A SERIOUS THREAT TO PUBLIC HEALTH AND SAFETY. DON'T DO IT!

Name and Address: CLIFFORD L. FARM
2801 RIGNEY RD. L23
STEILACOOM, WA 98388

350-1

RESPONSE TO COMMENT
COMMENTOR NO. 350: FARM, CLIFFORD L.

Response to Comment No. 350-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 351: PENDLETON, DOLORES

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I do not want the nuclear waste coming thru Tacoma. I live on the Commencement Bay shoreline next to railroad tracks as many others do. This city is concentrated too close to the port and rail system.

Name and Address: Dolores Pendleton
2002 Schuster Parkway #202
Tacoma, WA 98402

351-1

RESPONSE TO COMMENT
COMMENTOR NO. 351: PENDLETON, DOLORES

Response to Comment No. 351-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 352: PETERSON, H.E.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

- THE AREA IS TO POPULATED
- TRANSPORTATION AND ROUTES NOT ADEQUATE
- STORAGE AREA CLOSE TO FAR BAY

352-1

Name and Address:
H.E. PETERSON
411 S 61ST ST
TACOMA WA 98408

RESPONSE TO COMMENT
COMMENTOR NO. 352: PETERSON, H.E.

Response to Comment No. 352-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

The port selection process is documented in Appendix D of the EIS. To evaluate and select acceptable ports of entry, the EIS developed five evaluation criteria which are discussed in Appendix D, Section D.1.9. One of the criteria (Criterion 5) evaluates the population in and around the port, and along the routes from the port to the DOE management sites. Criterion 5 indicates those ports that can safely handle foreign research reactor spent nuclear fuel (Appendix D, Section D.1.9 of the EIS) with the least risk to populations near the port. By seeking to minimize the risk to populations surrounding the ports of entry, the EIS further diminishes the low risks associated with an accident (Section 4.2.2.3 of the EIS). DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port.

COMMENTOR NO. 353: STAKESBERRY, CATHREW

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I think it's Terrible that were getting waste from other Countries Let them keep their own waste

353-1

Name and Address: Cathrew Stakesberry
6214 104th St E.
Puyallup Wash 98373

RESPONSE TO COMMENT
COMMENTOR NO. 353: STAKESBERRY, CATHREW

Response to Comment No. 353-1

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

COMMENTOR NO. 354: MCELROY, JUNE

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

No - Why can keep their
Waste over seas
We have enough of our own
It is to dangerous to be
On Ferrys with nuclear
Waste.

Name and Address: June McElroy
7407 - 20 Ave E a Tac Wa 98404

354-1

RESPONSE TO COMMENT
COMMENTOR NO. 354: MCELROY, JUNE

Response to Comment No. 354-1

Management Alternative 2 and the No Action Alternative are the alternatives in which no foreign research reactor spent nuclear fuel would be accepted into the United States, and the commentor's preference for this alternative is noted. These alternative is discussed in Sections 2.3, 2.5, 4.4, and 4.6 of the EIS..

COMMENTOR NO. 355: DAM, DONALD A.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I do not want nuclear waste coming through Tacoma from 41 other countries. I don't believe it is safe for me or our children or grandchildren. I believe it will depress property values and the values of our city for residents.

Keep it in Europe for future use.

John 3:16-21

Name and Address: Donald A. DAM
1818 E. 32nd
Tacoma, WA 98404

355-1

RESPONSE TO COMMENT
COMMENTOR NO. 355: DAM, DONALD A.

Response to Comment No. 355-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

In regard to a possible reduction in property values as a result of the receipt of foreign research reactor spent nuclear fuel at the Port of Tacoma, DOE would have no control over such possible side-effects. However, by developing this EIS, which demonstrates that the risks are low, by conducting public hearings, and through safe operation, DOE hopes to convince residents in the Tacoma area that the shipment of foreign research reactor spent nuclear fuel is truly a low-risk operation, thereby maintaining property values. Historically, there were no adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

COMMENTOR NO. 356: MELVILLE, MARILYN

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

We have enough to worry about with the oil being transferred from Alaska, so we should not have to worry about Nuclear Waste. I feel the countries should keep ~~to~~ the waste right on their countries.

356-1

Name and Address:

Marilyn Melville
4324 No 8th
Tacoma, WA 98406

RESPONSE TO COMMENT
COMMENTOR NO. 356: MELVILLE, MARILYN

Response to Comment No. 356-1

Overseas storage is Management Alternative 2, Subalternative 1a and the commentor's preference for this alternative is noted. This alternative is discussed in Sections 2.3 and 4.4.1 of the EIS.

COMMENTOR NO. 357: LITTLE, ADAM

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

NOT IN MY BACK BOAY!!

WHY ISN'T THE PUBLIC NOTIFIED ALL ALONG?
BETTER YET WHY DOESN'T ANY OF THESE COMPANIES
THINK OF THE FUTURE INSTEAD OF QUICK
SOLUTIONS WHEN THEY'RE OUT OF TIME?

Name and Address: ADAM LITTLE
3520½ McKinley Ave
TACOM WA 98404

357-1

RESPONSE TO COMMENT
COMMENTOR NO. 357: LITTLE, ADAM

Response to Comment No. 357-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Concerning the commentor's question of why the public has not been informed all along, DOE has attempted to conduct this EIS in a completely open manner. Prior to preparation of the draft EIS, public scoping meetings were held in locations near most of the potential ports of entry and interim management sites, and written comments were also accepted. In response to these public comments, a wider range of potential ports of entry and interim management sites were considered in the draft EIS. After issuance of the draft EIS, seventeen public hearings were held in the locations determined to be most likely to be directly affected by the EIS alternatives.

The draft EIS was mailed to more than 1,500 people and an official DOE announcement of the meeting location and purpose was advertised in local newspapers. Public service announcements were also provided to local radio stations and to cable-access television. The meeting was included in the Federal Register Announcement concerning the EIS. In addition, 1-800 numbers were provided for preregistration and for requesting copies of the draft EIS. In addition to accepting public comments during the hearings, written comments were also welcomed, and encouraged. DOE considers that these actions have provided ample opportunity for the public to be involved.

COMMENTOR NO. 358: KELLER, MONTY

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I THINK THERE ARE 41 COUNTRIES WHO NEED TO DEAL WITH THEIR OWN "SPENT" FUEL. THEY NEED TO KNOW HOW IT FEELS TO HAVE THESE MATERIALS WITHIN 1.5 MILES OF THEIR CHILDREN - MINE ARE 17 MO. & 3 YRS. HOW OLD ARE THEIR CHILDREN???

358-1

Name and Address: Monty Keller
21721 130TH ST. E. SUMNER, WA.
98390

RESPONSE TO COMMENT
COMMENTOR NO. 358: KELLER, MONTY

Response to Comment No. 358-1

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

COMMENTOR NO. 359: JAQUEZ, JOHN JR.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

IF THESE [redacted] NUCLEAR FUEL RODS ARE COMPLETLY SAFE, THEN WHY ARE YOU SHIPPING THEM HALVE WAY AROUND THE WORLD TO DISPOSE OF THEM. WHY NOT DISPOSE OF THEM WHERE THEY CAME FROM.

359-1

Name and Address: JOHN JAQUEZ JR.
501 NO. E ST. TACOMA WA
98403

RESPONSE TO COMMENT
COMMENTOR NO. 359: JAQUEZ, JOHN JR.

Response to Comment No. 359-1

The purpose and need for moving the spent nuclear fuel is discussed in Section 1.2 of the EIS. The proposed action would support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide.

COMMENTOR NO. 360: HELMER, MARIE

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I am violently opposed to it. Unfortunately there was no early activity against it + all we can hope now is for success there work + more work by concerned Tacomans. Wake up!!

Tacoma

Name and Address: Marie Helmer

909 No. L, Tacoma 98403

360-1

RESPONSE TO COMMENT
COMMENTOR NO. 360: HELMER, MARIE

Response to Comment No. 360-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 361: WILLIS, KATHI

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Citizens of Tacoma & Pierce County have a Port that makes a significant contribution to the economic vitality of our area. The potential of having nuclear waste come through our port could jeopardize the growth of business & potentially cause some existing businesses to relocate!

Name and Address: Kathi Willis, 1905 Overhulse Dr NE
Tacoma, WA 98422

361-1

RESPONSE TO COMMENT
COMMENTOR NO. 361: WILLIS, KATHI

Response to Comment No. 361-1

In preparing the EIS, DOE has considered accepting the foreign research reactor spent nuclear fuel at any of 10 ports selected on the basis of specific criteria described in Section 2.6.3.1 of the EIS. For each port selected the impacts from activities related to the shipments of foreign research reactor spent nuclear fuel were evaluated in Section 4.2.2. The evaluation includes impacts from routine activities, credible accidents, including shipboard fires, emergency management and response, cumulative impacts, mitigation measures, and environmental justice concerns. The risk to the environment and the health and safety of workers and public resulting from the proposed action for all candidate ports was determined to be low.

COMMENTOR NO. 362: LAMENDOLA, ROBERTA

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I THINK IT UNCONSCIONABLE TO EVEN CONSIDER SHIPPING SPENT NUCLEAR WASTE ANY WHERE. FIND A WAY TO STORE IT WHERE IT LIVES NOW.

362-1

Name and Address: Roberta LaMendola
2220 N. Tyler
TACOMA WA 98406

RESPONSE TO COMMENT
COMMENTOR NO. 362: LAMENDOLA, ROBERTA

Response to Comment No. 362-1

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5 of the EIS, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

COMMENTOR NO. 363: YORK, BARBARA

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Personally, I have experienced the inadequate disposal of contaminates in the past (contaminated well water from the city of Tacoma dump.

I do not desire a continuation of earth's contamination - Nor - it passing through Tacoma. Man in his ignorance assumes great knowledge!

Name and Address: Barbara York
6917 88th Street S.W.
Lakewood, WA 98499

363-1

RESPONSE TO COMMENT
COMMENTOR NO. 363: YORK, BARBARA

Response to Comment No. 363-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 364: GOLDEN, MIKE

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Although there is a strong need to remove fissionable products for the international market there are better ways to do this than to ship it through the Port of Tacoma. A military port would be a better option - military port regularly handles nuclear materials and can provide better security as well as trained emergency personnel. 364-1

Name and Address:

Mike Golden
3631 South Alaska St.
Tacoma, WA 98408

RESPONSE TO COMMENT
COMMENTOR NO. 364: GOLDEN, MIKE

Response to Comment No. 364-1

The commentor's support of the proposed nuclear weapons nonproliferation policy is noted. The commentor's preference for the exclusive use of military ports to ship foreign research reactor spent nuclear fuel is also noted. However, Section 4.2.2.3 of the EIS demonstrates that there is no additional risk from the use of commercial ports.

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted.

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures can greatly reduce the risk of such actions. Security would be provided for all shipments of foreign research reactor spent nuclear fuel, as required by the Code of Federal Regulations (10 CFR Part 73). The security provisions are summarized in the new Appendix H that has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit.

COMMENTOR NO. 365: GOLDEN, LISA

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Even though I know the U.S. needs to remove these products from foreign markets, I think they could choose a better place than Tacoma. Tacoma's port has a lot to offer in the way of wildlife, such as seals, fish, eagles, etc. We do not need to ruin the environment in which we live. The waste needs to be taken some where else!

365-1

Name and Address:

Lisa Golden 3631 S. Alaska St.
Tacoma, WA 98408

RESPONSE TO COMMENT
COMMENTOR NO. 365: GOLDEN, LISA

Response to Comment No. 365-1

The commentor's support of the proposed nuclear weapons nonproliferation policy is noted. The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is also noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 366: SKELLY, IRENE

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

We just don't want any nuclear waste coming through Tacoma, let alone coming or across the whole state to Hanford where we already have leaking waste into the Columbia River which is contaminated and is causing too much cancer and other diseases etc.

Name and Address: Irene Skelly
2904 So MELROSE
TACOMA, WA. 98405

366-1

RESPONSE TO COMMENT
COMMENTOR NO. 366: SKELLY, IRENE

Response to Comment No. 366-1

The commentor's opposition to the transportation of foreign research reactor spent nuclear fuel through the Port of Tacoma and its management at the Hanford Site is noted.

In preparing the EIS, DOE has considered accepting the foreign research reactor spent nuclear fuel at any of ten ports selected on the basis of specific criteria described in Section 2.6.3.1 of the EIS. For each port selected the impacts from activities related to the shipments of foreign research reactor spent nuclear fuel were evaluated in Section 4.2.2 of the EIS. The evaluation includes impacts from routine activities, credible accidents, including shipboard fires, emergency management and response, cumulative impacts, mitigation measures, and environmental justice concerns. The risk to the environment and the health and safety of workers and public resulting from the proposed action for all candidate ports was determined to be low.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 367: NICHOLSON, M.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Most ports are not required to pay anything towards emergency and/or medical services. Will some monies be allotted to the agency expected to do this? Why are we volunteering to take other countries nuclear wastes? We have enough problems disposing of our own. NO to Tacoma & other N. Am. countries

How does it get to the final destinations? Accidents do happen.

367-1, 367-2, 367-3, 367-4

Name and Address: M. NICHOLSON.
1422. So FERDINAND DR.
TACOMA. Wa. 98405-1107.

RESPONSE TO COMMENT COMMENTOR NO. 367: NICHOLSON, M.

Response to Comment No. 367-1

Each port considered in the EIS has developed an Area Contingency Plan. This plan outlines response capabilities, procedures and authorities for responding to and recovering from hazardous material incidents. Additionally, DOE would provide assistance to local authorities to ensure that appropriate measures would be taken in the unlikely event of an accident. As part of this assistance, DOE's Radiological Assistance Program teams, from eight offices strategically located throughout the country, would be used to coordinate and to provide remediation assistance. This type of assistance and coordination would be specified in the Transportation Plan that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected.

Response to Comment No. 367-2

The commentor's opposition to acceptance of spent nuclear fuel from foreign research reactors is noted. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

Response to Comment No. 367-3

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 367-4

The impacts of ultimate disposition of foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1 of the EIS).

COMMENTOR NO. 368: DRYDEN, EVELYN

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

We here in the Northwest are late in recognizing the waste we are making of our environment - and while we can still make a difference it is vital we do so. I really resent absorbing the wastes of other countries - incinerated as we are not doing well enough on our local waste problems. I urge that we stop now!

368-1

Name and Address: Evelyn Dryden
909 No. 1 St #106
Tacoma 98403

RESPONSE TO COMMENT
COMMENTOR NO. 368: DRYDEN, EVELYN

Response to Comment No. 368-1

The commentor's opposition to the transportation of foreign research reactor spent nuclear fuel through the Port of Tacoma is noted.

In preparing the EIS, DOE has considered accepting the foreign research reactor spent nuclear fuel at any of 10 ports selected on the basis of specific criteria described in Section 2.6.3.1 of the EIS. For each port selected, the impacts from activities related to the shipments of foreign research reactor spent nuclear fuel were evaluated in Section 4.2.2. The evaluation includes impacts from routine activities, credible accidents, including shipboard fires, emergency management and response, cumulative impacts, mitigation measures, and environmental justice concerns. The risk to the environment and the health and safety of workers and the public resulting from the proposed action for all candidate ports was determined to be low.

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS).

COMMENTOR NO. 369: BARNES, MARGARETE

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I am against nuclear shipments in our Puget Sound area.

369-1

Name and Address: Margarete Barnes
611 So 78th St,
Tacoma WA. 98408

RESPONSE TO COMMENT
COMMENTOR NO. 369: BARNES, MARGARETE

Response to Comment No. 369-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Puget Sound area is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel through the Puget Sound area, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 370: WAY, KELLY

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I think nuclear waste through the Port would ruin all we've done to clean up the bay and enhance our reputation as a clean, safe industrial port. The safety risk would be too great. There aren't enough trained response personnel, especially with 11th St being taken away. I'm against it 100%

Name and Address:

Kelly Way
PO Box 45204
Tacoma Wa 98445

370-1

RESPONSE TO COMMENT
COMMENTOR NO. 370: WAY, KELLY

Response to Comment No. 370-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

DOE will continue to work with State and local officials to ensure that emergency response capabilities are adequate and that the communications channels between DOE and State and local governments remain open.

COMMENTOR NO. 371: KAMMILLER, LARRAIN

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Bad idea + I am against it. "Minimum risk" means what + to whom? We have a mountain ready to erupt + service thrust & earthquake that we have no control over but we can control this. This is the same stuff we dumped on Japan. Was it good!

371-1

Name and Address:

Lorraine Kammiller

3816 So Park Ave

Tacoma WA 98408

RESPONSE TO COMMENT
COMMENTOR NO. 371: KAMMILLER, LARRAIN

Response to Comment No. 371-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at the Port of Tacoma to fail, is not expected to compromise the spent nuclear fuel transportation cask.

DOE would like to point out that the foreign research reactor spent nuclear fuel is neither volatile nor unstable. The fuel that the proposed policy deals with is a metal which contains enriched uranium matrixed in, all clad with either aluminum or stainless steel. This type of fuel is very stable. Section 2.6.1 of the EIS presents a detailed description of the foreign research reactor spent nuclear fuel.

COMMENTOR NO. 372: THOMAS, JAMIE

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

IT'S MY UNDERSTANDING THAT IT WAS THE D.O.E. WHO MADE THE INITIAL DECISION 20+ YEARS AGO TO SUPPLY THE 41 COUNTRIES WITH THE ORIGINAL NUCLEAR FUEL. YOU'VE NOW ADMITTED THAT THAT DECISION WAS UNWISE. I NOW QUESTION WHY THE PUBLIC SHOULD TRUST YOU TO MAKE A SMART MOVE NOW. ALSO, WHEN WAS THE LAST TIME CANADA WAS CONSIDERED A THREAT TO US? WHY NOT LET THEM (AND OTHERS) HANDLE THEIR OWN WASTE??

Name and Address: JAMIE THOMAS (MS.)
3924 N. 32ND ST.
TACOMA, WA 98407

372-1

RESPONSE TO COMMENT
COMMENTOR NO. 372: THOMAS, JAMIE

Response to Comment No. 372-1

As discussed in Section 1.1 of the EIS, shortly after the end of the Second World War, the United States recognized that it must take action to prevent the spread of nuclear weapons throughout the world. Cooperative agreements were reached with other nations in which the United States provided assistance for peaceful applications of nuclear technology to foreign nations that agreed to refrain from developing nuclear weapons and that agreed to allow international inspection of their nuclear activities. One means of assisting other nations with peaceful applications of nuclear technology is to provide them with research reactors and fuel for those reactors. This approach, far from failing, has worked well, as demonstrated by the small number of countries possessing a nuclear weapons capability.

Canada is not considered a threat to the United States. As discussed in Section 1.2 of the EIS, the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators, including Canada, time to convert their research reactors to the use of LEU fuel and to make arrangements for disposition of their LEU spent nuclear fuel.

COMMENTOR NO. 373: TROTTER, ROBERT E.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Total opposition for 2 primary reasons:
The economic impact of negative perception by the traveling public on Tacoma/Pierce County tourism industry.
2) The potential for catastrophe to a unique/fragile eco-system in the Puget Sound

373-1

Name and Address: Robert E. Trotter
Sheraton Tacoma Hotel
1320 Broadway Plaza
Tacoma, WA 98402

RESPONSE TO COMMENT
COMMENTOR NO. 373: TROTTER, ROBERT E.

Response to Comment No. 373-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

In regard to the economic impact of the negative perception that the commentor alludes to, DOE considers that the economic impacts of the receipt of foreign research reactor spent nuclear fuel would be low, if quantifiable at all. Historically, there were no significant adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

The EIS analyses determined that there would be no significant adverse impacts to the ecology of any of the ports that might be used to receive the material (Sections 4.2.4.2.8 and 4.5 of the EIS). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive material has ever been released from a spent nuclear fuel transportation cask, even as a result of an accident (Section 2.6.2 of the EIS). Based on this experience, DOE considers that spent nuclear fuel transportation casks passing through the Port of Tacoma, or any other port, would not release their radioactive contents, so would not affect either the air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality. No significant health, safety, or environmental risk were found to exist at any of the candidate commercial or military ports identified (Sections 4.2.2 and 4.5 of the EIS).

COMMENTOR NO. 374: CASEY, NICELLE

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

my opinion is NO!

Name and Address: Nicelle Casey 5941 S. 15th
Tacoma, Wa 98408

374-1

RESPONSE TO COMMENT
COMMENTOR NO. 374: CASEY, NICELLE

Response to Comment No. 374-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 375: CASEY, MARY

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

MY VIEW IS THAT TACOMA IS A DENSELY POPULATED CITY AND THAT A SMALLER PORT WITH A LOWER POPULATION BASE WOULD BE A BETTER ALTERNATIVE. I HAVE TRAVELED THE GLOBE VIA U.S. AIR FORCE AND BELIEVE WE SHOULD ALL BE MORE SELF RELIANT...NOT ALWAYS DEPENDING ON OTHERS TO BE RESPONSIBLE FOR OUR OWN TO OWN LIVES.

375-1

Name and Address: MARY CASEY

5911 SO J ST TACOMA, WA 98408

RESPONSE TO COMMENT
COMMENTOR NO. 375: CASEY, MARY

Response to Comment No. 375-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

The use of a remote port might slightly reduce the already low consequences of an accident, however there are other considerations that also must be made when making port selection. Appendix D, Section D.1.9 of the EIS presents a complete discussion of the port selection process.

COMMENTOR NO. 376: KRONTZ, RAY A.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

TO GET TO TACOMA, THE NUCLEAR WASTE IS FIRST SHIPPED THROUGH PUGET SOUND, A HEAVILY POPULATED REGION AND ALL ECOLOGICAL REGION THAT WOULD BE DEVASTATED BY ANY RADIOACTIVE LEAKAGE. IN ORDER TO TRANSFER THE MATERIALS TO IDAHO, IT WILL NEED TO BE TRUCKED OR SHIPPED BY RAIL. FROM TACOMA, BY RAIL, IT WOULD HAVE TO GO THROUGH SEATTLE OR SPOKANE TO PORTLAND OREGON THEN WHY ADD THE EXTRA RISK OF THE LONGITUDE TRIP FROM TACOMA?

Name and Address: RAY A. KRONTZ
2001 N CEDAR ST
TACOMA WA 98406

THE SAME IS TRUE FOR THE MAIN TRUCKING ROUTES.

376-1

RESPONSE TO COMMENT
COMMENTOR NO. 376: KRONTZ, RAY A.

Response to Comment No. 376-1

The commentor's opposition to the use of the Port of Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. Populations surrounding candidate ports and along transportation routes to interim management sites were a factor in the selection of candidate ports (Appendix D, Section D.1.9 of the EIS). The analysis Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

The EIS analyses determined that there would be no significant adverse impacts to the ecology of any of the ports that might be used to receive the material (Sections 4.2.2 and 4.5 of the EIS). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than thirty years of spent nuclear fuel shipments, no radioactive material has ever been released from a spent nuclear fuel transportation cask, even as a result of an accident (Section 2.6.2 of the EIS). Based on this experience, DOE considers that spent nuclear fuel transportation casks passing through the Port of Tacoma, or any other port, would not release their radioactive contents, so would not affect either the air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

COMMENTOR NO. 377: KELLY, EUGENE

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

THE IDEA OF TRANSPORTING NUCLEAR WASTE THROUGH ANY METROPOLITAN AREA IS APPALLING. THAT ANYONE WOULD EVEN CONTEMPLATE THIS ACTION INDICATES THEIR IRRESPONSIBILITY IN REGARDS TO THE SAFETY OF THE LOCAL POPULATION! BAD IDEA! 377-1

Name and Address: EUGENE KELLY
811 N SHERIDAN
TACOMA WA 98403

RESPONSE TO COMMENT
COMMENTOR NO. 377: KELLY, EUGENE

Response to Comment No. 377-1

The commentor's opposition to the use of the Port of Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. Populations surrounding candidate ports and along transportation routes to DOE management sites were a factor in the selection of candidate ports (Appendix D, Section D.1.9 of the EIS). The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 378: LINVILLE, OTHEL

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I Think it is dangerous to ship this waste through such a closed in population area as The Puget Sound. The potential for accidents and the number of people that would be affected is very great. Why doesn't the other countries reprocess it first to less potential danger?

Name and Address: Othel Linville
P.O. Box 90
Indianola WA 98342

378-1

RESPONSE TO COMMENT
COMMENTOR NO. 378: LINVILLE, OTHEL

Response to Comment No. 378-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Puget Sound and the Port of Tacoma is noted. However, the analysis in the EIS indicates that the risks associated with an accident are low (Sections 4.2.2 and 4.5), and pose no significant risk to port personnel, the local population, or the environment. The commentor's preference for Management Alternative 2, to reprocess the foreign research reactor spent nuclear fuel overseas, is noted. This alternative is discussed in Sections 2.3 and 4.4 of the EIS.

COMMENTOR NO. 379: LINVILLE, SUE

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I am absolutely horrified. No matter what "safeguards" are taken, the potential results from a disaster — ships colliding or fire, collisions — who knows — are too horrific to expose such a populated area, let alone the ecological damage to a unique part of the planet.

Name and Address: Sue Linville
PO Box 90
Indianola WA 98342

I'm also sick of government officials having such power to affect the lives of citizens. Who do these people answer to.

379-1

RESPONSE TO COMMENT
COMMENTOR NO. 379: LINVILLE, SUE

Response to Comment No. 379-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Commentor No. 380: Pealet, J.C.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

380-1 1- This area is too populated to use as a flow-thru point for dangerous spent nuclear fuels/materials

2 Accidents always happen! We don't want to deal forever with the results of accidents

380-2 3- Remember the happenings at Richland - leaky containers, air releases & so forth. Your engineering [illegible] who will be around to enforce rates.

Name and Address: J C Pealet
2623-204 Ave Ct E
Sumner WA 98390

Response to Comment
Commentor No. 380: Pealet, J.C.

Response to Comment No. 380-1

The commentor's opposition to the use of the Port of Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. Populations surrounding candidate ports and along transportation routes to DOE management sites were a factor in the selection of candidate ports (Appendix D, Section D.1.9 of the EIS). The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

The probability of an accident at sea is discussed in Appendix C, Section C.5.5 of the EIS, while the port accident probabilities are found in Appendix D, Section D.5.3.1.3 of the EIS. This analysis demonstrates that the risks associated with an accident are low (Section 4.2.2.3).

Response to Comment No. 380-2

DOE considers that there would be no significant adverse impacts to any of the ports that might be used to receive the foreign research reactor spent nuclear fuel. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than thirty years of spent nuclear fuel shipments, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality. In the unlikely event of a severe accident, the analysis performed for the EIS shows that some radioactive material could be released from the cask and distributed into the environment. However, the analyses in Section 4.2.2.3 and Appendix D, Section D.5 of the EIS determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident. Close in to the accident, near the cask would likely require some cleanup, but the overall impact on the water and air quality in the port would be very small. Sections 4.2.2.3 and Appendix D, Section D.5 of the EIS detail the accident analysis and results.

COMMENTOR NO. 381: BUCKINGHAM, DAVID

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I THINK WASHINGTON SHOULD STORE ITS OWN NUCLEAR WASTE, OTHER STATES & COUNTRIES SHOULD STORE WHAT THEY USE.

Name and Address: DAVID BUCKINGHAM
8212 358TH ST E.
EATONVILLE, WA. 98328

381-1

RESPONSE TO COMMENT
COMMENTOR NO. 381: BUCKINGHAM, DAVID

Response to Comment No. 381-1

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

COMMENTOR NO. 382: TAYLOR, MARIE A.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Why give us other's poop?! Hey, it is my job to keep my house & property clean. So, why should I have to pay the cost, risk, & responsibility for someone else's mess. Let them be responsible for their nuclear poop!

Name and Address: Marie A. Taylor
5307 So. Oakes, Tacoma, Wa 98409

382-1

RESPONSE TO COMMENT
COMMENTOR NO. 382: TAYLOR, MARIE A.

Response to Comment No. 382-1

The commentor's opposition to Management Alternative 1 (management in the United States, Section 2.2 of the EIS, or elements of Management Alternative 3, Section 2.4) is noted. The commentor's support for Management Alternative 2 (management overseas, Section 2.3 of the EIS) or the No Action Alternative (Section 2.5 of the EIS) is noted.

An objective of the proposed action is to reduce the risk of weapons-grade nuclear materials falling into the hands of nations having the technology and intent to develop a nuclear weapons capability, while providing minimal disruption to the operations of foreign research reactors.

COMMENTOR NO. 383: TAYLOR, MONTE

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I am completely and totaly against shipping, storing or any other method of nuclear waste being introduced into Tacoma. I have ~~am~~ been in Tacoma since I was 3 years old and enjoy the mountains, forests, lakes, rivers and ocean. I do not want this beautiful region destroyed by an accident involving nuclear waste. Our Natural Resources are too valuable.

Name and Address: Monte Taylor
5307 So. Oakes
Tacoma, Wa. 98409
(206) 475-4356

383-1

RESPONSE TO COMMENT
COMMENTOR NO. 383: TAYLOR, MONTE

Response to Comment No. 383-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 384: GOLDEN, ALTA M.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I understand the need for a safe depository for Spent Nuclear Waste, however, I'm absolutely against using the Port of Tacoma for this purpose. A more rational plan seems to be the use of a military base. I repeat - I'm absolutely against using the Port of Tacoma. 384-1 384-2

Name and Address: Alta M. Golden
#22 Herron Island
Lakebay, Wa
98349

RESPONSE TO COMMENT
COMMENTOR NO. 384: GOLDEN, ALTA M.

Response to Comment No. 384-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 384-2

The commentor's preference for the exclusive use of military ports to ship foreign research reactor spent nuclear fuel is noted. However, the analysis in Section 4.2.2.3 of the EIS demonstrates that there is no additional risk from the use of commercial ports.

COMMENTOR NO. 386: LEWIS, EDWARD G., MRS.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

We do not think it is a good idea & strongly oppose it. Too little known about long term effects on future generations. It is not needed or wanted here!

386-1

Name and Address: Mrs. Edw. G. Lewis
5119 So. Cushman
Tacoma, Wa. 98409

RESPONSE TO COMMENT
COMMENTOR NO. 386: LEWIS, EDWARD G., MRS.

Response to Comment No. 386-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 387: AMDAHL, ONETA

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I am opposed to weapons grade nuclear waste going through the Port of Tacoma and the Puget Sound area.

Name and Address: ONETA AMDAHL
5301 PORT VIEW PL NE
TACOMA WA 98422

387-1

RESPONSE TO COMMENT
COMMENTOR NO. 387: AMDAHL, ONETA

Response to Comment No. 387-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 388: BESTROM, BETH

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Tacoma is spending a lot of money cleaning up the city and Ruston Way - why bother if this waste comes to Tacoma! I don't believe this is an accident-free proposition. There have been too many already around the world. I have children I'd like to see grown up safely; We have to contend with gang violence, drive-by shootings, drugs - Don't add nuclear waste to our list of problems!

388-1

Name and Address: Beth Bestrom
4517 48th St CtE
Tacoma WA 98443

RESPONSE TO COMMENT
COMMENTOR NO. 388: BESTROM, BETH

Response to Comment No. 388-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 389: BESTROM, ERIN

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I think nuclear waste should not come through Tacoma. I am a healthy 17 year old, and I'd like to stay that way. It could kill our beautiful animals or our forests. I don't think nuclear waste through Tacoma is a bad idea

389-1

Name and Address: Erin Bestrom - 4517 48th St. ct. E Tacoma, WA 98443

RESPONSE TO COMMENT
COMMENTOR NO. 389: BESTROM, ERIN

Response to Comment No. 389-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 390: CHRISTIANSEN, NINA

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I think nuclear waste should not come through Tacoma. It could kill crops, plants, and animals. The nuclear waste could go in the water and kill the fish or poison the fish, if we caught one and ate it we could get really sick. Tacoma doesn't need waste.

Name and Address: Nina Christiansen PO BOX 161 Tacoma 98442, I am twelve years old.

390-1

RESPONSE TO COMMENT
COMMENTOR NO. 390: CHRISTIANSEN, NINA

Response to Comment No. 390-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 391: HESS, B.H.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Not a good idea. DOE policy to prevent spent fuel becoming a weapon is a military problem & should be handled by defense dept 391-1

Use Bangor Sub Base & avoid cubelain concentrations 391-2

Name and Address: G. H Hess
4437 Sandman Dr N
Tacoma WA 98466

RESPONSE TO COMMENT
COMMENTOR NO. 391: HESS, B.H.

Response to Comment No. 391-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma and preference for the Department of Defense handling this issue are noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 391-2

The commentor's preference for the use of Bangor Sub Base and military ports to ship foreign research reactor spent nuclear fuel is noted. However, the analysis in Section 4.2.2.3 of the EIS demonstrates that there is no additional risk from the use of commercial ports.

COMMENTOR NO. 392: SIMAC, ANN

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

1. The risk is too great. — 392-1

2. Why should the U.S. be a dumping ground for Europes waste. — 392-2

3. Nothing is 100% safe or otherwise. — 392-3

4. We are not prepared to face a problem if the need arises.

Name and Address: Ann Simac
4908 N. 39
Tac WA 98407.

RESPONSE TO COMMENT
COMMENTOR NO. 392: SIMAC, ANN

Response to Comment No. 392-1

The commentor's opinion that the risk is too great is noted. Section 4 of the EIS demonstrates, however, that the risks are low.

Response to Comment No. 392-2

An objective of the proposed action is to reduce the threat of nuclear weapons proliferation (Section 1.2 of the EIS). Through cooperation with foreign nations in handling spent nuclear fuel from research reactors, the United States hopes to reduce international commerce in materials which could be used to build nuclear weapons.

Response to Comment No. 392-3

Each port considered in the EIS has developed an Area Contingency Plan. This plan outlines response capabilities, procedures and authorities for responding to and recovering from hazardous material incidents. Additionally, DOE would provide assistance to local authorities to ensure that appropriate measures would be taken in the unlikely event of an accident. As part of this assistance, DOE's Radiological Assistance Program teams, from eight offices strategically located throughout the country, would be used to coordinate and to provide remediation assistance. This type of assistance and coordination would be specified in the Transportation Plan that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected.

COMMENTOR NO. 393: KAUFMAN, DON

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I'M NOT SO MUCH AGAINST THE NUKE WASTE COMING THRU TACOMA, AS I AM ABOUT SHIPPING IT OVER LAND, THEN "STORING" THE STUFF, AT TAXPAYERS EXPENSE, AND RISK IN YEARS TO COME. HANFORD IS BAD ENOUGH NOW.

Name and Address: DON KAUFMAN
9921 WALLER RD.
TACOMA, WA. 98446

393-1

RESPONSE TO COMMENT
COMMENTOR NO. 393: KAUFMAN, DON

Response to Comment No. 393-1

The commentor's opposition to the acceptance and management of foreign research reactor spent nuclear fuel in the United States is noted.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 394: BROSMAN, LARRY

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

PLEASE DO NOT LET IT HAPPEN!
THE US GOVERNMENT WOULD END UP
BEARING MOST OF THE ECONOMIC [redacted]
BURDEN AND ALL OF THE ENVIRONMENTAL
RISK IF AN ACCIDENT DID OCCUR.
ALSO I BELIEVE THE US WOULD [redacted]
ALWAYS BEAR THE MAJOR ECONOMIC BURDEN OF
STORAGE AND TRANSPORT COSTS

394-1

394-2

Name and Address: LARRY BROSMAN
1003 N. FIRST ST, #202
RENTON, WA [redacted] 98055

RESPONSE TO COMMENT
COMMENTOR NO. 394: BROSMAN, LARRY

Response to Comment No. 394-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through any U.S. port is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to any of the ports analyzed in the EIS, is low.

DOE is considering that there would be no significant adverse impacts to any of the ports that might be used to accept the foreign research reactor spent nuclear fuel. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality. In the unlikely event of a severe accident, the analysis performed for the EIS shows that some radioactive material could be released from the cask and distributed into the environment. However, the analysis in Section 4.2.2.3 and Appendix D, Section D.5 of the EIS determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident. Close in to the accident, near the cask would likely require some cleanup, but the overall impact on the water and air quality in the port would be very small. Sections 4.2.2.3 and Appendix D, Section D.5 of the EIS detail the accident analysis and results.

Response to Comment No. 394-2

Sections 2.2.1.2 and 2.2.2.3 of the EIS discuss alternative financing arrangements that range from charging the reactor operators a fee that would cover all the costs of the proposed action, to having DOE subsidize all of the reactor operators' costs. One compromise position that is evaluated is to charge developed countries a competitive fee, while developing countries would be subsidized. If less than the full cost of the proposed action is charged to the reactor operators, the difference would be the cost to the United States of gaining participation by other countries in our nuclear weapons nonproliferation programs.

COMMENTOR NO. 395: PODMORE, RON

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

INRECENT EVENTS WE (OUR COUNTRY) HAVE HAD FEDERAL BUILDING & OUTPOST SUBJECT TO TERRORIST ATTACK; IF GOVERNMENT CANT ~~PROTECT~~ PREVENT THIS THEN WE GOING TO STOP THE TERRORIST ATTACKS ON THESE WASTE SITE?

395-1

Name and Address: RON PODMORE / ADAM LITTLE
3815 N PEARL
TACOMA WA 98407

RESPONSE TO COMMENT
COMMENTOR NO. 395: PODMORE, RON

Response to Comment No. 395-1

The threat of a terrorist attack on a spent nuclear fuel management site cannot be calculated accurately. It is clear, however, that the threat would be greater if the material were left in the 41 countries where it is now. In the present situation, some of the spent nuclear fuel could be diverted into a nuclear weapon development program. In addition, the DOE sites at which the foreign research reactor spent nuclear fuel (and target material) would be managed, if it is accepted into the U.S., are well protected by full-time security forces.

COMMENTOR NO. 396: SHAUGHNESSY, ROBIN

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

We oppose the idea of Nuclear Wast in Tacoma. Exhaust fumes are enough polution. Nuclear Waste can kill humans as well as animals. why take the risk of a spill? They generated it they can keep it.

Name and Address: Robin Shaughnessy
6917 88th St. SW
Lakewood, WA 98499

396-1

RESPONSE TO COMMENT
COMMENTOR NO. 396: SHAUGHNESSY, ROBIN

Response to Comment No. 396-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 397: SLUSARZ, DONNA

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I never wanted nuclear power any where in the world, let alone the waste brought here in our docks. I have seciously considered moving if the spent fuel is brought here. There's no amount of money that worth the risks.

Name and Address: Donna Slusarz
3827 So G St.
Tacoma Wa
98408

397-1

RESPONSE TO COMMENT
COMMENTOR NO. 397: SLUSARZ, DONNA

Response to Comment No. 397-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 398: VARNER, PAULA

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I have several concerns which all congeal to one inescapable conclusion: don't bring the nuclear waste into Puget Sound. My concerns include but are not limited to 1) no US gov't regulation at port of departure; 2) no ability to regulate the use of specific types of casks 3) lack of money to pay for training, monitoring & emergency issues; 4) fire; 5) US regulation allowance for cask leakage is unacceptable 6) Hanford is not prepared to handle the storage adequately. I also feel my decisions limited

Name and Address:

Paula Varner

3315 N 27th St

Tacoma WA 98407

398-1

398-2

398-3

398-4

398-5

398-6

RESPONSE TO COMMENT
COMMENTOR NO. 398: VARNER, PAULA

Response to Comment No. 398-1

U.S. regulations do not apply and cannot be enforced at the port of departure. However, DOE has three ways to ensure that shipments of foreign research reactor spent nuclear fuel would be safely conducted. First, DOE would require that the shipper meet the safety requirements of the International Atomic Energy Agency, which do apply at the port of departure. Second, DOE would require that all shipments meet U.S. regulations when the shipments enter U.S. territorial waters (this is a Coast Guard requirement). Third, through the contract that DOE would enter into with the overseas operators of the foreign research reactors, DOE would insist that only reputable shipping firms be used and that modern, well-equipped ships transport the foreign research reactor spent nuclear fuel.

Response to Comment No. 398-2

Spent nuclear fuel is required to be transported in "Type B" transportation casks that are certified for transporting radioactive materials. These transportation casks are subject to stringent design, fabrication, and operating requirements imposed by the competent authority for the country of origin (the Nuclear Regulatory Commission, in the United States) to withstand very severe accidents without releasing their contents. Regardless of where a transportation cask is designed, fabricated, or certified for use, if used internationally it must meet certain minimum performance requirements and regulations established by the International Atomic Energy Agency. The selection of a specific model of "Type B" transportation cask to be used would depend on the particular type of spent nuclear fuel to be shipped.

Response to Comment No. 398-3

Each port considered in the EIS has developed an Area Contingency Plan. This plan outlines response capabilities, procedures and authorities for responding to and recovering from hazardous material incidents. Additionally, DOE would provide assistance to local authorities to ensure that appropriate measures would be taken in the unlikely event of an accident. As part of this assistance, DOE's Radiological Assistance Program teams, from eight offices strategically located throughout the country, would be used to coordinate and to provide remediation assistance. This type of assistance and coordination would be specified in the Transportation Plan that would be prepared prior to any individual spent nuclear fuel shipments and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for

COMMENTOR NO. 398: VARNER, PAULA (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 398: VARNER, PAULA (CONT'D.)

the identification and resolution of emergency management and security issues specific to the communities that would be affected.

Response to Comment No. 398-4

Appendix D. Section D.5.3.1 of the EIS describes several accident scenarios that involve fire. The results of the analysis of these accidents can be found in Appendix D., Section D.5.4 of the EIS. The analysis shows that even in the event of a severe ship fire, neither the consequences nor risks are great (Appendix D., Section D.5.5). Although the nonradiological effects of such a catastrophic accident would obviously impact the local environment, no additional impacts are predicted due to the presence of foreign research reactor spent nuclear fuel.

Response to Comment No. 398-5

Regulations concerning "Type B" spent nuclear fuel transportation casks as specified in 10 CFR Part 71.5, require that there be no loss or disposal of radioactive contents during normal operation. The spent nuclear fuel elements contained in a transportation cask are mechanically sound. The cask would not contain water, thus there would be no "leakage" of radioactivity during transport. The only hazard is a very small, allowable radiation that emanates from the cask. The regulations governing the acceptable radiation level (10 CFR Part 71.47) are documented in Section 5.4 and Appendix B, Section B.2 of the EIS. The radiation level allowed by the regulations would not put an undue harm to the individual member of the public, or the general population as a whole. Historically, the radiation level associated with the transport of foreign research reactor spent nuclear fuel was one to two order of magnitude less than that allowed by 10 CFR Part 71.47. The EIS evaluated the risk of transporting foreign research reactor spent nuclear fuel using the allowed limits and concluded that the overall risk would be negligible (Section 4 and Appendix E of EIS).

Response to Comment No. 398-6

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 399: SIMAC, JOHN

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

The risk is too great. We have too much pollution as it is with out risking more.

399-1

Name and Address: JOHN SIMAC
4908 No 37th ST
Tacoma Wa, 98407

RESPONSE TO COMMENT
COMMENTOR NO. 399: SIMAC, JOHN

Response to Comment No. 399-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 400: LANTZ, SHIRLEY A.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I DO NOT WANT IT Here! NO, NO, NO, a Thousand Times NO!

The 40 European — Asian Countries can Keep it. They can neutralized the Stuff.

Name and Address: Shirley A. Lantz
TACOMA, WA

400-1

400-2

RESPONSE TO COMMENT
COMMENTOR NO. 400: LANTZ, SHIRLEY A.

Response to Comment No. 400-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 400-2

The commentor's preference for Management Alternative 2 is noted. This alternative is discussed in Sections 2.3 and 4.4 of the EIS.

COMMENTOR NO. 401: ROGALSKI, J.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

We have no facilities for this problem; Lots over the problem, where it started. Return to sender.

401-1

Name and Address: Jerry Rogalski Sr
3708 NO 21TH ST
TAC, WA 98406

RESPONSE TO COMMENT
COMMENTOR NO. 401: ROGALSKI, J.

Response to Comment No. 401-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 402: ROGALSKI, PAULINE A. PARR

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I do not want nuclear waste coming through Tacoma or anywhere in the vicinity. Hanford has been a source of concern for me for years. Please do not create any more problems for us

402-1

402-2

Name and Address: Pauline A. Parr Rogalski
3108 No. 20th St.
Tacoma, Wash. 98406
206-752-9668

RESPONSE TO COMMENT
COMMENTOR NO. 402: ROGALSKI, PAULINE A. PARR

Response to Comment No. 402-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 402-2

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 403: LANTZ, RUSSELL J.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

LEAVE IT WHERE IT IS. THE COUNTRIES THAT HAVE THE MONEY TO CREATE THE STUFF CAN BUILD THE PLANTS TO DE NUTILATE IT. AEC & DOE HAVE BEEN PUSHING PAPER & MONEY AT THE IMMENSE BATH OF WASTE AT HANFORD FOR MANY YEARS AND SO FAR HAVE ACCOMPLISHED NOTHING. IT WILL BE THE SAME WITH THIS SITE

403-1

Name and Address: Russell J Lantz 3704 N 20
TACOMA WA 98406

RESPONSE TO COMMENT
COMMENTOR NO. 403: LANTZ, RUSSELL J.

Response to Comment No. 403-1

The commentor's preference for the overseas storage alternative is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

COMMENTOR NO. 404: HEALOY, JOAN

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I gave a type statement, before the meeting, to a comparson who signed up to speak. I oppose nuclear shipments going through the Port of Tacoma. The risks are coricderable to the environment and the population. I am a Washington State born person and wish to live here; however not if it's going to be risky to the health of my children & other members of my family.

404-1

Name and Address:
Joan Healoy
P.O. BOX 98432
Tacoma, Wa. 95498

RESPONSE TO COMMENT
COMMENTOR NO. 404: HEALOY, JOAN

Response to Comment No. 404-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 405: KENDALL, DR. ROSS S.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma. Unbelievable to propose shipping nuclear waste through a populated area, one grown city struggling to rebuild its economy + reputation! However concerned we do have any reassurances of safety from a government that lied for years about the safety of Hanford. This would be a death blow to the growth of Tacoma. I would seriously consider moving to protect my children. I warn the government, even if this is approved, WE WILL NOT LET IT HAPPEN! There will be confrontations!

405-1

Name and Address:

ROSS S. KENDALL, MD, radiation
1501 CRYSTAL SPRINGS RD.
TACOMA, WA 98465

RESPONSE TO COMMENT
COMMENTOR NO. 405: KENDALL, DR. ROSS S.

Response to Comment No. 405-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 406: EVANS, ROBERT

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Neither through Tacoma nor the other selected ports should be used. It is defensible. 406-1

The logical, cost-effective, least hazardous solution is to allow the materials to be stored, reprocessed & re-used by the 406-2

country responsible, equipped & financed possessed within the U.K., France, Canada, Germany, Switzerland, Sweden & Japan - 5 of 8 nations controlling 70% of the material. If we become a recipient, we are not equipped to 406-3

store or reprocess. But to become an established corridor through which all other nuclear fleets can come to the U.S. - as Senator Murkowski attempts has already proposed.

Name and Address:

Robert Evans

2218 North Union

Tacoma, WA 98406

RESPONSE TO COMMENT
COMMENTOR NO. 406: EVANS, ROBERT

Response to Comment No. 406-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or any other port is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 406-2

The commentor's preference for overseas storage and reprocessing is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

Response to Comment No. 406-3

An objective of the proposed action is reduce the threat of nuclear proliferation (Section 1.2 of the EIS). Because of the research, medical, commercial, and educational benefits available from research reactors, foreign nations are reluctant to shut down their research reactors. Successful implementation of the proposed action would encourage foreign research reactor operators to find long-term solutions for disposition of their spent nuclear fuel without a disruption of their operations and unfavorable diplomatic consequences (Section 2.2.2.2 of the EIS)

COMMENTOR NO. 407: AVERY, JOHN

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

As one of the community organizers who helped to fill the room & gather the comments of citizens, I plead for our government to listen to the eloquence expressed through this process. We are concerned for many valid reasons - most having to do with safety but also for being used by our government. The options presented to us are too dangerous to consider. Consider again and deal responsibly to the citizens concerned

Name and Address: John Avery 2501 N. Union Tacoma, WA 98406

407-1

RESPONSE TO COMMENT
COMMENTOR NO. 407: AVERY, JOHN

Response to Comment No. 407-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 408: CHESSER, MARI

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

WE HAVE A LARGE QUANTITY OF NUCLEAR WASTE GENERATED IN THE U.S. THAT WE DON'T HAVE A RESPONSIBLE DISPOSAL SOLUTION. FOR. WE DON'T NEED ADDITIONAL SPENT FUEL FROM OTHER COUNTRIES. WE DON'T NEED TO SET OURSELVES UP AS POLICEMEN FOR INTERNATIONAL NUCLEAR WASTE.

408-1

Name and Address: MARI CHESSER
3823 N. 38TH ST.
TACOMA, WA. 98407

RESPONSE TO COMMENT
COMMENTOR NO. 408: CHESSER, MARI

Response to Comment No. 408-1

The commentor's opposition to acceptance of spent nuclear fuel from foreign research reactors is noted. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

COMMENTOR NO. 409: HAMILTON, C.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

From the information provided to date I oppose the nuclear waste coming through Tacoma.

409-1

Name and Address: C. Hamilton
4510 N. 31st

RESPONSE TO COMMENT
COMMENTOR NO. 409: HAMILTON, C.

Response to Comment No. 409-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 410: POHL, DR. GERALDINE L.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

This nuclear waste was NOT produced by people or business here. WHY should any place in the Puget Sound accept a problem generated by business & scientists thousands of miles away??? NO! NO! NO! Outside forces from the United States of America are most careless of our Country.

410-1

Name and Address: Dr. Geraldine L. Pohl
4027C Rucker Avenue, Everett
Washington 98201

RESPONSE TO COMMENT
COMMENTOR NO. 410: POHL, DR. GERALDINE L.

Response to Comment No. 410-1

The commentor's opposition to the use of the Puget Sound for the transportation of foreign research reactor spent nuclear fuel is noted. Section 1.1 of the EIS discusses the need to safely manage the uranium in foreign research reactor spent nuclear fuel, originally produced in the United States, for the purpose of reducing proliferation risks. The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Puget Sound, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 411: GUBBE, KIM

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I do not want nuclear waste to come through Tacoma. I do not live in Tacoma but close to the route (I-5) that the waste will be traveling down. I do not want to be exposed to this nuclear waste just for driving by it. Not to say what would happen if there was an accident. I also feel that what would happen when it blows! for me or my children

411-1

Name and Address: Mt Rainier is very active and

Kim Gubbe
7140 191st Ave SW #31
Rochester WA 98579

RESPONSE TO COMMENT
COMMENTOR NO. 411: GUBBE, KIM

Response to Comment No. 411-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 413: HAWKINS, CARL

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Keep this port free of Nuclear Waste. I do not feel it is in our economic or National interest to accept this waste

413-1

413-2

Name and Address: CARL HAWKINS
8920 33rd ST W #2
TACOMA, WA 98466

RESPONSE TO COMMENT
COMMENTOR NO. 413: HAWKINS, CARL

Response to Comment No. 413-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 413-2

The commentor's opposition to accepting foreign research reactor spent nuclear fuel in the United States is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

COMMENTOR NO. 414: NAVARRO, RUDY

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Tacoma should not be a Port of Entry for Nuclear Waste. The entire Puget Sound Area would be at risk. The regulations that safeguard the entry and transportation of nuclear waste (HWE) are totally inadequate on many levels. Washington State environmental agencies have pointed out a number of technical descriptions in the proposal. Puget Sound area City Councils are unanimously against Tacoma being a Port of Entry. The technical reasons for excluding Seattle are essentially the same as Tacoma. The notion that the U.S. be responsible for this world problem needs to be examined.

414-1

414-2

Name and Address: Rudy Navarro
4936 N. Vrooscher St. Tacoma, Wa. 98407

RESPONSE TO COMMENT
COMMENTOR NO. 414: NAVARRO, RUDY

Response to Comment No. 414-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

All shipments of radioactive material are tightly regulated. Internationally the International Atomic Energy Agency (part of the United Nations) and the International Maritime Organization regulate such shipments. In the United States, the U.S. Department of Transportation, DOE, and the NRC all have regulations and rules that apply to these shipments. Section 5 of the EIS presents a detailed description of the applicable laws, regulations and other requirements.

The Port of Seattle is not among the ten candidate ports listed in Section 2.2.1.6 of the EIS; however, the Port of Tacoma is a candidate port (Appendix D, Section D.1.9 of the EIS) which could receive foreign research reactor spent nuclear fuel under Management Alternative 1 or 3.

Response to Comment No. 414-2

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). This policy is being developed to encourage peaceful applications of nuclear technology, while opposing the spread of nuclear weaponry. Prior to 1989, it was the policy of the United States to accept spent nuclear fuel containing uranium enriched in the United States (Section 1.1 of the EIS). Thus, the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). Thus, foreign research reactor operators are on notice that once the acceptance period expires, the United States would no longer accept foreign research reactor spent nuclear fuel.

COMMENTOR NO. 415: SCHMERTZ, CHRISTINE

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

The Department of Energy is concerned about National Security risks and the benefits for the DOE in selecting Tacoma as a Port of Entry. There are no benefits, only risks to Tacoma and the whole Puget Sound region. The DOE has not carefully evaluated the specific risks of this choice - Puget Sound depth, high population and dense traffic. Furthermore, risks have not been dealt with fire, terrorist attacks, leaks, etc. and general exposure to radioactive materials. Can we spend money on research? 415-1

Name and Address: Christine Schmertz
49316 N. Visscher St.
Tacoma, WA 98407

RESPONSE TO COMMENT
COMMENTOR NO. 415: SCHMERTZ, CHRISTINE

Response to Comment No. 415-1

The benefit to the citizens of the United States from the proposed action, including those in potential ports of entry, along transportation routes, or near potential management sites, is less risk that weapons grade uranium from civil programs could be diverted into the production of nuclear weapons that might be used against us or our allies. On the other hand, the analyses recorded in Section 4 of the EIS indicate that the risks from the proposed action would be low.

A sentence has been added to Appendix D, Section D.2.1.9 of the EIS regarding Commencement Bay being a Superfund Site. The analysis of impacts in Section 4 of the EIS demonstrates that there would be no significant adverse impacts on the ports, people, or natural environment from shipments of foreign research reactor spent nuclear fuel and the overall impacts to Commencement Bay would be unchanged by the various management alternatives.

The population in close proximity to the terminal as well as those as far away as 50 miles, was considered when the effects of possible accidents were calculated (Appendix D, Section D.5 of the EIS). These calculations demonstrate that the risk from accidents to all individuals is low. Likewise, the incident-free radiation exposure to people nearer to the cask than those living outside the fence around the port was calculated and found to pose no significant risk (Section 4.2.3.2 of the EIS). The dose rate at 100 feet from a cask containing foreign research reactor spent nuclear fuel is essentially zero. For these reasons, the close-in population near the Port of Tacoma would not be subjected to any significant risk from the use of the terminal to accept foreign research reactor spent nuclear fuel.

Appendix D, Section D.5.3.1 of the EIS describes several accident scenarios that involve fire. The results of the analysis of these accidents can be found in Appendix D, Section D.5.4 of the EIS. The analysis indicates that even in the event of a severe ship fire, neither the consequences nor risks were found to be great (Appendix D, Section D.5.5). Although the nonradiological effects of such a catastrophic accident would obviously impact the local environment, no additional impacts are predicted due to the presence of foreign research reactor spent nuclear fuel.

The analysis of the consequences and risk associated with an accident in port involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS) and that the risk associated with accidents in port for the entire proposed action, was low (Section 4.2.2.3 of the EIS). Likewise the consequences and risks associated with marine transport were found to be low (Section 4.2.1.3 of the EIS).

COMMENTOR NO. 415: SCHMERTZ, CHRISTINE (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 415: SCHMERTZ, CHRISTINE (CONT'D.)

Section D.5.9 has been added to Appendix D of the EIS to address terrorism and sabotage. This section concludes that, while certain terrorist and sabotage attempts cannot be precluded, theft would be. DOE considers that the foreign research reactor spent nuclear fuel can safely be transported to the management sites, if the foreign research reactor spent nuclear fuel is accepted into the United States. The security measures employed would meet or exceed all the security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. DOE supports these regulations as being adequate to protect the foreign research reactor spent nuclear fuel.

Appendix H has been added to the final EIS in response to public comments, to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

COMMENTOR NO. 416: REYNOLDS, ROB

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

No one wants "spent nuclear fuel" to be handled in their community, especially since the Tacoma port is extremely busy and there is a large urban community around + through which the fuel will be unloaded and rehandled. There are always "accidents" even though reasonable caution is used. We have only to look at the history of the nuclear fuel industry to see the truth of this. These nuclear waste products need to be disposed of in a less densely populated area.

416-1

Name and Address: Rob Reynolds
2822 N. Union
Tacoma, WA 98407

RESPONSE TO COMMENT
COMMENTOR NO. 416: REYNOLDS, ROB

Response to Comment No. 416-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with xbringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 417: TUROSIK, LEONA

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

We do not need the Nuclear Waste going thru Tacoma and surrounding cities. 417-1

I this material should be handled by the Military through the United States Government. That have qualified personnel to handle Nuclear waste. 417-2

Name and Address: Leona Turosik
9716 Portland Ave E
Tacoma Wa 98445

RESPONSE TO COMMENT
COMMENTOR NO. 417: TUROSIK, LEONA

Response to Comment No. 417-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 417-2

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without the additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all of the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted.

COMMENTOR NO. 418: DAM, NATALIE

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I think it would be a detriment to our city and affect our property values adversely, especially on the East side. It makes a lot more sense to me to store it in some remote area, like Liberia, and have an international monitoring team.

418-1

418-2

Name and Address: Natalie Dam
1818 E. 30th
Tacoma, WA 98404

RESPONSE TO COMMENT
COMMENTOR NO. 418: DAM, NATALIE

Response to Comment No. 418-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 418-2

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

Commentor No. 419: Pedersen, Mary

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I think that it is dangerous and the people of Tacoma should not have to put up with it. It would not be foolproof in any containers. If a earthquake should happen, there would be no end to problems. And the citizens of Tacoma don't need that. I'm an against any of it to be transported here.

419-1

Name and Address:

Mary Pedersen
3315 No 35th
Tacoma, Washington 98407

Response to Comment
Commentor No. 419: Pedersen, Mary

Response to Comment No. 419-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 420: RIPPLE, GOLEN

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

The port of Tacoma Security is very undereauipted To handle nuclear waste. in the event of any Terrorist activity.

420-1

Name and Address: Golen Ripple
728 Broadway
Tacoma Wa 98402

RESPONSE TO COMMENT
COMMENTOR NO. 420: RIPPLE, GOLEN

Response to Comment No. 420-1

The commentor's concern regarding port security is noted. DOE considers that the foreign research reactor spent nuclear fuel could safely be received at commercial ports including the Port of Tacoma, without additional security. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all of the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures can greatly reduce the risk of such actions. Security would be provided for all shipments of foreign research reactor spent nuclear fuel, as required by the Code of Federal Regulations (10 CFR Part 73). The security provisions are summarized in the new Appendix H that has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify the details of the transportation process, including security provisions in port and during transit.

COMMENTOR NO. 421: BATES, SONNIE

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I am opposed to the possibility. As a business owner near the port, a parent and concerned citizen I know the possibility of human error or evil intent is too great to be in favor of transport of such waste except directly to waste storage - dry casks preferable, at sites specifically protected & designed. Protected by safeguards an ordinary port like ours does not have.

Name and Address: Sonnie Bates 3570 McKinley Ave E Tacoma Wa 98404

421-1

RESPONSE TO COMMENT
COMMENTOR NO. 421: BATES, SONNIE

Response to Comment No. 421-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 422: ROBERTS, LAURA

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I feel that this area is too heavily populated for the risk. There should be facilities that have special training in dealing with this type of transfer that would be more appropriate. 422-1

Name and Address: Laura Roberts
17805 84th Ave. East
Puyallup, WA 98373

RESPONSE TO COMMENT
COMMENTOR NO. 422: ROBERTS, LAURA

Response to Comment No. 422-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 423: HARRIS, DIANE & ROBERT

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Not now, not ever! Tacoma and surrounding communities are a part of a very populated corridor which is growing by leaps & bounds. There is no assurance that a nuclear accident will not happen and such an accident would have horrendous consequences. We are adamantly opposed

423-1

Name and Address:
Diane & Robert Harris
2316 - 146th Ave. E.
Spanaway, WA 98387-6118

RESPONSE TO COMMENT
COMMENTOR NO. 423: HARRIS, DIANE & ROBERT

Response to Comment No. 423-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 424: ANDERSON, J.H.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Strongly opposed !!

424-1

Name and Address: J. H. Anderson
[illegible] Sacramento St. SW.
Tacoma, WA 98499

RESPONSE TO COMMENT
COMMENTOR NO. 424: ANDERSON, J.H.

Response to Comment No. 424-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 425: DUARTE, HANNAH

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I myself am only 14 years of age. And I know people wounder how I could have an opion on whats going on well I do. The fact is that what ever we decide on doing today is what myself and other people my age are gonna have to deal with in the future. The "grown-ups" of these days should be focusing on how this is gonna affect the kids in the future. I do know that the shipping / handeling of nuclear waste of any kind is very messy & dangerous job. All I want to know is why take the chance to ruin our beautiful state. There are always possiabilities of any thing happening.

(more on back.)

425-1

Name and Address: Hannah Duarte
4419 Elwood Dr. W.
Tacoma Wa, 98466

RESPONSE TO COMMENT
COMMENTOR NO. 425: DUARTE, HANNAH

Response to Comment No. 425-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 426: HEALEY, BARBARA

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

As a 3rd generation, registered voter and Tax payer, I am fully opposed to any nuclear waste coming Through Tacoma or Through our state. There can be no guarantee of safety from accidents - hundreds of lives could be lost. We don't need this added to our environment

426-1

Name and Address: Barbara Healey
6822 86TH St. SW.
Tacoma, Wa 98498

more on other side →

as a member of Edgewood Grange, Pierce County Grange, Washington State Grange and United States National Grange I feel I can speak as a representative of several hundred Grangers who will be opposed to nuclear waste entering any port or coming into our state. We love our country - lets NOT make it a world wide dumping ground.

B. Healey

Send me petition, I'll get them up

RESPONSE TO COMMENT
COMMENTOR NO. 426: HEALEY, BARBARA

Response to Comment No. 426-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 427: CLAYTON, P. MARC

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I do not feel nuclear waste should come through our area because of the high risk on the waters of Puget Sound, the remote mountain areas as well as the plains of Eastern Washington. Puget Sound and the highways (particularly the highways) are dangerous passages that provide high risk for accident and exposure. Rail transportation is risky because of the frequent delays and generally low maintenance of the tracks. There are too many derailments to risk transporting this material now.

Name and Address: P. Marc Clayton
115 McKenna Ct. Apt A
Enumclaw, WA
98022

427-1

427-2

427-3

RESPONSE TO COMMENT
COMMENTOR NO. 427: CLAYTON, P. MARC

Response to Comment No. 427-1

The commentor's opposition to the use of the Port of Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. However, the analysis in the EIS indicates that the risks associated with an accident at the port are low (Sections 4.2.2.3 and 4.5) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel at the port are also low (Section 4.2.2.2), and would pose no significant risk to port personnel, the local population, or the environment.

Response to Comment No. 427-2

The commentor's view that transport of the foreign research reactor spent nuclear fuel through Puget Sound and on the highways would be dangerous is noted. Sections 4.2.1 and 4.2.3 of the EIS, however, demonstrate that the risks would be low.

Response to Comment No. 427-3

The commentor's view that transport of the foreign research reactor spent nuclear fuel by rail would also be dangerous is noted. Section 4.2.3 of the EIS, however, demonstrates that the risks would likewise be low.

COMMENTOR NO. 428: KELLY, M.L.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

A poorly conceived idea that has no place in any one's backyard! The minimalization of a threat is good enough if there is ANY hint of threat, our government should not jeopardize the welfare of any segment of our population. It is such a strange foolishness to bring in a

428-1

Name and Address:
M. L. Kelly
811 N Sheridan
Tacoma WA 98403-1419

Strange's spent fuel when we've yet to embrace a safe policy for the storage of spent fuel generated in our own country

RESPONSE TO COMMENT
COMMENTOR NO. 428: KELLY, M.L.

Response to Comment No. 428-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

The impacts of ultimate disposition of spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. A detailed quantitative discussion of these impacts would have to be the subject of future NEPA documentation.

COMMENTOR NO. 429: KELLER, BEVERLY

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

As a mother of two small children, I worry about what every mother worries about. But now I am being told that spent nuclear fuel will be coming by my home and children. This to me is my worst nightmare. I may be ignorant to all the facts about transporting it but all it takes is one accident and it could be my children, my home that is affected for the next 30,000 years. I think the communities will not benefit from this, [redacted] This to me is a human issue We need to stop making such dangerous products! Humanity first!! People don't need it!

over →

Name and Address: Beverly Keller
21721 130th ST. E.
Sumner, WA. 98390

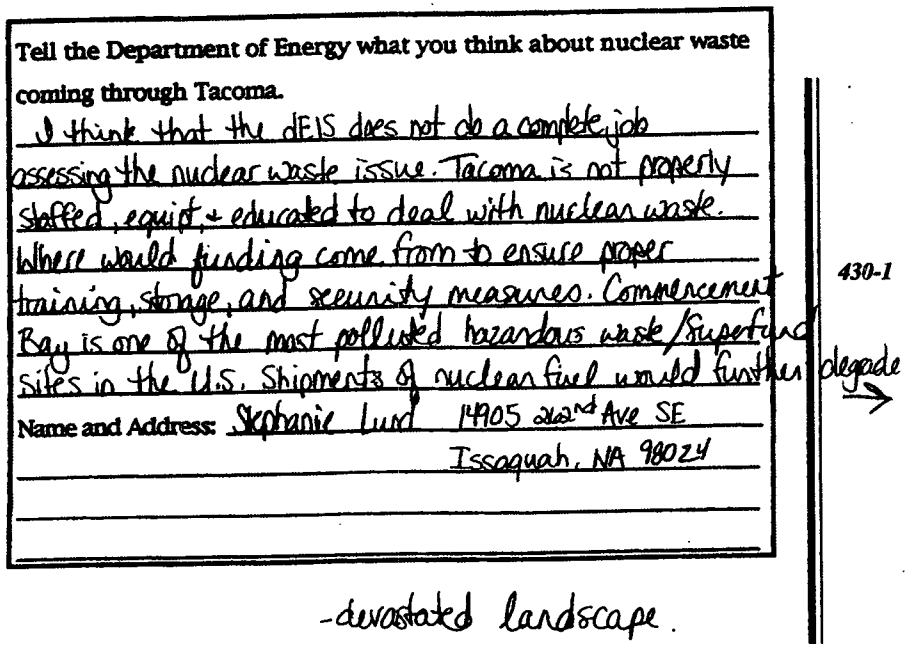
429-1

RESPONSE TO COMMENT
COMMENTOR NO. 429: KELLER, BEVERLY

Response to Comment No. 429-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 430: LUND, STEPHANIE



Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

I think that the dEIS does not do a complete job assessing the nuclear waste issue. Tacoma is not properly staffed, equipt, + educated to deal with nuclear waste. Where would funding come from to ensure proper training, storage, and security measures. Commencement Bay is one of the most polluted hazardous waste/Superfund sites in the U.S. Shipments of nuclear fuel would further degrade

Name and Address: Stephanie Lund 14905 202nd Ave SE
Issaquah, WA 98024

-devastated landscape.

430-1

RESPONSE TO COMMENT
COMMENTOR NO. 430: LUND, STEPHANIE

Response to Comment No. 430-1

DOE considers that the port selection criteria identify ports that could safely handle foreign research reactor spent nuclear fuel. DOE further considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3 of the EIS) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel casks are also low (Section 4.2.2.2 of the EIS).

Funding for training, security, and storage is not necessary. Spent nuclear fuel from foreign research reactors would be shipped in standard ISO containers, and would not require special training of workers (Section 2.6.3.2.2 of the EIS); experience handling of ISO containers is all that is necessary. The security provided for the spent nuclear fuel shipments is required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternative 1 or Management Alternative 3), there would be no storage of this material in the Port of Tacoma, or any other port. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma as noted by the commentor. The analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2 of the EIS). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Based on over 30 years of experience shipping spent nuclear fuel, DOE considers that transportation casks passing through the Port of Tacoma, Commencement Bay, or any other port or waterway would not affect air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

COMMENTOR NO. 431: WILHITE, MELODY R.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

This is A ludicrious Plan! Instead of Spending the money incured - put it into Perfecting MIT's Glassification and Helping the Countries that produce the waste develop ways of Dealing with their own Waste - for the most part these are not Countries that pose a risk

431-1

Name and Address:

Melody R. Wilhite
4307 So 32d Ave #1
Everett, WA 98203

431-2

and if we take their garbage what is the motivation to change their Practices?

Please use some sense and Solve the Problem!
Lets Quit Playing "musical" waste!

RESPONSE TO COMMENT
COMMENTOR NO. 431: WILHITE, MELODY R.

Response to Comment No. 431-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 431-2

DOE is funding efforts to perfect waste classification technologies, but these are outside the scope of this EIS.

The commentor's preference for Management Alternative 2 is noted. This alternative is discussed in Sections 2.3 and 4.4 of the EIS.

As discussed in the EIS, with the exception of Implementation Subalternative 2b to Management Alternative 1, none of the management alternatives would involve accepting foreign research reactor spent nuclear fuel indefinitely. At the end of the policy period, each nation that operates research reactors would be responsible for its own nuclear waste disposal. Thus, the foreign research reactor operators would have a motivation to change their practices under any of the alternatives.

COMMENTOR NO. 432: RYAN, POUKIE

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

THE DOE'S EIS DOES NOT TAKE INTO ACCOUNT THAT THE PUGETSOUND HAS 2000 COSTAL MILES INLAND AND IS ADJACENT TO SEVERAL LARGE AND HEAVY POPULATION CITIES, SEATTLE, EVERETT, BREMERTON, VANCOUVER B.C., MOUNT RAINIER IS THE ONLY SOLUTION THAT SHOULD BE CONSIDERED

432-1

432-2

Name and Address: [redacted] POUKIE RYAN
3535 55TH AVENE
TACOMA WA 98422-3123

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

THE DOE EIS DOESNOT ADEQUATELY ADDRESS SECURITY OF HEU DURING TRANSPORTATION AND SHIPMENTS.

432-3

Name and Address: POUKIE RYAN
3535 55TH AVE NE
TACOMA WA 98422

RESPONSE TO COMMENT
COMMENTOR NO. 432: RYAN, POUKIE

Response to Comment No. 432-1

The fact that Puget Sound has an extensive inland shoreline is not relevant to the acceptance of foreign research reactor spent nuclear fuel. The spent nuclear fuel that might be brought into the United States through the Port of Tacoma is a solid metal, shipped in a dry cask, thus there is no spill potential to impact the shoreline.

In evaluating the impact of accidents, the EIS considered the population included in a 50-mile radius around the Port of Tacoma, and around the shipping channel at its nearest point to Seattle. The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Puget Sound to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. Also, the analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS).

Response to Comment No. 432-2

The commentor's preference for Management Alternative 2, Subalternative 1a is noted. This alternative is discussed in Sections 2.3 and 4.4.1 of the EIS.

Response to Comment No. 432-3

Appendix H has been added to the final EIS in response to public comments, to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

COMMENTOR NO. 432: RYAN, POUKIE (CONT'D.)

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

THE DOE EIS DOES NOT ADEQUATELY CONSIDER EXPOSURE TIME OF LONGSHOREMAN ~~AS~~ WORKING IN THE ~~FAR~~ VICINITY OF THE CASKS. 432-4

Name and Address: POUKIE RYAN
3335 55TH AVE NE
TACOMA WA 98422

RESPONSE TO COMMENT
COMMENTOR NO. 432: RYAN, POUKIE (CONT'D.)

Response to Comment No. 432-4

There is a maximum allowable radiation dose rate of 200 mrem per hour, however, this limit is on the dose rate at the surface of the transportation cask, which would be inside of the container. The maximum radiation dose rate limit of interest to those that would be near the container, such as longshoremen, is 20 mrem per hour at a distance of 2 meters from the surface of the container (both dose rate limits come from regulation 49 CFR Part 173). The actual total dose that a longshoreman would get handling a cask is quite small due to the fact that the person is not at the surface of the container for long and the total time near the cask is quite short. Appendix D, Section D.4.3.2.1 of the EIS provides the time/distance analysis of cask handling, Appendix D, Section D.4.5 presents the resulting doses and risks, and Appendix F, Section F.5 presents an evaluation of the dose rates from a transportation cask containing research reactor spent nuclear fuel. The maximum allowable exposure for port workers would be 200 mrem per year, the same radiation dose limit established by the NRC to protect individual members of the public (Section 4.2.2.2 of the EIS). As the EIS demonstrates, both the dose and dose rate for the port workers would be low.

COMMENTOR NO. 433: RYAN, LAURA

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

YOUR EIS DOES NOT CONSIDER POPULATION AREAS WHEN HEU IS SHIPPED BY RAIL OR SEA. THE PORT OF TACOMA IS LOCATED 10 HOURS BY SEA (PUGET SOUND) FROM OPEN WATER (CAPE FLATTERY) THE VESSELS WOULD HAVE TO PASS MANY HIGHLY POPULATED AREAS IE. SEATTLE, BREMERTON, TACOMA, EVERETT

Name and Address: LAURA RYAN NETACOMA HOMEOWNER
3535 55TH AVE NE
TACOMA WA 98422-3123

433-1

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

THE DOES EIS DOES NOT ADEQUATELY ADDRESS THE MANAGEMENT ALT #2. BUT IT IS CLEAR THAT THIS MANAGEMENT ALT 2 IS THE MOST ECONOMICAL CHOICE,

Name and Address: LAURA Ryan
3535 55TH AVE NE
TACOMA WA 98422

433-2

RESPONSE TO COMMENT
COMMENTOR NO. 433: RYAN, LAURA

Response to Comment No. 433-1

The port selection process that determined that the Port of Tacoma was an acceptable port considered the population of the port and surrounding areas. Appendix D, Section D.1.9.5 of the EIS provides an explanation of the "population" criterion. The passage through Puget Sound meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). The population and favorable transit from open ocean are not the only considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel, if it is accepted into the United States. Other items of importance include population along the route to the management site, port experience with handling containers, and port facilities. Appendix D, Section D.1.9 of the EIS presents details of the port selection process.

Rail transport is discussed in Appendix E and Section 4.2.3 of the EIS, and the populations along the rail routes have been taken into account. In all cases, the risks were found to be low.

Response to Comment No. 433-2

Management Alternative 2 is discussed in Sections 2.3 and 4.4 of the EIS. Since the commentor did not mention any specific inadequacy in the analysis, DOE cannot respond in specific terms.

COMMENTOR NO. 434: RYAN, RICHARD P.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

HOW WILL THE DOE QUALIFY LOCAL GOV'TS TO RESPOND TO HAZARDOUS SPILLS INCLUDING ALL COMMUNITIES ALONG THEIR TRANSPORTATION ROUTES. CORRIDORS.

434-1

Name and Address: RICHARD P. RYAN
3535 55TH AVE NE
TACOMA WA 98422

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

ANY VESSELS SHIPPING HERE SHOULD BE U.S. FLAG CARRIERS, CERTIFIED UNDER U.S.C.G. BY U.S. MERCHANT MARINE OFFICERS

434-2

Name and Address: RICHARD P RYAN
3535 55TH AVE NE
TACOMA WA 98422-7123

RESPONSE TO COMMENT
COMMENTOR NO. 434: RYAN, RICHARD P.

Response to Comment No. 434-1

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provision include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Response to Comment No. 434-2

If foreign research reactor spent nuclear fuel is accepted into the United States, the responsibility for arranging the shipping would be in the hands of the shippers of the material, that is, the operators of the foreign research reactors. Therefore, the selection of the carrier, U.S. flag ship or otherwise, would be the responsibility of the current owners of the foreign research reactor spent nuclear fuel. However, DOE could and would require in the contract with the foreign research reactor operators, that only well-equipped, well-maintained ships be used. This cannot guarantee the use of U.S. flag vessels, but it would ensure the safety of the foreign research reactor spent nuclear fuel, which is the primary concern. It should also be pointed out that any ship entering U.S. territorial waters must meet U.S. safety regulations, which ensures that any ship carrying foreign research reactor spent nuclear fuel meets the minimum U.S. safety requirements.

COMMENTOR NO. 434: RYAN, RICHARD P. (CONT'D.)

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

COUNTRIES INVOLVED IN THE USE OF HEU SHOULD BE HELD ACCOUNTABLE FOR THE SAFE STORAGE OF THE SPENT FUEL. THESE COUNTRIES WILLINGLY ACCEPTED TO ENTER THE NUCLEAR AGE, AND MAINTAINING THE SPENT FUEL IS A BY-PRODUCT OF THIS LUXURY. WE CAN NOT BE THEIR BABY SITTERS, LEAVE IT WHERE IT IS!

434-3

Name and Address: RICHARD RYAN NETACOMA HOMEOWNER
3535 55TH AVE NE
TACOMA WA 98422-3123

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

THE EIS DOESNOT ADDRESS CLEARLY THE PROCESS PORTS ~~WITH~~ WERE SELECTED, IF POPULATION IS A CONSIDERATION FOR THE VICINITY OF THE PORT - HOW CAN THE DOE STRESS THAT ~~THE~~ THESE SHIPMENTS ARE SAFE, IF IN FACT THEY ARE USING POPULATION CONSIDERATIONS.

434-4

Name and Address: RICHARD P. RYAN
3535 55TH AVE NE
TACOMA WA 98422-3123

RESPONSE TO COMMENT
COMMENTOR NO. 434: RYAN, RICHARD P. (CONT'D.)

Response to Comment No. 434-3

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

Response to Comment No. 434-4

The port selection process is documented in Appendix D of the EIS. To evaluate and select acceptable ports of entry, the EIS developed five evaluation criteria which are discussed in Appendix D, Section D.1.9. One of the criteria (Criterion 5) evaluates the population in and around the port, and along the routes from the port to the management sites. Criterion 5 identifies ports that can safely handle foreign research reactor spent nuclear fuel (Appendix D, Section D.1.9) with the least risk to populations near the port. By seeking to minimize the risk to populations surrounding the ports of entry, the analysis in the EIS further diminishes the low risks associated with an accident (Section 4.2.2.3). DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

FLAWS IN THE CASKS USED TO SHIP HEU, WILL HAVE PROBLEMS HANDLING DEPTHS AS LOW AS 50'. AND ARE NOT ADEQUATE FOR SHIPPING THROUGH THE PUGET SOUND

Name and Address: R.P.RYAN
3535 58TH AVE NE
TACOMA WA 98422-3123

434-5

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

THE DOE SHOULD WORK WITH THE 42 NATIONS THAT ARE INVOLVED TO DEVELOP A PROGRAM WHERE ALL INVOLVED SHOULD CONTRIBUTE TO THE SOLUTION. NOT JUST THE USA!

Name and Address: R.P.RYAN
3535 58TH AVE NE
TACOMA WA 98422

434-6

Response to Comment No. 434-5

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. After construction, every transportation cask is radiographed to ensure that no significant flaws exist. Transportation casks for spent nuclear fuel transport within the United States are designed, fabricated, and maintained under NRC requirements found in 10 CFR Part 71 (Appendix B, Section B.2.1.3 of the EIS). Under these requirements, spent nuclear fuel transportation casks must be able to withstand a series of accident conditions, including water immersion in 50 feet of water for eight hours. Transportation casks have demonstrated their ability to maintain integrity at much greater depths (Section 4.2.1.3 of the EIS)

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1000 feet). Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

Response to Comment No. 434-6

The EIS evaluates the potential for implementing the proposed action overseas (Management Alternative 2, Section 2.3 of the EIS). It is unrealistic, however, to assume that all 41 foreign countries are capable of managing this spent nuclear fuel without risks to our national security and United States nuclear weapons nonproliferation policy.

Sections 2.2.1.2 and 2.2.2.3 of the EIS provide evaluations of several alternatives for financing the proposed action. These alternatives cover the range of options from having the United States pay all costs to having foreign countries pay all costs.

COMMENTOR NO. 434: RYAN, RICHARD P. (CONT'D.)

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

TRANSPORTATION SAFETY VIA RAIL OR HIGHWAY HAS NOT BEEN ADEQUATELY RESEARCHED IN THE DOE EIS. 434-7

Name and Address: RICHARD P. RYAN
3535 35TH AVE NE
TACOMA WA 98422

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

THE DOE SHOULD LEAVE THE HEU IN PLACE AND TRAIN SPECIAL FORCES TO RETRACT THE FUELS IN THE EVENT OF THREAT BY HOSTILE NATIONS. 434-8

Name and Address: R. P. RYAN
3535 35TH AVE NE
TACOMA WA 98422-3703

RESPONSE TO COMMENT
COMMENTOR NO. 434: RYAN, RICHARD P. (CONT'D.)

Response to Comment No. 434-7

Ground transport risks are discussed in Section 4.2.3 and Appendix E of the EIS. Since the commentor did not mention any specific inadequacy in the analysis, DOE cannot respond in specific terms.

Response to Comment No. 434-8

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

PLEASE LEAVE THE HEU ONSIGHT OVERSEAS.

434-8 (Cont'd.)

Name and Address: RICHARD P. RYAN
3535 55TH AVE NE
TACOMA WA 98422

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

THE MAJORITY OF THE COUNTRIES THAT HEU WILL BE SHIPPED FROM ARE NON-HOSTILE. THREATS OF HEU IN THESE COUNTRIES IS LOW. IT SHOULD REMAIN IN THESE COUNTRIES UNTIL A TIME WHEN THEIR ~~US~~ STATUS CHANGES.

434-9

Name and Address: R. P. RYAN
3535 55TH AVE NE
TACOMA WA 98422-3123

Response to Comment No. 434-9

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). If the United States does not include its stable, developed allies in this program, then many of the research reactors in these countries are likely to switch back to (or continue) the use of HEU as fuel, or they would have to shut down.

As stated in the EIS, the U.S. has an obligation under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) to assist nonnuclear weapons states with peaceful applications of nuclear energy. Actions which compel a country to shut down a peaceful nuclear research program, or to seek reprocessing, could cast doubt on U.S. commitment to NPT principles. Any perception that the U.S. does not support the NPT, which is the foundation of the entire international nuclear nonproliferation regime, would make it that much harder to negotiate further nuclear nonproliferation agreements.

If the research reactors are forced to shut down, the United States is likely to be accused, rightly or wrongly, of failing to live up to its obligations under the Treaty on the Non-Proliferation of Nuclear Weapons to assist nonnuclear weapons states with peaceful applications of nuclear technology.

If the reactors switch back to (or continue) the use of HEU as fuel, the move towards elimination of the civil use of HEU will be severely diminished.

While it is true that these countries do not pose a threat of nuclear weapons proliferation themselves, they serve as examples for other countries. Furthermore, several of them manufacture and sell research reactors to other countries, including third world countries. If our stable allies continue to use HEU as fuel for their research reactors, then the countries which buy reactors from them will demand reactors fueled in the same manner.

Finally, the United States is currently attempting to persuade Russia and China to implement programs, similar to that of the United States, to convince their client states to switch their research reactors to LEU. If, through action or inaction, the United States is unable to persuade its allies to discontinue the use of HEU as fuel, then the U.S. would be unlikely to convince Russia and China to cooperate in this effort.

COMMENTOR NO. 434: RYAN, RICHARD P. (CONT'D.)

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

DOE'S METHOD OF SELF REGULATION ~~[illegible]~~ IS NOT AN EFFECTIVE MANAGEMENT PROCESS WHEN NUCLEAR SAFETY IS TO BE CONSIDERED. THE DOE WILL NOT ACT AS AN EFFECTIVE WATCH DOG TO REPORT THEM ON PUT THEMSELVES ON REPORT.

Name and Address: R.P. RYAN
3535 55TH AVE NE
TACOMA WA 98422

434-10

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

THE DOE'S EIS DOES NOT REPORT RADIATION EXPOSURE ADEQUATELY. BUT USES WATERED DOWN POPULATION RISKS

Name and Address: R.P. RYAN
3535 55TH AVE NE
TACOMA WA 98422

434-11

RESPONSE TO COMMENT
COMMENTOR NO. 434: RYAN, RICHARD P. (CONT'D.)

Response to Comment No. 434-10

DOE is a self regulating agency as established by the Atomic Energy Act of 1954, as amended (Section 5.3 of the EIS). DOE must comply with the same regulations as the public, unless specifically excluded. With respect to receipt, transport and management of foreign research reactor spent nuclear fuel, various NRC and U.S. Department of Transportation regulations would apply to these activities.

Response to Comment No. 434-11

DOE's estimates of radiation exposure are presented throughout Section 4 of the EIS. Since the commentor did not mention any specific inadequacy in the analysis, DOE cannot respond in specific terms.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

THE DOE'S EIS DOES NOT ADEQUATELY ADDRESS LONGSHOREMAN EXPOSURE TO HEU CASKS. THE MANAGEMENT ALT 2 WOULD NOT REQUIRE FURTHER INVESTIGATION OF EXPOSURE

434-12

Name and Address: R. P. RYAN
3535 55TH AVE NE
TACOMA WA 98422

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

IF THE DOE'S EIS DOES NOT TAKE INTO CONSIDERATION IF A SPILL OCCURES IN PUGET SOUND, THE TIDAL MOVEMENT WOULD TAKE MUCH LONGER TO DISPOSE THE NUCLEAR CONTAMINATION.

434-13

Name and Address: R.P. RYAN
3535 55TH AVE NE
TACOMA WA 98422-5313.

Response to Comment No. 434-12

The potential environmental impacts (including radiation exposure) to port workers is discussed in Section 4 of the EIS. Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the transportation casks would be low. Appendix D, Section D.4 of the EIS demonstrates that the radiation dose that anyone would receive handling or being near a cask is less than the limit that is allowed to the public in an unrestricted area by NRC regulations (10 CFR Part 20). As discussed in Section 4.2.2.5 of the EIS, to avoid radiation doses which may exceed public dose limits, DOE would establish administrative procedures and maintain records to track individual exposures. Otherwise, no special handling or loading/unloading procedures would be required for the foreign research reactor spent nuclear fuel when it is contained in standard shipping containers.

Response to Comment No. 434-13

The EIS did not address marine spills in Puget Sound or elsewhere because the metal fuel is transported dry inside a transportation cask, so there is nothing to spill. However, the maximum impacts of a sunken cask, both recovered and unrecovered, are evaluated in Section 4.2.1.3 of the EIS. Should an accident occur in Puget Sound that resulted in a cask, containing foreign research reactor spent nuclear fuel, sinking in U.S. coastal waters it would be recovered, regardless of depth, including Puget Sound, which reaches 305 meters (1000 feet) in depth.

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radiative contents have ever been released from a transportation cask, nor has a transportation cask ever been punctured, even as a result of an accident.

COMMENTOR NO. 434: RYAN, RICHARD P. (CONT'D.)

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

THE DOE'S EIS DOES NOT ADEQUATELY ADDRESS SECURITY OF HEU SHIPMENTS. SECURITY IS A KEY ISSUE IN THE HEU SHIPMENTS. COMMERCIAL PORTS SHOULD BE REMOVED FROM THE TOP TEN LIST AND SUBSITUTED WITH MILITARY CONTROLLED PORTS. 434-14 434-15

Name and Address: R.P. RYAN
3535 55TH AVE NE
TACOMA WA 98422.

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

MANAGEMENT ACT #1 ONLY COVERS A PERIOD OF 40 YEARS. WHAT HAPPENS THEN? DOES THE PROCESS BEGIN AGAIN. STOP WHILE YOU AHEAD CHOOSE ALT #2 434-16

Name and Address: R.P. RYAN
3535 55TH AVE NE
TACOMA WA 98422-3123

RESPONSE TO COMMENT
COMMENTOR NO. 434: RYAN, RICHARD P. (CONT'D.)

Response to Comment No. 434-14

The commentor's concern regarding port security is noted. The security provided for the foreign research reactor spent nuclear fuel shipments would be required to meet or exceed all of the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. The general security provisions are provided in the new Appendix H that has been added to the final EIS. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit.

Response to Comment No. 434-15

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security that might be present at military bases. The analyses of impacts associated with accidents and incident-free operations involving foreign research reactor spent nuclear fuel, demonstrate that commercial ports and facilities represent an acceptable option for the transportation of foreign research reactor spent nuclear fuel (Section 4.2.2.3 on consequences of port accidents and Section 4.2.2.2 for impacts of incident-free operation).

Response to Comment No. 434-16

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS). As stated in Sections 2.1 and 4.2.7 of the EIS, if a geologic repository is not prepared to accept the foreign research reactor spent nuclear fuel or its resultant stable waste forms (generated due to chemical separation or other processing technology) DOE would continue to manage the material in exisiting facilities at the DOE management site(s).

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

TACOMA IS A SUPERFUND PORT AND SHOULD BE TAKEN OFF OF THE ~~40~~ TOP TEN PORT LIST.

Name and Address: R.P. RYAN
3535 55TH AVE NE
TACOMA WA 98422

434-17

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

MANAGEMENT ALT #2 IS THE ONLY CLEAR CHOICE, BUT THE EIS DOES NOT GO INTO ANY DETAIL OF THIS PROGRAM. THIS I BELIEVE ~~[illegible]~~ MAKES THIS EIS OBSOLETE.

Name and Address: R.P. RYAN
3535 55TH AVE NE
TACOMA WA 98422

434-18

Response to Comment No. 434-17

A sentence has been added to Appendix D, Section D.2.1.9 of the EIS regarding Commencement Bay being a Superfund Site. The analysis of impacts in Section 4.2.2 of the EIS demonstrates that there would be no significant adverse impacts on the ports, people, or natural environment from shipments of foreign research reactor spent nuclear fuel and the overall impacts to Commencement Bay would be unchanged by the various management alternatives.

Response to Comment No. 434-18

The commentor's preference for Management Alternative 2 is noted. The commentor is correct that the EIS does not contain detailed, comprehensive analyses of the environmental impacts of Management Alternative 2. Most of the impacts under this alternative would occur overseas, so they are outside the scope of this EIS. The EIS does present the potential impacts of this alternative within the United States in Section 4.4.

COMMENTOR NO. 435: BENOY, BOB

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

Alt. II is the only Way

435-1

Name and Address:
Bob Benoy
670 Fir Park Ln.
Forest, Wa. 98466

RESPONSE TO COMMENT
COMMENTOR NO. 435: BENOY, BOB

Response to Comment No. 435-1

The commentor's preference for the alternative of overseas management is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4. of the EIS.

COMMENTOR NO. 436: ANONYMOUS

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

No to Nuclear [redacted] wastes being shipped through Tacoma.
The government can not protect these shipments from acts of terrorism [redacted] such as happened in Oklahoma

436-1

436-2

Name and Address: An

RESPONSE TO COMMENT
COMMENTOR NO. 436: ANONYMOUS

Response to Comment No. 436-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 436-2

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk. All shipments of foreign research reactor spent nuclear fuel would be conducted meeting or exceeding all the security requirements in the Code of Federal Regulations (10 CFR Part 73). To better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel, Appendix H has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site. In addition, Section 2.8 has been added in the EIS to address security measures.

COMMENTOR NO. 437: ANONYMOUS

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

There are other countries that have facilities to deal with this type of hazardous better than we can - such as France - There are also military facilities such as North Carolina that can deal with this much better than we can - they are trained in those matters. Look at all the illness Hanford has caused + the tests they did without people knowing

437-1

437-2

437-3

Name and Address: PF.

RESPONSE TO COMMENT
COMMENTOR NO. 437: ANONYMOUS

Response to Comment No. 437-1

The commentor's preference for the overseas management alternative is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

Response to Comment No. 437-2

The commentor's preference to use military ports to receive foreign research reactor spent nuclear fuel for safety and security reasons is noted. Safety was one of the main considerations in developing the port selection criteria (Appendix D, Section D.1.9) of the EIS, so that any port selected by these criteria would be able to safely receive the foreign research reactor spent nuclear fuel. Spent nuclear fuel from foreign research reactors would be shipped in standard ISO containers, and would not require special training of workers (Section 2.6.3.2.2 of the EIS); experience in handling of ISO containers, is all that is necessary.

Response to Comment No. 437-3

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 438: ELLIOTT, MRS. ELEANOR

1859 Pillar Rock Rd
Roseburg, Wa - 98643
June 14/95

Dear Mr Head:

I am writing to urge you to please do all that you can to prevent the importation of nuclear waste from foreign countries. 438-1

I live on the bank of the Columbia River and there is a very high incidence of cancer in this area. My daughter and my son both have it.

There is so much pollution in our country it seems a shame to import more.

Please do what you can to protect us.

Yours sincerely,
(Mrs) Eleanor Elliott

RESPONSE TO COMMENT
COMMENTOR NO. 438: ELLIOTT, MRS. ELEANOR

Response to Comment No. 438-1

The commentor's opposition to accepting foreign research reactor spent nuclear fuel into the United States is noted. Section 2.3 of the EIS describes other alternatives under consideration.

COMMENTOR NO. 441: EASTWOOD, SUSAN D.

Susan Drummond Eastwood
152 3rd Avenue S., #101
Edmonds, WA 98020
206-517-4048

June 19, 1995

U.S. Department of Energy
Patrick J. Wells
Office of Spent Fuel Management
1000 Independence Avenue SW
Washington D.C., 20585

RE: Prospective Nuclear Waste Transport Stations

Dear Mr. Wells,

Tacoma is not a good city to transport large amounts of nuclear waste through. Reasons against transport through Tacoma include:

1) Tacoma /Seattle area is long over due for a massive earthquake; occasional tremors are not uncommon.
2) The area has a large population base, which includes the Seattle area.
3) The Pacific Northwest is an area of active volcanos: Mount Rainier has a history of major mud flows every 500 years and Mt. St. Helens could be a potential problem. 441-1

I am concerned that federal laws governing notice upon people affected by this "significant" action have been breached. These include APA and NEPA. Notice in the Tacoma News Tribune alone does not constitute sufficient notice. This action has potentially disastrous effects upon all those who live in western Washington. As such, notice should be given in all major newspapers and through local television stations. 441-2

It also concerns me that the U.S. is willing to dispose of nuclear waste generated by other countries on its own soil. That country that chooses to partake in activity which results in nuclear waste brings upon itself a duty to dispose of the waste upon its own soil. It is not right to spread the contamination upon others. 441-3

I have been unable to attend the public hearings as I did not hear about them until there were only two meetings left. As a student on limited funds and work schedule I was unable to travel to Tacoma for these last two meetings.

Thank you for your time and attention to this matter.

Sincerely yours,

Susan D. Eastwood

RESPONSE TO COMMENT
COMMENTOR NO. 441: EASTWOOD, SUSAN D.

Response to Comment No. 441-1

All population within a 50-mile radius of the Port of Tacoma was considered when analyzing the impact of a range of hypothetical port accidents. The risks were found to be quite low (Section 4.2.2.3 of the EIS). Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident, and thus affect the probability of such accidents; however, the number of earthquake-induced ship and road accidents is small compared to other causes.

Response to Comment No. 441-2

DOE complied with NEPA and other applicable laws and regulations in advertising for the public hearings. Specifically, advertising included sending public service announcements to local radio stations and to local cable access television and placing advertisements in major newspapers in each of the meeting locations. Newspaper advertisements were published one week before each meeting and again one day before each meeting. Also in accordance with NEPA, announcements of the hearings were published in the Federal Register.

Response to Comment No. 441-3

The commentor's preference for overseas storage and disposal is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS. As explained in Section 1.2 of the EIS, DOE and the Department of State have developed the proposed action as a means of supporting U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons grade) uranium in civil programs worldwide. This action is motivated by a desire to serve the interests of the U.S., not those of other countries (although they also benefit from a more stable world that is less likely to be the victim of a nuclear attack).

COMMENTOR NO. 447: CONCORD AREA CITIZENS

May 28, 1995

We request another hearing with the Federal Government regarding the shipment of Nuclear Waste at the Concord Naval Weapons Station, Concord, Ca. The signiture's on this petition are in agreement for postponement of transporting Nuclear Waste to Concord, Ca. NO to Necular Waste to Concord, Ca.

447-1

	Print Name	Signiture	Address	Zip
1.	Candice Johnston	Candice Johnston	187 Apple Dr. Concord	Ca. 94518
2.	Colette Taylor	Colette Taylor	171 Apple Dr. Concord	94518
3.	Kenneth Taylor	Kenneth Taylor	1811 Block Dr. Concord	94521
4.	Jena Garcia	Jena Garcia	2541 Braxil Ct. Antioch,	CA 94509
5.	GELERINO G. GONASERE	[illegible]	30 COVINGTON DR. PITTSBURG,	CA 94565
6.	Doris Saeed	Doris Saeed	1814 Power Pittsburg	CA 94565
7.	Lucille Davis	Lucille Davis	53 Lorraine Ave. Pittsburg	
8.	[illegible]	[illegible]	173 Kirkwood Clyde	CA 94520
9.	MYRIAM ESCARCEGA	[illegible]	2222 LynBrook DR	94565
10.	Rose J. Dale	ROSE J. DALE	96 BAY VIEW AVE. BAY POINT	94
11.	Arturo S. Santiago	[illegible]	2520 Trinity Mines Way Antioch	CA. 945
12.	LOWELL CERVANTES	[illegible]	7605 MARIN AV. SAC.	95820
13.	Tracy Root	[illegible]	4884 Sunset Trail Sacramento	CA
14.	Martha Gomez	[illegible]	501 Monument Cir. Concord	Ca 94520
15.	KATHRYN I. LAVINE	[illegible]	520 Patterson Blvd.	
16.	Angela Ramirez	[illegible]	28 Tricia Ave. Pittsburg	94565
17.	Sonia C. Alide	[illegible]	171 Skipper dr. Pittsburg	CA 94565
18.	majors mena	[illegible]	405 Norma	
19.	[illegible]	[illegible]	1560 Apple Drive	CA 94518

RESPONSE TO COMMENT
COMMENTOR NO. 447: CONCORD AREA CITIZENS

Response to Comment No. 447-1

Although the applicable NEPA regulations only require DOE to hold a single public hearing on a draft EIS, DOE held seventeen public hearings on the draft of this EIS, including one in the area of Concord NWS. In addition, several means were provided through which written comments could be provided on the draft EIS, and the acceptance period for written comments was extended from June 20 to July 20, 1995. Written comments are given the same weight as comments received during public hearings. As a result, DOE considers that an additional public hearing in the area of the Concord NWS is not required.

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

Department of Energy - Washington, DC.
Mr. Frank Coe and
Mr. Charles Head,

May 28, 1995

We request another hearing with the Federal Government regarding the shipment of Nuclear Waste at the Concord Naval Weapons Station, Concord, Ca. The signiture's on this petition are in agreement for postponement of transporting Nuclear Waste to Concord, Ca. NO to Necular Waste to Concord, Ca.

	Print Name	Signiture	Address	Zip
1.	Candice Johnston	Candice Johnston	1871 Apple Dr. Concord Ca.	94518
2.	Colette Taylor	Colette Taylor	1721 Apple Dr. Concord	9451?
3.	Kenneth Taylor	Kenneth Taylor	1721 Apple Dr. Concord	94521
4.	Jena Garcia	Jena Garcia	2544 Braxil Ct. Antioch, CA	94509
5.	GELSEMINO G. GONZALES	[illegible]	30 COVINGTON DR. PITTSBURG, CA	94565
6.	Dani's Saeed	Dania Saeed	1814 Power Pittsburg CA	945?
7.	Lucille Davis	Lucille Davis	53 LORRAINE AVE. Pittsburg	
8.	[illegible]	[illegible]	113 Kirkwood Cl. Clyde CA	94520
9.	MYRIAM ESCARCEGA	[illegible]	2222 LYNBROOK DR	94565
10.	Rose J. Dale	ROSE J DALE	36 BAY VIEW BLVD. BAY POINT	9
11.	Anna S. Santiago	[illegible]	2520 Trinity Mtn. Way Antioch	CA. 94
12.	LOWELL COUNTIES	[illegible]	7605 MARIN AV. SAC.	95820
13.	Tracy Foot	[illegible]	4884 Sunset Terr. Sacramento	CA
14.	Martha Gomez	[illegible]	520 Monument Cir. Concord	CA 9452?
15.	KATHRYN I. JANNE Kotter	[illegible]	550 Patterson Blvd. Pleasant Hill	
16.	Angela Ramirez	[illegible]	201 Tricia Ave. Pittsburg	CA 945
17.	Sonia C. Alicia	[illegible]	171 Clipper dr. pittsburg CA	94565.
18.	major's merza	[illegible]	405 Northampton Drive Apt C	94518
19.	[illegible]	[illegible]	[illegible]	

RESPONSE TO COMMENT
COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

Department of Energy - Washington D.C.
Mr Frank Coe and Mr. Charles Head May 28, 1995

We request another hearing with the Federal Government regarding the shipment of Nuclear Waste at the Concord Naval Weapons Station, Concord, Ca. The signeture's on this petition are in agreement for postponement of transporting Nuclear Waste to Concord, Ca. NO to Necular Waste to Concord, Ca.

	Print Name	Signature	Address	Zip
1.	Heidy Baldizon	Heidy Baldizon	3337 Bennett Wy	Concord 94519
2.	ANAM. HEREDIA	Anam Heredia	110 nautilus pl pittsburg	
3.	CHESTER DALE	Chester Dale	24 Bay View Ave Bay Point Ca	94565
4.	Carol DelPrado	Carol DelPrado	64 Loretta Point Pittsburg Ca	
5.	SHANNON DEL PRADO	Shannon DelPrado	46 BAYVIEW AVE BAY POINT, CA	94565
6.	Elvira Cardenas		550 Patterson Blvd P.H.	94523
7.	JOSIE ESTIOKO		189 CYPRESS AVE. VALLEJO, CA.	94590
8.	Beatriz Somoza	Beatriz Somoza	1235 Quandt Rd Lafayette Ca.	94549
9.	Silvia Lapitan		550 Patterson Blvd. Pleasant Hill, Ca.	94523
10.	Paul Matte	Paul Matte	267 Santa Fe	94598
11.	Elfrieda K Matte	Elfrieda K Matte	267 Santa Fe	94598
12.	Angela Johnston	Angela Johnston	1271 Apple Dr Concord, CA	94518
13.	Marcelas Pilones		418 Templemoor Valley	94571
14.	Catherine A. Reader	Catherine A. Reader	525 Glenwood Ct. Concord	94518
15.	Debra Hall	Debra Hall	15 Summithill Way, Pittsburg	94565
16.	Gretchen Cruz		550 Patterson Blvd. P.H.	94523
17.	Tom Cruz		16711 Marsh Creek Rd #190 Clayton	CA 94517
18.	Brenda Reed		3777 Willow Pass Rd #58 Bay Point,	CA. 94565
19.	Veronica Mattson		213 Patterson Blvd. P.H. Ca.	94523
20.	Charles H Lee		1280 Apple Drive, Concord,	CA 94518

COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

Department of Energy
Washington D.C.
Mr. Frank Coe and Mr. Charlestad, May 28, 1995

We request another hearing with the Federal Government regarding the shipment of Nuclear Waste at the Concord Naval Weapons Station, Concord, Ca. The signature's on this petition are in agreement for postponement of transporting Nuclear Waste to Concord, Ca. NO to Nuclear Waste to Concord, Ca.

	Print Name	Signature	Address	Zip
1.	James R Peterson	James R Peterson	1300 Apple Dr Concord	94518
2.	[illegible]	[illegible]	534 Cathy Ln	94553
3.	Lance Keller	Lance Keller	780 Oak Grove Rd #C218	94518
4.	Karen Blank	Karen Blank	3024 11th St SP	94806
5.	Kenneth J Solari	Kenneth J Solari	1297 Krona	94520
6.	Tom Solari	Tom Solari	1247 Krona	94521
7.	MARIAN FRAZIER	Marian Frazier	1321 Kristine Cir.	94518
8.	Josh Dillon	Josh Dillon	3693 San Michele Concord	94521
9.	Patty Mello	Patty Mello	31 Mori Ct Oakley	94561
10.	Steve Townsend	[illegible]	655 Santa Ray, Oakland	94610
11.	Marilyn Wang	[illegible]	348 Sheffield Dr. Concord	94518
12.	Nicole Lake	Nicole Lake	2601 CELAYA CIRCLE	94583
13.	Edward L Dauer		1856 Yolanda Cir Clayton	94517
14.	Natalia Silva	Natalia Silva	1988 Edgewood Ln walnut creek	94598
15.	Lillian Attwood		239 Thomas Way Pittsburg	94565
16.	[illegible]		1231 Apple Drive Concord,	94518
17.	[illegible]			
18.	Chad Schuetz		1655 La Bonita Way Concord	94519
19.	[illegible]		309 Meredith Ct. Clayton	94517
20.	Theresa Isidro	Theresa Isidro	3330 Sweet Dr. Lafayette	94549

RESPONSE TO COMMENT

COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

Department of Energy - Washington, D.C.
Mr. Frank Coe and Mr. Charles Head,

May 28, 1995

We request another hearing with the Federal Government regarding the shipment of Nuclear Waste at the Concord Naval Weapons Station, Concord, Ca. The signature's on this petition are in agreement for postponement of transporting Nuclear Waste to Concord, Ca. NO to Necular Waste to Concord, Ca.

	Print Name	Signature	Address	Zip
1.	Don Francis	Don Francis	550 Patterson Blvd Pleasant Hill, Ca	94523
2.	Jacqueline Labrie	Jacqueline Labrie	550 Patterson Blvd Pleasant Hill, Ca.	94523
3.	DANITZA COOKS	Danitza Cooks	" "	
4.	Joyce Cornill	Joyce Cornill	" "	
5.	Joann Mitchell	Joann Mitchell	" "	
6.	Janice Parker	Janice Parker	" "	
7.	Rita Boone	Rita Boone	" " " "	94523
8.	EUGENIA F. FELTRAN	Eugenia F. Feltran	3434 CHANDLER CIRCLE BAY POINT, CA. 94565	
9.	Sally Astone		290 Lennox Circle #H	
10.	Carol Taylor		898 Gilbert Dr., Concord	94518
11.	Valeria Thigpen		1461 Peacheli Concord ca	94525
12.	Susan Lee		2330 Carpenter Dr W.C. CA	94598
13.	Sarah M. Neate		9 Kenneth Ln Pleasant Hill	94523
14.	Doris Dath	DORIS DATH	2261 HICKORY DR CONC.	945
15.	Nancy Wolf	Nancy Wolf	193 Oak Park Lane P.H.	945
16.	Clarence Wolf	Clarence Wolf	193 Oak Park Lane P.H.	945
17.	Melanie Wilkerson	Melanie Wilkerson	4041 Hiawatha Dr Concord	945
18.	Linda Brinkman	Linda Brinkman	#7 Plato Ct. P.H.	945
19.	William Brinkman	William Brinkman	" "	
20.	Diana Peterson	Diana Peterson	1300 Apple Dr. Concord	945

COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

3

Department of Energy
Washington DC
Mr. Frank Coe & Mr. Charlos Head, May 28, 1995

We request another hearing with the Federal Government regarding the shipment of Nuclear Waste at the Concord Naval Weapons Station, Concord, Ca. The signature's on this petition are in agreement for postponement of transporting Nuclear Waste to Concord, Ca. NO to Nuclear Waste to Concord, Ca.

	Print Name	Signiture	Address	Zip
1.	Desiree Dunlap	[illegible]	2030 Walnut Shadows Ct.	94518
2.	[illegible]	[illegible]	[illegible] Cir.	94519
3.	[illegible]	[illegible]	[illegible] Lane	94596
4.	Nichole Alvarez	[illegible]	1432 Willowood Ct	94521
5.	Tina Heffernan	Tina Heffernan	1340 Apple Dr Concord CA	94518
6.	[illegible]		380 Apple Dr Concord CA	9451[illegible]
7.	[illegible]		[illegible] Apple Dr Concord CA	[illegible]
8.	[illegible]		1411 Apple [illegible] Concord	9451[illegible]
9.	Martha [illegible]		1460 Apple Dr Concord	94518
10.	Elizabeth K. [illegible]		1531 Apple Ln Concord	94518
11.	[illegible] H. [illegible]		1531 Apple Ln Concord	94518
12.	Raymond J. [illegible]		819 [illegible] St [illegible] CA	94565
13.	[illegible]		1917 Risdon Rd, Concord, CA	94518
14.	[illegible]		1626 [illegible] Cir P.H. CA	94523
15.	Bob Mannaberg		2520 Ryan Rd #74 Concord	9451[illegible]
16.	Patrick [illegible]		2047 [illegible] Dr. #70 P.H. CA	94523
17.	[illegible] Miles		610 Azores Cir. Bay Point, CA	94565
18.	Edita [illegible]		1441 Creekside #37 [illegible]	[illegible]
19.	[illegible]		780 Oak Grove Rd	94518
20.	[illegible]		780 Oak Grove Rd	94518

RESPONSE TO COMMENT

COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

Department of Energy - Washington D.C.
Frank Coe &
Mr Charles Head,

May 28, 1995

We request another hearing with the Federal Government regarding the shipment of Nuclear Waste at the Concord Naval Weapons Station, Concord, Ca. The signiture's on this petition are in agreement for postponement of transporting Nuclear Waste to Concord, Ca. NO to ~~Nuclear~~ Nuclear Waste to Concord, Ca.

	Print Name	Signiture	Address	Zip
1.	Deborah Royster		1755 Sixth St. Concord	94519
2.	Howard Heath		" " "	"
3.	Josephine Barnes		2430 Erie Dr. Concord	9451
4.	Virginia Scott		942 Via Mariposa Concord	9452
5.	Mary E Kunz		1039 Ridge Park Ct Concord	9452
6.	William D. Kunz		1039 Ridge Park Ct Concord	9452
7.	Zoe Shaffer		4060 Sprucewood Way Concord	94521
8.	Suzanne Berry		4030 Sprucewood Way Concord	94521
9.	Dan Rosenblatt	Dennis Rosenblatt	2334 Rivera Dr Concord	94520
10.	Graciela Guerrero-Reynoso		840 McElroy Court	94518
11.	Henry J Reynoso		840 McElroy Ct. Concord	94518
12.	Shawn H. Young		844 McElroy Ct Concord	94518
13.	Kathy Lafferty		1344 Sherwood Dr Concord	94518
14.	Marvin Rose		3024 WILDERWOOD Dr. Concord	94518
15.	Peter Rood		3024 Wilderwood Dr Concord	94518
16.	Tom Bridges		308 Meredith Ct Clayton	94517
17.	Phyllis W. McAfee		1986 Marion Ct Lafayette	94549
18.	Dennis Thomas		147 St Germain Pleasant Hill	94523
19.	RIAN Shultze		1655 La Bonita Concord	94519
20.	Zachary Flores		1889 Carlotta dr Concord	94519

RESPONSE TO COMMENT
COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

Department of Energy-Washington D.C.,
Frank Coe &
Mr. Charles Head,

May 28, 1995

We request another hearing with the Federal Government regarding the shipment of Nuclear Waste at the Concord Naval Weapons Station, Concord, Ca. The signiture's on this petition are in agreement for postponement of transporting Nuclear Waste to Concord, Ca. NO to Nuclear Waste to Concord, Ca.

	Print Name	Signiture	Address	Zip
1.	Jane Aguilar	[signature]	43 Madsen Lane	94596
2.	Catherine [illegible]	[signature]	[illegible]	94518 Concord
3.	[illegible]	[illegible]	[illegible]	
4.	Steve Russell	[signature]	4161 [illegible] Dr.	Concord
5.	Autumn Russell	[signature]	4161 [illegible]	Concord 94521
6.	Michelle [illegible]	[signature]	[illegible]	94578
7.	Nancy Hartman	Nancy Hartman	193 Twinview Dr	P.H. 94523
8.	Julia Hartman	[signature]	193 Twinview Dr	P.H. 94523
9.	[illegible]	[signature]	78 [illegible]	P.Hill 94523
10.	Diane Hayhurst	Diane Hayhurst	200 [illegible] Dr. P.Hill	94523
11.	Summer Adams	[signature]	78 [illegible] Dr	P.Hill 94523
12.	Valerie ABAD	[signature]	[illegible] Ct	Concord
13.	Megan Ordway	Megan Ordway	1437 [illegible] Ct	
14.	Jennifer Miller	Jennifer Miller	849 Royal Oak Ln. Concord	945[illegible]
15.	Paul Kaczan	[signature]	1259 Apple Dr, Concord	94518
16.	Jeremy Coleman	Jeremy Coleman	1351 Apple Dr	
17.	Zack Dilgard	Zack Dilgard	1211 Apple Dr.	
18.	Jamie P. [illegible]	[signature]	1211 Apple Dr	
19.	Steve Sweek	[signature]	1211 Apple Dr.	
20.	Matt Sheng	[signature]	1269 Apple Dr.	

RESPONSE TO COMMENT

COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

Dept of Energy - Washington, D.C.
Frank Coe & Mr. Charles Head.

May 28, 1995

We request another hearing with the Federal Government regarding the shipment of Nuclear Waste at the Concord Navel Weapons Station, Concord, Ca. The signiture's on this petition are in agreement for postponement of transporting Nuclear Waste to Concord, Ca. NO to Necular Waste to Concord, Ca.

	Print Name	Signiture	Address	Zip
1.	Ewrik	[illegible]	—	
2.	TERRESA Cast	[illegible]	2200 Westwood Ct	94565
3.	Rose ANTHONY		1301 - [illegible] St	
4.	LEO ANTHONY		" "	
5.	Mary Bertoni	Mary Bertoni	840 Central Pitts	945
6.	[illegible]	[illegible]	1CO Acacia St Pitts	94
7.	Randy Trueman	Randy	1344 Acacia St. Pitts.	945
8.	Tabitha Trueman		1344 Acacia St Pitts.	9456
9.	Virginia Hendin		1360 Acacia St. Pitts (Pittsburgh)	94565
10.	Ana Figueroa		1391 Acacia ST Pitt	94565
11.	Lysette Figueroa		1391 Acacia ST Pitt	9456.
12.	Aveline Figueroa		1391 ACACIA St Pitt	94565
13.	[illegible] Fletcher		1383 Acacia St Pitt	94565
14.	[illegible] Fletcher		1383 " " "	"
15.	Lydia [illegible]		1375 Acacia Pitts	94565
16.	Carrie m conrad		1357 C Acacia St Pitts	
17.	Richard Dale Pe[illegible]		1445 aster drive #19 Concord	945[illegible]
18.	Shalom George		1345 acacia Ave. Pitts.	94565
19.	[illegible]		1314 Acacia St. Pittsburg	94565
20.	Michael A. [illegible]		1240 apple Ln Con.	94518

RESPONSE TO COMMENT
COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

Dept of Energy - Frank Coe and Charles Head
Washington, D.C.

May 28, 1995

We request another hearing with the Federal Government regarding the shipment of Nuclear Waste at the Concord Naval Weapons Station, Concord, Ca. The signiture's on this petition are in agreement for postponement of transporting Nuclear Waste to Concord, Ca. NO to ~~Nuclear~~ Nuclear Waste to Concord, Ca.

	Print Name	Signiture	Address	Zip
1.	Joseph Rio		Hdl	95240
2.	Maria White	Maria White	140 Cunningham Ct. Pitts.	94565
3.	Rosmarie d. Te	Rosmarie d. Te	2 Honeywood Court Pitt.	94565
4.	Marianda Stanek	Marianda Stanek	140 Castle Rock Rd.	94598
5.	DAVID MONIZ	David Moniz	956 CHANDLER CT. Concord	94518
6.	Craig Radholm	Craig Radholm	1240 Apple Dr.	94518
7.	Debra A. Fedako	Debra A. Fedako	1240 Apple Dr.	94518
8.	DENNIS FLORES	[illegible]	418 TEMPLE WAY WD CA	94571
9.	THARCO	[illegible]	1449 Seven Oaks Dr. Valley Q	94588
10.	Dwayne Bond	Dwayne Bond	8943 Burns Pl. Yorba	95209
11.	Gail Yamamoto	Gail Yamamoto	1770 Hemlock St. Mpt.	94559
12.	Leroy Reamer	[illegible]	3207 Barker Dr. Concord,	94519
13.	Jim Caldwell	[illegible]	4196 Quail Run Danville	94526
14.	Kirk Jensen	Kirk Jensen	1440 Contra Costa Blvd. #13 Pleasant Hill	94523
15.	Bob Russell	Bob Russell	1626 Barnett Circle P.H.	94523
16.	Greg Getty	[illegible]	PO Box 1637 Pittsburg, Ca.	94565
17.	Cathy Williams	Cathy Williams	2875 B Euclid Ave Concord, Ca	945[illegible]
18.	Minnie GASTER	Minnie Gaster	1321 acacia St. Pitts	945[illegible]
19.	Calvin F Strickland	Calvin F Strickland	1321 acacia St. Pitts	945[illegible]
20.	N. Sultan	N. Sultan	1630 Shirley Dr. Pleasant Hill	CA 94523

RESPONSE TO COMMENT

COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

Dept of Energy - Washington, DC.
Mr. Frank Coe and Mr. Charles Head, May 28, 1995

We request another hearing with the Federal Government regarding the shipment of Nuclear Waste at the Concord Navel Weapons Station, Concord, Ca. The signature's on this petition are in agreement for postponement of transporting Nuclear Waste to Concord, Ca. NO to Necular Waste to Concord, Ca.

	Print Name	Signature	Address	Zip
1.	MARIA VILLANUEVA		4179 Woodbridge Way	94509
2.	Diego Gomez		1061 Twin Bridges Ct Brentwood	94513
3.	Gail Swatley		1254 New Hampshire St. Concord	94521
4.	Sherlonda Thompson		2201 Sycamore Ave #272 Antioch	94509
5.	Natalie Sanchez		1100 E. 13th St. Antioch	94509
6.	Mika Li		301 Columbia Circle Benicia CA	94510
7.	LETICIA BANDE		3621 Hudson Ct #78 ANTIOCH	94509
8.	Guadalupe Espinoza		3276 Betty Dr Pittsburg	Ca 94565
9.	Mary Jane Mello		4525 Hogan Lane Oakley	Ca 94561
10.	Diana Albritton		721 Almond Dr Oakley	Ca 94561
11.	MARITA SISON		2753 CARPINTERIA DR	ANTIOCH CA 94531
12.	ERLINDA O. [illegible]		273 LOVELOCK CIR	PITT. CA
13.	ARPINA JACKSON		4416 meadowlake dr	Antioch CA
14.	[illegible]		[illegible]	
15.	Edelie Comaya	Edelie Comaya	90 sandalwood ct	
16.	HERMAN V. SAGUN		4203 WOLVERINE WAY	ANTIOCH
17.	Jerry M. Ramirez		103 Pyramid Way,	Pittsburg, Ca. 94
18.	Angelina Jason		1078 Mellana Dr	Pittsburg Ca 94565
19.	M. Hart		450 E. Leland Rd	Pittsburg CA 94561
20.	Ernestine Watts		1212 Mahogany Way	Antioch CA 94509

COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

Department of Energy - Washington, D.C.
Mr. Frank Cox and Mr. Charles Head, May 28, 1995

We request another hearing with the Federal Government regarding the shipment of Nuclear Waste at the Concord Naval Weapons Station, Concord, Ca. The signiture's on this petition are in agreement for postponement of transporting Nuclear Waste to Concord, Ca. NO to ~~Nuclear~~ Nuclear Waste to Concord, Ca.

	Print Name	Signature	Address	Zip
1.	Tara Neil	[signature]	1455 Arnold Dr. #31 Mtz	945[illegible]
2.	Stone, Betty	Betty Stone	1818 Boxwood Dr. Concord	945[illegible]
3.	Stephanie Eysted	Stephanie Eysted	1309 Del Rio #C Concord	94[illegible]
4.	Virginia James	Virginia James	2211 Sunshine Dr. Concord	9452[illegible]
5.	Jerry E[illegible]		[illegible] Clayton Rd. Conc. CA	94521
6.	Tyler Snorton-Phelps		1211 Orange ST. Concord	94598
7.	Lisa Snorton-Phelps	[signature]	1211 Orange St. Conc.	94518
8.	Christy Gale	Christy [illegible]	2215 Charlotte Avenue, Concord	94518
9.	Jacqueline Cl[illegible]		1030 - 45th St. Apt #5 Emeryville, CA	94608
10.	Yolanda Miles		600 Azores Circle Bay Point CA	94565
11.	Anthony Diedrich	[signature]	POB 736 Mtz CA	94553
12.	Jeff Bocker		68 Camelback Ct., Pleasant Hill, Ca.	94523
13.	Bob Mannelorg		2520 Ryan Rd, Concord	94518
14.	Wes Nicholson		4810 Moffit Dr. Concord	94521
15.	Joly Craig		" " " "	"
16.	M. [illegible]		124 [illegible] Ct. Walnut Creek Ca.	945[illegible]
17.	Nestor Coyman		2705 Carpinteria Dr. Antioch Ca.	94509
18.	Josephine Stinn		219 Clearpointe Dr. Vallejo CA	94591
19.	Sue Chavez		1430 Peach Pl. Concord	94518
20.	Crissy Chavez	X	1430 Peach Pl. Concord	94518

RESPONSE TO COMMENT

COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

May 28, 1995

We request another hearing with the Federal Government regarding the shipment of Nuclear Waste at the Concord Naval Weapons Station, Concord, Ca. The signiture's on this petition are in agreement for postponement of transporting Nuclear Waste to Concord, Ca. NO to Necular Waste to Concord, Ca.

	Print Name	Signiture	Address	Zip
1.	Anthony Fiorelli	Anthony Fiorelli	Conc	94518
2.	D Crowe	DCrowe	Conc	94520
3.	L. de Boer	L. de Boer	Pleasant Hill	94523
4.				
5.	Tanya Johnson	Tanya Johnson	Concord	94520
6.	Kia Williams	Kia Williams	CONCORD	94519
7.	Sandra Vela	Sandra Vela	Concord	94518
8.		Joan Holsinger	Concord	94518
9.	Kelly Hickerson	Kelly Hickerson	Walnut Creek	94598
10.			ANTIOCH	94509
11.	Terry Gomez		Pittsburg	94565
12.	Scott Dunaway		Concord	94519
13.	Sue Kyle	Sue Kyle	Concord	94518
14.	Cheryl Franklin	Cheryl Franklin	Concord	94521
15.				94518
16.	Lisa Simpson		Concord	94521
17.			Concord	94518
18.	Helen Rite	Helen Rite	Concord	94521
19.	Elizabeth Benavente	Elizabeth Benavente	Concord	94520
20.	Elizabeth Bloom	Elizabeth Bloom	Concord	94521
21.	Cheryl Kwiecien	Cheryl Kwiecien	"	94518
22.			Antioch	94509

RESPONSE TO COMMENT
COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

May 28, 1995

We request another hearing with the Federal Government regarding the shipment of Nuclear Waste at the Concord Naval Weapons Station, Concord, Ca. The signiture's on this petition are in agreement for postponement of transporting Nuclear Waste to Concord, Ca. NO to Nuclear Waste to Concord, Ca.

	Print Name	Signature	Address	Zip
1.	Beverly L Fazio	B. Fazio	4708 Sharbi	94505
2.	E. SULTAN	E Sultan	1630 Shirley Dr. P.H. CA.	94523
3.	Mark Miller	M Miller	1797 Ladam Dr.	94519.
4.	J. Kincaid	J Kincaid	1796 Dakota Ln	94519
5.	JOHN MCGRAW	John McGraw	34 Adelaide MARTINEZ CA	
6.	PAUL L ALLEN	Paul Allen	[illegible] ST.	94521
7.	Christine A Pfister Cox	Christine A Pfister Cox	851 Maple Ave Concord CA	94520
8.	Judy Quinlan	[illegible]	3909 Manzanita Ct Concord	94
9.	Terhune	K Terhune	3028 Windmill Cyn Clayton	
10.	Betty Hurah	B [illegible]	1939 [illegible] Dr. Concord	94519
11.	Dominic von Zedom	[illegible]	3316 [illegible] W. Pittsburg CA	9456
12.	Edward J. Robinson	E J Robinson	2561 [illegible] Concord	
13.	Barbara A Chase	BARBARA CHASE	435 Sun Cir RD Walnut Creek, Ca.	94598
14.	Mercedes Toro	Mercedes Toro	4672 North Larwin Ave Concord CA	94521
15.	Gayle Salter	Gayle Salter	502 Mt. Sierra Place Clayton, CA	94517
Collins	Vincent K Collins	[illegible]	1897 Lyon [illegible] Concord	94519
17.	VIRGINIA COLLINS	Virginia Collins	1897 [illegible] Concord	94519
18.	Ferne Seelos	Ferne Seelos	1780 Sunshine Cove	94520
19.	Michael Seelos	Michael Seelos	1780 Sunshine Cove	94520
20.	~~[illegible] + MARY KOBAYASHI~~	~~[illegible]~~	~~4001 [illegible]~~ [illegible]	94521

RESPONSE TO COMMENT

COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

May 28, 1995

We request another hearing with the Federal Government regarding the shipment of Nuclear Waste at the Concord Naval Weapons Station, Concord, Ca. The signiture's on this petition are in agreement for postponement of transporting Nuclear Waste to Concord, Ca. NO to Necular Waste to Concord, Ca.

	Print Name	Signiture	Address	Zip
1.	Scott Whitworth	Scott Whitworth	5021 Laurel	94521
2.	Ryan Carini	Ryan Carini	1621 Roberts ct	94521
3.	Erin Whitworth	Erin Whitworth	5021 LAUREL Dr.	94521
4.	Ann McCollough	A.I McCollough	1371 Apple Dr	94518
5.	G. Robert McCollough	G Robert McCollough	1371 Apple Dr.	94518
6.	Amanda Vida	685-7532	1360 apple DR	concord
	James Beardle	685-7532	1360 apple DR	94518
8.	Alexandra Vida	1360 apple DR	concord	94518 685-7509
9.	Lucille Ferguson	1391 apple Dr		94518
10.	Francis J Ferguson	Francis J Ferguson	1391 Apple Dr	94518
11.	Geo. M. Loving	1451 Apple Dr	Concord Ca	94518
12.	Ed Wolfson	1471 Apple Dr.	Concord, CA	94518
13.	Sue Vigo	1500 APPLE DR	Concord CA	94518
14.	Hal Vigo	"	"	"
15.	ARMOO ARDIORO	1500 APPLE DR	CONCORD	CA 94518
16.	Mayan zhi	1511 APPLE DR		
17.	Kelly Stiller	1540 Apple Dr.	Concord	94518
18.	Eric Stiller	" "	"	"
19.	Lonnie Kuhlman	2564 Walnut Blvd. #195	W.C.	94596
20.	Eric Stiller	117 Lovevidge Rd.	Pittsburg	

RESPONSE TO COMMENT
COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

Commentor No. 447: Concord Area Citizens (Cont'd.)

May 28, 1995

We request another hearing with the Federal Government regarding the shipment of Nuclear Waste at the Concord Naval Weapons Station, Concord, Ca. The signature's on this petition are in agreement for postponement of transporting Nuclear Waste to Concord, Ca. NO to Necular Waste to Concord, Ca.

	Print Name	Signiture	Address	Zip
1.	Nancy Stanley	Nancy J. Stanley	2107 Gill Cove	94520
2.	[illegible]	[illegible]	577 McKean Pl	94518
3.	Dawn Reese	Dawn Reese	10 Summerwood Pl. Con.	94518
4.	[illegible]	Phyllis	1094 Railroad Av	94521
5	Becky Lea	Becky Lea	2330 [illegible] Ln	94598
6.	Amparo Casillas	[illegible]	1311 Apple Dr	94518
7.	[illegible] Casillas		"	
8	[illegible] Casillas		"	
9.	Ron Somers	Ron Somers	1331 Apple Dr	
10.	Kristin Holtwick	Kristin Holtwick	1320 Apple Dr	
11	Jacklyn White	Jacklyn White	960 Terry Ct. Pittsburg, CA.	9[illegible]
12	Deborah Skelton		2737 Barcelona Ln Antioch, Ca.	
P.C. 13	Jeannette Washington		70 Marcia Ct. Bay Point, CA	94565
14	[illegible]		2030 [illegible] Dr. Con	
15	[illegible]	[illegible]	550 Patterson Blvd P.H.	952[illegible]
16	[illegible]		508 1/2 W 5th Antioch	
17	[illegible]		1424 Ryder Vallejo Ca	94590
18	[illegible]		1472 Rice Ct. Apt E Walnut Creek	94[illegible]
19	Mary A. Hall	Mary Ann Hall	[illegible] Willow Pass Rd Concord	
20	[illegible]		436 W 10th St. Pittsburg, Ca.	9[illegible]

Response to Comment
Commentor No. 447: Concord Area Citizens (Cont'd.)

May 28.1995

We request another hearing with the Federal Government regarding the shipment of Necular Waste at the Concord Naval Weapon s Station, Concord. Ca. The signiture s on this petition are in agreement for postponement of transporting Necular Waste to Concord, Ca. No to Necular waste to Concord. Ca..

Print Name	Signiture	Address
Joleen Schmid		5 Brookshire 94565 Pitts. Ca
Cheryl Narez		1348 Enea Dr. 94565 Pitts. Ca
Regina Narez		1348 Enea Dr 94565 Pitts. Ca
Joe Narez		1348 Enea Dr 94565 Pittsburg C
Tracy Narez		1348 Enea Dr 94565 Pittsburg C
[illegible]		52 [illegible] Concord Ca 94518
Esther Baker		231 [illegible] Concord Ca 94518
Jack [illegible]		1010 Crestview
Betty White		1023 Crestview 94565
[illegible]		180 Northstar Dr 94565
Hughe Willson		130 Northstar Dr 94565 Pittsburg.
Jennifer Jackson		160 Northstar Dr 94565 Pittsburg Ca
Cindy Ward		1880 [illegible] Av. Pittsburgh
[illegible]		2017 [illegible] Av. 94565 Pittsburg Ca
Athena [illegible]		928 Blackdiamond St 94565 Pitts C
[illegible]		3319 [illegible] Dr 94518

RESPONSE TO COMMENT
COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

May 28, 1995

We request another hearing with the Federal Government regarding the shipment of Nuclear Waste at the Concord Naval Weapons Station, Concord, Ca. The signature's on this petition are in agreement for postponement of transporting Nuclear Waste to Concord, Ca. NO to Nuclear Waste to Concord, Ca.

	Print Name	Signature	Address	Zip
1.			1491 Apple Dr.	
2.	Tom Forbes		3530 Monterey Blvd Oak, 94561	
3.	Jerry Forbes		107 Regency Ct Vac	94591
4.	Diana M Forbes		107 Regency Ct Vac	94591
5.	Diana Garcia		1240 Clayton Rd #28	94521
6.	Betty Skiles		1933 Woodmont Ct Co	94578
7.			Concord	
8.	Debbie Boon		Concord	
9.		Keith Seizmann	Concord	
10.			Concord	
11.			Concord	
12.	Marcella Carleton		3231 Alfonso Dr. Concord	94518
13.			826 Oak Grove Rd Concord	94518
14.	Barbara L Moore		1017 Pinehurst Ct Concord	94521
15.			1232 Kay & Kaycrest Dr., W.C.	
16.			3055 Treat Blvd # Concord CA.	94518
17.		SAME AS ABOVE		
18.			780 Oak Grove Rd. Concord	
19.			744 Fairmont Cir Concord	
20.			1271 Apple Dr. Concord	94518

RESPONSE TO COMMENT
COMMENTOR NO. 447: CONCORD AREA CITIZENS (CONT'D.)

COMMENTOR NO. 448: COONEY, JERRY W.

655 Chapman Road
Castle Rock, WA 98611
12 June 1995

Department of Energy
% Charles R. Head
Office of Spent Fuel Mangement
EM-37
1000 Independence Ave, SW
Washington, D.C. 20585-0001

Dear Mr. Head,

This letter, that recently was in the Longview, WA, Daily News, speaks for itself, and also me. The US government still has not solved the problem of the nuclear waste at Hanford left over from the Cold War. Now the present administration wishes to import more. Do we want to see that portion of the State of Washington nothing but a glowing heap of nuclear waste? How long will we commit ourselves to being a dumping ground for such waste? What about the possible contamination of the entire Columbia River downstream from Hanford? Isn't the necessity of keeping that river clean just as important as the spotted owl? Or is this administration's concern for ecology just for show? I consider this to be one of the stupidest, most dangerous proposals to come out of Washington, D. C., for a long time.

448-1

Sincerely,

Jerry W. Cooney

Jerry W. Cooney

RESPONSE TO COMMENT
COMMENTOR NO. 448: COONEY, JERRY W.

Response to Comment No. 448-1

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 449: WONG, TAMMY

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Tammy Wong Phone: 510-687-3760

Title and Organization:

Address: P.O. Box 5143

City: Walnut Creek State CA Zip 94596

*** COMMENTS ***

As a Concord homeowner and resident, I am deeply concerned about the DOE's proposal to use the Concord Naval Weapon Station for transporting this highly dangerous ~~waste~~ nuclear waste. I oppose this plan, and strongly urge DOE to extend the public comment period so that all people of the Bay Area can express their concerns. Please remove the Concord Naval Weapons Station / SF Bay Area from this toxic waste transport route.

Sincerely

Tammy Wong

449-1

449-2

449-1 (Cont'd.)

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 449: WONG, TAMMY

Response to Comment No. 449-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 449-2

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 days total) to be sufficient for public comment.

COMMENTOR NO. 452: HANSON, JANESS R.

June 10, 1995

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Indipendence Avenue, SW
Washington, DC 20585-0001

RE: Handling Spent Nuclear Fuel
Concord Naval Weapons Station

Dear Mr. Head:

I am a resident of Bay Point, the community on the east border of the Concord Naval Weapons Station in Concord, California. In fact, I reside just 1/2 block from that boundary, very near the Port Chicago Highway eastern entrance to CNWS, and only a few hundred feet from the railroad tracks serving CNWS. I also currently serve as chairperson of the East Contra Costa County Planning Commission, representing the Bay Point community on land use issues.

I am opposed to the handling of spent nuclear fuel--or any nuclear material--at the Concord Naval Weapons Station for a number of reasons. Following are my comments regarding transportation, transfer and storage of nuclear waste, in Concord or any other location:

1. The Concord Naval Weapons Station is located near the Concord faultline, and thus is very vulnerable in case of earthquake. Hundreds of thousands of residents and dozen of toxic-based industries are nearby, also extremely vulnerable to earthquake damage. The combination nearby of dense population and industries handling toxic materials, with nuclear material at CNWS, could be deadly to the entire San Francisco Bay area if an earthquake were centered locally. 452-1

2. Transportation from the Pacific Ocean to the port of the Concord Naval Weapons Station is subject to many potential hazards. The ship channel from the Golden Gate Bridge to Stockton is acknowledged to be inadequate and unsafe for existing ship traffic and a draft Environmental Impact Report is now in process to study possible improvement plans. A ship docking at CNWS must safely negotiate under six bridges across the Bay, and pass by a number of oil refinery and chemical plant dock facilities, competing with ships headed for these facilities, and also loaded with potentially toxic materials. Thus a serious safety factor exists, just to arrive at the CNWS docks. 452-2

3. Personnel handling the large containers of spent nuclear waste for unloading and re-loading to alternate transport at CNWS should be specially trained in nuclear waste handling in order to safeguard against accidents in process. 452-3

4. Transportation from CNWS to the final storage destination will be a special problem, whether by rail or truck transport. Local residents know from experience that railroad derailment accidents have occurred frequently in our neighborhoods, often involving toxic materials going to or from a local industry. These accidents sometimes require notifying local residents about existing environmental problems and halting rail traffic in both directions until danger from toxic materials is contained and remedied. 452-4

RESPONSE TO COMMENT
COMMENTOR NO. 452: HANSON, JANESS R.

Response to Comment No. 452-1

Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the transportation cask. Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident, and thus affect the probability of such accidents; however, the number of earthquake-induced ship and road accidents is small compared to other causes. The port selection criteria do not consider the existence of land-based facilities such as refineries because they have no direct impact on the risk associated with the shipment of foreign research reactor spent nuclear fuel.

Response to Comment No. 452-2

The physical constraints of the passage from San Francisco Bay to Concord NWS were considered as part of the port selection process. The passage does meet the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (port selection Criterion 2; Appendix D, Section D.1.9.2 of the EIS). Appendix D, Section D.5.3.1.3 of the EIS presents a discussion of the determination of the probability of ship accidents used in the EIS. In regard to the size of vessels, increased volumes of hazardous cargos, say gasoline, would not change the accident consequences because the most severe accidents analyzed already assumed a collision with tanker and that the resulting fire was not limited by quantity of fuel available (Attachment D5 to Appendix D). Also, the port selection criteria do not consider the existence of land-based facilities such as refineries because they have no direct impact on the risk associated with the shipment of spent nuclear fuel from foreign research reactors.

Response to Comment No. 452-3

The experience criterion used in the port selection process evaluates the port's experience in handling containerized cargo. Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the casks used to transport it would be low. No

COMMENTOR NO. 452: HANSON, JANESS R. (CONT'D.)

5. Highway transportation is even more subject to problems. State Highway 4, on which CNWS is located, is known locally as "Blood Alley" because of accident frequency. This highway regularly operates at commute time at Grade Level F in volume of traffic--sheer gridlock. If truck transport involved Highway I-80 going east, weather would be a severe problem. Donner Summit is frequently closed for extended periods due to ice or snow storms. If proceeding north on Highway I-5, the route through the Siskiyou Mountains in northern California is also subject to winter delays and accidents. Thus weather conditions could cause the nuclear material to be delayed in its journey to safe storage, waiting either at CNWS, or along the route subject to hazardous roads -- further safety problems for the surrounding public. 452-5

6. The community of Bay Point, with a population of over 20,000, receives its water supply via pipeline crossing through CNWS from Concord along Port Chicago Highway near the docking area. The addition of nuclear waste to CNWS, even temporarily, is just one more safety problem for our drinking water. 452-6

7. The possibility of decreased property values for homeowners in the CNWS, while not a safety factor in itself, is certainly pertinent in the over-all picture. In case of property changing hands, it would be necessary to disclose that one of the activities on nearby CNWS is long-term transportation and handling of nuclear waste. This could be a factor in potential home sales in the future.

8. A paramount concern for all of us is that no local agencies in our area--nor probably in any other area--have the expertise or facilities to respond in the event of a nuclear accident. It is utterly irresponsible of the U.S. government to expect that local law enforcement or environmental personnel would be able to respond adequately to a problem in any or every area through which this material would be transported to its final storage place. 452-7

9. I suggest that in the event that nuclear materials are transported from a foreign country to the United States, a heavy armed military escort, trained for safety and environmental response, be required to accompany each shipment from portal to portal, i.e., from its point of origin to its final storage place. This team should be able to respond, both in case of attack from outside forces, or in case of accident, to contain and minimize the devastation of a nuclear accident. 452-8

10. And finally, no permanent site has yet been established for the final storage of this nuclear material in the United States. A site should first be established, and only later, a study made regarding the safest entry and unloading port. This would insure that the shortest possible in-country route be involved in transporting the waste, and reduce potential additional hazards involved in long-distance transport. 452-9

RESPONSE TO COMMENT
COMMENTOR NO. 452: HANSON, JANESS R. (CONT'D.)

special handling or loading/unloading procedures would be required; experience with handling containers is sufficient. Therefore, no special training of longshoremen is required.

Response to Comment No. 452-4

The commentor's view that transport by rail would be dangerous is noted. Section 4.2.3 of the EIS, however, demonstrates that the risks would be low.

Response to Comment No. 452-5

The commentor's view that transport on highways would also be dangerous is likewise noted. Section 4.2.3 of the EIS, however, demonstrates that the risks would also be low.

For the likely local routes around Concord, see the response to Comment 22-11. In case of delays due to severe weather, DOE has arranged through Memoranda of Agreement with other Federal agencies for the commercial carrier to divert to any Federal installation (e.g., a DOE site or military base) and request "SAFE PARKING" at that facility. (Section 2.7.5).

Response to Comment No. 452-6

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 40 years of spent nuclear fuel shipments, no radioactive contents have ever been released from a spent nuclear fuel transportation cask, nor has a spent nuclear fuel transportation cask ever been punctured, even as the result of an accident. Based on this experience, DOE considers that spent nuclear fuel transportation casks passing through the Concord NWS would not release their contents, and thus would not affect the quality of the water supply for Contra Costa Water District via Mallard Reservoir or any other path. Analysis of a severe accident involving a ship at Concord NWS (Section 4.2.2.3) indicates that the resultant contamination would be so small that no cleanup would be required other than possibly in the immediate vicinity of the accident.

In regard to a possible reduction in property values as a result of the receipt of foreign research reactor spent nuclear fuel at Concord NWS, the analyses in Section 4.2.2.3 and Appendix D, Section D.5 of the EIS determined that no decontamination, interdiction, or condemnation of property would result form the worst plausible accident.

Response to Comment No. 452-7

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive

COMMENTOR NO. 452: HANSON, JANESS R. (CONT'D.)

In summary, I strongly urge that the Concord Naval Weapons Station be dropped as a possible entry site for spent nuclear rods. Please keep me informed as to the subject proposal's resolution.

Sincerely,

Janess R. Hanson

431 Levee Road
Bay Point, CA 94565
(510) 458-0860

RESPONSE TO COMMENT
COMMENTOR NO. 452: HANSON, JANESS R. (CONT'D.)

Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Response to Comment No. 452-8

DOE considers that the foreign research reactor spent nuclear fuel can safely be received at ports and transported to DOE management sites using the security arrangements that have been successful for over 30 years and without additional security such as might be provided by a special military escort. The requirements for physical protection of spent nuclear fuel shipments are specified in the Code of Federal Regulations (10 CFR Part 73). The principal points are: 1) cooperation with local law enforcement agencies, 2) armed escorts, and 3) communications with a communications center that is staffed 24 hours per day. Section 5.4.2 of the EIS provides more information on this issue.

As stated in the response to Comment 452-7, above, Appendix H has been added to the EIS to describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

Response to Comment No. 452-9

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. A detailed, quantitative discussion of these impacts would have to be the subject of future NEPA documentation.

COMMENTOR NO. 453: SCHLOSSTEIN, LEROY & ANNA

June 14/95
1425 N. Shirley St
Tacoma, Wash.
98406

Charles Head Program Manager
Office of Spent Nuclear Fuel Management
U.S. Department of Energy
1000 Independence Ave S.W.
Washington D.C. 20585

Dear Sir

We the people of the City of Tacoma. including My wife & me wish to protest the shipping & Bringing the Nuclear waste through Our Port. 453-1

There are other ports but We like to keep Our Port Clean. We highly Oppose the use of Our Port for Nuclear Waste Handling.

Yours Truly
Leroy & Anna Schlosstein

RESPONSE TO COMMENT
COMMENTOR NO. 453: SCHLOSSTEIN, LEROY & ANNA

Response to Comment No. 453-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any port analyzed in the EIS, is low.

COMMENTOR NO. 454: COHEN, ELLEN

3612 N. 33rd Street
Tacoma, WA 98407
June 15, 1995

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

Dear Mr. Head,

As I will be unable to attend the upcoming public hearing in Tacoma, Washington regarding bringing nuclear waste through Tacoma, I am writing to you to express my strong opinion that an alternative port of entry MUST be found.

The citizens and government of the City of Tacoma have been working extremely hard to clean up Commencement Bay, a site of much industrial pollution and toxic waste (part of which is a Super Fund site). To now present the citizens with the potential disaster that the shipment of nuclear waste brings, would be a major setback to the economic, cultural and environmental renewal that the city has begun.

454-1

In addition, as the parent of a young child, I am especially concerned about the health and safety issues involved in the shipment of nuclear waste through our port and then through city streets and state roads in our area. This is a densely populated community and our streets and roads are heavily traveled, with daily reports of highway accidents. No one can absolutely guarantee the safe shipment of nuclear waste. Even our "job hungry" unions are opposed to this idea because of the health and safety issues.

I strongly urge you to look elsewhere: to an area that is not as densely populated, which does not already have the environmental clean-up problems that Tacoma has, and to an area that expresses interest in providing a port of entry for nuclear waste.

Yours truly,

Ellen Cohen

RESPONSE TO COMMENT
COMMENTOR NO. 454: COHEN, ELLEN

Response to Comment No. 454-1

The commentor's opposition to the use of the Port of Tacoma to receive foreign research reactor spent nuclear fuel is noted. The port selection criteria discussed in Appendix D, Section D.1.9 of the EIS identify those ports that can safely handle foreign research reactor spent nuclear fuel. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma or Portland, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3 of the EIS) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel casks are also low (Section 4.2.2.2 of the EIS).

Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma as noted by the commentor. The analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2 of the EIS). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Based on over 30 years of spent nuclear fuel shipping experience, DOE considers that spent nuclear fuel transportation casks passing through the Port of Tacoma, or any other port or waterway would not affect air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

COMMENTOR NO. 460: LAMBERT, DAVID & MARTI

June 17, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management
U.S. Dept. of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

Dear Mr. Head:

We are opposed to the potential for high level nuclear waste being shipped through our community here in Tacoma, WA. We think there is too much risk in shipping such material through a major metropolitan area like ours. We do not want our children, our friends, neighbors and other community members to be exposed to it. 460-1

Thank you.

Sincerely,
David Lambert, Marti Lambert
2915 N. 10th
Tacoma, WA. 98406

RESPONSE TO COMMENT
COMMENTOR NO. 460: LAMBERT, DAVID & MARTI

Response to Comment No. 460-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 462: TARANOFF, IRENE

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: PETE + IRENE TARANOFF Phone: 510/932-4164

Title and Organization: _____

Address: 3435 BAYBERRY DR.

City: WALNUT CREEK, CA. State CA Zip 94598

*** COMMENTS ***

TO ARRIVE BY SHIP TO CONCORD NAVAL WEAPONS BY SHIP YOU MUST PASS UNDER AT LEAST 5 BRIDGES — THE ONE AT CONCORD-BENICIA IS THE ONLY EVACUATION ROUTE DIRECTLY NORTH — THIS IS A VERY POPULOUS AREA AND NO WHERE TO GO. 462-1

I ALSO AGREE WITH CONGRESSMAN GEORGE MILLER, 7TH DISTRICT, CALIFORNIA JUNE 2, 1995, CALLING FOR "A FULL SCALE REVIEW" OF THE PROPOSAL TO BRING SPENT RODS FROM OVERSEAS. 462-2

To Mail in Comments, Address Correspondence to:

Irene Taranoff

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 462: TARANOFF, IRENE

Response to Comment No. 462-1

The physical constraints of the passage from San Francisco Bay to Concord NWS were considered as part of the port selection process, and the passage was determined to meet the requirements of Criteri,kon 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). As discussed in Appendix D, Section D.1.9 of the EIS, other considerations such as port population, population along the route to the management site, port experience with handling containers, and port facilities have also been considered in making the final selection of ports of entry. Regarding the commentor's concern about the population of the San Francisco Bay area, the port selection process that determined that Concord NWS was an acceptable port, did consider the population of the port and surrounding areas. Appendix D, Section D.1.9.5 of the EIS presents an explanation of the "population" criterion.

Response to Comment No. 462-2

The EIS, and the NEPA process of which it is part, constitute a full scale review of the proposed action concerning foreign research reactor spent nuclear fuel.

COMMENTOR NO. 462: TARANOFF, IRENE (CONT'D.)

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: MR. PETE TARANOFF Phone: 510/933-4164
Title and Organization: SONS IN RETIREMENT
Address: 3435 BAYBERRY DR.
City: WALNUT CREEK State CA Zip 94598

*** COMMENTS ***

MR HEAD -
I You missed the boat in Concord, Calif. mtg because you showed no sympathy & no understanding of the 6 million persons living here
II. You gave no routes to carry nuclear waste and gave the audience doubt that you know the exits are few & really no secret. Short ways out are over vulnerable bridges!
III Would you Sir move to this area with your family when this project takes place. Why the rush. The nations that accept our millions free don't deserve our response - or is it that with all this spent waste we have the monopoly on Nuclear Weapons still to be made? Come on!

462-3

462-4

462-5

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

Pete Taranoff

RESPONSE TO COMMENT
COMMENTOR NO. 462: TARANOFF, IRENE (CONT'D.)

Response to Comment No. 462-3

Health and safety were primary considerations during the evaluation of environmental effects for the proposed action and its management alternatives. Conservative estimates of radiological and nonradiological impacts show that risks to the population and workers are low (Sections 4.2.2 and 4.5 of the EIS). Section 4.10 describes risks associated with U.S. acceptance of the spent nuclear fuel to the proposed action and compares these risks with those due to the natural background radiation and other common risks.

Response to Comment No. 462-4

DOE has not yet selected ports, routes, or transport modes for the foreign research reactor spent nuclear fuel. If Concord NWS is selected, then DOE would choose the best route to I-680 in accordance with Department of Transportation regulations (49 CFR 397.101 (a)(2)). That route could use Route 4, Route 24, and/or Waterfront Road. The State of California routing agency can designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103.

Response to Comment No. 462-5

As demonstrated by the analysis in Section 4 of the EIS, the risks associated with implementation of the proposed action to human health or the environment would be low. The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS).

COMMENTOR NO. 467: NELSON, LINDEN C. & DIANE L.

Linden C. and Diane L. Nelson
414 North "J" Street
Tacoma WA 98403
(206) 627 2071

June 16, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management
U.S. Department of Energy
1000 Independence Ave SW
Washington DC 20585

We say "NO" to Tacoma becoming a port of entry for worldwide nuclear waste.

The Port of Tacoma is a vital part of the economic renewal of the City of Tacoma and should not be used as a port of entry for worldwide nuclear waste. This would only jeopardize the City's potential for continued economic and cultural development that the people of Tacoma have spent considerable time and money to achieve. Nuclear waste is potentially dangerous and would portray a negative image for the City of Tacoma. 467-1

As natives of the Tacoma area, we are delighted with the visual improvements and vitality of Tacoma, a city again beginning to blossom. Tacoma has so much to offer and needs only positive influence to succeed at what so many have set out to accomplish.

We ask that you support our opposition.

Respectfully,
Linden C. Nelson
Diane L. Nelson
Linden C. Nelson
Diane L. Nelson

RESPONSE TO COMMENT
COMMENTOR NO. 467: NELSON, LINDEN C. & DIANE L.

Response to Comment No. 467-1

DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore would not endanger the ports' economic development. Nor should it contribute to any stigma, based on the EIS analyses which indicate that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2 of the EIS). This is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions. As such, there should be no adverse cultural or economic reaction to the use of the port. Historically, there were no adverse economic or cultural impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years during which it was received in the past.

COMMENTOR NO. 471: LEUNG, EDMUND

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: EDMUND LEUNG Phone: (510) 680-8668

Title and Organization: HOMEOWNER

Address: 2621 TRAFALGAR CT.

City: CLYDE State CA Zip 94520

*** COMMENTS ***

Nuclear waste is hazardous to our health safety, environment, nature & almost everything. Why do we have to live with it and has no right to refuse such waste from other countries. Naval Weapons station in Concord is particularly not a good place for this kind of waste. It stands on the borders of four heavily populated cities, Martinez, Pittsburg, Clyde & Concord, in the center of four overly-crowded highways, Hwy. 24, 4, 242 and 680. These highways are jammed up in the morning, noon, afternoon and early evening. I don't think anyone of us would like to receive one more headache additional to traffic in our daily life. Please re-consider. Thanks.

471-1

To Mail in Comments/Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 471: LEUNG, EDMUND

Response to Comment No. 471-1

The port selection process is described in detail in Appendix D, Section D.1.9 of the EIS. One of the criteria (Criterion 5) evaluates the population in and around the port, and along the routes from the port to the management site(s). DOE considers that the port selection criteria successfully indicate those ports that can safely handle foreign research reactor spent nuclear fuel (Appendix D, Section D.1.9) with the least risk to populations near the port. DOE further considers that the use of any of the ports indicated by the port selection process, including the Concord NWS, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel casks are also low (Section 4.2.2.2). The specific population of the port area is included in the analysis of the impacts of accidents (Appendix D, Section D.5 of the EIS).

COMMENTOR NO. 473: TOLBERT, ROBERT N.

6209 N.W. 395th St.
Woodland, Wa. 98674
June 14, 1995

Dept. of Energy
Office of Spent Fuel Management
1000 Independence ave. S.W.
Washington, D.C. 20585-0001

To Charles R. Head
EM-37

Dear Mr. Head,

We are opposed to the importation of high-level nuclear waste from anywhere in the world. 473-1

Our understanding is that our own nuclear waste has gone begging for a permanent waste storage. Why then should we be bringing in from foreign countries waste they have not been able to store either. Hanford, in our state, already has a leaking storage pool very close to the Columbia River.

I am not willing to spend my money on what appears to be a losing short and/or long term problem of this magnitude.

Sincerely

Robert N. Tolbert

Eileen M. Tolbert

RESPONSE TO COMMENT
COMMENTOR NO. 473: TOLBERT, ROBERT N.

Response to Comment No. 473-1

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

COMMENTOR NO. 476: JACKSON, GEORGIA F.

29700 NE Healy Rd
Amboy, WA 98601
June 15, 1995

Dept. of Energy
c/o Charles R. Head
Office of Spent Fuel Management, EM 37,
1000 Independence Ave. SW
Washington, D.C. 20585-0001

Dear Mr. Head:

I recently read in our newspaper that much of the world's nuclear waste is scheduled to be dumped at the "K-Basin" area at Hanford near the Columbia River in the State of Washington. If this information is correct, I request that you do all in your power to put a stop to this planned dumping of high-level nuclear waste in the State of Washington or anywhere in the United States.

476-1

RESPONSE TO COMMENT
COMMENTOR NO. 476: JACKSON, GEORGIA F.

Response to Comment No. 476-1

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Page 2

It would seem this country has become the dumping ground of the world. We have enough problems cleaning up our own messes. We don't need the responsibility of cleaning up all the problems of every other nation, too.

Respectfully,
Georgia F. Jackson

COMMENTOR NO. 478: HANEWALD, KARL

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: KARL HANEWALD Phone: (510)687-0459

Title and Organization: NONE

Address: 1831 ELKWOOD DRIVE

City: CONCORD State CA Zip 94519-1142

*** COMMENTS ***

I CANNOT UNDERSTAND WHY (DOE) FEELS OBLIGATED TO ADVISE LOCAL GOV'T (CITY OF CONCORD) IN THE FIRST PLACE. THE SO CALLED CONCORD NAVAL WEAPONS STATION IS NOT PART & PARCEL OF CITY OF CONCORD. — RATHER, IT IS UNINCORPORATED FEDERAL LAND. — THE EXCUTIVE BRANCH OF THE FEDERAL GOV'T HAS A MANDATE FROM LEGISLATIVE BRANCH, THE U.S. CONGRESS, TO DO JUST THAT. PURSUE A NUCLEAR WEAPONS NONPROLIFERATION POLICY. IT'S THAT SIMPLE. 478-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

Karl Hanewald

JUNE 6TH, 1995

CC: THE CONTRA COSTA BOARD OF SUPERVISORS
CC: THE CONCORD CITY COUNCIL.

RESPONSE TO COMMENT
COMMENTOR NO. 478: HANEWALD, KARL

Response to Comment No. 478-1

NEPA requires that federal agencies prepare environmental impact statements on proposed major federal actions that significantly affect the environment. Therefore, as part of the NEPA process, the public must receive notice of the proposed action, and opportunities to comment on the proposed action and on the draft EIS. DOE must hold a scoping meeting (it held nine on this spent nuclear fuel proposed policy) and at least one public hearing (DOE held 17). Public input is critical to the NEPA decisionmaking process.

—"SHIPS MAY COME
SHIPS MAY GO
WE DON'T KNOW THE ONES
THAT GLOW." ——
HOW BACKAT?!

SPENT NUCLEAR FUEL RODS
DO NOT GLOW; NOR DO THEY
BLOW UP INTO YOUR FACE.——
WHENEVER THERE IS A NUCLEAR
POWERED AIRCRAFT CARRIER,
A NUCLEAR POWERED SUBMARINE,
COMES ABOUT, THRU THE GOLDEN
GATE, WITH ALL THE THAT LETHAL
STUFF ABOARD, THE UNITED STATES
NAVY DOES NOT FILE AN
ENVIORNMENTAL IMPACT STATEMENT.
NOR SHOULD THEY, - IT IS NOT REQUIRED.-
IT IS MATTER OF NATIONAL SECURITY.——

COMMENTOR NO. 479: CROOKS, GREGORY W.

June 15, 1995

Charles Head
Program Manager
Office of Spent Nuclear Fuel Management
U.S. Dept. of Energy
1000 Independent Ave. S.W.
Washington D.C. 20585

Mr. Head:

I am writing to voice my strong opposition to the use of the port of Tacoma, Washington as an entry port for nuclear waste. 479-1

If it is necessary to transport this material by way of commercial shipping lines only, thereby requiring passage through a U.S. port and handling by it's residents, I am extremely surprised that a city located at a far inland point of the fragile Puget Sound has been given serious consideration by your department.

Since there are obvious concerns about potential danger to the local population center and the ecosystem, I cannot believe that the government is seemingly willing to package and ship this material with no monitoring or assistance to the handlers.

I realize that non-proliferation of nuclear weapons is an important policy for our country to adopt. If, however, the logistics of this government decision cannot be carried out without passing off the burden of safety and security to the general public, I feel it is unduliful.

Yours,

Gregory W. Crooks
Lifetime Tacoma resident

Gregory Crooks
9702 N. Lawrence
Tacoma, Wa. 98407

RESPONSE TO COMMENT
COMMENTOR NO. 479: CROOKS, GREGORY W.

Response to Comment No. 479-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Puget Sound to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. The analysis in the EIS indicates that the use of the Port of Tacoma would not pose any significant risk to either the port personnel, the population near the port, or Puget Sound. The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS). The physical constraints of the marine passage to the Port of Tacoma do not alter the determination that it meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2).

COMMENTOR NO. 480:
EMPLOYEE OWNERS OF FORT VANCOUVER PLYWOOD COMPANY

DOE
C/O Charles E. Head
Office of Spent Fuel Management
EM, 37
1000 Independence Avenue S.W.
Washington, D.C. 20585-0001

Subject: Nuclear Waste Storage from other Countries

Exposing the whole West Coast to possible, and most likely, hazardous accidents, is inhuman, as well as poor judgement on our government's part, for keeping America clean and beautiful. 480-1

Right now we (the Northwest) are already exposed by Hanford's Nuclear waste storage. Why do we wish to import more for us, the people to pay for? In health, birth defects, and animal deformities, not to speak of, the tax payers' money. The U. S. can not clean up or contain our own waste from nuclear generation.

The irresponsibility of our government to even propose such a plan, is absurd.

PLEASE, DO NOT CONSIDER SUCH A PLAN.

Our company has worked hard to comply with the environmental laws for clean air and water. Now the DOE wants to contaminate every living thing with other nations' nuclear waste!

Please, for future generations; Do not import nuclear waste to our beautiful northwest.

Thank you,

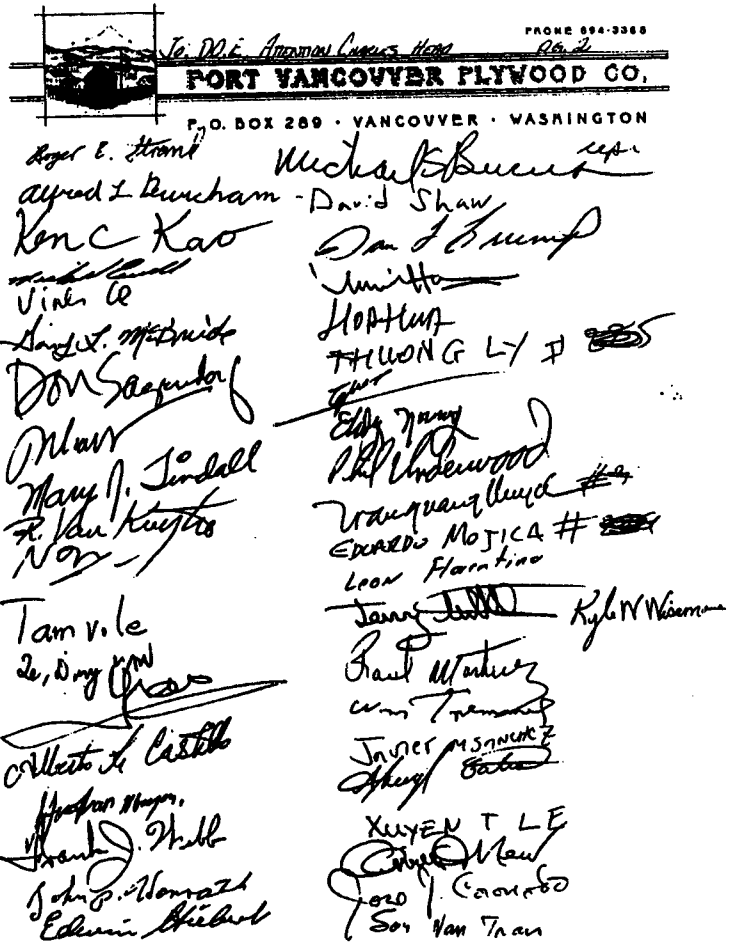
Employee owners of Fort Vancouver Plywood Company, and all of their families.

RESPONSE TO COMMENT
COMMENTOR NO. 480:
EMPLOYEE OWNERS OF FORT VANCOUVER PLYWOOD COMPANY

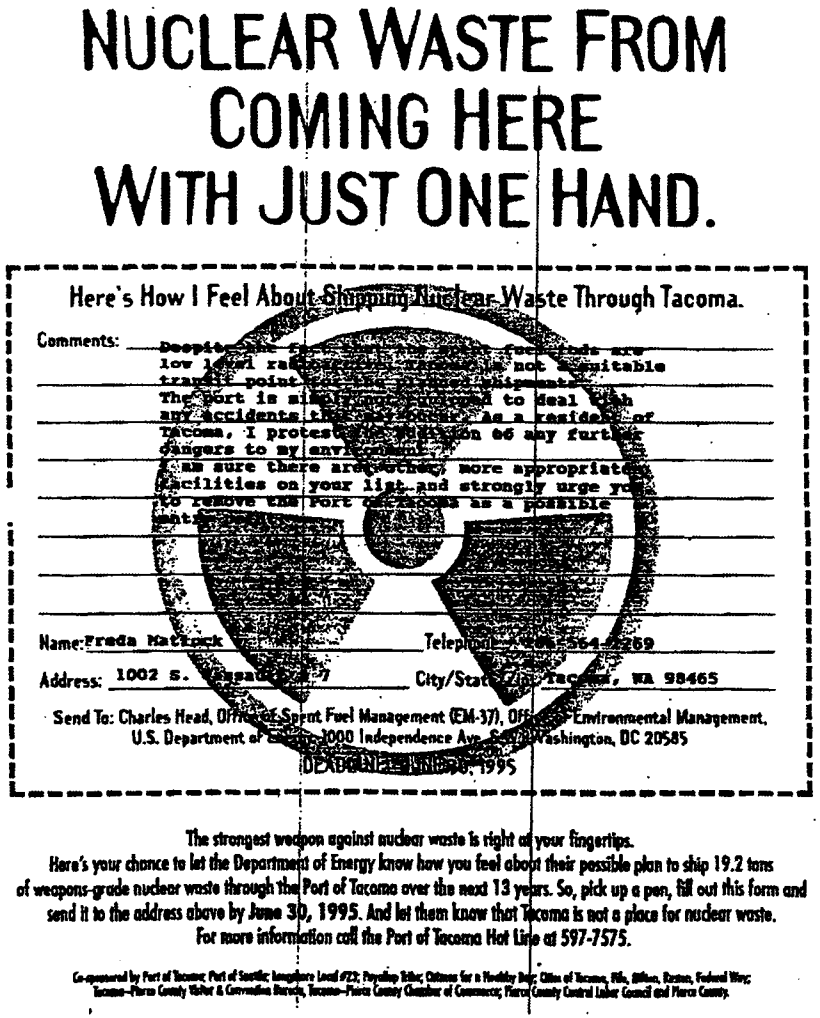
Response to Comment No. 480-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel to the Pacific Northwest is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to any of the ports analyzed in the EIS, including the Port of Tacoma, is low. Section 4.2.4 of the EIS evaluates the risk of storage of the spent nuclear fuel and concludes that it is low.

COMMENTOR NO. 480:
EMPLOYEE OWNERS OF FORT VANCOUVER PLYWOOD COMPANY (CONT'D.)



RESPONSE TO COMMENT
COMMENTOR NO. 480: EMPLOYEE OWNERS OF FORT VANCOUVER PLYWOOD COMPANY (CONT'D.)



NUCLEAR WASTE FROM
COMING HERE
WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: Despite [illegible] low level radioactive [illegible] are not a suitable transit point for the proposed shipments. The Port is simply not equipped to deal with any accidents that may occur. As a resident of Tacoma, I protest [illegible] any further dangers to my environment. I am sure there are other, more appropriate facilities on your list, and strongly urge you to remove the Port of Tacoma as a possible [illegible]

Name: Freda Matlock Telephone: [illegible]

Address: 1002 S. [illegible] City/State/Zip: Tacoma, WA 98465

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. SW, Washington, DC 20585

DEADLINE: June 30, 1995

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Fircrest, Federal Way; Tacoma-Pierce County Labor & Convention Bureau, Tacoma-Pierce County Chamber of Commerce, Pierce County Central Labor Council and Pierce County.

486-1

Response to Comment No. 486-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 488: BENJAMIN, RICHARD W.

Comments on the Draft Environmental Impact Statement on Foreign Research Reactor Spent Nuclear Fuel

Richard W. Benjamin
805 Hammond Drive
North Augusta, SC 29841
Phone: (803) 279-2560

From the Draft EIS: "The proposed action in this EIS is to adopt a policy to manage foreign research reactor spent nuclear fuel, in 41 foreign countries, to promote United States nuclear weapons nonproliferation policy objectives".

The policy should be aimed at removing this Highly Enriched (HEU) Spent Nuclear Fuel (SNF) from any possibility of malevolent use as quickly and as permanently as possible. This suggests that the fuel should be placed as quickly as possible under IAEA or US safeguards, particularly that fuel stored at present in the less-well-controlled and less-stable parts of the world. While the fuel stored in Europe is important, it is not the most "at risk". After this fuel is safeguarded, it should be rendered unsuitable for weapons use as quickly as possible through blending the HEU with natural or depleted uranium until it contains less than 20% U-235.

The best solution to these problems is a strategy that offers a technically, politically, and economically sound approach for disposing permanently of aluminum-based, HEU SNF. It depends upon using both the US processing facilities at the Savannah River Site (SRS) and the smaller UK processing facilities at Dounreay, Scotland to process and blend HEU-aluminum fuels to commercial-grade Low Enriched Uranium (LEU) under IAEA safeguards. **This ends the proliferation risk and substantially reduces accidental criticality risks of HEU SNF** and puts the recovered uranium and the high level waste into acceptable forms for commercial utilization and geologic disposal, respectively.

488-1

I suggest the following integrated approach for HEU-Aluminum SNF disposition:

1. The US Government establishes agreements and protocols with the foreign and domestic research reactor operators, the European Community, and the British Processing Facility at Dounreay which will:

   (a) return most existing HEU fuels to the US for disposal by the year 2003.

   (b) make arrangements for the future (post 2003) supply and disposal of reduced enrichment fuels (non-weapons grade uranium), for both domestic and foreign reactors, through US and European nuclear fuel service organizations.

   (c) arrange for the processing at Dounreay (under IAEA safeguards) of some of the foreign research reactor HEU spent nuclear fuel. Separated HEU would be blended to commercial-grade LEU in the facility so that it would no longer present a proliferation risk and could be used in current commercial reactors. The primary reason for this is to keep the small Dounreay processing facility open beyond the time when SRS processing facilities shut down.

2. Use existing DOE processing and waste treatment facilities at SRS to treat all aluminum-based enriched uranium spent fuels stored at DOE sites and returned

488-2

RESPONSE TO COMMENT
COMMENTOR NO. 488: BENJAMIN, RICHARD W.

Response to Comment No. 488-1

The commentor's support for removal of HEU from potential diversion to use in nuclear weapons is noted. The commentor's preference for blending down HEU is likewise noted (Section 2.2.2.6 of the EIS). The commentor's preference for Management Alternative 3 (management partly in the United States and partly overseas, Section 2.4 of the EIS) is noted.

Response to Comment No. 488-2

The commentor's suggestion for an effective implementation of the proposed action is noted. The suggestion supports Management Alternative 3 described in Section 2.4 of the EIS characterized by some reprocessing of foreign research reactor fuel in Europe and chemical separation of aluminum-based fuel at the Savannah River Site.

from research/test reactors. Assurance that HEU would not be used for weapons would be made an inherent part of the chemical processing operations by blending HEU solution with natural or depleted uranium to create a low enriched uranium (LEU) product. The relatively small high level waste (HLW) stream would be treated in existing waste processing facilities with the existing 30 million gallons of high level waste (HLW) at SRS and converted into stainless steel encapsulated borosilicate glass waste forms for geologic disposal. When the backlog of HEU spent fuel is completed, SRS processing facilities would be shut down and the remaining small annual quantity of research reactor HEU SNF processed at Dounreay (Dounreay is much smaller than the SRS facility and can treat the small annual throughput more economically).

488-2 (Cont'd.)

Benefits

If this integrated approach were implemented, it would:

- dispose of the waste products and weapons-capable uranium in the spent fuel using existing technologies now and eliminate prolonged storage with no established method for final disposal.
- treat highly radioactive fission products with existing high level SRS waste and vitrify it into borosilicate glass waste forms in DWPF.
- isotopically dilute highly enriched uranium during processing, creating LEU for use in power or research reactor fuels.
- comply with US non-proliferation goals.

Advantages

This approach has several advantages over other alternatives for disposing of enriched uranium-aluminum spent fuels, including:

- significantly reduces uncertainties relative to other alternatives, for it is the quickest route to an already acceptable waste form for geologic disposal and commercial re-use of the uranium. In addition there is currently no assurance that HEU spent fuel will ever be acceptable for geologic disposal.
- provides the smallest number of HLW canisters for geologic disposal.
- carries the lowest capital investment.
- probably provides the lowest net (total) cost.
- provides no additional significant safety, health or environmental impacts.

COMMENTOR NO. 497: JOHNSTON, CANDICE

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Candice Johnston Phone: 510 8270553
Title and Organization: LVN - resident-citizen
Address: 1271 Apple Dr.
City: Concord State Ca Zip 94518

This can contaminate all this county's drinking water! The canal runs through the Weapons Station

*** COMMENTS ***

No Nuclear Waste to be sent to Concord Concord Naval Weapon's Station

Accident's & train derailments with 13 sent to the hospital with radiation poisoning 497-1
1944 - Explosion at Port Chicago
Earthquake's - Concord fault is active
This is a Health hazard to all of us. It will cause Depreciation value of land & property in Concord, Ca.

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

Keep the nuclear waste in each country that used it
Quit making nuclear product's
Candice Johnston don

RESPONSE TO COMMENT
COMMENTOR NO. 497: JOHNSTON, CANDICE

Response to Comment No. 497-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 40 years of spent nuclear fuel shipments, no radioactive contents have ever been released from a spent nuclear fuel transportation cask, nor has a spent nuclear fuel transportation cask ever been punctured, even as the result of an accident. Based on this experience, DOE considers that spent nuclear fuel transportation casks passing through the Concord NWS would not release their radioactive contents, and would not affect the quality of the water supply for Contra Costa Water District via Mallard reservoir or any other path. Analysis of a severe accident involving a ship at Concord NWS (Section 4.2.2.3 of the EIS) indicates that the resultant contamination would be so small that no cleanup would be required, other than possibly in the immediate vicinity of the accident. Therefore, contamination of Mallard Reservoir would be minimal. To insure this was the case, if such a severe accident were to occur, all water supplies in the area, as well as food and air, would be tested for contamination.

As a result of the television report the commentor cites, the Contra Costa County Board of Supervisors initiated an investigation of the allegations. Their report on the subject, "Safety at the Concord Naval Weapons Station" dated November 2, 1993, concluded in part, "There were no incidents involving explosions or radiation exposure," and that "Many of the reported incidents were not accidents caused by Weapons Station employees but, rather, were discoveries by employees that materials being received had been damaged during loading or transit. In some cases the shipments had not been properly blocked, braced or banded."

In fact, the safety record at Concord NWS is significantly better than that of similar activities in ports in the private sector. According to the Department of Labor statistics, for the category of marine cargo handling, the number of lost workday cases per 100 full-time workers for 1993 was 7.1 nationwide (1994 data not available), which is typical. The number of lost workday cases per 100 workers at Concord NWS for the first three quarters of fiscal year 1995 was 5.3, which is also typical for Concord.

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Spent nuclear fuel transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the transportation

COMMENTOR NO. 497: JOHNSTON, CANDICE (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 497: JOHNSTON, CANDICE (CONT'D.)

cask. Further, the analyses of impacts associated with accidents involving foreign research reactor spent nuclear fuel presented in Section 4.2.2.3 of the EIS demonstrate that the use of any of the selected ports would not pose any significant risk to the port personnel or the population near the ports.

In regard to a possible reduction in property values as a result of the receipt of foreign research reactor spent nuclear fuel at Concord NWS, the analyses in Section 4.2.2.3 and Appendix D, Section D.5 of the EIS determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident.

The commentor's preference for keeping this waste in each country that used it, is noted. Many foreign research reactor operators have no immediate means of disposing of their spent nuclear fuel. (Section 1.2 of the EIS). Management Alternative 1 or 3, if implemented, would provide foreign research reactor operators with a limited time period to develop arrangements for disposition of their spent nuclear fuel outside of the United States, while avoiding reactor shutdowns and conversions from LEU fuel to HEU fuel (Section 1.2 of the EIS).

COMMENTOR NO. 499: MOO, DENICE

Dear Mr. Head,

Nuclear Fuel is one of the most dangerous and deadly elements on earth. Would you let your children or your [illegible] live on it? Me either. Please Keep it out of Port of Tacoma. Thanks

Denice

499-1

RESPONSE TO COMMENT
COMMENTOR NO. 499: MOO, DENICE

Response to Comment No. 499-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 501: JACOBSMEYER, ELIZABETH

June 14, 1995

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585-0001

Dear Mr. Head:

I attended the D.O.E. public hearing in Concord, California on May 22, 1995. My husband (who also attended the hearing) and I are homeowners in Concord. Our subdivision borders on the Concord Naval Weapons Station.

I am very much opposed to the transportation of spent nuclear fuel out through the "host countries'" ports, in through United States' ports, and overland across our nation to temporary processing and storage facilities. This action poses considerable risks in the case of an accident to millions of people living on and near the shipping paths in the host countries and the United States, and to all points in between, as well as to people directly involved with the handling of the toxic materials. 501-1

The only rational course of action is to minimize the distance spent nuclear waste must travel between reactor and reprocessing and/or storage, which action is Management Alternative 2 (S.4.6., Draft Environmental Impact Statement, pg. 44). As for the "drawbacks" to Management Alternative 2 as summarized in the D.E.I.S., Subsection S.4.6.1.:

1. Cost of U.S. assistance to help countries set up a secure area, purchase storage casks, etc..

If the United States does not spend the money overseas to set up secure storage areas for the nuclear waste we will spend it here for the same purpose. Also, where is it written that the U.S. must totally bankroll this operation? Most of the host countries involved are "first-world", developed nations that can darn well afford to build containment facilities and accept responsibility for their own nuclear waste products. 501-2

2. "The accumulation overseas of ever larger amounts of spent nuclear fuel containing HEU poses a risk that such weapons-usable material might be illicitly diverted to a weapons program."

Because "Only spent nuclear fuel containing uranium enriched in the United States would be covered by the proposed (D.O.E.) policy" (Cover Sheet, D.E.I.S.), the obvious solution is for the United States to totally withhold highly-enriched uranium from host countries. The incentive for host countries to expend funds to build facilities using low-enriched uranium for their

RESPONSE TO COMMENT
COMMENTOR NO. 501: JACOBSMEYER, ELIZABETH

Response to Comment No. 501-1

The commentor's opposition to acceptance of foreign research reactor spent nuclear fuel into the United States is noted. The risks to the environment and the health and safety of the workers and the public that would result from acceptance of the foreign research reactor spent nuclear fuel into the U.S. were determined to be low as indicated in Section 4.2 of the EIS.

Response to Comment No. 501-2

The commentor's preference for Management Alternative 2, is noted. This alternative is discussed in Sections 2.3 and 4.4 of the EIS.

As discussed in Section 4.4.1 of the EIS, the cost of establishing storage facilities in the foreign countries would be much greater than building one or two storage facilities in the United States. Furthermore, the United States would not necessarily pay for the entire operation. Financing alternatives are discussed in Sections 2.2.1.2 and 2.2.2.3 of the EIS.

As discussed in Section 1.1 of the EIS, the United States has not supplied HEU to any foreign research reactors since 1992 and has no plans to resume this activity. There are, however, other possible suppliers, such as Russia and China, and there is a significant backlog of spent nuclear fuel containing U.S.-origin HEU abroad at this time.

COMMENTOR NO. 501: JACOBSMEYER, ELIZABETH (CONT'D.)

"peacetime" research and to refuse shipments of highly-enriched uranium from countries other than the United States is their participation in NPT. THE UNITED STATES MUST NOT, UNDER ANY CIRCUMSTANCES, PROVIDE URANIUM FUEL TO COUNTRIES THAT ARE NOT SIGNATORIES TO THE TREATY ON NON-PROLIFERATION OF NUCLEAR WEAPONS.

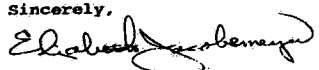
501-2 (Cont'd.)

Any host country that uses spent HEU to develop nuclear weapons or sells spent HEU to third-party nations for the purpose of developing nuclear weapons, or for any ostensible purpose, is by definition hostile to the goals of the NPT, the United States of America, and its allies. Because some, if not most, of the spent fuel concerned supplied to such host countries would be from the U.S., such countries would essentially be blackmailing the people of the United States with their own philanthropy, as the nuclear fuel in question is supposedly being used for the benefit of the host countries' medical and scientific research.

501-3

In summary, I feel the host countries must accept the lion's share of responsibility for their nuclear programs for the purposes of safety in the handling of spent nuclear fuel and to honor their ethical commitment as signatories of the NPT. U.S. management and technical assistance in the reprocessing and/or storage of spent nuclear waste in the host countries is both logical and desirable, and shoves up the United States' commitment to cooperate with other nations in the very serious business of decreasing the proliferation of nuclear weapons in our world.

Sincerely,



Elizabeth Jacobsmeyer
1930 Palo Verde Drive
Concord, CA 94519
(510) 682-6581

cc: Mayor Helen Allen
City of Concord
1950 Parkside Drive
Concord, CA 94519

Supervisor Mark DeSaulnier
2425 Bisso Lane, Suite 110
Concord, CA 94520

Gov. Pete Wilson
Constituent Affairs
State Capitol
Sacramento, CA 95814

Rep. George Miller
2205 Rayburn House Off. Bldg.
Washington, D.C. 20515-0507

Sen. Barbara Boxer
112 Hart Senate Off. Bldg.
Washington, D.C. 20510

Sen. Dianne Feinstein
367 Hart Senate Off. Bldg.
Washington, D.C. 20510

RESPONSE TO COMMENT
COMMENTOR NO. 501: JACOBSMEYER, ELIZABETH (CONT'D.)

Response to Comment No. 501-3

An objective of the proposed policy is to support the continuation of cooperative agreements with foreign nations in reducing the risks of nuclear weapons proliferation (Sections 1.1 and 1.2 of the EIS). Foreign research reactor operators purchase their fuel and bear the costs of reactor operations. It is inaccurate to characterize foreign research reactor operations as dependent on charity. Most of the radioisotopes used for medical analyses in the United States are produced in foreign research reactors.

COMMENTOR NO. 502: MABRY, DIANE C.

DIANE C. MABRY
11408 N.E. 98TH CIRCLE
VANCOUVER, WA. 98662
360-892-6325/360-694-8501

D.O.E.- CHARLES E. HEAD
OFFICE OF SPENT FUEL MANAGEMENT
EM-37, 1000 INDEPENDENCE AVE. SW
WASHINGTON, D.C. 20585-0001

DEAR MR. HEAD,

THIS LETTER IS IN RESPONSE TO THE PROPOSAL TO IMPORT HIGH-LEVEL NUCLEAR WASTE FROM OTHER COUNTRIES AND ROUTE THEM THROUGH OUR AREA TO HANFORD. I MUST SAY I STRONGLY PROTEST THIS PROPOSAL AS I HAVE TO LIVE HERE AND I AM RAISING MY CHILDREN HERE. I BELEIVE IF YOU PROCEED WITH THIS PROPOSAL YOU WILL BE PUTTING ALL OF US AT RISK OF GREAT DANGER , AND GREAT EXPENSE THAT WE SHOULD NOT HAVE TO TOLERATE.

HANFORD IS ALREADY A HIGH-RISK AREA WITH A LEAKING STORAGE POOL ALONGSIDE THE COLUMBIA RIVER AND IS NOT AN ACCEPTABLE STORAGE FACILITY FOR THE WASTE ALREADY STORED THERE, WASTE THAT WILL NOT GO AWAY. HOW CAN YOU POSSIBLY CONSIDER TAKING ON THIS RESPONSIBILITY? I IMPLORE YOU TO FIGHT THIS PROPOSAL AND PROTECT OUR COUNTRY BEFORE TAKING ON EVERYONE ELSE'S PROBLEMS. I WANT MY CHILDREN TO BE SAFE!

502-1

SINCERELY,

Diane Mabry

DIANE C. MABRY

RESPONSE TO COMMENT
COMMENTOR NO. 502: MABRY, DIANE C.

Response to Comment No. 502-1

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 503: MICKEY, STEPHEN

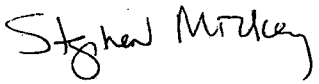
Stephen Mickey
19806 N.E. 224 Ave.
Brush Prairie, Washington
98606

Dear Mr. Head

I am opposed and ask you in my behalf as my appointed public official not to import more spent nuclear fuel to Hanford Washington. Our problem here is already serious beyond repair and we need no more contaminants in our death yard. 503-1

My wife and I both hold Masters degrees and have thought this issue through carefully. We both want no more spent fuel here. Please write to us and lets us know what your intentions are. Thank you

Stephen Mickey



RESPONSE TO COMMENT
COMMENTOR NO. 503: MICKEY, STEPHEN

Response to Comment No. 503-1

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 504: DEWEY, DAVID D.

June 14, 1995

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585-0001

Dear Mr. Head:

I attended the D.O.E. public hearing in Concord, California on May 22, 1995. My wife and I own our home in Concord.

I am concerned about several of the conclusions in the Draft EIS about the use of the Concord Naval Weapons Station as a port for shipment of nuclear research reactor spent fuel. Specifically, I do not understand how Concord passed the six screening criteria for port selection.

Criteria 2 - Ports must provide a safe passageway for ships from the open ocean to the selected terminals.

Concord issue: The passageway to the Concord Naval Weapons Station passes through the Golden Gate Bridge, the Carquinez Strait, and the Delta to Concord. This is a narrow passageway and very heavily traveled due to the proliferation of oil refineries in the area. This does not qualify as a safe passageway.

Criteria 5 - Ports must have the lowest human populations to the extent economically feasible and maximum extent practicable.

Concord issue: Concord is part of the Bay Area with a population of 6.3 million people. This is not a low population area. The decision to choose Concord must have been made based on Concord's population of 113 thousand only. Oakland was taken out of consideration as a port because of the high population center in close proximity to the port. Concord should be withdrawn from the list for the same reason.

Criteria 6 - Ports must be reasonably close to potential storage sites so that foreign research reactor spent fuel can be quickly delivered to the storage site.

Concord issue: Concord is not reasonably close and fuel would not be quickly delivered. Any shipment would have to go over the Sierra which could be dangerous anytime of the year. Also freeways around the Weapons Station are very accident-prone.

504-1

RESPONSE TO COMMENT
COMMENTOR NO. 504: DEWEY, DAVID D.

Response to Comment No. 504-1

The physical constraints of the passage from the Pacific, through San Francisco Bay to Concord NWS were considered as part of the port selection process. This passage meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS).

The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (port selection Criterion 2; Appendix D, Section D.1.9.2 of the EIS). Appendix D, Section D.5.3.1.3 of the EIS presents a discussion of the determination of the probability of ship accidents used in the EIS.

The worst plausible accident associated with the shipment of foreign research reactor spent nuclear fuel is considered to be the collision of the ship carrying the spent nuclear fuel with a petroleum tanker. In this accident, which is evaluated in the EIS, the transportation cask is assumed to be damaged in the collision, then subjected to a fire that resulted from the collision (Appendix D, Section D.5). Section 4.2.2.3 of the EIS discusses the assumptions that went into the port accident analyses and the results of those analyses. The addition of a mishap at a land-based facility, although it might in some way be the precursor for a severe accident involving a spent nuclear fuel-carrying ship, would not add to the severity of the worst plausible accident discussed above. As a result, the existence of land-based facilities such as refineries have no direct impact on the risk associated with spent nuclear fuel shipments, and are not included in the port selection criteria.

The distance from the port to the management site is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations such as port population, route population, port experience with handling containers, and access to the ocean would also be considered in making the final selection of ports of entry. Appendix D, Section D.1.9 of the EIS presents details of the port selection process.

COMMENTOR NO. 504: DEWEY, DAVID D. (CONT'D.)

Please rethink Concord's status in relation to the port screening criteria and for the safety of the Bay Area, please take Concord off the list of ports.

Sincerely,

David D. Dewey

David D. Dewey
1930 Palo Verde Drive
Concord, CA 94519
(510) 682-6581

cc: Mayor Helen Allen
City of Concord
1950 Parkside Drive
Concord, CA 94519

Supervisor Mark DeSaulnier
2425 Bisso Lane, Suite 110
Concord, CA 94520

Gov. Pete Wilson
Constituent Affairs
State Capitol
Sacramento, CA 95814

Rep. George Miller
2205 Rayburn House Off. Bldg.
Washington, D.C. 20515-0507

Sen. Barbara Boxer
112 Hart Senate Off. Bldg.
Washington, D.C. 20510

Sen. Dianne Feinstein
367 Hart Senate Off. Bldg.
Washington, D.C. 20510

RESPONSE TO COMMENT
COMMENTOR NO. 504: DEWEY, DAVID D. (CONT'D.)

COMMENTOR NO. 515: KOMAROMY, MARGI

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: MARGI KOMAROMY Phone: 510 680 4961

Title and Organization: EXECUTIVE-ADMINISTRATOR-SECRETARY

Address: 3135 CLAYTON RD #103A

City: CONCORD State CA Zip 94519-2712

*** COMMENTS ***

I live in Clyde with my fiancé and his family. It would make us all feel very uncomfortably scared to know that toxic nuclear waste would be in our backyards. Preferrably it would best serve this nation well to close down the Naval Weapons Station, and to utilize energies within the nation toward peace + alternate forms of research for electricity etc. 515-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 515: KOMAROMY, MARGI

Response to Comment No. 515-1

Concord NWS is a Department of Defense facility. Any decision to close it down would be undertaken as a separate action by the Department of Defense. In the foreseeable future, Concord NWS would be an operating facility.

COMMENTOR NO. 516: POE, W. LEE, JR.

June 19,1995
807 E. Rollingwood Rd.
Aiken, SC 29801

Foreign Research Reactor EIS
Office of Spent Nuclear Fuel Management (EM-37)
Office of Environmental Management
United States Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

Dear Sir:

Comments on Policy Concerning Foreign Research Reactor Spent Nuclear Fuel in DEIS

I would like to provide my comments on DOE/EIS-0218-D.

If, as the EIS says, there is a national benefit for the United States to receive foreign highly enriched fuel; then the U. S. should adopt a 10-year policy for receiving this fuel. The FRR SNF should be sent to either SRS or INEL for safe interim storage and/or processing. I feel strongly that DOE should not plan to store SNF indefinitely at SRS or INEL. As I state in the bulk of this letter, the scope of the management alternatives must be expanded to include all management activities for the SNF up to actual disposal.

Near-term plans should be made and demonstrated to be acceptable for disposal of these materials in a geologic repository out of the way of man. My present preference is reprocess the SNF, recover the HEU, dilute it to the 20% level that no longer presents a proliferation problem and reuse the enriched uranium. Both SRS and INEL have demonstrated that this can be accomplished in a safe, environmentally sound method using essentially available equipment and facilities. I strongly believe that this recovery and dilution should be DOE's selected alternative for HEU research reactor fuels. My major justification for this is that SRS has developed and is in the process of implementing means to dispose of low level waste, TRU waste and high level waste. Conditioning and disposal can be accomplished in an environmentally sound manner. Disposal requires DOE to complete and start-up the WIPP and high-level radioactive waste geologic repository. The suitability of these wastes for geologic disposal has been well demonstrated. I understand SRS is further along in demonstration of the high-level waste disposal than INEL; therefore, SRS is a better choice to receive this FRR SNF.

516-1

516-2

The DEIS seems to favor Alternative 1, safe interim storage of the FRR SNF, using for SRS, a two phased storage mode.

RESPONSE TO COMMENT
COMMENTOR NO. 516: POE, W. LEE, JR.

Response to Comment No. 516-1

The commentor's preference for domestic chemical separation is noted. This is Management Alternative 1, Implementation Alternative 6, which is discussed in Sections 2.2.2.6 and 4.3.6 of the EIS. The commentor's preference for blending the HEU down to LEU would also be DOE's stated preference. It is also part of Management Alternative 3, which is discussed in Section 2.4 and 5.5 of the EIS.

Response to Comment No. 516-2

The commentor's preference for chemical separation at the Savannah River Site over the Idaho National Engineering Laboratory is noted. In the near future the chemical separation facilities at the Savannah River Site might resume operations for the foreign research reactor spent nuclear fuel or for another purpose. These options are discussed in Section 2.2.2.6 of the EIS.

DOE announced a Record of Decision on May 30, 1995 for the Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs EIS. Chemical separation at Idaho National Engineering Laboratory was not included in this Record of Decision, so additional site-specific NEPA documentation would be required to restart the chemical separation facilities at this management site.

- Phase I would be to store the SNF in RBOF and L-Reactor Basin. RBOF has a demonstrated corrosion-free environment and could be used for long-term interim storage. L-Reactor Basin was designed for short-term wet storage and has had corrosion problems storing aluminum clad SNF for long periods. There is a corrective action (underway or planned) to improve this environment, but my judgment is that it can never be made corrosion free. In addition, the basin has no containment. I question long-term storage in that basin. I was not convinced that safe interim storage could be accommodated in L-Reactor by the information included in the DEIS. 516-3
- Phase II considers construction of improved dry storage capability. The DEIS states that these facilities cannot be available for 10 years. This alternative goes on to say the SNF would be transferred to the new dry storage facilities (Phase II storage facilities) and could be used for approximately 30 years until ultimate disposal. The DEIS does not address what would be required for this disposal. DOE should demonstrate that aluminum-clad HEU research reactor fuel can be disposed of in a geologic repository without extensive reprocessing before disposal to stabilize the components of the SNF for disposal. In addition, DOE should beef up the information on the technology and facility requirements for conditioning the aluminum clad SNF for safe interim (30-50 years) dry storage. 516-4

It is clear, from reading the DEIS that dry storage offers a safe, efficient storage mode, if the SNF has been properly conditioned. It is also important, in comparing this alternative to Alternative 6, that the final conditioning of the SNF be included in the evaluation.

I feel the DEIS shows that the 10-year envelope for acceptance of the fuel under this policy is adequate for this nation and foreign nations to develop alternative plans to safeguard the nuclear materials from these reactors. 516-5

I also feel that the DEIS shows in sufficient detail that modes of ocean and land transport, ports of entry do not offer significant risk. I recognize that "not in my neighborhood" comments will be heard from people not understanding the risk. I understand the risk and am willing to have the SNF in my neighborhood for my lifetime and the lifetime of my children as long as the U. S. Government has sound technical plans for geologic disposal at some reasonable future time and can show the SNF to be safe until that time. I am unwilling to say receive the FRR SNF with no closure of this concern even though interim storage is shown to be safe. I am unwilling to have wet or dry storage at SRS become the defacto disposal mode. 516-6

Very truly yours,

W. Lee Poe

W. Lee Poe, Jr.

Response to Comment No. 516-3

The commentor's concern about corrosion issues associated with the storage of foreign research reactor spent nuclear fuel at the L-Reactor Disassembly basin at the Savannah River Site is noted. Appendix F, Section F.1.3.1.1 has been revised to include the upgrades planned for the L-Reactor basin and the reasons why DOE considers the basin appropriate for safe interim storage of foreign research reactor spent nuclear fuel.

Response to Comment No. 516-4

Ultimate disposition of spent nuclear fuel from foreign research reactors is beyond the scope of this EIS (Section 1.3 of the EIS). Section 4.2.7 of the EIS contains a summary description of expected environmental effects of ultimate disposition. As stated in Sections 2.1 and 4.2.7 of the EIS, if a geologic repository is not prepared to accept the foreign research reactor spent nuclear fuel or its resultant stable waste forms (generated due to chemical separation or other processing technology) DOE would continue to manage the material in exisiting facilities at the DOE management site(s).

Section 2.6.5.1 and Appendix F, Section F.2.9 of the EIS indicate that, based on the existing experience of dry storage of aluminum-based spent nuclear fuel, no special conditioning of the fuel would be needed for safe 30- to 50-year dry storage.

Response to Comment No. 516-5

The commentor's suggestion that the proposed 10-year policy period would give research reactor operators sufficient time to develop other alternatives for safeguarding the foreign research reactor spent nuclear fuel, is noted.

Response to Comment No. 516-6

The commentor's support for the risk analyses provided in the EIS for marine, port and ground transportation is noted. If the spent nuclear fuel is accepted into the United States, it would be stored in either wet or dry storage at one of the five DOE management sites (including the Savannah River Site) identified in this EIS for an interim period not to exceed 40 years. Ultimate disposition in a geologic site, such as the one under consideration at Yucca Mountain, would occur after that time.

COMMENTOR NO. 519: GOLDEN, SUE

Please listen to us,
we do not want
nuclear waste
shipped through
Port of Tacoma or
any of our Ports.

Sue Golden

519-1

RESPONSE TO COMMENT
COMMENTOR NO. 519: GOLDEN, SUE

Response to Comment No. 519-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 520: FORM LETTER E

June 23, 1995

Charles Head, Federal Project Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue Southwest
Washington, D.C. 20585
fax 202 586 5256

Re: Nuclear Waste being shipped through the port of Tacoma, WA.

Dear Mr. Head:

I would like to express my concern on this issue. Please do not ship "spent" nuclear fuel through Tacoma, WA. I am a registered voter and a copy of this letter is being sent to my member of Congress and my Senators. Feel free to contact me at the address below should you have any questions or responses to this letter. 520-1

Thank you for your prompt attention to this matter.

Sincerely,

Robert T. Werner
9513 Sunrise Beach Dr. NW
Gig Harbor, WA 98332

RESPONSE TO COMMENT
COMMENTOR NO. 520: FORM LETTER E

Response to Comment No. 520-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Commentor No. 520: Form Letter E (Cont'd.)

Individuals submitting this form letter:

Allen, Annette E
Bilow, Dennis
Bilow, Loretta E
DeShaw, Marjorie
Heath, Traci
Kelly, Donald
Kenefick, Virginia
Landree, Sheri
Lawrence, Robyn
Miller, Brent
Morrow, Lillian
Nordquist, Greg
Ottoson, Lisa M.
Sperling, Barbara E.
Wardlow, Karen
Werner, Robert T.
Wicker, Melanie
Wilcox, Willis

Response to Comment
Commentor No. 520: Form Letter E (Cont'd.)

COMMENTOR NO. 524: GENNOW, TERRY & SHELIA

06/23/95 05:30 FAX 12066469582 CSS 001

Send To: Charles Head

Firm: Office of Spent Nuclear Fuel Management (EM-37) U.S. Department of Energy

Receiving Fax Number: 202-586-5258

Sent From: Terry & Shelia Gennow Federal Way, Washington

Sending Fax Number: 206-946-9582

Sending Phone Number: 206-927-6315

WE CARE ABOUT OUR CHILDREN'S FUTURE AND OUR QUALITY OF LIFE - PLEASE DO NOT ALLOW THE SHIPMENT OF HIGHLY RADIOACTIVE NUCLEAR WASTE THRU THE PORT OF TACOMA 524-1

Number of Pages Sent Including Cover Sheet: 1
June 23, 1995, 05:28 AM

*** * * CONFIDENTIAL MATERIAL * * ***

The material contained in this fax is confidential. If this transmission does not reach the correct addressee, please contact us immediately at the location below:

CSS, Inc.
10900 N.E. 4th Street, Suite 900
Bellevue, WA 98004
1 - 800 - 843 - 2188

RESPONSE TO COMMENT
COMMENTOR NO. 524: GENNOW, TERRY & SHELIA

Response to Comment No. 524-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 525: DEVIK, BARBARA & RUDOLF

June 22, 1995 3:46 PM From: RUDOLF DEVIK Fax #: 2067626964 Page 2 of 3

FAX

June 22, 1995

TO: CHARLES HEAD
OFFICE OF SPENT NUCLEAR FUEL (EM37)
US DEPT. OF ENERGY
1000 INDEPENDENCE AVE. SW
WASHINGTON DC 20585

FAX NO. 202-586-5256

FROM: Barbara and Rudolf Devik

REF./No. Pages:

MESSAGE:

We were unable to attend the Tacoma meeting with reference to the scheme to consider Tacoma as a port of entry for nuclear waste.

We object to the plan.

We feel the use of this city for a site of this kind would be a great mistake.

Geographically the area is in the middle of a growing and expanding urban area of several million persons. Economically, it would stifle the growth which is taking place here and which offers promise of even greater expansion. Environmentally, it would jeopardize and area which is of great concern to the government and to the private sector.

525-1

RESPONSE TO COMMENT
COMMENTOR NO. 525: DEVIK, BARBARA & RUDOLF

Response to Comment No. 525-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. The analyses provided in Sections 4.2.2 and 4.5 of the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port.

The population in the port, surrounding areas, and along the route to the management sites were considered during the analysis of potential ports of entry (Appendix D of the EIS). In the case of both incident-free transport of foreign research reactor spent nuclear fuel and accidents, impacts on these populations were shown by the analyses (Section 4 of the EIS) to be low.

DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' status with respect to their clients. This is based on the fact that the foreign research reactor spent nuclear fuel would be shipped to the United States in standard shipping containers that would require no special handling or precautions. As such, there should be no adverse commercial or economic reaction to the use of the port. Historically, there were no adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

COMMENTOR NO. 525: DEVIK, BARBARA & RUDOLF (CONT'D.)

June 22, 1995 3:45 PM From: RUDOLF DEVIK Fax #: 2067526964 Page 3 of 3

The Dept. of Energy and its forerunners have much to answer for in this State. We hope this will not be added to the list.

3615 No. Gove St., Tacoma, WA 98407 206 759 3534/3535

RESPONSE TO COMMENT
COMMENTOR NO. 525: DEVIK, BARBARA & RUDOLF (CONT'D.)

COMMENTOR NO. 526: WRIGHT, DARLA J.

23 June 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue S.W.
Washington, D.C. 20585

Dear Mr. Head,

I want to add my voice to those opposed to the transporting of any Nuclear waste through the Port of Tacoma. I am appalled to think of the catastrophic consequences this could create through any kind of accident that could possibly occur. 526-1

When Nuclear Reactor plants are built and used the disposal of the waste that is generated there should be part of the plan. Not an afterthought! And NOT transported anywhere. Disposal should be handled right on the site. 526-2

Our world is so fragile as it is. We have abused it far to long and it's time to stop and take care of it. This is not right and should not happen. Do not even think of this as a viable solution. It is not!

Sincerely,

Darla J. Wright

Darla J. Wright
1712 S.W. 347th Pl.
Federal Way, Washington 98023
(206) 838-1349

RESPONSE TO COMMENT
COMMENTOR NO. 526: WRIGHT, DARLA J.

Response to Comment No. 526-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 526-2

The commentor's opposition to the transportation of radioactive wastes is noted. The commentor's preference for disposal at the reactor site is likewise noted. This is Management Alternative 2, Subalternative 1a, which is described in Section 2.3 of the EIS.

As part of its nuclear weapons nonproliferation policy, the United States accepted spent nuclear fuel from foreign research reactors for over 30 years (Section 1.1 of the EIS). This policy of planned acceptance by the United States was intended to minimize risks that HEU would be diverted to the construction of nuclear weapons. As discussed in Section 1.2 of the EIS, many of the foreign research reactor operators cannot store their spent nuclear fuel at the reactor site due to a lack of facilities or regulatory constraints. Thus, the intent of the proposed policy is to remove as much U.S. -origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

COMMENTOR NO. 531: GIBELYOU, SHERRIE

Tom & Sherrie Gibelyou
6202 59th St. Ct. W.
Tacoma, WA 98467

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

June 22, 1995

Dear Mr. Head,

I cannot remember a time in my life when anything has concerned me as much as the proposal to ship high-level nuclear waste through the Port of Tacoma. My husband and I are the parents of two children. We were born and raised in Tacoma and have chosen to remain here because we are convinced that the Pacific Northwest offers unique beauty, opportunity, and a way of life that cannot be duplicated in other parts of the nation.

Until now, our children's futures appeared bright and promising. At 4 yrs. and 9 yrs. old, our daughter and son have had fears about natural disasters, most recently the threat of a large-scale earthquake. I've always told them not to worry, we have taken measures to be safe and are as prepared as we can be. Earthquakes are something we cannot control. Unfortunately, I cannot offer the same reassurances concerning this proposal. Should this become a reality for our city, there is no way to prepare, no way to feel safe. We become sitting ducks and pray that an accident never happens. But what if it does?

Unlike earthquakes, this doesn't have to be something that we live with. Our children have a right to grow up without this kind of threat hanging over their heads. You have the power to help restore our peace of mind. I implore you to please do everything possible to stop this from happening. You don't have to live here, Mr. Head. We do. Tacoma is our home, our life. Please, for our children, do not recommend the Port of Tacoma for this proposal.

531-1

Thank you for your consideration,

Sherrie Gibelyou

RESPONSE TO COMMENT
COMMENTOR NO. 531: GIBELYOU, SHERRIE

Response to Comment No. 531-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 532: REYNOLDS, GREGG

June 22, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
Washington, D.C. 20585
fax (202) 586-5256

Dear Mr. Head:

I urge that the Department of Energy scrap the horrendous proposal that high-level nuclear waste be shipped through the Port of Tacoma or any other port in Washington State. Such high-risk shenanigans obviously would endanger all who live or travel in this region, the wildlife, and natural, national treasures including Puget Sound, and Olympic National Park. This is a dumb idea whose time must never come! 532-1

I also wish to complain about the federal bureaucratic arrogance displayed in the so-called public hearings conducted in Western Washington. You and your associates should be ashamed of yourselves...more importantly you should become sensitized and genuinely responsive to the public with its genuine concerns about its remote, heavy-handed big government. 532-2

Sincerely,

Gregg Reynolds
4305 - 68th Ave. N.E.
Olympia, WA 98516

cc: U.S. Senator Slade Gorton
U.S. Senator Patty Murray

RESPONSE TO COMMENT
COMMENTOR NO. 532: REYNOLDS, GREGG

Response to Comment No. 532-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 532-2

DOE does not agree with the commentor's assertion of "federal arrogance" displayed at public meetings in Western Washington. DOE's responsiveness to the public is demonstrated by the seventeen public hearings which were held on the draft EIS in the locations determined to be most likely to be directly affected by the EIS alternatives, specifically in the ports of entry and at the potential management sites. In addition to accepting comments from the public during these hearings, written comments were also welcomed, and encouraged.

COMMENTOR NO. 533: SMITH, WILLIAM F., JR.

June 22, 1995

Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

Mr. Charles Head:

Washington State has been trashed enough by nuclear waste problems that plague Hanford. I myself am a "Downwinder" and now you want to bring nuclear waste through a community with several hundred thousand people living nearby. I say NO!

533-1

I have already contacted my state and federal senators and representatives asking them to intervene.

Stay Away From The Puget Sound!

William F. Smith Jr.
622 175th St. S.
Spanaway, WA 98387

RESPONSE TO COMMENT
COMMENTOR NO. 533: SMITH, WILLIAM F., JR.

Response to Comment No. 533-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 536: LIU, DENISE

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: DENISE LIU Phone: 510-686-9386

Title and Organization:

Address: 2640 WELLINGTON CT.

City: CONCORD State CA Zip 94520

*** COMMENTS ***

I am writing to you to let you know I protest the use of the Concord Naval Weapon station as a port to receive weapons grade nuclear waste. You obviously have a current system you are using to transport the material to waste storage, and I don't see the advantage of changing the system. You are endangering people who live in the area, who did not buy their homes with the knowledge that was going to happen. You are lowering our property values on our homes and endangering all the people in the surrounding areas. 536-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 536: LIU, DENISE

Response to Comment No. 536-1

The commentor's opposition to the use of the Concord NWS to receive foreign research reactor spent nuclear fuel is noted. The port selection criteria discussed in Appendix D, Section D.1.9 of the EIS identify ports that can safely handle foreign research reactor spent nuclear fuel. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Concord NWS, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel casks are also low (Section 4.2.2.2).

In regard to a possible reduction in property values as a result of the receipt of foreign research reactor spent nuclear fuel at Concord NWS, the analyses in Section 4.2.2.3 and Appendix D, Section D.5 of the EIS determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident. Historically, there were no adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

No "system" currently exists in the United States for transporting foreign research reactor spent nuclear fuel to waste storage. The goal of this EIS is to evaluate the environmental impacts of reasonable alternatives for disposition of this spent nuclear fuel, so that policy makers can factor this knowledge into the decisionmaking process.

COMMENTOR NO. 538: CONRY, MARGARET

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Margaret Conry **Phone:** _____

Title and Organization: Green Party member / Student

Address: 1441 Creekside Dr., Apt # 1074

City: Walnut Creek **State** CA **Zip** 94596

*** COMMENTS ***

I feel that the proposed storage site for nuclear fuel rods in Concord would be a devastating and destructive situation: not only for the 300,000 citizens of the Concord area but the millions of people in any site on the planet. This planet is a gift of God which is on loan to us, and we have the responsibility of being good Stewards of the planet. We have the responsibility as co-creators to protect and save it and all its inhabitants

538-1

Cont →

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 538: CONRY, MARGARET

Response to Comment No. 538-1

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternative 1 or 3), there would be no storage of this material at the Concord NWS, or any other port. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

COMMENTOR NO. 538: CONRY, MARGARET (CONT'D.)

Putting a nuclear storage site in Concord is not a responsible action and will only bring further ruin and destruction to the planet.

538-1 (Cont'd.)

Margaret Conry

RESPONSE TO COMMENT
COMMENTOR NO. 538: CONRY, MARGARET (CONT'D.)

COMMENTOR NO. 540: MCTAGGART, FRANCIS & ROSALIE

June 16, 1995

Charles Head
Office of Spent Fuel Management, EM-37
U.S. Dept. of Energy
1000 Independence Ave. SW
Washington, D.C. 20585-0001

Dear Mr. Head:

Please be informed that we are totally opposed to any high level nuclear spent fuel rods being shipped through our communities in the Pacific Northwest as well as the storing of such waste. 540-1

Sincerely,

Francis & Rosalie McTaggart

Francis & Rosalie McTaggart
1202 N.W. 52nd Street
Vancouver, WA 98663

RESPONSE TO COMMENT
COMMENTOR NO. 540: MCTAGGART, FRANCIS & ROSALIE

Response to Comment No. 540-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through any ports in the Pacific Northwest is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 544: ADLE, DOROTHY R.

2570 Walnut Blvd. #23
Walnut Creek, CA
94596

Mr. Charles R. Head
U.S. Dept. of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585-0001

Dear Mr. Head

The proposal to transport and store temporarily spent nuclear fuel to and at the Concord Naval Weapons Station, Concord, California is a terrible idea! Approaching Concord via San Francisco Bay entails sailing under several highly travelled bridges. San Francisco Bay has

544-1

544-2

RESPONSE TO COMMENT
COMMENTOR NO. 544: ADLE, DOROTHY R.

Response to Comment No. 544-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternative 1 or 3) there would be no storage of this material at Concord NWS, any other port, or anyplace except for DOE management sites. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the spent nuclear fuel transportation cask.

Response to Comment No. 544-2

The physical constraints of the passage from San Francisco Bay to Concord NWS were considered as part of the port selection process and found to meet the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS).

On the issue of air and water quality as it pertains to the proposed policy of managing foreign research reactor spent nuclear fuel, DOE is convinced that there would be no significant adverse impacts to any of the ports that might be used to receive the material. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

already been heavily polluted, the worst offenders being various branches of the armed services. Now we should risk the most dangerous pollution of all?

544-2 (Cont'd.)

In addition, this is an earthquake-prone area. Not only the well-known San Andreas Fault, but much closer to Concord the Hayward and Concord Faults are a constant worry.

544-1 (Cont'd.)

Someone in your department should listen to a few traffic reports

544-3

Response to Comment No. 544-3

The frequency of accidents on highways has been taken into account in all the ground transport risk estimates in the EIS. As discussed in Section 4.2.3 and Appendix E of the EIS, spent nuclear fuel has been transported along highways, railways, and waterways for over four decades without release of the radioactive contents from the spent nuclear fuel transportation cask.

COMMENTOR NO. 544: ADLE, DOROTHY R. (CONT'D.)

in this immediate area. Overturned "Semis" are all-too-frequent and traffic is really heavy near Concord.

544-3 (Cont'd.)

I'm certainly in favor of "non-proliferation" but there must be a better way than this.

Very truly yours,

Dorothy R. Adle

RESPONSE TO COMMENT
COMMENTOR NO. 544: ADLE, DOROTHY R. (CONT'D.)

COMMENTOR NO. 546: DIVET, BETTY H.

June 19, 1995

Mr Charles Head
9000 Independence
Washington DC. 20585

Dear Mr Head,
We do not want nuclear
waste transported into the
United States or into the
Port of Tacoma Washington.

546-1

Sincerely
Betty Divet
9225 Tacoma
Tacoma Wa. 98444

RESPONSE TO COMMENT
COMMENTOR NO. 546: DIVET, BETTY H.

Response to Comment No. 546-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 547: MOWAT, GREG

GREG MOWAT

Telephone 206-759-9596

4108--26TH ST. NO.
TACOMA,WA.-98407

TO: Charles Head--Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
1000 Independence Ave.
Washington,D.C. 20585

RE: Potential Shipment of Highly Enriched Nuclear Fuel Though the Port of Tacoma
Puget Sound, and The Pacific Northwest

I am an activist in the Tacoma community,currently the elected chair of the Pierce County Democratic Party,a senior member of the United Way Board (second term),a member of the Citizen's Advisory Committee for the University of Washington branch campus in Tacoma,and also serve as an at-large member of the state-wide board of Washington Citizen Action--an affiliate of National Citizen Action.I am most concerned that the Department of Energy,an organization that I have respected for it's adroit decision -making ,would consider utilizing The Port of Tacoma for the trans-shipment of these highly unstable and toxic nuclear wastes.Apart from the negligent aspects of the draft environmental impact statement,I am most concerned that the Department has so little regard for the efforts and hard work of the Citizens of Tacoma as they labor to establish a City of which they can be proud.They have cleaned up a major environmental nightmare with the considerable effort expended in reclaiming the site of the Asarco copper smelter, absorbing job loss and facilitating major political co-operation in the process;They have worked to clean up Commencement Bay,and are laboring to convert a mill town economy to the 21st century,being at a very delicate stage of that evolution--This move to potentially make Tacoma a nuclear waste trans-shipment point will have a disastrous impact on the progress the City is about to make--several other proposed sites are much better established and are beyond the point where the impact will cripple their growth and potential.

It would be poor public policy if the Department decides to proceed with plans to designate Tacoma based on relative political clout--There are excellent objective reasons to choose another Port;there are compelling human reasons for allowing our community to proceed with its growth and development unfettered by the damaging stigma that would surely result from your designation of this City as the trans-shipment point.I trust that you will weigh your options carefully and make the right decision. 547-1

Thank you for your careful consideration of my concerns.I have fallen in love with this community and sincerely believe that its best interests are served as are those of this Nation by seeking another alternative for this purpose.

Sincerely Greg Mowat

RESPONSE TO COMMENT
COMMENTOR NO. 547: MOWAT, GREG

Response to Comment No. 547-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Under NEPA regulations, the socioeconomic effects evaluated for this EIS do not include those associated with psychological fear of receiving spent nuclear fuel. Based on past experience DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Tacoma would have no adverse economic impacts on business within the port or the surrounding communities.

COMMENTOR NO. 549: AGNELLO, EVONNE

Evonne Agnello

June 22, 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. SW
Washington, D.C. 20585

Dear Mr. Head:

I want to register my strong protest to the proposal for nuclear waste to be shipped through the Port of Tacoma. 549-1

I believe the people of Tacoma would rally to stop this proposal from going any further, should plans proceed. A heavily populated area of pristine natural beauty should be the antithesis of where these dangerous wastes should pass.

Sincerely,

Evonne Agnello

Evonne Agnello
913 N. Newton St.
Tacoma, WA 98406

RESPONSE TO COMMENT
COMMENTOR NO. 549: AGNELLO, EVONNE

Response to Comment No. 549-1

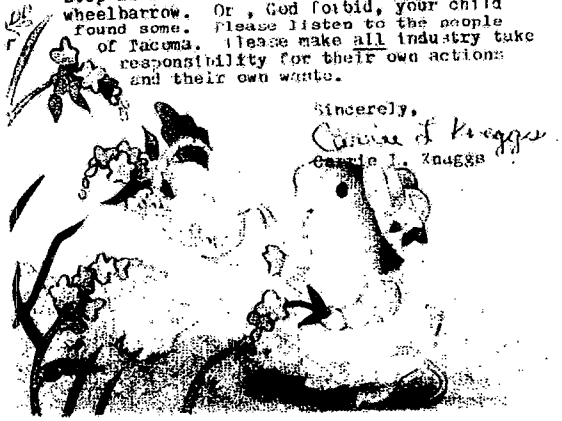
The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 550: KNAGGS, CARRIE L.

June 22, 1995

Dear Mr. Tead,
I am against the movement of nuclear waste through the Port of Tacoma not only because it indangers me and my children but because it is wrong to allow the nuclear industry to bury their waste in somebody else's back yard. If they are not made to deal with their own crud they will not be made to take precautions and use common sense. They will not be encouraged to look for better ways of doing things. If they want to use nuclear energy they should have to deal with the consequences. Dealing with it should not include making it someone elses problem. The question I have for you is...How would you like it if your neighbor to your right took his wheelbarrow full of dog poo across your backyard every day to dump it in the yard of your neighbor on your left? How would you like to walk out in your yard and step in some of the gick that fell off that wheelbarrow. Or , God forbid, your child found some. Please listen to the people of Tacoma. Please make all industry take responsibility for their own actions and their own waste.

Sincerely,
Carrie L. Knaggs
Carrie L. Knaggs



550-1

RESPONSE TO COMMENT
COMMENTOR NO. 550: KNAGGS, CARRIE L.

Response to Comment No. 550-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 555: HARRISON, SANDEE

NORTHWEST ENDOCRINE LABORATORIES
314 SOUTH K STREET, SUITE 405 • TACOMA, WASHINGTON 98405 • (206) 272-2300

The citizens of Tacoma Washington are telling you something, are you listening...

NO RADIOACTIVE NUCLEAR WASTE IN OUR PORT!!!

555-1

Sincerely,

Sandee Harrison
518-136th Ave. E.
Sumner, WA 98390

RESPONSE TO COMMENT
COMMENTOR NO. 555: HARRISON, SANDEE

Response to Comment No. 555-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 558: TATE, H.

To Whom it may Concern,

Washington State does not want "Nuclear Waste" being shipped threw our ports.

No Nuclear Waste for Washington State!!

558-1

Sincerly H. TATE
806 15th Ave SE.
~~FA~~ Puyallup WA.
98404

RESPONSE TO COMMENT
COMMENTOR NO. 558: TATE, H.

Response to Comment No. 558-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 559: ZWICKEL, ABRAHAM

DR & MRS ABRAHAM ZWICKEL
2189 COPP AVE
PITTSBURG, CA 94565

4 P.M.
JUNE 20, 1995

Department of Energy
Wash., D.C.

We 3 sovereign citizens,
Abraham 91, Jean 81
and Daniel Zwickel 47
are opposed to storing
spent atomic waste
fuel rods in Concord,
Naval Weapons Station,
Concord, California,
Temporary or permanent.
Abrahame for 7 years has
witnessed unsafe truck
driving EXPLOSIVE cargoes.
2 times intentionally
run over. Once speed
stop signs in presence
of Sargent and
Security officers at
base entrance.

559-1

NOED proper construction
of bomb bunkers, atomic.

RESPONSE TO COMMENT
COMMENTOR NO. 559: ZWICKEL, ABRAHAM

Response to Comment No. 559-1

The commentor's opposition to using Concord NWS is noted. However, DOE considers that the port selection criterion successfully identify ports that can safely handle foreign research reactor spent nuclear fuel. The analyses provided in Sections 4.2.2 and 4.5 of the EIS indicate that the use of any of the ports indicated by the port selection process, including Concord NWS, would not pose any significant risk to either the port personnel or the population near the port. Foreign research reactor spent nuclear fuel would only pass through Concord NWS and the State of California on its way to a DOE management site, but would not be stored there.

COMMENTOR NO. 559: ZWICKEL, ABRAHAM (CONT'D.)

Open flues of drinking water flowing through CHWS at mercy of microscopic atomic waste fuel.

We three Zwickels, demand an end to all atomic POWER and atomic bombs. Leave uranium in the ground to avert itself over ages finally into lead according to DR. DAVID BRADLEY medical scientist of BRAIN TEST. REFERENCE. NO PLACE TO HIDE

Respectfully
Abraham Zwickel

RESPONSE TO COMMENT
COMMENTOR NO. 559: ZWICKEL, ABRAHAM (CONT'D.)

COMMENTOR NO. 560: LEWIS, CORA

June 20, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue SW
Washington DC, 20585

Dear Mr. Head,

I was delighted to see an over-capacity crowd to comment on the D.O.E.'s proposition to bring spent nuclear waste from other countries through the Port of Tacoma. Unfortunately, I was one of those concerned citizens that could not get into the auditorium to express my disapproval, however, I hope my letter will be taken with the seriousness intended.

As I follow this issue, I can't seem to get the picture out of my mind...a map of the United States with a big red circle with a line through it over the glowing state of Washington. I have difficulty enough with the United States deciding to be the world's nuclear garbage dump. Bringing it through an inland port, transporting it through waters whose shores are heavily populated, shipping it on our freeways and railways, over our rivers and through our rich farmlands seems to be a definate effort to ruin the reputation of a state rich in beauty and natural resources. Washington has its share of nuclear substances, Washington doesn't need this, Tacoma doesn't need this.

560-1

I can't imagine any commercial port wanting this kind of cargo. As I watched the televised meeting between the Port of Tacoma and the D.O.E. a few weeks ago, I became greatly offended that the D.O.E. has the attitude that Tacoma's citizens lives and health were less important than those who live in Seattle. As was put by the representatives from the D.O.E., Tacoma has fewer people so its best to let them take the risks. You want our longshoremen to handle the waste, you want our port to be responsible for protecting the waste and although you seem to have the attitude that this cargo comes to us with no dangers (therefore should be safe for any port), you still think it is best to bring it through an area of less population. In case you were unaware, Tacoma is the second largest city in our state, we have over 150,00 citizens; a sizable population, by all means.

560-2

If you feel the United States must take this waste under our care, then bring it to a ocean port...a military port that has experience handling this type of cargo and the military equipment to protect it. Ship it along railways and roadways that are isolated from as much population as possible. At the meeting between the Port of Tacoma and the D.O.E., the D.O.E. stated it would be expensive to update a military port. I don't think the government can put a price tag on safety for it's citizens when the world's nuclear waste is being pushed down the throats of Tacoma's citizens, our beautiful state of Washington, and our country.

560-3

My impression is that the D.O.E. feels that if we take this nuclear waste, it will stay out of the hands of those less desirable that may use it to build weapons to be used against us. As we look back over the past few years, it is apparent that there are terrorists within our borders too. Will the United States be responsible if the spent nuclear waste gets in the wrong hands and is used against on of the world's countries. I can't think of anything that would bring down a great nation faster!

Tacoma is working hard and succeeding in building a positive image. Our theaters are restored, our superfund sites are clean, Universities are coming in to support the educational needs of our area, our artists are coming home. Please leave us alone and let us finally become a desirable destination.

Sincerely,

Cora Lewis
3917 - 47 Avenue NE
Tacoma, WA 98422

cc: Representative Randy Tate

RESPONSE TO COMMENT
COMMENTOR NO. 560: LEWIS, CORA

Response to Comment No. 560-1

In evaluating and selecting acceptable ports of entry, DOE has developed evaluation criteria. DOE considers that the port selection criteria successfully identify ports that can safely handle foreign research reactor spent nuclear fuel. DOE further considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel or the population near the port. The EIS shows that the risks associated with an accident are low (Section 4.2.2.3 of the EIS) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel casks are also low (Section 4.2.2.2 of the EIS).

Response to Comment No. 560-2

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without the additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all of the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted.

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures can greatly reduce the risk of such actions. Security would be provided for all shipments of foreign research reactor spent nuclear fuel, as required by the Code of Federal Regulations (10 CFR Part 73). The security provisions are summarized in the new Appendix H that has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify the details of the transportation process, including security provisions in port and during transit.

Response to Comment No. 560-3

The broad purpose of the proposed action is to support the nonproliferation of nuclear weapons (Section 1.2 of the EIS). It is unlikely that internal terrorists could steal spent nuclear fuel from foreign research reactors and construct a nuclear weapon from it based on the fact that this spent nuclear fuel requires sophisticated processing techniques to extract the uranium for use in the construction of a nuclear weapon (Section 1.2 of the EIS). A greater risk is that HEU available through international commerce could be diverted to a nation capable of extracting the uranium and whose intent is to develop nuclear weapons capability.

COMMENTOR NO. 561: GUTHRIE, ANNETTA

Charles Head
Office of Spent Nuclear Fuel
Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

June 22, 1995

Re: Nuclear Waste Shipment Through The Port of Tacoma, WA

Dear Mr. Head,

I definitely do not want shipments of high-level nuclear waste coming through the Port of Tacoma, Washington. No one can say that this would be 100% safe. There is always a chance for accident. Three Mile Island, the Exxon Valdez, Chernobyl, and the leaks at Hanford, Washington, were never supposed to happen--but they did. I do not want this nuclear waste coming through my community. I want my grandchildren to grow up safely in a healthy community and not have to worry about a nuclear waste accident. 561-1

Sincerely,

Annetta Guthrie

Annetta Guthrie
4901 Barbara Lane SE
P.O. Box 160
Olalla, WA 98359

206-851-4503

RESPONSE TO COMMENT
COMMENTOR NO. 561: GUTHRIE, ANNETTA

Response to Comment No. 561-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 562: WINNIE, SHIRLEY L.

June 23, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Dept. of Energy
1000 Independence AVE SW
Washington, D.C. 20585

Dear Sir:

This is in opposition to the government's proposal to ship highly radioactive nuclear waste through the Port of Tacoma. We take pride in our beautiful Northwest and do not want any threats to the environment. I do not believe there can be any assurances that something could not happen to cause an "accident" during such shipping--look at the oil spills etc. that were caused by human error.

Any spill here would be devestating. Please let the Department of Energy know we do not want the waste moved through our Port.

562-1

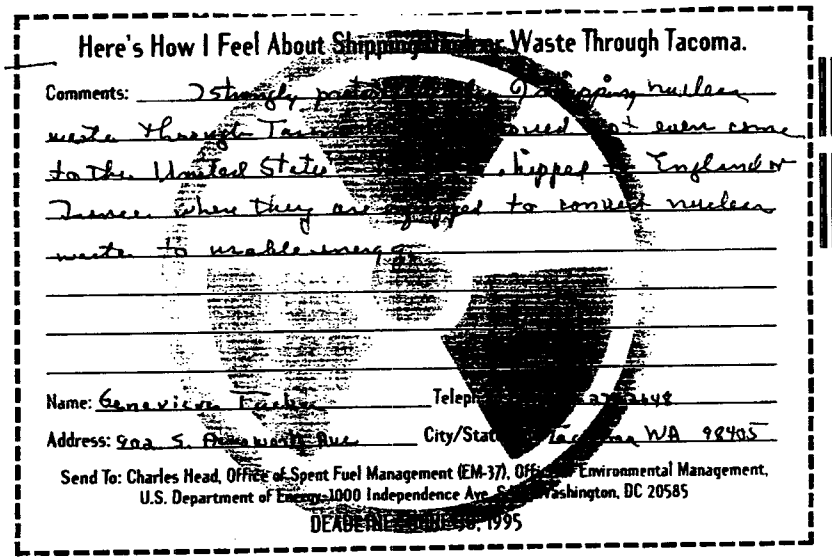
Sincerely
Shirley L Winnie
Shirley L. Winnie
Donald C. Winnie
Donald C. Winnie
3307 So. K St.
Tacoma, Wa. 98408-4021

RESPONSE TO COMMENT
COMMENTOR NO. 562: WINNIE, SHIRLEY L.

Response to Comment No. 562-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 563: TUCKER, GENEVIEVE



Here's How I Feel About Shipping [illegible] Waste Through Tacoma.

Comments: I strongly [illegible] shipping nuclear waste through Tacoma. [illegible] not even come to the United States [illegible] shipped to England or France where they are equipped to convert nuclear waste to usable energy.

Name: Genevieve Tucker Telephone: [illegible]

Address: 902 S. Fawcett Ave City/State: Tacoma, WA 98405

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, DC 20585

DEADLINE: [illegible], 1995

563-1

563-2

RESPONSE TO COMMENT
COMMENTOR NO. 563: TUCKER, GENEVIEVE

Response to Comment No. 563-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 563-2

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 564: MEYER, SHERRY

June 22, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel
Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue Southwest
Washington, D.C. 20585

Dear Mr. Head:

I'm writing to you in regards to the possible shipments of high-level nuclear waste through the Port of Tacoma.

As a mother of young children, here's a question for you: Do you have children or even grandchildren living in Washington state? Probably not. This is an area, I'm sure, which is far enough away for all families of the Department of Energy to not have to feel threatened in any way.

There is no way you (or anyone else, for that matter) can guarantee there would never be a leak, spill, or contamination of this waste. If paid well enough, some will believe many things. But this is human life we're talking. Many generations of it. 564-1

Speaking for my family, find another way of dealing with this nuclear waste. It is unnecessary to risk lives. Certainly there are many other options — find them. Leave our lives, and our waters, alone.

Sincerely,

Sherry Meyer
3619 91st Avenue Court East
Puyallup, Washington 98371

RESPONSE TO COMMENT
COMMENTOR NO. 564: MEYER, SHERRY

Response to Comment No. 564-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 565: ROBERTSON, CLAIRE MURPHY

June 23, 1995

Dear Mr. Head,

Please do not send that nuclear waste through the Port of Tacoma, for fear it should leak or spill. I have two young boys under the age of three and they deserve to be protected. Everyone says that nothing should go wrong, but in my experience, if anything can go wrong it will.

565-1

Thank-you,
Claire Murphy Robertson

RESPONSE TO COMMENT
COMMENTOR NO. 565: ROBERTSON, CLAIRE MURPHY

Response to Comment No. 565-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 566: HIATT, NORA

June 22, 1995

Mr Charles Hand
U S Dept. Of Energy
1000 Independence Ave SW
Washington DC 20505

Dear Mr Hand

I am writing to let you know how unhappy I am with the decision to bring spent nuclear fuel from foreign countries into the United States through the Port of Tacoma. **566-1**

I don't understand why the fuel can't remain where it is at now. Heaven knows that we have enough nuclear waste sites to clean up of our own, we don't need someone elses too, And IF its as safe as your department claims, why can't it be brought into the Port of Seattle? **566-2**

Here in Washington State, we were told by the U S Government how safe the activities going on at Hanford were. Now we are finding out about leaking tanks, releases of waste into the air and the rivers. Just today in the Seattle P I there is another article about how bodies were snatched and tested for effects of radiation. Those who were unfortunate enough to live downwind from the facilities have suffered miscarriages, cancers, & birth defects. All this from a "safe" facility. **566-3**

Mr Hand, find some other place to bring in the foreign waste. Find someplace who hasn't worked as hard as we have to clean up their environment. Someplace where there isn't appx 188,000 people living. Anyplace but The Port of Tacoma. Hey while your at it, maybe you could find someplace who would be willing to take our spent fuel?? **566-1 (Cont'd.)**

Sincerely yours
Nora Hiatt
Nora Hiatt

PS The next time you have a community meeting like the one here in Tacoma on June 19, please arrange for a larger facility. I was one of those that couldn't get in. **566-4**

RESPONSE TO COMMENT
COMMENTOR NO. 566: HIATT, NORA

Response to Comment No. 566-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 566-2

Many of the foreign research reactor operators cannot store their spent nuclear fuel at the reactor site due to a lack of facilities or regulatory constraints (See Section 1.2 of the EIS). Thus, the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). The Port of Seattle was not selected among the proposed ports of entry based on the port selection process described in Appendix D of the EIS due to the application of the population criterion.

Response to Comment No. 566-3

DOE is committed to the Tri-party agreement for cleanup activities at the Hanford Site; however, the cleanup at the Hanford Site is beyond the scope of this EIS. Section 4.2.4 and Appendix F, Section F.4.3, discuss the impacts of foreign research reactor spent nuclear fuel management at the Hanford Site.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 566-4

DOE appreciates the commentor's frustration at not being able to personally attend the Tacoma meeting due to the overflow turnout. The facility for the June 19, 1995 meeting was selected by the City of Tacoma officials.

COMMENTOR NO. 567: RITZHAUPT, P.J.

Sir:

I protest the moving of nuclear waste thru the Port of Tacoma/Seattle area! We cannot deal with our own U.S. made radioactive waste properly (look at the Hanford mess) so why are we taking on waste from other countries! Are we going to keep our terrorist from making bombs by bringing it here ... Think not. Do not subject our area to possible danger from this deadly waste.

P.J. Ritzhaupt
Ret. Teacher

567-1

RESPONSE TO COMMENT
COMMENTOR NO. 567: RITZHAUPT, P.J.

Response to Comment No. 567-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 568: DAVIS, RANDAL L.

June 22, 1995

Charles Head
Office of Spent Nuclear Fuel (EM-37)
U.S. Department of Energy
1000 Independence Ave S.W.
Washington, D.C. 20585

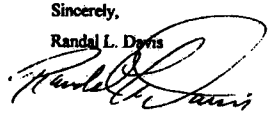
Dear Mr. Head:

As a citizen of the city of Tacoma I have followed with great concern the debate regarding the shipment of spent nuclear fuel through our city's port. I have listened as government officials and their paid representatives assure us that the risk of an accident is minimal and that the containers the fuels are stored in are extremely safe. I have listened as they tell us shipping spent fuel through our city will create jobs. To be frank with you, we don't believe the government has Tacoma's best interests at heart. Regardless of the amount of risk, the fact remains that accidents *do* happen. Chernobyl, Three Mile Island, leaks at Hanford, are all proof positive that the chance for disaster is quite possible. It may be true that the chance of an accident happening is quite minimal, but frankly Mr. Head, the citizens of Tacoma are not willing to take that risk. We are not willing to stake our children's future or the future of our city on government assurances. The government lies. The government covers up. The bottom line is, the government works *for the people*. The people of Tacoma shout a resounding NO!! to spent Nuclear fuel through our port. We will not allow this to happen. Our city's longshoremen have already said they would refuse to unload it. Other business' are concerned about the public perception of possible contamination to their own products. And what's more, we refuse to stake anyone's life on the government's assurances that the risk of an accident is minimal. We the citizens of Tacoma will fight this with all our will and might. We will do whatever is necessary to see that spent nuclear fuel does not pass through our port. The waters of Commencement Bay already sit high atop the list of superfund cleanup sites and we are *not* willing to jeopardize it further. The government will have to find some other port to ship the world's nuclear waste through because the citizens of Tacoma will not allow it to happen here.

568-1

Sincerely,

Randal L. Davis



RESPONSE TO COMMENT
COMMENTOR NO. 568: DAVIS, RANDAL L.

Response to Comment No. 568-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. DOE has added a sentence to (Appendix D, Section D.2.1.9 of the EIS) regarding Commencement Bay being a Superfund Site. The analysis of impacts in Section 4.2.2 of the EIS demonstrates that there would be no significant adverse impacts on the ports, people, or natural environment from shipments of foreign research reactor spent nuclear fuel and the overall impacts to Commencement Bay would be unchanged by the various management alternatives.

COMMENTOR NO. 570: TAYLOR, INEZ

June 22, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management
1000 Independent Ave. S.W
Washington D C 20585

Dear Mr. Head,

I, besides thousands of other Tacomans, do not want shipments of Nuclear waste going through the Port of Tacoma. 570-1

Accidents do happen and the thought of our beautiful Commencement Bay being contaminated is unacceptable.

Sincerely,

Inez Taylor
2220 East George St.
Tacoma, Wa 98404

RESPONSE TO COMMENT
COMMENTOR NO. 570: TAYLOR, INEZ

Response to Comment No. 570-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 571: BEACH, DONNA

June 22, 1995
4416 Elwood Dr. W.
Tacoma, Wa. 98466

Charles Head
Office of Spent Nuclear Fuel Mgmt.
U.S. Department of Engergy
1000 Independence Ave. SW.
Washington, D.C. 20585

Dear Mr. Head,

I and my immediate family of 7, want to let you know we do NOT want our Port of Tacoma to become the unloading spot for all the worlds' nuclear waste.

We don't care how supposedly safe it it, accidents happen. Our water and port are too important to the livelihood of many hundreds of people, besides the possible contamination of all the local residents. 571-1

Our commuinity does NOT want to have all the health problems connected to over exposure to radiation. Look at what happened to all those people in Russia when the reactor metled down. That was quite a few years ago and they are still having health problems.

Find some other low populated area to bring it into the country. Not IN OUR BACKYARD!

We always thought our government was looking out for the best interest of its' citizens but this plan sure leaves us wondering!

Sincerely,

Donna Beach

Donna Beach

RESPONSE TO COMMENT
COMMENTOR NO. 571: BEACH, DONNA

Response to Comment No. 571-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 572: ELEY, MRS. J.

June 22, 1995

Dear Mr. Head

Altho we now reside in Arizona, we lived in the Sea Tac. area for many years. We have Children, grandchildren & great grandchildren in the Seattle area & altho the possibility of a mishap in transporting spent Nuclear Fuel thru the Tacoma Port is minute, there is always a risk. Therefore Mr. Eley & myself are definitely against using the Port of Tacoma.

572-1

Thank you

Sincerely

Mrs J. Eley

RESPONSE TO COMMENT
COMMENTOR NO. 572: ELEY, MRS. J.

Response to Comment No. 572-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 573: SIMAC, JOHN & ANNICE A.

4908 No. 39th St.
Tacoma, WA. 98407
June 22, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management(EM-37)

U.S. Dept of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

Dear Sir:

I know that you are aware of the meeting in TAcoma, WA. June 20, 1995 concerning using our port for the receiving of spent nuclear fuel coming from countries other than our own.

Please be advised that we are emphatically opposed to having any of it proceed through our port. 573-1

We are jusr as emphatically opposed to having any of it coming into our country at all. 573-2

There is no way that the United States should be a dumping ground for any other countries spent fuel. Just because we let them have it is no good reason to store the left overs from it. Why would the United States let them have it in the first place if they are so unreliable that they cannot take care of their own.

Concerning the nations that are not reliable enough to be trusted to take care of their own, they will get it to use for whatever purpose they choose to use it for regardless of our efforts. There are many avenues open to them from even from those who are our supposed Allies. 573-3

Thank you for your consideration in this matter.

John Simac
Annice A. Simac

RESPONSE TO COMMENT
COMMENTOR NO. 573: SIMAC, JOHN & ANNICE A.

Response to Comment No. 573-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 573-2

The commentor's further opposition to management of spent nuclear fuel from foreign research reactors in the United States is also noted. Sections 2.3, 2.5, and 4.5 of the EIS describe other alternatives under consideration.

Response to Comment No. 573-3

Many of the foreign research reactor operators do not currently have means for storage or other disposition of their spent nuclear fuel (Section 1.2 of the EIS). This is a result of a longstanding policy of cooperation with the United States in the prevention of the proliferation of nuclear weaponry (Section 1.1 of the EIS). The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

The United States provides LEU fuel to research reactor operators who agree to cooperate in the prevention of the spread of nuclear weaponry (Section 1.1 of the EIS). A willingness to assume responsibility for spent nuclear fuel containing uranium enriched in the United States does not imply that our allies are untrustworthy. Since a relatively small amount of HEU can be used to construct a nuclear weapon, it is prudent to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide.

COMMENTOR NO. 575: WILSON, EDIE

917-A Village Drive, East
North Brunswick, N.J. 08902-2820

June 14, 1995

Charles Head, P.M.
Office SNFM (EM-37)
U.S.D.O.E.
1000 Independence Avenue, S.W.
Washington, D.C. 20585
Re:D.E.I.S. Nonproliferation Policy

Dear Sir:
Thank you for this opportunity of comment. They are as follows.

1- This program is to expensive. 575-1
2- I would believe that we could afford to provide maintenance and security with our own funding and troops much less expensively than the necessary process of returning and storing it here in the U.S.
3- Yesterday France, one of our allies, announced they were going to star nuclear testing again. Probably to scare the Bosnians or whoever they think they are threatened by, or to try to influence us in our policy towards the Bosnians. Who knows? Any responsible gov't is not going to use nuclear bombs. I don't know if it is the new millenium, and the number 2 instead of 1 in the date of the year that has people acting strangely, or what. But I feel we have a policy that protects the U.S., and the last time France went to war it was VietNam and she left(France's history is it never stays) and the U.S. rushed in. I frankly don't worry much about France. 575-2
4- I do not worry about Iraq, either, altho I feel we should have been more decisive in our action while engaged in Desert Storm. 575-3
5- After the bombing of Oklahoma City, That I worry about. I think if any truly freaked out militia were to be able to secure the nuclear material I would worry, alot.
6- In N.Y.C. last week the F.B.I. found a cannister of spent waste that had come into this country undetected.Until it's arrival.It had none of the proper casings prescribed in this draft, so I must think anyone on that flight, and any oythers that came in contact should be tested. That worries me. 575-4
7- Nuclear energy is too expensive. I would much prefer to see th money required for this proposal to be as stated in #2, and spend money saved on solar or wind energy, or maybe take a new look at water as a source. 575-5

RESPONSE TO COMMENT
COMMENTOR NO. 575: WILSON, EDIE

Response to Comment No. 575-1

Safely transporting, receiving, storing or chemically separating, and finally disposing of spent nuclear fuel rods is expensive. Depending on decisions made in other programs, particularly high-level waste disposal, the foreign research reactor spent nuclear fuel program, could be very expensive. Indefinitely storing and guarding spent nuclear fuel all over the world is more expensive than any program that consolidates the fuel for the same purpose. Furthermore, as explained in Section 4.4.1 of the EIS, overseas storage of the spent nuclear fuel would not be compatible with U.S. nuclear weapons nonproliferation policy objectives. Spent nuclear fuel management, whether in the form of storage, chemical separation (i.e., reprocessing), or geologic disposal, benefits from very large economies-of-scale. Consolidating the spent nuclear fuel costs less per fuel element than handling them separately in dozens of countries.

Response to Comment No. 575-2

France's announcement that it will begin nuclear testing again is outside the scope of this EIS.

Response to Comment No. 575-3

U.S. involvement in Desert Storm is outside the scope of this EIS.

Section D.5.9 has been added to Appendix D of the EIS to address terrorism and sabotage. This section concludes that, while certain terrorist and sabotage attempts cannot be precluded, theft would be. DOE is confident that the foreign research reactor spent nuclear fuel can safely be transported to the management site(s), if the foreign research reactor spent nuclear fuel is accepted into the United States. The security measures employed would meet or exceed all the security requirements in the Code of Federal Regulations (10 CFR Part 73). DOE supports these regulations as being adequate to protect the foreign research reactor spent nuclear fuel. If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

To better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel, Appendix H has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that provides details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

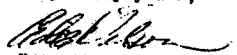
COMMENTOR NO. 575: WILSON, EDIE (CONT'D.)

-2-

8- If this policy does continue, the standards are all too low in all areas.

Thank you for this opportunity.

Very truly yours,



Edie Wilson

For any questions please call 908-246-2179, if I may be of assistance.

RESPONSE TO COMMENT
COMMENTOR NO. 575: WILSON, EDIE (CONT'D.)

Response to Comment No. 575-4

DOE intends to implement the proposed policy in a manner that is in accordance with all applicable laws and regulations. Therefore, the proposed action would be tightly regulated and the potential for diversion of foreign research reactor spent nuclear fuel by terrorists, or by nations seeking to develop nuclear weapons, would be minimized. DOE considers that proper implementation of the proposed action would prevent the type of occurrence the commentor has described.

Response to Comment No. 575-5

Consideration of alternative energy sources is outside the scope of this EIS. However, it is important to note that as part of its mission, DOE currently has ongoing programs that are seeking to develop and promote use of such alternatives, including solar, wind, and water resources.

COMMENTOR NO. 579: HERMANSON, SALLY

June 21, 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-31)
U.S. Dept of Energy
1000 Independence Ave. SW
Washington, D.C. 20585

Dear Mr. Head,

I was unable to attend the meeting held Monday June 19 in Tacoma, Washington re: Shipment of nuclear waste through the Port of Tacoma. I do, however, want to make sure that my view is known.

I am totally against any such movement by any local, State or Federal Government agency using the Puget Sound region to transport nuclear waste to the West Coast of the United States. Additionally I don't agree that we need to accept any waste from other countries period! Let's spend the dollars developing the means to recycle our own nuclear materials instead.

579-1

579-2

RESPONSE TO COMMENT
COMMENTOR NO. 579: HERMANSON, SALLY

Response to Comment No. 579-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 579-2

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and ultimately eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide. Pursuit of this goal would help to ensure that U.S. citizens may all benefit from the security and peace of mind associated with the curbing of the spread of nuclear weapons in the hands of terrorists and irresponsible nations.

I further would like you to know that if this issue becomes a reality for our area, I will personally join the fight against it.

579-1 (Cont'd.)

Please, this time do what is right - listen to us.

Sincerely,

Sally Hermanson
7611 Moorelands Ave NW
Key Harbor, Wa
98335

COMMENTOR NO. 580: STEFFENS, DONALD B.

6-23-95

Dear Mr. Head;
We are writing to express our objection to radioactive nuclear waste being shipped through the Port of Tacoma. Please explore other options.

Sincerely

Donald B. Steffens
Margaret C. Steffens

580-1

RESPONSE TO COMMENT
COMMENTOR NO. 580: STEFFENS, DONALD B.

Response to Comment No. 580-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. Sections 2.3, 2.5, and 4.4 describe other alternatives under consideration.

COMMENTOR NO. 581: SCOTT, FERN R.

3201 N. Bristol
Tacoma, Wa. 98407
June 23rd 1995

Charles Head (EM-37)
Office of Spent Nuclear Fuel Management
U.S. Dept. of Energy
1000 Independence Ave S.W.
Washington D.C. 20585.

Dear Sir;

I don't like the idea of radioactive nuclear waste being shipped through the Port of Tacoma. 581-1

I hope this letter will receive your attention.

Sincerely
Fern R. Scott.

RESPONSE TO COMMENT
COMMENTOR NO. 581: SCOTT, FERN R.

Response to Comment No. 581-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 582: MAST, LAWRENCE

4413 N. 27th St
TACOMA, WA. 98407
JUNE 23, 1995

Mr. Charles Head;

Why should this country take nuclear waste from foreign countries when we have plenty of our own? Have you ever asked a foreign country to store our nuclear waste?

There is two much supposition about the shipping of our nuclear waste, we don't need more of that from other countries. Let them take care of their own.

One accident could ruin the welfare of whole cities and towns; killing or crippling hundreds of thousands innocent citizens, like those exposed to radiation years ago and are still suffering.

Even containers that are supposed to be unbreakable are like everything else, there are flaws.

582-1

Lawrence Mast
Alton G. Mast

RESPONSE TO COMMENT
COMMENTOR NO. 582: MAST, LAWRENCE

Response to Comment No. 582-1

Many of the foreign research reactor operators cannot store their spent nuclear fuel at the reactor site due to the lack of facilities or regulatory constraints (Section 1.2 of the EIS). The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). Sections 2.3, 2.5, and 4.4 of the EIS describe other basic policy alternatives under consideration.

Radiological risks due to accidents at candidate ports, along transportation routes, and at interim management sites were analyzed in the EIS (Sections 4.2.2, 4.2.3, and 4.2.4, respectively, and Appendices B through F of the EIS). As demonstrated by the analysis, risks associated with implementation of the proposed action to human health or the environment would be low.

Transportation casks for spent nuclear fuel are built to withstand accidents (Section 2.6.2 and Appendix B of the EIS). During the past four decades spent nuclear fuel has been shipped along highway, rail, and barge routes in the United States. No transportation cask containing spent nuclear fuel has ever released its radioactive contents, nor has a transportation cask ever been punctured, including those involved in traffic accidents. (Section 4.2.3 of the EIS).

Commentor No. 583: Eckard, Dorothy H.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: It seems that our government [illegible] too much for granted [illegible] the citizens of USA are [illegible].
As for shipping in other countries [illegible] and as I have [illegible].
Please stop [illegible] now. 583-1

Name: Dorothy H. Eckard Telephone: [illegible]472-6303
Address: 3534 [illegible] City/State: Tacoma Wa 98404

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, DC 20585

DEADLINE: [illegible] 30, 1995

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by **June 30, 1995**. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Ruston, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

Response to Comment
Commentor No. 583: Eckard, Dorothy H.

Response to Comment No. 583-1

A national nuclear waste policy does not currently exist. Although such a policy would, no doubt, clarify and direct this country's efforts to address the nuclear waste issue, the question of managing foreign research reactor spent nuclear fuel that is addressed by this EIS cannot wait for a national nuclear waste policy to be developed. The main driver behind the proposed policy to manage foreign research reactor spent nuclear fuel is a concern to limit the possibilities of the proliferation of nuclear weapons. This issue cannot wait, especially since the amount of spent nuclear fuel involved here is so small compared to that elsewhere in the public and private sectors.

COMMENTOR NO. 584: WEISE, LESLIE

June 23, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. SW
Washington, D.C. 20585

Dear Mr. Head,

This letter is regarding the issue of whether the **Port of Tacoma (Washington State), will be the port of entry for shipments of high-level nuclear waste**. I speak on behalf of a large number of individuals in Western Washington state. We are extremely angry at the ignorance of you and your office to not listen to the concerns of the people of this state. This issue does not affect only the Port of Tacoma, but all of Western Washington State, which as you are forgetting has a very large population of people and natural wildlife. The chance of even a small leak or spill is not only *inevitable, but probable* and a number of disasters are proof of this, such as the leaks at Hanford and Three Mile Island. I implore you to make the right decision and choose another route for this very dangerous substance. The Northwest, especially western Washington state is so beautiful, please help to keep it and all its inhabitants safe and healthy.

584-1

Sincerely,

Leslie Weise
Concerned Resident of Seattle, WA

RESPONSE TO COMMENT
COMMENTOR NO. 584: WEISE, LESLIE

Response to Comment No. 584-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Regulations concerning "Type B" cask leakage during normal operation are specified in 10 CFR Part 71.51, and the allowed leak rate is essentially zero. The spent nuclear fuel elements contained in a transportation cask are mechanically sound. The cask would not contain water, thus there would be no leakage of radioactivity during transport. The only hazard is a very small, allowable level of radiation that emanates from the cask. The regulations governing the acceptable radiation level (10 CFR Part 71.47) are documented in Section 5.4, and Appendix B, Section B.2 of the EIS. The radiation level allowed by the regulations would not place undue harm on the individual member of the public, or the general population as a whole. Historically, the radiation level associated with the transport of foreign research reactor spent nuclear fuel was one to two orders of magnitude less than that allowed by 10 CFR Part 71.47. The EIS evaluated the risk of transporting foreign research reactor spent nuclear fuel using the allowed limits and concluded that the overall risk would be negligible (Section 4 and Appendix E of the EIS).

Accidents do occur. That is why the spent nuclear fuel transportation casks are designed, constructed and tested by simulation to withstand a series of impact and fire tests (Appendix B, Section B.2 of the EIS). Representative transportation casks have been crash tested to confirm compliance with regulatory standards. Two actual crash tests one involving a locomotive and the other a tractor trailer carrying a spent nuclear fuel transportation cask have been performed. Both tests showed no failure of the casks, but the locomotives were destroyed. These tests concluded that the transportation casks built to the federal standard would protect and retain their contents in the most severe accidents. With regards to fire duration, real life tests have been conducted to determine the accuracy of the techniques used to demonstrate compliance with this regulatory requirement. Further, examinations of real life fires on land and at sea, and fire tests have demonstrated that high intensity fires are unlikely to be sustained for lengthy periods, and even then not in a single location.

Nevertheless, in spite of the improbability of such fires, the EIS contains the results of an analysis of such a fire (Section 4.2.1.3). The results of the analyses are given in Appendix D of the EIS.

COMMENTOR NO. 587: KENNEDY, STEVE

6-17-95

To Mr. Charles Head,

Just a note to say, please don't let the U.S. become a dumping ground for nuclear waste. Do what ever you can to end this terrible problem, please fight all government waste, end all trade to countries that still trap & kill Tigers, there are only a few thousand beautiful Bengal Tigers left, we need to protect them better. And get rid of that expensive & un-necessary Helium complex in Amarillo, Texas, gross example of government waste. Lets have a strong, tough on crime, beautiful America,

587-1

587-2

Thank You
Steve Kennedy

RESPONSE TO COMMENT
COMMENTOR NO. 587: KENNEDY, STEVE

Response to Comment No. 587-1

The commentor's concern that the United States not become a dumping ground for nuclear waste is noted. If foreign research reactor spent nuclear fuel is accepted into the United States the policy would be of limited duration (Sections 2.2.1.1 and 2.2.2.2 of the EIS). The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). Sections 2.3, 2.5, and 4.4 of the EIS describe other basic policy alternatives under consideration.

Response to Comment No. 587-2

The commentor's concern about the preservation of Bengal Tigers is noted. Although this matter falls outside the scope of this EIS (Section 1.3 of the EIS), policies of United States Government Agencies support efforts to preserve endangered species.

Facilities in Amarillo, Texas would not be used for management of spent nuclear fuel from foreign research reactors and are outside the scope of this EIS. Section 1.5 of the EIS describes environmental documentation related to this EIS.

COMMENTOR NO. 588: SNORTUM-PHELPS, TYLER

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Tyler Snortum-Phelps Phone: (510) 689-4340
Title and Organization: Green Party of Contra Costa
Address: 1211 Orange St.
City: Concord State CA Zip 94518

*** COMMENTS ***

The DraFT EIS Does NOT address the many safety issues specific to this area. The ships passing through the Delta will pass by many hazards + sensitive sites. The risk of accident is great enough that this is a totally unacceptable plan. The emergency response systems are not in place to deal with accidents, and there are far too many risks when transporting such hazardous material. Concord says NO!

588-1

588-2

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 588: SNORTUM-PHELPS, TYLER

Response to Comment No. 588-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 588-2

DOE considers that there is adequate regulatory and emergency preparedness infrastructure to ensure the safe acceptance and transport to designated management sites if the foreign research reactor spent nuclear fuel is managed in the United States. Federal funding to State, Tribal, and local governments for maintaining emergency response programs is discussed in Section 2.7.1. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advise and assistance to the State, Tribal and local agencies involved with a radiological incident. Emergency preparedness, security, and coordination of DOE with local emergency response authorities, and security are discussed in general in Sections 2.7 and 2.8 of the EIS. Details would be contained in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments..

COMMENTOR NO. 590: DAUTEUR, ADELE

Tacoma, Washington
June 16, 1995

Dear Sirs
I believe that your choice of Tacoma as a Port for the disposal of spent fuel is one more example of picking a town with a smaller population and therefore less response from the citizens. 590-1

We object & we have roused the town before to action and will again. Do not use our port.

Sincerely,

Adele Dauteur

RESPONSE TO COMMENT
COMMENTOR NO. 590: DAUTEUR, ADELE

Response to Comment No. 590-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 591: SISTERS OF SAINT DOMINIC

Sisters of Saint Dominic
Tacoma Dominican Center

(206) 272-9688
FAX (206) 272-8790
935 Fawcett Avenue South
Tacoma, Washington 98402-5605

June 19, 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
US Department of Energy
1000 Independence Avenue
Washington, DC 20585

Dear Sir:

This letter is in response to the potential shipment of highly enriched nuclear fuel through the Port of Tacoma, Puget Sound and the Northwest. We, along with our port and local government officials, oppose these shipments.

We have reason to believe that the Draft Environmental Impact Statement used outdated, incorrect or incomplete information in forming its conclusions and that a number of issues were not adequately addressed, namely:

- The DEIS does not consider the potential harm to the environment and people in the affected area, if a release of nuclear fuel or high levels of radiation were to occur; 591-1

- The DEIS does not address the potential loss of business to Tacoma and the surrounding area that could result from a release of nuclear fuel or high levels of radiation; and

- The DEIS does not adequately address the life cycle costs, risks and benefits, and alternatives to handling this cargo at the Port.

We oppose the shipment of highly enriched nuclear fuel through the Port of Tacoma, and respectfully request that you look further into the above stated objections. Thank you for your attention to this matter.

Sincerely,
Administrative Staff, Sisters of Saint Dominic

Agnes Huck, OP — Patty Beattie, OP — Margaret Murphy, OP — Joyce Roach, OP

Marie Hollinshead — Steve Kirby — Christel Mason Gillespie

RESPONSE TO COMMENT
COMMENTOR NO. 591: SISTERS OF SAINT DOMINIC

Response to Comment No. 591-1

Updated information on the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS. All of these errors have been corrected in the final EIS, so the final decision will be based on current information.

The commentor's opposition to the use of the Port of Tacoma to receive foreign research reactor spent nuclear fuel is noted. The port selection criteria discussed in Appendix D, Section D.1.9 of the EIS identify ports that can safely handle foreign research reactor spent nuclear fuel. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel casks are also low (Section 4.2.2.2).

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments. The analysis of the consequences and risk associated with an accident in port involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS). Thus, businesses would not be adversely impacted by the presence of foreign research reactor spent nuclear fuel shipments.

Costs associated with this proposed action are discussed in Section 4.9 of the EIS. The benefit to the citizens of the United States from the proposed action, including those in potential ports of entry, along transportation routes, or near potential management sites, is less risk that weapons grade uranium from civil programs could be diverted into the production of nuclear weapons that might be used against us or our allies. Another benefit is the support for the U.S. position in regard to the Treaty on the Non-Proliferation of Nuclear Weapons. The analyses recorded in Section 4.2.2 of the EIS demonstrate that the risks from the proposed action are low. Various alternatives associated with the proposed policy are also discussed in Section 4 of the EIS.

COMMENTOR NO. 593: QUAINTANCE, JOE M.

JOE M. QUAINTANCE
ATTORNEY AT LAW
First Interstate Plaza
1201 Pacific Avenue, Suite 1502
Tacoma, Washington 98402

Admitted to practice
Washington
California
U.S. Supreme Court

Telephone
Seattle (206) 623-4541
Tacoma (206) 627-5056
Facsimile (206) 272-5515

June 20, 1995

ATTN: Charles Head
USDOE (EM-37)
1000 Independence Avenue
Washington, D.C. 20585

RE: Tacoma, Washington

Dear Mr. Head:

70% of the 20 metric tons of enriched nuclear fuel waste is generated by France, Britain, Germany, Japan, Sweden and Switzerland. A processing facility in Scotland has expressed a desire to upgrade its ability to handle all three types of nuclear waste. Your draft Environmental Impact Statement fails to adequately explore Alternative 2, which provides for the safe processing of this waste closer to where it is created. 593-1

Millions of dollars and years of civic effort have been successfully invested in cleaning the Puget Sound of pollution, as a Superfund Site, and improving the economic and social environment of the City of Tacoma. Shipping nuclear waste through the Port of Tacoma will result in narrow ship navigation and deep water safety problems for canisters, longshore union labor disruption and refusal to handle this dangerous cargo, congested freeway slowdowns and dense urban area population impact. 593-2

Do not underestimate the outrage in the entire Puget Sound area, from Seattle to Tacoma, that will result if you implement your plan. I assure you the attendance at your poorly publicized meeting in Tacoma on June 19, 1995 is only the beginning. I join the organized effort necessary to defeat the implementation of any plan to ship nuclear waste through Tacoma.

Sincerely,

JOE M. QUAINTANCE

RESPONSE TO COMMENT
COMMENTOR NO. 593: QUAINTANCE, JOE M.

Response to Comment No. 593-1

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS. Since the commentor identified no specific inadequacy in the analysis, DOE is unable to respond specifically.

Response to Comment No. 593-2

Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma as noted by the commentor. The analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2 of the EIS). A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

DOE considers that the use of any of the ports indicated by the port selection process, including the Port of Tacoma, would not impact standard commercial operations, and therefore not endanger the ports' economic development, based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions. Historically, there were no adverse economic or cultural impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

The passage through Puget Sound meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). The population and favorable transit from open ocean are not the only considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel, if it is accepted into the United States. Other items of importance include population along the route to the management site, port experience with handling containers, and port facilities. Appendix D, Section D.1.9 of the EIS presents details of the port selection process.

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Section 4.2.1.3 of the EIS has been modified to include this assurance of recovery in coastal waters. Appendix C, Section C.5.5 of the EIS presents information on the probability of

COMMENTOR NO. 593: QUAINTANCE, JOE M. (CONT'D.)

RESPONSE TO COMMENT

COMMENTOR NO. 593: QUAINTANCE, JOE M. (CONT'D.)

a cask sinking in coastal and deep ocean waters. The impacts of a foreign research reactor spent nuclear fuel transportation cask sinking in coastal and deep waters are estimated in the EIS (Appendix C, Section C.5). The results of this analysis show that both the consequences and the risk of these accidents are low (Appendix C, Sections C.5.4 and C.5.5).

The possibility of a longshoremen strike was not considered in the port selection process since that factor does not impact on the capability to safely receive containers carrying foreign research reactor spent nuclear fuel.

COMMENTOR NO. 594: VAN DOORNINCK, KITTY-ANN

June 19, 1995

Charles Head
Office of Spent Nuclear Fuel Management
U.S. Department of Energy
1000 Independence Ave. SW
Washington DC, 20585

Dear Mr. Head,

I am writing to express my concern that Tacoma is being considered as a possible port of entry for nuclear fuel shipments. 594-1

I am adamantly opposed to any nuclear fuel shipments coming through the Port of Tacoma. The beauty and the depth of Puget Sound is unique, and the potential for terrible destruction is great.

As a citizen of Tacoma, I am concerned that this new "stigma" will only add to Tacoma and Pierce County's woes. You may not be aware that we are struggling with increasing violence in our community; having the problems of inability to pay for basic services: police, fire, jail, while struggling as a community to deal with the increasing number of poor, homeless, and mentally ill.

Please reconsider your proposal.

Sincerely,

Kitty-Ann van Doorninck
1528 N.Fife
Tacoma, WA 98406

RESPONSE TO COMMENT
COMMENTOR NO. 594: VAN DOORNINCK, KITTY-ANN

Response to Comment No. 594-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 595: EISNER, NANCY

June 19, 1995

Dear Sirs —

Please don't allow ~~all~~ any spent fuel go thru the port of Tacoma — It is a bad idea for many, many reasons —

595-1

Thank-you.
Nancy Eisner
21 Lummi Key
Bellingham, WA
98006-1015

RESPONSE TO COMMENT
COMMENTOR NO. 595: EISNER, NANCY

Response to Comment No. 595-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 596: BRAUNGER, ROBERT M.

TO: Charles Head@FAX:202-586-5256
FROM: PlasmaBob
DATE: 95-06-23 20:41:57 EDT
SUBJ: A Tacoma citizen against NIMBY

Mail from America Online user "PlasmaBob":

To: Charles Head
Office of Spent Nuclear Fuel Management (EM-37)

Dear Mr. Head-

I recently read a rather antagonistic article in my local Tacoma paper about a meeting on 17 June that you had with local citizens about the possibility of moving waste through the area. I do not think the local papers have been fair to you or the issue and have done a disservice to our community. I am an officer in the military, and I know how hard it can be to serve a nation that often does not want to be served. Keep up the hard work; I know that the issue of radioactive waste is a "hot potato" that no-one wants to handle but *must* be dealt with responsibly for our nation's sake. 596-1

I sent the following letter to the writer in the local paper (C. R. Rogers at the Tacoma News Tribune (crr@p.tribnet.com)). I don't expect him to respond or to print any of it, but I wanted to speak my views against the "NIMBY" knee-jerk reaction that you apparently observed from my community.

Dear Mr. Roberts-

I read your 22 June article in the Tacoma News-Trib, "Enough Voices May Awaken Those Who 'Don't Have Time To Listen'" with some concern. Tacoma citizens seem to have let "Not in My Backyard" (NIMBY) fears of radioactive waste sway common sense and the needs of the nation.

I am a Federal (military) employee. I can somewhat empathise with Mr. Head, the DOE representative, as he sat and was heckled by angry Tacoma citizens irate at the possibility of radioactive waste moving through the Port of Tacoma.

Your paper has reported quotes from the people who drove in from all over the state, environmentally-concerned citizens fearful of the possible consequences. But how big is the "silent majority" on this issue? I have chosen not to be silent: I think that our Federal Government has a serious problem in trying to deal with radioactive waste, which is complicated by communities putting their desires above the needs of the nation.

Most of us approve of the submarines in the Navy roving the seas; a mission that could not happen without nuclear power. We approve of medical research and the use of radioisotope tracers to locate illnesses. And yet, no-one is willing to allow the wastes that will come from even the most essential uses to move through their community. The Federal Government has spent billions designing a safe permanent waste disposal site in the Southwest US, only to be stymied by the local population changing its mind and voting against the site. As a result, hundreds of tons of nuclear waste remains in substandard "temporary" holding sites, causing significant risk of contamination. NIMBY sentiment has caused a serious problem that will harm the entire nation; we need to get a handle

RESPONSE TO COMMENT
COMMENTOR NO. 596: BRAUNGER, ROBERT M.

Response to Comment No. 596-1

The commentor's concerns and views on these matters are noted. Section 4 of the EIS presents radiological and nonradiological health effects calculated for the proposed action and management alternatives. No significant adverse health risks were found to result from implementation of the proposed action. Section 4.10 of the EIS provides a perspective of health risks and other common radiological and nonradiological risks.

COMMENTOR NO. 596: BRAUNGER, ROBERT M. (CONT'D.)

on the radioactive waste problem, but a community like ours refusing to let the nation use its port is adding to the problem, not solving it.

I understand that local citizens are concerned about the chances of an accident; they *should* be concerned. They should be presented clear data by the DOE and must be convinced that there are sufficient safeguards and procedures to protect against leaks. But in all of the articles that the News-Trib published on the radioactive waste issue, I never saw data. You only cited examples like Chernobyl, the Challenger disaster, and the Exxon Valdez. Your article went on to bash "bureaucrats" and the Federal Government. This is not responsible reporting. Sure, technology has had and will have disasters. But let us compare apples with apples. How about discussing some *real* data, like, say, what environmental impact there has been on other ports that had radioactive waste moving through them. I have no idea what data was presented at the meeting by Mr. Head, since your paper decided not to report it, merely to deride it.

I fear that the citizens of Tacoma are somewhat overreacting; yes, there is a finite probability of a serious accident. This probability needs to be lowered as much as possible, and safeguards and plans must be made to deal with the risk. But we are dealing with a min-max problem here: a very small probability of a very bad thing, much like the very small probability of an big asteroid slamming into the earth and causing mass extinctions. Low-probability disasters must have the probability weighted against the danger. I would contend that an earthquake or volcano eruption is a much larger *weighted* danger to the Puget Sound community than any nuclear waste moving through the port.

I apologize if this letter has become long-winded, but I feel that your column really did not present a balanced view of a complicated issue. If every community let NIMBY sentiments rule policy, then our nation would be unable to perform necessary, but unpleasant tasks, such as garbage disposal, waste disposal, or military weapon tests. Our community is binding the hands of the Federal Government as it attempts to cope with a nationwide problem. Tacoma needs to take a balanced view at the real risks of radioactive waste and make an informed decision.

Yours,

Robert M Braunger
Tacoma Resident

RESPONSE TO COMMENT
COMMENTOR NO. 596: BRAUNGER, ROBERT M. (CONT'D.)

6/25/95

CHARLES HEAD
OFFICE OF SPENT FUEL MANAGEMENT (EM-37)
OFFICE OF ENVIRONMENTAL MANAGEMENT
US DEPT OF ENERGY
1000 INDEPENDANCE AVE SW
WASH. D.C. 20585
FAX 202 586 5256

DEAR MR HEAD:

WE VIGOUROUSLY ASK YOU TO NOT USE THE PORT OF TACOMA TO SHIP OR TO RECEIVE SHIPMENTS OF NUCLEAR MATERIAL. 597-1

THE RISK IS TOO HIGH; THE BENEFITS VERY SMALL AS COMPARED TO THE RISK.

WE WERE NOT AWARE OF THE PUBLIC MEETING HELD HERE - IF WE HAD BEEN AWARE OF IT WE CERTAINLY WOULD HAVE ATTENDED TO CONVEY OUR OBJECTIONS IN PERSON

WE APPRECIATE YOUR LISTENING TO OUR VOICES OF UTMOST CONCERN.

Phil & Colleen Forde
1377 SKYLINE DR
TACOMA, WA 98406

c: SENATOR GORTON
SENATOR MURRAY

Response to Comment No. 597-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 598: OWEN, DOUGLAS E.

DOUGLAS E. OWEN
P.O.Box 84043
Tacoma, WA 98464-0043

Telephone & FAX (206) 566-6734
e-mail: keo1st@aol.com

June 25, 1995

Mr. Charles Head
Office of Spent Nuclear
Fuel Management (EM-37)
1000 Independence Ave. S.W.
Washington, DC 20585

FAX (202) 586-5256

By this letter, I join hundreds of other Tacoma residents who object to the very idea of importing foreign nuclear waste to the U.S. via the Port of Tacoma. 598-1

Obviously, this idea was not very well thought out from the beginning – among other problems I see (in addition to the possibility of an 'accident' in this area) is the enormous handling/transportation expense of moving this material across the country to its ultimate destination. 598-2

Why not select a port nearer to the ultimate dump destination for this material and for once, save the taxpayers considerable money? Even though this is foreign generated material, there is no doubt that the U.S. Government will be picking up the tab on this one.

I will appreciate your consideration of the facts.

Sincerely,

RESPONSE TO COMMENT
COMMENTOR NO. 598: OWEN, DOUGLAS E.

Response to Comment No. 598-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, Section 4.2.2 demonstrates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 598-2

The concept that the United States has a responsibility to manage the foreign research reactor spent nuclear fuel has received a great deal of attention, as is partly exemplified by the preparation of this EIS. Handling and disposing of this nuclear material is a task that should be done to reduce the risk associated with the proliferation of nuclear weapons.

The accident risks, which were found to be low, are evaluated in Sections 4.2.2.3 and 4.5 of the EIS. The costs associated with the various alternatives are also evaluated (Section 4.9 of the EIS) as are the various financing arrangements (Section 2.2.1.2 of the EIS). The port selection process is discussed in detail in Appendix D, Section D.1.9 of the EIS. Distance from the management site(s) is only one of five port selection criteria.

COMMENTOR NO. 599: SMITH, HELEN

22 June 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 20585

Sir:

Please add my name to the already long list of Tacomans who are opposed to having spent nuclear fuel shipped through my port and town from other countries. I live here, my 81 year old father and 72 year old stepmother, my brother and sister-in-law, my grown son and my granddaughter, and my four cats live here and on behalf of all of them, I object most strenuously to this plan. 599-1

I thought the days of having to protest such things were in the past, but to paraphrase someone else's words, "The price of freedom is eternal vigilance!" I would like to continue the freedom of myself, my family, friends and neighbors from fear of some stupid accident making us all not only glow in the dark but just plain dead.

Since these other countries were "smart" enough to figure out how to make and use this material, let them figure out how to dispose of it in their own country instead of shipping it here to mine!

Sincerely,

Helen Smith

Helen Smith
818 S. 118th St.
Tacoma, WA 98444

RESPONSE TO COMMENT
COMMENTOR NO. 599: SMITH, HELEN

Response to Comment No. 599-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 605: TAYLOR, NANCY

June 23, '95

Dear Sir,
We are very very much against any radioactive nuclear material being shipped thru Tacoma or any other US city for that matter. The health and welfare of our generation and future generations are at risk. Accidents do happen. Oil spills, hazardous waste leakages in other parts of the world including Hanford, WA.
Accidents do happen - an accident on the West coast could and would affect as far as the East Coast. Washington D.C. won't be immune.

Nancy Taylor
26904 Ravensdale Way SE
Ravensdale, WA. 98051

605-1

605-2

RESPONSE TO COMMENT
COMMENTOR NO. 605: TAYLOR, NANCY

Response to Comment No. 605-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 605-2

DOE agrees that accidents do occur. That is why the spent nuclear fuel transportation casks are designed, constructed and tested by simulation to withstand a series of impact and fire tests (See EIS Appendix B, Section B.2). Representative transportation casks have been crash tested to confirm compliance with simulation process. Two actual crash tests involving a locomotive and a tractor trailer carrying a transportation cask have been performed. Both tests showed no failure of the casks but the locomotive and tractor trailer were destroyed. These tests demonstrated that a spent nuclear fuel transportation cask built to the federal standard would protect and retain its contents in all credible accidents. Nevertheless, the EIS evaluated the consequences of accidents involving a spent nuclear fuel transportation cask where the cask is considered failed with a certain probability. The accidents ranged from no cask failure to that of cask failure combined with a high intensity fire. Section 4 of the EIS provides a summary of impacts, both the risks and consequences, resulting from accidents involving a spent nuclear fuel transportation cask. The results indicate that the risk associated with the transport of the spent nuclear fuel is low.

Also, the spent nuclear fuel is solid metal and it is transported dry inside the transportation casks. As a result, the radioactivity within the spent nuclear fuel cannot "leak" from the transportation casks.

COMMENTOR NO. 606: GRIESSEL, ALAN E.

THE DOOR STORE, INC.
3110 Ruston Way – Tacoma, Washington 98402 – (206) 752-1900 or 1-800-624-4402

Mr. Head —
Add my voice + my wife's
+ children's to

NO NUCLEAR Waste
IN Puget Sound,
Period. —

Alan E. Griessel

606-1

RESPONSE TO COMMENT
COMMENTOR NO. 606: GRIESSEL, ALAN E.

Response to Comment No. 606-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 607: LARSEN, CAROL

Dear Mr. Head,

I, and my family do not want nuclear waste shipped through the Port of Tacoma. There is always a chance of the accident that can't happen actually happening in spite of all our precautions. Remember Three Mile Island, Exxon Valdez + Chernobyl to name just a few. 607-1

At most, it should be brought through a military port by trained military personnel. At best, it should be kept in the countries that already have nuclear dumpsites in place. They can + do use it to generate electricity to meet their country needs. 607-2 607-3

Carol Larsen
6007 N. 35 St.
Tacoma, WA 98407

RESPONSE TO COMMENT
COMMENTOR NO. 607: LARSEN, CAROL

Response to Comment No. 607-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 607-2

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted.

Response to Comment No. 607-3

There are no countries that have disposal sites for spent nuclear fuel in operation today, so the option suggested by the commentor is not feasible. Nevertheless, options for management of the foreign research reactor spent nuclear fuel overseas are evaluated in the EIS, as Management Alternative 2, in Sections 2.3 and 4.4 of the EIS.

COMMENTOR NO. 608: JOWDERS, JULIA E.

June 22, 1995

Charles Head,

No nuclear waste through the Port of Tacoma.

608-1

Julia E. Jowders
Victor R Jowders
9101-106 S Tacoma Rd
Olympia, WA 98513

RESPONSE TO COMMENT
COMMENTOR NO. 608: JOWDERS, JULIA E.

Response to Comment No. 608-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 609: HANSEN, GERTRUDE C.

June 22, 1995

Attention: Mr. Head,

Please do not allow nuclear waste to be shipped through our Port of Tacoma.

Please! Please! Please!

It would be a terrible mistake to endanger our wonderful Northwest in such a way.

Please dont allow this to happen!

Sincerely,

Gertrude C. Hansen

6845 So. Montgomery

Tacoma, Wa.

98409

P.S. First of all Puget Sound should be protected above everything else.

609-1

RESPONSE TO COMMENT
COMMENTOR NO. 609: HANSEN, GERTRUDE C.

Response to Comment No. 609-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 610: NICHOLS, DEBI R.

June 22, 1995

Dear Mr. Head,

My family and I are terrified of the idea of having nuclear waste shipped into our area through the Port of Tacoma.

Please don't dump on us !!!

Sincerely yours
Debi R Nichols

610-1

RESPONSE TO COMMENT
COMMENTOR NO. 610: NICHOLS, DEBI R.

Response to Comment No. 610-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 611: OLSEN, DIANE

June 21, 1995

Dear Mr. Head,

As a lifelong resident of Tacoma, Washington, it is with great urgency that I request that you re-think your shocking plan to use Tacoma's Commencement bay for nuclear waste transport. This is a highly populated area, and obvious safety problems could occur. We strongly protest this un-fair plan. We will do everything in our power to fight this faulty plan. 611-1

Sincerely,

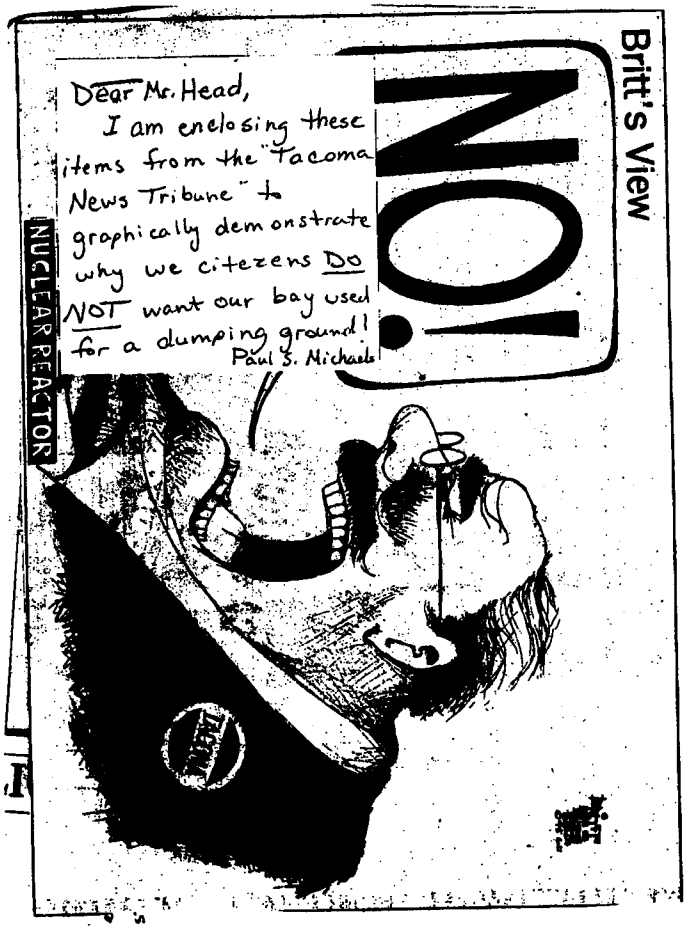
Diane Olsen
322 Berkeley Ave.
Tacoma, WA. 98466

RESPONSE TO COMMENT
COMMENTOR NO. 611: OLSEN, DIANE

Response to Comment No. 611-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Commentor No. 612: Michaels, Paul S.



612-1

Response to Comment
Commentor No. 612: Michaels, Paul S.

Response to Comment No. 612-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 613: OSBORNE, JUDY C.

Dear Mr. Head,

My name is Judy Osborne. I was born and raised here in Tacoma, Washington. It is with great surprise and disappointment that I was informed (while presently on vacation) that the D.O.E. is considering using our dynamic area as a dumping ground for nuclear waste, some from other countries.

I implore you to select other ways to deal with this issue rather than endanger innocent people in a highly populated area.

Sincerely, Judy C. Osborne
4219 N. Alki St.
Tacoma, WA. 98407

613-1

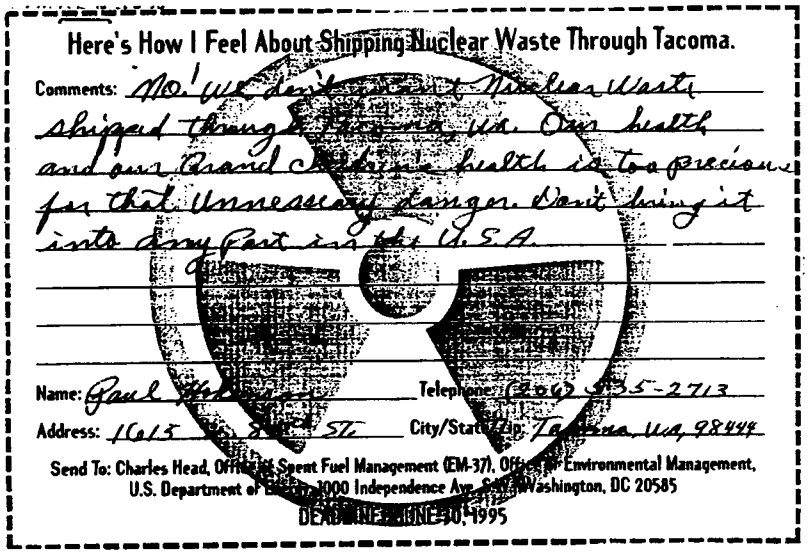
RESPONSE TO COMMENT
COMMENTOR NO. 613: OSBORNE, JUDY C.

Response to Comment No. 613-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

If the foreign research reactor spent nuclear fuel is accepted into the United States, there would be no storage of this material in the Port of Tacoma, or any other port. Under normal circumstances, it would remain at the port for a few hours. In the event of a major disruption of ground transportation systems, due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination.

Commentor No. 614: Hokenson, Paul



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: NO! We don't want Nuclear Waste shipped through Tacoma via. Our health and our Grand Children's health is too precious for that Unnessary danger. Don't bring it into any Port in the U.S.A.

Name: Paul Hokenson Telephone: (206) 535-2713

Address: 1613 S. 84th St. City/State/Zip: Tacoma, Wa. 98444

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. SW, Washington, DC 20585

DEADLINE: JUNE 30, 1995

614-1

Response to Comment
Commentor No. 614: Hokenson, Paul

Response to Comment No. 614-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma, or any United States port, is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 615: EINERT, DAVID & SUSAN

June 22, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue SW
Washington, D.C. 20585

Mr. Head,

We adamantly oppose the transfer of high level nuclear wastes through the Port of Tacoma. We have read in the newspaper the plans to ship the spent nuclear wastes will be relatively safe and need little extra security. What about Three Mile Island, the Exxon Valdez, Chernobyl, the leaks at Hanford? As for security, what of the terrorists that plague our world? 615-1

Mr. Head, you are quoted as saying that (the department of Energy) "They don't have time to listen." We expect that you take the time necessary for them to understand that Washington is an unacceptable choice.

Sincerely,

David Einert

Susan Einert

David and Susan Einert
4006 206th Street Court East
Spanaway, Washington 98387
(206) 846-3316

RESPONSE TO COMMENT
COMMENTOR NO. 615: EINERT, DAVID & SUSAN

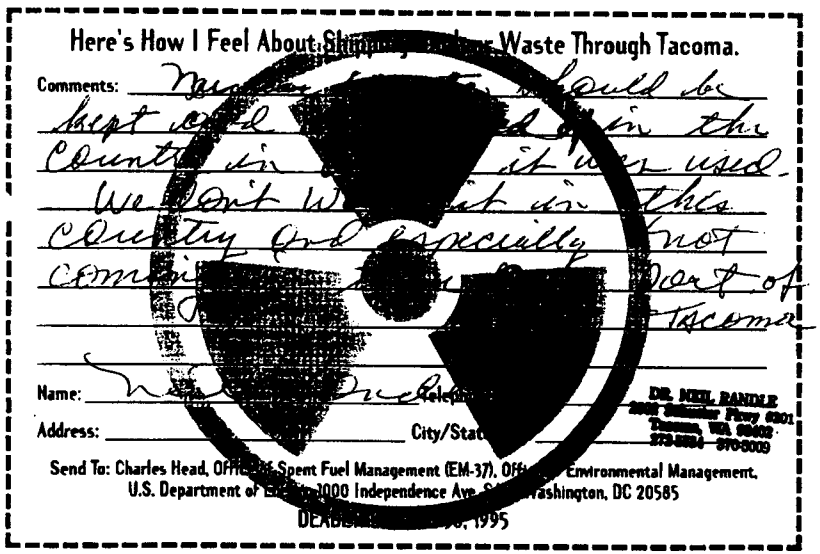
Response to Comment No. 615-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security measures employed at any port would meet or exceed all the security requirements in the Code of Federal Regulations (10 CFR Part 73). DOE supports these regulations as being adequate to protect the foreign research reactor spent nuclear fuel in any commercial port.

Appendix H has been added to the final EIS in response to public comments to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



616-1

616-2

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Boston, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

Response to Comment No. 616-1

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

Response to Comment No. 616-2

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 617: THARP, JENNY

June 22, 1995
1524 so Madison
Tacoma, Wa. 98405

Charles Head
Office of Spent Nuclear Fuel Mgmt.
U.S. Department of Engergy
1000 Independence Ave. SW.
Washington, D.C. 20585

Dear Mr. Head,

I and my immediate family of 2 want to let you know we do NOT want our Port of Tacoma to become the unloading spot for all the worlds' nuclear waste.

We don't care how supposedly safe it it, accidents happen. Our water and port are too important to the livelihood of many hundreds of people, besides the possible contamination of all the local residents.

617-1

Our communinity does NOT want to have all the health problems connected to over exposure to radiation. Look at what happened to all those people in Russia when the reactor metled down. That was quite a few years ago and they are still having health problems.

Find some other low populated area to bring it into the country. Not IN OUR BACKYARD!

We always thought our government was looking out for the best interest of its' citizens but this plan sure leaves us wondering!

Sincerely,
Jenny Tharp

RESPONSE TO COMMENT
COMMENTOR NO. 617: THARP, JENNY

Response to Comment No. 617-1

The commentor's opposition to the use of the Port of Tacoma to receive foreign research reactor spent nuclear fuel is noted. The analyses provided in the EIS indicate that the use of any of the ports, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel casks are also low (Section 4.2.2.2).

COMMENTOR NO. 618: CUMMINGS, MRS. VIKKI

3819 South Park Avenue
Tacoma, WA 98408
June 22, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

Dear Mr. Head:

Thank you for listening to Tacoma's concerns about becoming a receiving port for spent nuclear waste. As you have noted, "There's certainly a strong undercurrent of public opinion that is negative to this." You have also indicated that even before meeting with Tacoma's citizens, you had a fairly good idea what your recommendation would be in your report to the director of the Office of Spent Nuclear Fuel Management.

As you know, our public officials have strongly condemned this purposed shipment of nuclear waste into our town. As a concerned citizen who has lived in Tacoma most of my life, I also urge you not to allow our town to become a port of entry for nuclear waste.

No matter how many safety precautions are made, accidents happen. To think of the "what ifs" is beyond comprehension--Three Mile Island, the Exxon Valdez, Chernobyl, the leaks at Hanford. These were all accidents that shouldn't have happened. The potential for spent nuclear waste to contaminate our area is real. I agree with Harold Moss, Tacoma's Mayor, "This is a major threat."

Please recommend Tacoma not become a nuclear waste port. Thank you for listening. **618-1**

Sincerely,

Mrs. Vikki Cummings

Mrs. Vikki Cummings

RESPONSE TO COMMENT
COMMENTOR NO. 618: CUMMINGS, MRS. VIKKI

Response to Comment No. 618-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 619: LARSON, IVAN & ELEANOR

Mr. Charles Head
Office of Spent Nuclear Fuel Mgmt (EM-37)
U.S. Dept of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

June 23, 1995

RE:Radioactive nuclear waste

Dear Mr. Head:

There are other places in this world to dump radioactive nuclear waste than shipping it thru the Port of Tacoma. 619-1

You know this is a highly populated part of the State of Washington and of the country and you can find other places in the world that you could ship it thru other than the Port of Tacoma.

I just want to register our complaint loud and clear as 2 registered voters in the state.

Sincerely,

Eleanor Larson

Ivan and Eleanor Larson

RESPONSE TO COMMENT
COMMENTOR NO. 619: LARSON, IVAN & ELEANOR

Response to Comment No. 619-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 620: JEWART, JACK E.

24508-38th Ave Ct E
Spanaway, Washington, 98387
21 June 1995

Charles Head, Program Manager
Office Of Spent Nuclear Fuel Management (EM-37)
US Department Of Energy
1000 Independence Ave SW, Washington, DC 20585

Dear Sir:

I'm writing with regards to plans for movement of nuclear materials through Port of Tacoma, Washington. To begin with, I represent NO Agency, Group, or Affiliation but am speaking only as a citizen living in Pierce County, Washington. To demonstrate my knowledge of nuclear material, I'm including with this letter several diplomas and certificates I've been awarded. In particular, I would draw your attention to certificate awarding "The Meritorious Service Medal" by US Army which was given to me upon my retirement from US Army. It reads in part "Of particular importance was a completely rewritten Nuclear Accident/Incident Control Plan for Fort Lewis and the Northern United States Army SRX Sector" (Pacific Northwest). 620-1

Fully realizing this was some 28 years ago and procedures and equipment may have changed somewhat over these years, I will draw your attention to a couple problems that existed prior, without going into classified information. Army nuclear cargo in past was shipped by air. Aircraft routes included Pacific Northwest. Sixth US Army was responsible as long as planes were airborne. It suddenly became Fort Lewis's responsibility if a plane would crash into ground carrying nuclear cargo. Here are some limitations that I'm aware of.

One piece of safety monitoring equipment, used by emergency teams, was a gas proportional meter. Once calibrated, requiring various standards, this meter would NOT function when elevation varied by several thousand feet. Being calibrated at Fort Lewis location gave it a range of 0-3,000 feet. Unfortunately, many areas of Pacific Cascades, as well as Mount Rainier, exceed these elevations. In short, should accident occur by a plane hitting Mount Rainier at a high elevation, meter necessary for safety of emergency crews, would not function unless recalibrated (a lengthy procedure) at elevation in which accident occured. I realize that Tacoma Tideflats would not be a problem in this case.

Another piece of monitoring equipment used had a different specification. It's operational range was from 0-98% relative humidity. At humidity ABOVE 98%, meter did NOT function. Areas of Pacific Northwest DO, at sometimes, have a relative humidiy in excess of 98%. I again realize it would be a once in a blue moon shot that an accident would occur as safety is stressed in entire program. I also realize that should an accident occur, there might only be a slim possibility relative humidity would be in excess of 98% on that particular day.

Again, it's been some 28 years and I realize safety equipment necessary may be changed. I would ASSUME a complete review of environmental limitations of safety equipment will be checked prior to approval of Tacoma as a receiving site. Other areas, such as a location in California may NOT have climatic conditions of Seattle/Tacoma area and may not present problems.

In summary, and passing, I'll give you an actual account of an unloading situation of hazardous cargo I was given once. Necessary monitoring equipment for off loading a Merchant Marine ship was not available. Instructions given me were monitoring device was not needed as hazardous cargo would smell like fish if leaking. My reply to my superior was, "Do you realize that everything around docks in port town we're unloading in smells like fish!" Needless to say, correct monitoring equipment was positioned prior to unloading.

Yours Truly,

Jack E. Jewart (206) 847-1281
cc: Deputy Mayor Evans, City Of Tacoma

RESPONSE TO COMMENT
COMMENTOR NO. 620: JEWART, JACK E.

Response to Comment No. 620-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 621: CECCANTI, MARGHERIT

June 22, 1995

Charles Head

Dear Sir,

I do not want nuclear waste being shipped through the Port of Tacoma. Any suggestion would be to put in your back yard.

Respectfully

Margherit Ceccanti

2408 Day St.

Tacoma Wa 98466

621-1

RESPONSE TO COMMENT
COMMENTOR NO. 621: CECCANTI, MARGHERIT

Response to Comment No. 621-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 622: RIDENOUR, MARGARET A.

June 22, 1995

Dear Sir,
My husband and I are residents of Tacoma Wa, We are in our late 70's. For the sake of people and especially our young people and eventually their children we DO not repeat DO not want highly radioactive nuclear waste shipped thru the Port of Tacoma - For that matter nuclear waste from a foreign country should not repeat not be shipped to the U.S. Sometime, somewhere there is bound to be an accident. It matters whether the accident is this year or 100 or 200 years from now - It is a major threat.

Margaret A. Ridenour
Charles E. Ridenour
8006 75th St. S.W
Tacoma, WA. 98498

622-1

622-2

622-3

RESPONSE TO COMMENT
COMMENTOR NO. 622: RIDENOUR, MARGARET A.

Response to Comment No. 622-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 622-2

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States is noted (Management Alternative 1 or 3, Sections 2.2 and 2.4 of the EIS). Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

Response to Comment No. 622-3

DOE agrees that accidents do occur. That is why the spent nuclear fuel transportation casks are designed, constructed and tested by simulation to withstand a series of impact and fire tests (Appendix B, Section B.2 of the EIS). Representative spent nuclear fuel transportation casks have been crash tested to confirm compliance with the simulation process. Two actual crash tests involving a locomotive and a tractor trailer carrying a transportation cask have been performed. Both tests showed no failure of the casks, but the locomotive and tractor trailer were destroyed. These tests demonstrated that a spent nuclear fuel transportation cask built to the federal standard would protect and retain its contents in all credible accidents. Nevertheless, the EIS evaluated the consequences of accidents involving a spent nuclear fuel transportation cask where the cask is considered failed with a certain probability. The accidents ranged from no cask failure to that of cask failure combined with a high intensity fire. Section 4.2.3 of the EIS provides a summary of impacts, both the risks and consequences, resulting from accidents involving a spent nuclear fuel transportation cask. The results indicate that the risk associated with the transport of the spent nuclear fuel is low.

Also, the spent nuclear fuel is solid metal and it is transported dry inside the transportation casks. As a result, the radioactivity within the spent nuclear fuel cannot "leak" from the transportation casks.

COMMENTOR NO. 623: DUNKIN, EVELYN

Tacoma Wa
June 22 - 95

Dear Charles Head:

I do not wish to have Nuclear fuel Waste dumped into Port of Tacoma also my family and all the People living here in Tacoma, do Not Want it dumped Here. In Washington D.C. at Dept of Energy. The Bureaucrats. don't care about the People here. So they say dump the Nuclear Waste here. they dont live here. They can just dump it in their own Area. We don't Want that Nuclear wast dumped here. Our Commencement Bay in Tacoma, does not need Nuclear fuel here to Leak and Kill our wild Life fish. We are human Not Rabats. we dont want any Part of Nuclear fuel here. there are lot of Places in this World to dump it. But Please Not here. Who wants to Dump it here. Please dump it in your own Area We Are people here, Keeping Are City Clean from Nuclear Waste we dont need it Here. I know I Served in Military. Why pick Tacoma of all Places. Some one is putting. Money in their Pocket from Such arrangements. I know talk is Big. But money goes in to their Packet. I been around and Said things Happen. Please Dont Dump Nuclear fuel Here. We dont Need it.

Evelyn Dunkin

623-1

RESPONSE TO COMMENT
COMMENTOR NO. 623: DUNKIN, EVELYN

Response to Comment No. 623-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 624: KOSKI, WILLIAM A.

William A. Koski
1001 No. Hudson ST
Tacoma, WA., 98406-3125

22 JUNE 1995

MR CHARLES HEAD
OFFICE OF SPENT NUCLEAR FUEL MANAGEMENT (EM 37)
U.S. DEPT OF ENERGY
1000 INDEPENDENCE AVE., S.W.
WASHINGTON, D.C. 20585

REFERENCE THE SHIPMENT OF SPENT NUCLEAR FUEL THROUGH TACOMA.

PUGET SOUND IS KNOWN FOR ITS PRISTENE BEAUTY, AND TO ENDANGER IT AND ITS INHABITANTS WOULD BE TANTAMOUNT TO HAVING A CHILD HOLD A LOADED GUN IN A CROWDED ROOM. EVENTUALLY SOMEONE IS GOING TO BE HURT.

I IMPLORE YOU TO RECONSIDER SIR, - NO NUCLEAR FUEL THROUGH TACOMA! 624-1

William A Koski

P.S. TAKE TIME TO READ C.R. ROBERTS ARTICLE, INCLOSED. TAKE TIME

RESPONSE TO COMMENT
COMMENTOR NO. 624: KOSKI, WILLIAM A.

Response to Comment No. 624-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 625: KENDALL, RAYMOND

Please dont send us waste

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: Why ship [illegible] populated area?
Why is Tacoma [illegible] place to ship waste?
Who determined [illegible] needed the business?
Who do I call to stop this?
Hand Carr Dept. of Energy say Tacoma is the best
Place [illegible]?
The Port of Tacoma [illegible] the most
Pristine [illegible] the [illegible] Why take
The chance with [illegible]

Name: Raymond [illegible] Kendall Telephone: 206 [illegible]-1273

Address: PO Box [illegible] Tacoma City/State/Zip: Wa. 98401

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, DC 20585

DEADLINE: JUNE 30, 1995

625-1

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

RESPONSE TO COMMENT
COMMENTOR NO. 625: KENDALL, RAYMOND

Response to Comment No. 625-1

The port selection process, described in Appendix D, Section D.1.9 of the EIS, identifies ports that are acceptable for the receipt and handling of foreign research reactor spent nuclear fuel; it does not determine which port is best. The decision as to which port or ports would be used in the case that foreign research reactor spent nuclear fuel is accepted into the United States, will be in the Record of Decision. The population in the port, surrounding areas, and along the transportation route to the management site are some of the many factors that must be considered in determining the best port. Section 4.2.2 of the EIS discusses the impacts on ports of the proposed action.

COMMENTOR NO. 626: MASSETTI, GUY

1418 - 68th Avenue East
Tacoma, Wa 98466
June 22, 1995

Charles Head
Office of Spent Nuclear Fuel Mgmt (EIS-31)
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

Dear Sir:
No! - No! - No! to the
shipment of nuclear waste
being shipped through the
Port of Tacoma.
We cannot take the
chance of an accident. Our
Children and our Children's
Children deserve more -
from us. We must protect
them.

Sincerily -
Hugh M. Massetti
Guy Massetti

626-1

RESPONSE TO COMMENT
COMMENTOR NO. 626: MASSETTI, GUY

Response to Comment No. 626-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 627: ZMUDA, MICHAEL

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: We have enough problems. We don't need any more with nuclear waste in our town. NO NUCLEAR WASTE! We shouldn't even be [redacted] along this nuclear waste in our country.

627-1

Name: Michael Zmuda Telephone: (206) 627-2074

Address: 3420 So Proctor #A City/State/Zip: Tacoma WA 98409

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., SW, Washington, DC 20585

DEADLINE: JUNE 30, 1995

RESPONSE TO COMMENT
COMMENTOR NO. 627: ZMUDA, MICHAEL

Response to Comment No. 627-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 628: BODENHUFER, PAUL J.

318 HARVARD AVE.
TACOMA WA. 98466-4305
20 JUNE 1995

CHARLES HEAD, PROGRAM MANAGER
OFFICE OF SPENT NUCLEAR FUEL MANAGEMENT (RW-37)
U.S. DEPT OF ENERGY
1000 INDEPENDENCE AVE SW
WASHINGTON D.C., 20585

DEAR MR. HEAD:
WE ARE OPPOSED TO NUCLEAR FUEL SHIPMENTS THROUGH THE PORT OF TACOMA.
THE MEETING ROOM LAST NIGHT HOLDING 300 PERSONS TO DISCUSS THIS ISSUE WITH DOE WAS NOT LARGE ENOUGH TO HOLD ALL THE PERSONS WHO WANTED TO ATTEND INCLUDING US. PROBABLY ABOUT 500 PEOPLE WANTED TO ATTEND TO VOICE THEIR OPINIONS.
THE DOE USED OUTDATED INFORMATION ON THE PORT OF TACOMA. THE DEIS LISTS ONLY ONE TERMINAL THROUGH WHERE THESE SHIPMENTS WOULD POTENTIALLY BE SHIPPED. THE PORT OF TACOMA HAS 6 CONTAINER TERMINALS. THE CONFIGURATION OF THESE TERMINALS IS SHOWN IN STATE IN EXISTENCE IN YEAR 1990 OR BEFORE. ON-DOCK RAIL YARD CONFIGURATIONS ARE NOT SHOWN AND WATERWAYS ARE SHOWN INCORRECTLY. GIVEN THESE ERRORS IN ANALYZING FACILITIES FOR HANDLING THESE SHIPMENTS THERE IS NO REMEDIATE THAT NEARBY POPULATIONAL CENTERS WERE SHOWN CORRECTLY AND EVALUATED CORRECTLY
THERE ARE SEVERAL AREAS IN THE PUGET SOUND REGION SHOWING WATER DEPTH OVER 200 METERS IN MAJOR SHIPPING LANES TO AND FROM THE PORT OF TACOMA. DOE DESCRIBED IN THE DEIS THAT IT WOULD BE VERY DIFFICULT OR IMPOSSIBLE TO RECOVER FUEL CASKS FROM DEPTHS GREATER THAN 800 METERS. DOE DID NOT CONSIDER THE DEEP WATER DEPTH IN PUGET SOUND

628-1

RESPONSE TO COMMENT
COMMENTOR NO. 628: BODENHUFER, PAUL J.

Response to Comment No. 628-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

In regard to the EIS being based on outdated and inaccurate information, updated information on the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS. The errors identified by the commentator have been corrected in the final EIS, so the final decision will be based on current information. In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Section 4.2.1.3 of the EIS has been modified to include this assurance of recovery in coastal waters. Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters. The impacts of a foreign research reactor spent nuclear fuel transportation cask sinking in coastal and deep waters are estimated in the EIS (Appendix C, Section C.5). The results of this analysis show that both the consequences and the risk of these accidents are low (Appendix C, Sections C.5.4 and C.5.5).

COMMENTOR NO. 628: BODENHUFER, PAUL J. (CONT'D.)

2

318 HARVARD AVE
TACOMA, WA. 98466-7305
20 JUNE 1995

COMMENCEMENT BAY AND THE PORT OF TACOMA ARE LOCATED IN FEDERALLY DESIGNATED SUPERFUND SITE ("DIRTY PORT"). DOE DID NOT RECOGNIZE THAT SHIPMENT OF NUCLEAR MATERIALS WOULD CONTRIBUTE TO THIS "DIRTY PORT" STIGMA.

SEVERE FIRE OR EXPLOSION INVOLVING A SHIPPING CASK OF NUCLEAR SPENT FUEL WOULD CAUSE SEVERE DAMAGE AND HAVE LONG-TERM EFFECTS ON A LARGE AREA NEAR THE DISASTER SITE. IT WOULD HAVE CRIPPLING EFFECTS ON MANY BUSINESSES IN THE AREA.

628-1 (Cont'd.)

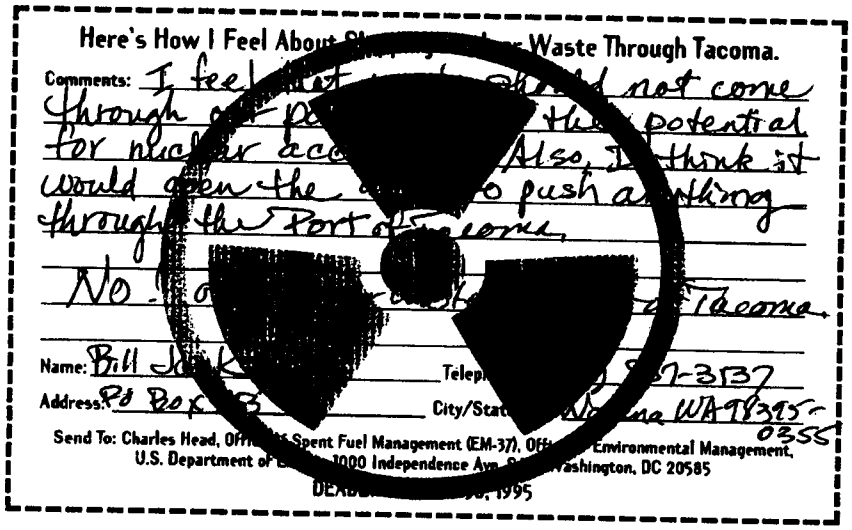
DOE DID NOT ADEQUATELY ADDRESS THE SECURITY REQUIREMENTS FOR THESE SHIPMENTS. THIS MATERIAL IS USEABLE IN NUCLEAR WEAPONS AND HIGHLY ATTRACTIVE TO TERRORISTS. PROPER SECURITY MEASURES TO COUNTER POSSIBLE ACTS BY TERRORISTS WERE NOT PROVIDED FOR IN DEIS.

THE BOUR ARE SOME OF THE REASONS WE ARE OPPOSED TO NUCLEAR FUEL SHIPMENTS THROUGH OUR PORT.

SINCERELY YOURS,
Paul J. Bodenhufer
PAUL J. BODENHUFER
MARGARET BODENHOFER
Margaret Bodenhofer

RESPONSE TO COMMENT
COMMENTOR NO. 628: BODENHUFER, PAUL J. (CONT'D.)

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



Here's How I Feel About [illegible] Waste Through Tacoma.

Comments: I feel [illegible] should not come through [illegible] the potential for nuclear acc[illegible] Also, I think it would open the [illegible] to push a[illegible] thing through the Port of Tacoma.

No [illegible] Tacoma.

Name: Bill Jack[illegible] Telep[illegible] 7-3537

Address: PO Box [illegible] City/State [illegible] WA 98335-0355

Send To: Charles Head, Off[illegible] Spent Fuel Management (EM-37), Off[illegible] Environmental Management, U.S. Department of [illegible] 1000 Independence Ave[illegible] Washington, DC 20585

DEA[illegible] 1995

629-1

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

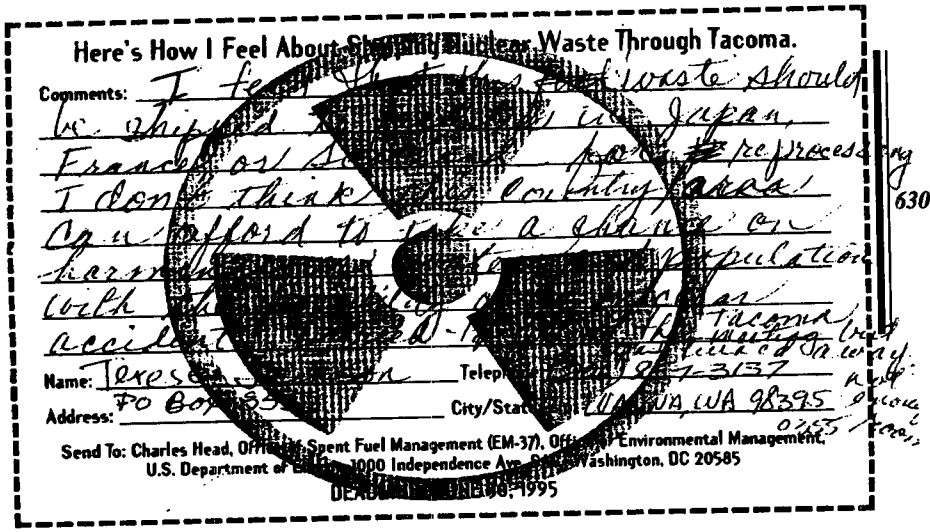
Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Buston, Federal Way; Tacoma-Pierce County Visitor & Convention Bureau, Tacoma-Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

Response to Comment No. 629-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 630: JACKSON, TERESE

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: I feel this waste should be shipped to Japan, France or [illegible] for reprocessing. I don't think this country can afford to take a chance on [illegible] with [illegible] accident. [illegible] Tacoma [illegible]

630-1

Name: Teresa [illegible] Telephone: [illegible]-3137

Address: PO Box [illegible] City/State: [illegible] WA, WA 98395

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: June 30, 1995

The strongest weapon against nuclear waste is right at your fingertips. Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste. For more information call the Port of Tacoma Hot Line at 597-7575.

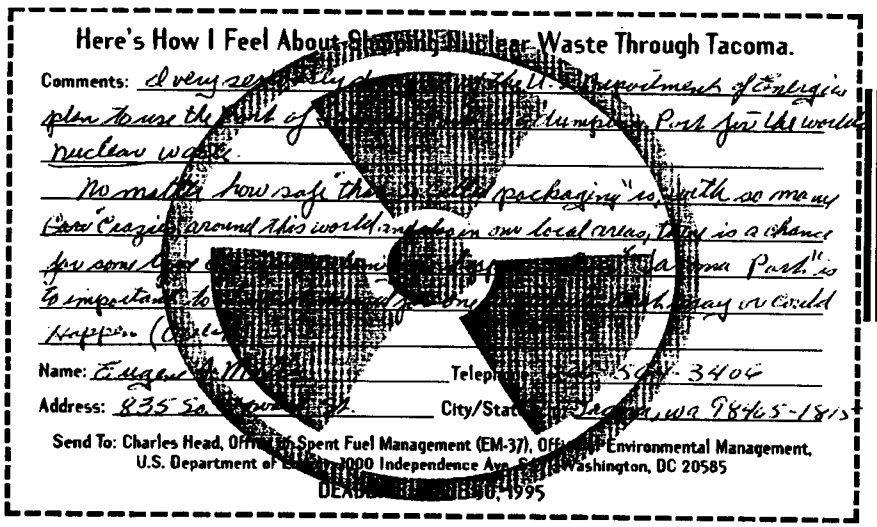
Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Ruston, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

RESPONSE TO COMMENT
COMMENTOR NO. 630: JACKSON, TERESE

Response to Comment No. 630-1

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: I very seriously [illegible] the U.S. Department of Energy's plan to use the Port of [illegible] Tacoma Port for the world's nuclear waste.

No matter how safe the "[illegible] packaging" is, with so many Crazies around this world and even in our local area, there is a chance [illegible] Tacoma Port" is [illegible] important to [illegible] may or could happen. (Chernobyl)

631-1

Name: Eugene J. Miller Telephone: (206) 581-3404

Address: 835 So. [illegible] City/State: Tacoma, WA 98465-1815

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: June 30, 1995

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by **June 30, 1995**. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Ruston, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

Response to Comment No. 631-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 632: REMILLARD, MICHELE

June 22, 1995

Mr. Charles Head
Program Manager
Office of Spent Nuclear Fuel Mgmt.
US Dept. of Energy
1000 Independence Ave.
SW Washington, D.C. 20585

Dear Mr. Head:

I oppose bringing nuclear waste to the Port of Tacoma from foreign countries. I also oppose burying the ~~Nuc~~ nuclear waste any where in the State of Washington or The United States of America. 632-1 632-2

Sincerely,
Michele ReMillard
9916 NW 3rd Ct.
Vancouver, Wa. 98685

RESPONSE TO COMMENT
COMMENTOR NO. 632: REMILLARD, MICHELE

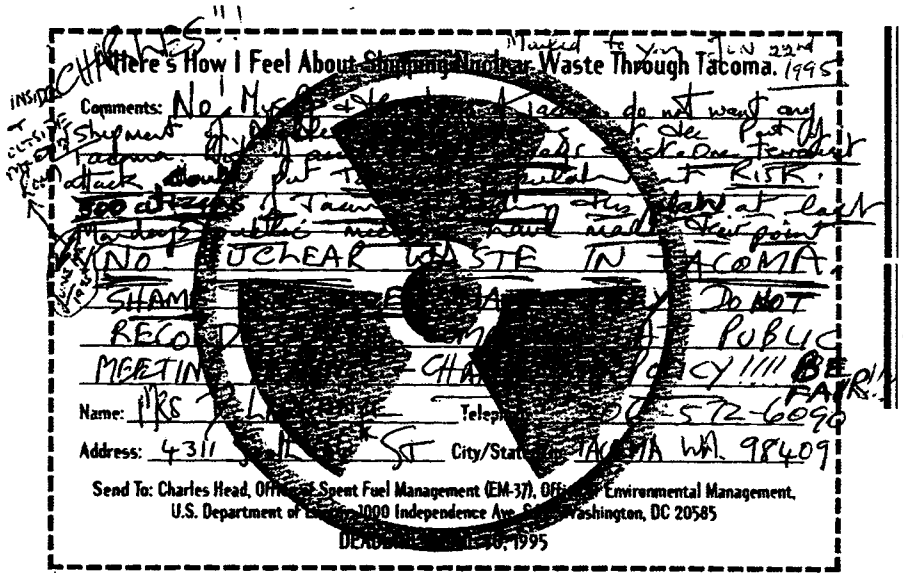
Response to Comment No. 632-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 632-2

The commentor's opposition to acceptance of foreign research reactor fuel into the United States (Management Alternatives 1 and 3, Sections 2.2 and 2.4 of the EIS) is noted. Under the basic implementation of Management Alternative 1, above ground dry cask storage would be used for the foreign research reactor spent nuclear fuel. Wet storage is also considered as an implementation alternative (Section 2.2.2.5 of the EIS). Underground burial would not be used, nor is it considered as an implementation alternative in the EIS.

COMMENTOR NO. 633: LAWRENCE, DOROTHY


Here's How I Feel About Shipping Nuclear Waste Through Tacoma. 1995

Comments: No ... do not want any ... Port ... RISK ... NO NUCLEAR WASTE IN TACOMA ... SHAM ... Do NOT ... PUBLIC ... MEETIN ... CHA ... POLICY !!!! BE FAIR!

Name: [illegible] Telep... 572-6096

Address: 4311 ... ST City/State ... TACOMA WA. 98409

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of ... 1000 Independence Ave. ... Washington, DC 20585

DEADLINE ... 30, 1995

633-1

633-2

RESPONSE TO COMMENT
COMMENTOR NO. 633: LAWRENCE, DOROTHY

Response to Comment No. 633-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 633-2

DOE did request that comments be submitted in writing, however, all oral comments presented at each hearing were summarized and have been addressed along with the written comments in Volume 3 of the EIS. All comments, written and oral, are part of the public record. The format adopted by DOE for the public hearings held on the draft EIS is fully in compliance with the requirements of NEPA regulations and DOE's requirements for conducting such hearings. In the large majority of cases, this public hearing format has been well received by the public. Nevertheless, in addition to the public hearings, several other avenues were also provided through which members of the public could make their comments on the draft EIS known.

COMMENTOR NO. 634: JENSEN, LAURA

Friday, June 23, 1995
Tacoma, Washington

Charles Head
Office of Spent Nuclear Fuel Management
(EM-37)
US Department of Energy
L000 Independence Avenue, S.W.
Washington, DC 20585

To Charles Head;

As a person who has always been a citizen of Tacoma but could only feel dumbfounded by the sound of the extraordinary plan to ship highly radioactive uranium through the Port of Tacoma, I could only feel so very sympathetic with the many comments I heard at the meeting Monday at the Untilities Building in Tacoma. I felt convinwed by the speaker who was a Renton resident who was concerned that the second alternative, to leave the uranium where it is, was not considered. He wondered if it could be fair to have the United States be the deposit of spent fuel for all these countries which have used the fuel themselves. He added that there was concern for wildlife in the event of a spill like an oilspill. I felt convinced by the speaker from the company that does deep water research that insisted that the described casks could not take the deep water pressure, that they were designed for shallower water. He insisted that the casks were not safe for shipping. I felt convinced by the speaker who believes the information from the report about the Port is out of date. This speaker argued that cask recovery would be difficult. He also argued that the Commencement Bay is a superfund site - much effort has gone toward clearing the contamination. He also urges that Tacoma not be used because operational plans are not adequate for safety.

634-1

634-2

634-3

634-4

634-3 (Cont'd)

Again, I felt shocked by the plan and felt sympathy for the imtelligent comments of the speaker.

Truly,

Laura Jensen
302 North Yakima C3
Tacoma, WA 98403-2213

RESPONSE TO COMMENT
COMMENTOR NO. 634: JENSEN, LAURA

Response to Comment No. 634-1

The commentor's preference for the overseas management alternative is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

Response to Comment No. 634-2

The intent of the proposed action is to support U.S nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide. The intent of the resultant proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

If foreign research reactor spent nuclear fuel were accepted into the United States, the policy would be of limited duration (Section 2.2.1.1 and 2.2.2.2 of the EIS).

Response to Comment No. 634-3

The EIS did not address marine spills in Puget Sound or elsewhere because the metal fuel is shipped dry inside a transportation cask, thus there is nothing to spill. In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Section 4.2.1.3 of the EIS has been modified to include this assurance of recovery in coastal waters. Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters. The impacts of a foreign research reactor spent nuclear fuel transportation cask sinking in coastal and deep waters are estimated in the EIS (Appendix C, Section C.5). The results of this analysis show that both the consequences and the risk of these accidents are low (Appendix C, Sections C.5.4 and C.5.5).

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radioactive contents have ever been released from a spent nuclear fuel transportation cask, nor has a spent nuclear fuel transportation cask ever been punctured, even as a result of an accident.

Updated information on the terminals at the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS.

DOE has added a sentence to Appendix D, Section D.2.1.9 of the EIS regarding Commencement Bay being a Superfund Site. The analysis of impacts, as documented in Section 4 of the EIS, demonstrates that there would be no significant adverse impacts on the ports, people, or natural environment from shipments of foreign research reactor spent nuclear fuel and the overall impacts to Commencement Bay would be unchanged by the various management alternatives.

Foreign research reactor spent nuclear fuel has been accepted at ports in the United States without incident for over 30 years (Sections 1.1 and 1.2 of the EIS). If a policy to accept foreign research reactor spent nuclear fuel into the United States is adopted, this spent nuclear fuel would be shipped in standard transportation containers which are routinely handled at all of the candidate ports (Section 2.6.3.2 of the EIS).

Response to Comment No. 634-4

The commentor's reference to an individual who claimed that the spent nuclear fuel transportation casks are designed only for shallow water is noted. It is true that the regulations governing the design and construction of spent nuclear fuel transportation casks require a series of tests including immersion test to a depth of 50 meters, but this does not mean that the cask would buckle if it were to sink in deeper water. The pressure test resulting from the immersion test is a means to determine the tightness of cask seals, and it is not a structural integrity test. If a cask were to sink in a deep ocean, the cask seals would fail and the seawater would enter the cask. The seawater in-leakage would eventually equalize the pressure inside the cask to that of the outside. At that point, only the seawater corrosion would damage the cask structural integrity. If there is no seal failure the cask would not buckle at depths of less than 305 meters (1000 feet). The EIS evaluated scenarios involving sinking of a spent nuclear fuel transportation cask in the deep ocean and in the continental shelf (Section 4 and Appendix C of the EIS). If a cask were to sink in U.S. coastal waters it would be recovered.

COMMENTOR NO. 635: KAATTARI, OSCAR

June 23, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

Dear Mr. Head,

I have never written to protest anything but I am now in hopes that my small voice might add to those you have already heard from and will hear from. Mine is on two counts:

1. The entry of "nuclear scrap" into this country through the Port of Tacoma, Washington.

2. The fact of the entry of foreign nuclear scrap to add to our own that we have to contend with already.

635-1

In 1963 I became a journeyman machinist following a four year apprenticeship at Puget Sound Naval Shipyard. It was apparent to me at that time that to be involved in nuclear was to be "on the fast track" to advancement.

I chose not to because it looked to me that, in spite of all the "advantages" for it's use, it is too involved and makes too much too long term mess. You have a job now because of that mess, but I wouldn't want it.

I don't see that people living on Puget Sound, Washington, especially Tacoma, in this day should have to contend with scrap entering this country that belongs to someone else. More, I don't see that generations in the future should have to contend with the mess we have made in this country, and then to add to it bringing in foreign material.

We don't want Washington to be a dumping ground, either by accident (Tacoma), or by design (Hanford).

Oscar Kaattari

Oscar Kaattari
E30 Park Place,
Shelton, Washington
98584

RESPONSE TO COMMENT
COMMENTOR NO. 635: KAATTARI, OSCAR

Response to Comment No. 635-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 636: OSTMANN, HEATHER

Heather Ostmann
906 Manor Dr.
Fircrest, WA 98466
June 22, 1995

Charles Head, Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington D.C. 20585

Dear Charles Head:

I am writing you this letter in regards to the plan to ship toxic nuclear waste through the Port of Tacoma. You must be well aware of the fact that the people of Western Washington strongly oppose this idea since your attendance at the meeting on June 19, 1995. I understand that this must be a difficult problem to solve (nobody wants boat loads of nuclear waste I am sure). Yet, I feel it is very unprofessional and disrespectful of not only you and your staff but also the entire Department of Energy to show so little concern for the people of Western Washington. It is us who will have to live with this stuff and the results of any accidents that may occur. Western Washington is a densely populated area and is continuing to grow at a rapid rate. I find it very callous on your part to disrespect our opinions on the matter and to not report our opinions to your bosses. I see no reason why your bosses should not listen to our opinions. As officials it is their job to represent the people of the United States. Yet, they do not have the time to listen to a large chunk of those people express their opinions on something as important as nuclear waste. With all due respect it is going to be shipped into our front yard. I think you and your bosses need to reevaluate not only your decision but, also your responsibilities to the American people. I think everyone in Washington D.C. who is a part of this decision should seriously consider every aspect of this situation (including the opinions of the public) before making a final decision. I feel that you at least owe us that. Thank you for your time.

636-1

Sincerely yours,

Heather Ostmann

Heather Ostmann
Tacoma Resident

RESPONSE TO COMMENT
COMMENTOR NO. 636: OSTMANN, HEATHER

Response to Comment No. 636-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. As a part of the overall evaluation of impacts, the EIS identifies ports of entry in the United States that are acceptable for the receipt and handling of foreign research reactor spent nuclear fuel. The Port of Tacoma is identified in the EIS as acceptable. The analysis in the EIS indicates that the use of any of the ports identified by the port selection process would not pose any significant risk to either the port personnel or the population near the port (Section 4.2.2.3 of the EIS).

Consistent with its responsibilities under NEPA, DOE has solicited comments and has encouraged public participation in preparing the final Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. DOE has considered public comments in this process. The comment response document of the Final EIS (Volume 3) identifies public comments and the DOE responses. The decision on the implementation of the proposed action will be contained in the Record of Decision.

COMMENTOR NO. 638: PATRICK, JOHN

JUNE '95

TO WHOM IT MAY CONCERN, EACH & ALL:

WITH THE DEPARTMENT OF ENERGY, LIFE COULD BE O.K., LIFE COULD BE BETTER, IT COULD BE ENHANCED, AND AT THE LEAST, LIFE COULD BE AFFIRMED

THE D.O.E.'S CONCERNS ARE CONSTRUCTIVE-LIFE'S CONCERNS. THE D.O.E'S CONCERNS ARE PEOPLE'S CONCERNS. THE D.O.E.'S CONCERNS ARE LARGER THAN THE UNITED STATES CONCERNS AS A NATION STATE. THERE ARE CONCERNS OF THE EARTH, CONCERNS OF ANY COMMUNITY, CONCERNS OF THE ADULTS & ELDERS AND CONCERNS OF THE YOUNGER ARRIVING-AT-ADULTS, CONTINUING THE SEQUENCE & CYCLE OF LIFE. PERVASIVE IS THE CONCERNS OF THE SPIRIT OF LIFE ITSELF. THESE CONCERNS ARE "BITS THAT WILL ADD UP", MR. HEAD, ARE PARTS OF THE WHOLE WITH WHICH TO BE CONCERNED. THE MORE PARTS, THE MORE DEPTH, THE MORE COMPREHENSIVE, THEN THE GREATER THE POLICY. . . EXAMINATION OF NUCLEAR ANNIHILATION IS ESSENTIAL, OF NUCLEAR POWER IS

638-1

RESPONSE TO COMMENT
COMMENTOR NO. 638: PATRICK, JOHN

Response to Comment No. 638-1

The commentor's support for nuclear weapons nonproliferation and other concerns are noted.

EVER-IMPORTANT, OF NUCLEAR RESEARCH & DEVELOPMENT & FINALITY PARAMOUNT. ALL THIS EXAMINATING, THIS DISCUSSION IS TO BE DONE INDIVIDUALLY AND WITH EACH & ALL OTHERS, CO-OPERATIVELY ARRIVING AT A SHARED RESPONSIBILITY TO LIVING

SINCE THE BEGINNINGS OF IT, IN ITS DARK DELIVERANCE WITH PROMISES OF LIGHT, THE ~~NEUTRAL~~ SCIENTIFIC-NEUTRAL NUCLEAR ERA, THIS AGE OF ATOMIZATION, THE RADIOACTIVE ~~RESPONSIBILITY~~ IS COMPROMISING BETTER JUDGEMENT. CERTAINLY, FOLKS, THROUGHOUT THE MANY YEARS, THE MULTIPLE GENERATIONS, THE LIFE-TIMES EXPERIENCING THESE BROKEN-ATOME MOMENTS WE LEARN. CONCIOUSNESS IS EVER-EXPANDING. WE ARE SEEING WHAT WE ARE DOING, WE SEE WHAT WE CAN DO. WE ARE SHOWN ITS DEVASTATION TO LIFE, ITS REFUSAL TO BE CONTAINED, ITS BREAK WITH HUMANITY... SO WE MANAGE, WE MANAGE IT ALL. WE MUST, EACH & EVERYONE. WE ARE OBLIGED COLLECTIVELY AND CONSTRUCTIVELY TO MANAGE THE ENORMITY OF THE ALREADY-ACCUMULATED ATOMIC RADIOACTIVE LEFT-OVER WORLD-WIDE WASTE FOR NUMEROUS

638-1 (Cont'd.)

COMMENTOR NO. 638: PATRICK, JOHN (CONT'D.)

CENTURIES OF CENTURIES, JUST AS IT STANDS NOW. WE CAN DO THIS HUMANELY, IN TRUTHFULNESS, IN THE SPIRIT AND RESPECTFULNESS AND HUMILITY OF RECONCILIATION. WE CAN DO THIS WITH THE BEST IN HUMANITY, THE SHARED AND SHARING HUMANITY. LET THAT WHICH BRINGS OUT THE WORST OF HUMANITY BE DISCONTINUED. HANDS ARE FULL HANDLING THIS RADIOACTIVE MOMENT AND CARRYING IT FORTH... MAY THESE HANDS BE MANY, AS WELL AS LOVING

638-1 (Cont'd.)

John Patrick
9250 ALEGRE DRIVE
DESERT HOT SPGS
CALIFORNIA
U. S. of A
Citoyen du Monde

EXTEND PUBLIC REVIEW PERIOD & PUBLIC FORMATION OF POLICY.

638-2

- ENOUGH (TWO TOO MANY) WAR BOMBS—NEVER AGAIN.
- ENOUGH (MUCH TOO MANY) WEAPONS TESTING — COMPREHENSIVE TEST BAN
- ENOUGH (TCHERNOBYL, 3-MILE ISLAND, ANY STORAGE SITE) ATOMIC ENERGY NUCLEAR WASTE — BEGIN ENCASEMENT, CLEAN-UP, AND FUTURE CARETAKING PROCESS

638-3

HALT THE CONTINUATION OF NUCLEAR PROLIFERATION, BEGIN THE EXAMINATION FOR NON-PROLIFERATION TO DEVELOP INTO REVERSING CONTINUATION. IT SEEMS LIKE NOTHING LESS WILL DO...

638-4

RESPONSE TO COMMENT
COMMENTOR NO. 638: PATRICK, JOHN (CONT'D.)

Response to Comment No. 638-2

The deadline for submission of comments in response to the draft EIS was extended from June 20 to July 20, 1995. DOE considers the comment period (90 days total) to be sufficient for public comment.

Response to Comment No. 638-3

An objective of the proposed policy is to safely manage the U.S.-origin HEU from foreign research reactors. Safe management of this material, which may include acceptance into the United States, is critical to the success of the U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapon-grade) uranium contained in spent nuclear fuel in civil programs worldwide. Both the management of the existing spent nuclear fuel and the reduction in the future use of HEU are aimed at reducing the risk of nuclear weapons proliferation. Nothing in the proposed action relates to military use of nuclear materials, weapons testing, or power reactor operation (e.g., Chernobyl, TMI-2). The proposed action is entirely related to civilian use of enriched uranium, particularly HEU.

Response to Comment No. 638-4

Regarding the commentor's general opposition to nuclear proliferation associated with nuclear activities of any type, it is essential to distinguish research reactors from other nuclear reactors and activities. Research reactors are used for many important commercial purposes, the most well-known of which is the production of medical radioisotopes and pharmaceuticals. They are not used to produce power or material for weapons. While some people might prefer to abandon the important commercial purposes of research reactors, the reality is that U.S. abandonment of the industry would only lead to the rest of the world continuing without the United States. Any safeguards against nuclear weapons proliferation the United States could hope to implement would be lost. Civilian research reactor operations would continue and weapons-grade uranium (fresh HEU) would be the fuel of choice in many cases.

COMMENTOR NO. 639: HALL, TIM

FROM: TIM HALL
P.O. BOX 709
WAHIA, WA. 98396-0709
(206) 858-8487

TUESDAY 6/20/95

MR HEAD,

I'M A TRUCK DRIVER LIVING IN GIG HARBOR, WASHINGTON STATE WITH MY WIFE AND TWO CHILDREN, NOT FAR FROM TACOMA (JUST ACROSS THE NARROWS BRIDGE IN FACT.) BRING THE NUCLEAR WASTE TO TACOMA. 639-1

FOR MANY REASONS IT WOULD BE A GOOD THING.

1. IT WILL CREATE JOBS
2. IT WILL BE A WAY TO PROTECT THE NUCLEAR SECURITY OF THE UNITED STATES AND THE WORLD IN GENERAL.
3. IT WOULD SOLVE YOUR [redacted] PROBLEM OF WHERE TO RECIEVE THE SHIPMENTS.

THESE ARE JUST A FEW OF THE GOOD REASONS. THE ARGUMENTS AGAINST BRINGING IT HERE ARE NUMEROUS AND BASED ON FEAR AND MISINFORMATION, PERPETRATED BY PEOPLE CONDITIONED TO REACT NEGATIVELY TO ANYTHING ASSOCIATED WITH THE WORD NUCLEAR AND I WON'T DISCUSS THEM HERE.

THE CHANCES OF BEING EXPOSED TO DANGEROUS LEVELS OF RADIOACTIVITY FROM A [redacted] DAMAGED IN AN ACCIDENT CASK (BUILT AS GOOD AS THEY ARE) IS A FRACTION OF 1%.

RESPONSE TO COMMENT
COMMENTOR NO. 639: HALL, TIM

Response to Comment No. 639-1

The commentor's support of the U.S. nuclear weapons nonproliferation policy and Management Alternative 1 of the EIS and reasons for encouraging the DOE to bring foreign research reactor spent nuclear fuel through the Port of Tacoma are noted.

COMMENTOR NO. 639: HALL, TIM (CONT'D.)

I TAKE MORE CHANCES WITH MY LIFE AND THE LIFE OF MY FAMILY WHEN I GET OUT ON THE FREEWAY AND CROSS THE NARROWS [redacted] BRIDGE TO GO TO A MOVIE. SAME THING HAPPENS WHEN I GO TO WORK AND DRIVE MY TRUCK. LIFE IS A RISK AND IN THESE CYNICAL TIMES I STILL DON'T BELIEVE THAT MY GOVERNMENT OR A GOVERNMENT AGENCY WOULD GAMBLE WITH MY LIFE, THE LIVES OF MY [redacted] FAMILY, OR THEIR OWN LIVES WHEN IT COMES TO NUCLEAR ENERGY OR THE WASTE IT PRODUCES.

WELL THERE'S MY STATEMENT; I'M MORE AFRAID OF THE HAZMAT CONTAINERS BEING BROUGHT INTO AND OUT OF THE SEALAND TERMINAL THAN NUCLEAR WASTE CASKS.

KEEP UP THE GOOD WORK HOPE YOU PILE BALLOONS.

SINCERELY

T Hall

TIM HALL

P.S.
DIXIE LEE RAY WAS RIGHT COMMON SENSE AND GOOD SCIENCE MUST PREVAIL.

RESPONSE TO COMMENT
COMMENTOR NO. 639: HALL, TIM (CONT'D.)

COMMENTOR NO. 641: OWENS, IRENE

523 South 52 Street
Tacoma, WA 98408
June 22, 1995

Mr. Charles Head
U.S. Department of Energy
1000 Independence Avenue S.W.
Washington, D.C. 20585

Dear Mr. Head:

Please do all you can to prevent the shipment of nuclear waste through the Port of Tacoma. The people of this area are depending upon you as a representative of our Government to protect us from the possibility of a terrible accident. 641-1

Don't let us down.

Sincerely,

Irene Owens

Irene Owens

RESPONSE TO COMMENT
COMMENTOR NO. 641: OWENS, IRENE

Response to Comment No. 641-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 642: PUTZ, MARLENE M.

Marlene M. Putz
7605 S. C St. Apt. I
Tacoma, WA 98408

Dear Head,

I am against shipment of nuclear waste through the Port of Tacoma.

It is said that the containers are perfectly safe. I have a feeling that when Hanford was being built, the word SAFE was being used as well, & look at the mess now. Washington State has enough environmental problems!

Who made us nuclear waste policemen of the world? I believe all Governments should be held responsible for their own messes, cleanups & storage.

Sincerely,
Marlene M. Putz

642-1

642-2

RESPONSE TO COMMENT
COMMENTOR NO. 642: PUTZ, MARLENE M.

Response to Comment No. 642-1

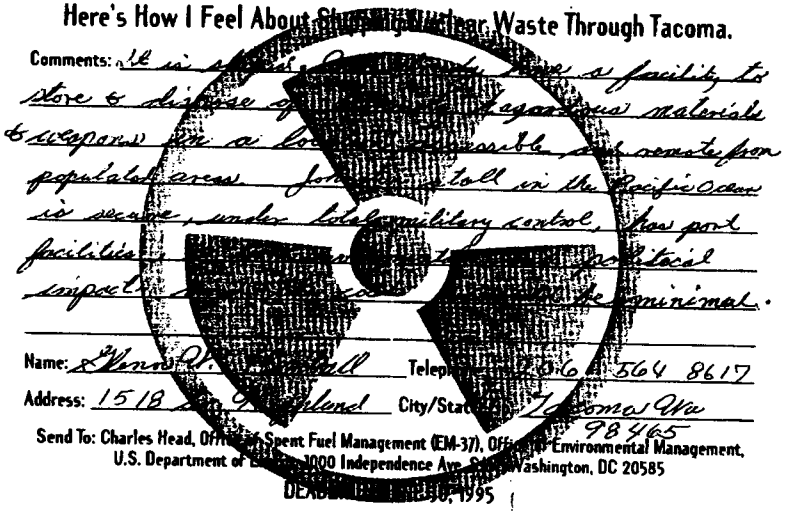
The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 642-2

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). Prior to 1989, it was United States policy to accept spent nuclear fuel containing uranium enriched in the United States (Section 1.1 of the EIS). Thus the intent of the resultant proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

* This is the best available copy of this comment document.

COMMENTOR NO. 643: KIMBALL, GLENN W.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: It is ... a facility to store & dispose of ... hazardous materials & weapons in a ... remote, non-populated area. Johnston Atoll in the Pacific Ocean is secure, under ... control, has port facilities, ... minimal impact ... the minimal.

Name: Glenn W. Kimball Telephone: (206) 564 8617

Address: 1518 ... Olympia City/State: Tacoma Wa 98465

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, DC 20585

DEADLINE: ... 30, 1995

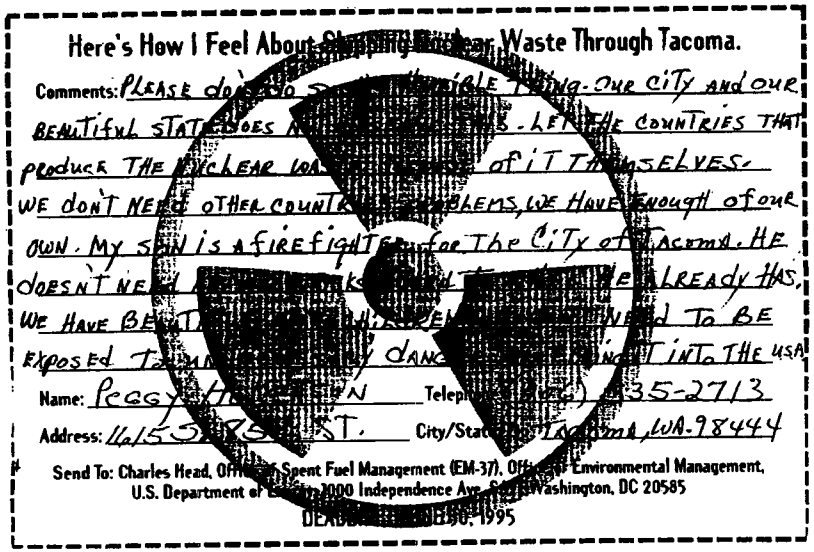
643-1

RESPONSE TO COMMENT
COMMENTOR NO. 643: KIMBALL, GLENN W.

Response to Comment No. 643-1

A discussion has been inserted into Section 2.2.1.8 to explain why this option (storage on Johnston Atoll) is not feasible.

COMMENTOR NO. 644: HOKENSON, PEGGY



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: PLEASE do not do something terrible to our city and our BEAUTIFUL STATE. DOES ANYONE LISTEN? LET THE COUNTRIES THAT produce THE NUCLEAR WASTE take care of it THEMSELVES. WE don't NEED OTHER COUNTRIES PROBLEMS, WE HAVE ENOUGH of our OWN. My SON is a FIREFIGHTER for The City of Tacoma. HE doesn't NEED [illegible] HE ALREADY HAS. WE HAVE BEEN [illegible] NEED TO BE EXPOSED TO [illegible] DANGER [illegible] IN TO THE USA

Name: Peggy [illegible] N Telephone: (206) 535-2713

Address: 16155 [illegible] ST. City/State: Tacoma, WA. 98444

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: DECEMBER 30, 1995

644-1

644-2

RESPONSE TO COMMENT
COMMENTOR NO. 644: HOKENSON, PEGGY

Response to Comment No. 644-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 644-2

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

Enough voices may awaken those

C.R. Roberts

The News Tribune columnist

"They don't have time to listen."

Charles Head, federal project manager for the environmental impact statement concerning shipments of high-level nuclear waste through the Port of Tacoma, sat patiently through the meeting Monday night.

Head sat, his face parked in objectivity. People spoke -- more than 50 people -- all against the proposed shipments.

A tape recorder heard it all. A facilitator made notes with multi-colored pens upon sheets of paper large enough for everyone to see. Hundreds in the audience watched politely. Speakers spoke their hearts.

Head sat, and when the meeting was over he talked about what happens next. He will offer a report to the director of the Office of Spent Nuclear Fuel Management. But the director will not see the colorful notes, nor will he hear the five hours of testimony.

"They don't have time to listen," Head said.

In Washington, D.C., at the Department of Energy, the people who will decide whether Tacoma becomes the port of entry for one of this planet's most dangerous substances will hear only from Head. He says he honestly has a fairly good idea what he'll say, but he's not yet ready to announce his decision.

He said of what he heard in Tacoma, "There's certainly a strong undercurrent of public opinion that is negative to this."

Still it's too bad the public spreads back at headquarters don't have time to hear how strong that undercurrent really is.

Too bad they won't hear from the speaker who said, "We have the right to be free from fear."

Too bad they won't hear what Alice Ordwall, a Tacoma great-grandmother, had to say: "I want to leave a decent legacy for my kids. They have the right to have a decent children to life."

That decent would be less decent by far should some of the spent nuclear fuel somehow leak, or spill, or otherwise contaminate Commencement Bay, Tacoma, Pierce County and much of Western Washington.

People spoke of Three Mile Island, the Ravna Volden, Chernobyl, the leaks at Hanford, the O-rings on the Space Shuttle Challenger -- of many accidents that could never happen, but did.

They think we're not smart enough. They think they can put this over on us," said the gray-haired

who 'don't have time to listen'

talking about Charles Head. "We've given him enough watch to chew on. I hope he gets indigestion."

Legislators, part commissioners and members of the City Council spoke. Mothers and fathers -- some angry enough to swear -- spoke.

And it's too bad the bureaucrats have better ways to spend their time, rather than listening to what these people had to say. How easy it will be for them to ignore the comments -- the anger, the fear and the anguish -- of the people who were there on Monday night.

"When I was a kid, everybody told me Russia was going to drop the bomb. Now, it's the U.S. that's threatening me," said Melody Wilhite, who drove down from Everett.

"I see this as a major threat," Tacoma Mayor Harold Moss said.

A citizen asked, "Do we really trust the federal government to do the right thing? We'll fight you. We the people say no. We will not stop."

"I take with a grain of salt the statistics and information you gave us," Laureen Roth said.

"We will fight you. It won't happen," state Sen. Marilyn Rasmussen (D-Eatonville) said. "I think you have heard from the people."

Washington, D.C.

Hundreds of people came. People spoke. Charles Head sat through it all, and when it was over, when asked what he thought of what the people said, he replied with a weary sigh, "I was more impressed by the number of public officials."

But perhaps Head and his bosses would take time to listen if the rest of us spoke a bit louder.

If you don't like the idea of highly radioactive nuclear waste being shipped through the Port of Tacoma, write, before June 30, to Charles Head, Office of Spent Nuclear Fuel Management (EM-37), U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, D.C. 20585. Or fax to (202) 586-8356.

If you don't care one way or the other, do nothing. If you haven't got the time to write a letter, then sit back and wait. Just you wait and see what happens next.

Your silence will be of great benefit to those who would rather not be bothered by whatever it is you have to say.

C.R. Roberts' column appears Sundays, Tuesdays and Thursdays. He can be reached at 597-8535, or by fax at 597-8274. Address TRIBnet e-mail to CR Roberts and Internet e-mail to cr@p.tribnet.com

Dear Mr Director. Please read this.
How the people here as opposed to
Hell Mr Head really Tell it as it is.
Margaret Ridenour. 8006 75th St S.W.
Tacoma, Wa. 98498

645-1

Response to Comment No. 645-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 647: GRAY, TERESA M.

Teresa M Gray
233 Sc 55th ST
Tacoma, WA. 98408 6402
6/23/95

Mr Head,

I am very much against the radioactive waste being shipped through the Port of Tacoma. 647-1

I am sure that every precaution would be taken against having an accident while handling this but needless to say accidents do happen sooner or later.

The Port of Tacoma has been working very hard to increase productivity and so far has done very well, not to mention all the improvements that are in process in the down town area.

I also feel very strongly that our children and grandchildren have the right to have a decent chance in life.

I see this as a major threat to our area.

And I say no.

Sincerely

Teresa M Gray

RESPONSE TO COMMENT
COMMENTOR NO. 647: GRAY, TERESA M.

Response to Comment No. 647-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS).

June 23, 1995

Charles Head
Office of Spent Nuclear Fuel Mgmt. (EM-37)
U.S. Dept. of Energy
1000 Independence Ave. S.W.
Wash. D.C. 20585

I am one of the many, together with my husband, who saw the hundreds of people who couldn't even get into the packed meeting in Tacoma — all violently opposed to shipping highly radioactive nuclear waste through the Port of Tacoma. Had there been enough space, I know thousands would have been inside that room!

The feeling that was predominant after the meeting was that you were not very moved by the flood of opposition.

I speak for everyone I know: do not allow this in Tacoma. People are opposed to it. Indeed, the majority. And if democracy means anything, it means the people's choice must be the deciding factor.

Richard & Martha Boucher
704 E. 95th St.
Tacoma, WA 98445

648-1

Response to Comment No. 648-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 650: NYUGEN, LYNN

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: I am anti- nuclear waste in any comment. Please stop this deadly "stuff" from coming to this community.

650-1

Name: Lynn Nyugen Telephone: 596-2814

Address: P[illegible] City/State/Zip: Tac. 98499

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, DC 20585

DEADLINE: JUNE 30, 1995

The strongest weapon against nuclear waste is right at your fingertips. Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by **June 30, 1995**. And let them know that Tacoma is not a place for nuclear waste. For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Ruston, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

RESPONSE TO COMMENT
COMMENTOR NO. 650: NYUGEN, LYNN

Response to Comment No. 650-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 651: HALLBERG, STEPHANIE L.

June 22, 1995

Charles Head, Federal Project Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue Southwest
Washington, D.C. 20585
FAX # 202-586-5256

Re: Nuclear Waste being shipped through the Port of Tacoma in Washington State

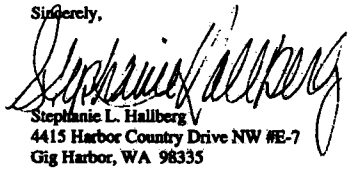
Dear Mr. Head:

I would like to express my concern on this issue as I am not prepared to risk my families health and safety to provide relief to foreign countries. I have heard that there has never been a shipping container leak in history, yet a leak is not impossible and I am absolutely *not* interested in having the first leak occur in my back yard. Please do *not* ship "spent" nuclear fuel through Washington State's Port of Tacoma. 651-1 651-2

I am a United States citizen and a registered voter in the State of Washington. I will be forwarding a copy of this letter to my Senatorial and Congressional representatives so that they too will hear the voice of the people.

Thank you for your attention to this matter. I hope that you will be compelled to make the right decision for the people of Washington State.

Sincerely,



Stephanie L. Hallberg
4415 Harbor Country Drive NW #E-7
Gig Harbor, WA 98335

RESPONSE TO COMMENT
COMMENTOR NO. 651: HALLBERG, STEPHANIE L.

Response to Comment No. 651-1

DOE agrees that accidents do occur. That is why the spent nuclear fuel transportation casks are designed, constructed and tested by simulation to withstand a series of impact and fire tests (Appendix B, Section B.2 of the EIS). Representative transportation casks have been crash tested to confirm compliance with simulation process. Two actual crash tests, one involving a locomotive and the other a tractor trailer carrying a transportation cask, have been performed. Both tests showed no failure of the casks but the locomotive and tractor trailer were destroyed. These tests demonstrated that a spent nuclear fuel transportation cask built to the federal standard would protect and retain its contents in all credible accidents. Nevertheless, the EIS evaluated the consequences of accidents involving a spent nuclear fuel transportation cask where the cask is considered failed with a certain probability. The accidents ranged from no cask failure to that of cask failure combined with a high intensity fire. Section 4 of the EIS provides a summary of impacts, both the risks and consequences, resulting from accidents involving a spent nuclear fuel transportation cask. The results indicate that the risk associated with the transport of the spent nuclear fuel is low.

Also, the spent nuclear fuel is solid metal and it is transported dry inside the spent nuclear fuel transportation casks. As a result, the radioactivity within the spent nuclear fuel cannot "leak" from the transportation cask.

Response to Comment No. 651-2

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 652: MCLEOD, LOUVEL

Charles Head
Office of Spent Nuclear Fuel
Management (em-37)
U. S. Department of Energy,
1000 Independence Ave. S.W.,
Washington, D.C. 20585

To Mr. Head

I sincerely hope that you make it a priority to listen to what the people of the North West think of the proposal to make the Port of Tacoma the port for shipments of nuclear waste. Who but us can tell you of our areas quirks and nuances? It is so vitally important to take the time to listen to our objections. There is no way that we should be considered as "The Port" for such hazardous waste shipments. It it ludicrous to consider such an arrangement. We have spent lots of time and effort in cleaning up our waters and land and we still have not come anywhere near getting it as clean as it was 25 years ago. 652-1

There is no indication of where you stand or what you are thinking of, but i can not stress enough the fact that our environment is critical to the sanctity of marine life, both in the Puget Sound and for our Oceans that I just can not imagine that there can be any reasonable reason or justification that you can give to support using this area for these shipments. You must not allow the endangerment of these unique, life supporting waters. There must and have to be other options that are more viable and of a less global impact.

Thank you. Sincerely

LouVel McLeod

RESPONSE TO COMMENT
COMMENTOR NO. 652: MCLEOD, LOUVEL

Response to Comment No. 652-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 653: WERNER, ROBERT T.

June 23, 1995

Charles Head, Federal Project Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue Southwest
Washington, D.C. 20585
fax 202 586 5256

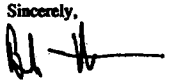
Re: Nuclear Waste being shipped through the port of Tacoma, WA.

Dear Mr. Head:

I would like to express my concern on this issue. Please do not ship "spent" nuclear fuel through Tacoma, WA. I am a registered voter and a copy of this letter is being sent to my member of Congress and my Senators. Feel free to contact me at the address below should you have any questions or responses to this letter. 653-1

Thank you for your prompt attention to this matter.

Sincerely,



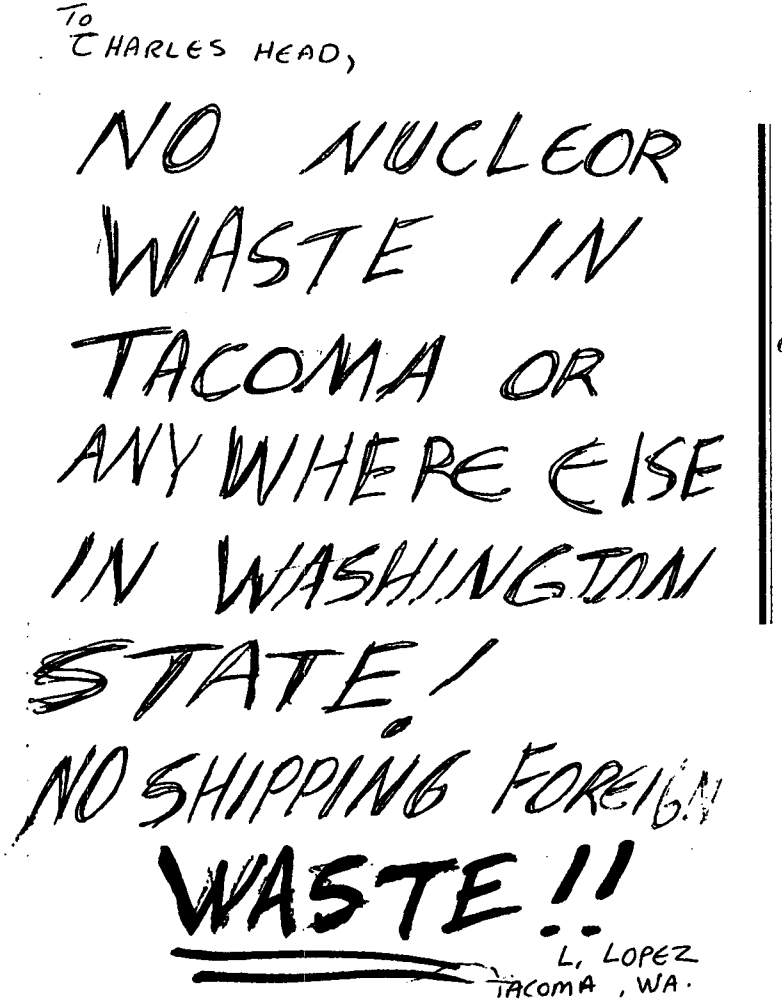
Robert T. Werner
9513 Sunrise Beach Dr. NW
Gig Harbor, WA 98332

RESPONSE TO COMMENT
COMMENTOR NO. 653: WERNER, ROBERT T.

Response to Comment No. 653-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 654: LOPEZ, L.



654-1

RESPONSE TO COMMENT
COMMENTOR NO. 654: LOPEZ, L.

Response to Comment No. 654-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 655: RUE, SHARON M.

22 July 1995

~~Dear~~ Mr. Head,

I wish to register my strong opposition to any plans to ship nuclear waste through the Port of Tacoma. 655-1

We in Tacoma are working very hard to clean up our city and to foster a strong economy. The shipment of nuclear waste goes against all we are doing.

My primary reason for opposition is my 5½ month old daughter. I want her to grow up in a safe world — and so I'm doing all I can to make her world safer.

Please take Tacoma off your list of possible sites.

Thanks,

Sharon M. Rue
3319 N. Adams
Tacoma, WA 98407

RESPONSE TO COMMENT
COMMENTOR NO. 655: RUE, SHARON M.

Response to Comment No. 655-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 656: SCHMIDT, ROB

June 20_95

Dear Mr. Head,

I was very distressed when I heard that it was possable that "Foreign Nucleor Waste" may be shipped threw the Port of Tacoma,

TACOMA and it's citizens Do Not want this.

I also would like to know why this possability has not been made public!

The citizens of TACOMA and of the State have every right to know about this And fight it!

We will not stand for this. We do not want our lives endangered by these shipments! 656-1

No Nucleor Waste in WAShington State or Waste Shipments going through our ports!!

Sincerly Rob Schmidt
of TACOMA

RESPONSE TO COMMENT
COMMENTOR NO. 656: SCHMIDT, ROB

Response to Comment No. 656-1

The draft EIS was mailed to more than 1,500 people and an official DOE announcement of the meeting location and purpose was advertised in local newspapers. Public service announcements were also provided to local radio stations and to cable-access television. The meeting was included in the Federal Register Announcement concerning the EIS. In addition, 1-800 numbers were provided for preregistration and for requesting copies of the draft EIS.

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or in the State of Washington is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. Likewise, Section 4.2.3.3 of the EIS demonstrates that the risks associated with land transportation are low and Section 4.2.4 of the EIS demonstrates that the handling and storage risks at any of the DOE management sites are low.

7231 A. 15 St.
Tacoma, WA 984
June 22, 1995

Charles Head
Office of Spent Nuclear Fuel Management
EM 37
U.S.D.O.E.
1000 Independence Ave. S.W.
Washington D.C. 20585

Dear Mr. Head:
The fact that Tacoma was chosen "because it has fewer inhabitants" proves there is a risk!!!
We say: "NO To Shipping NUCLEAR WASTE through our Port!"

657-1

"No to making WASH. STATE A DUMPING Ground for World's Waste!"

Bureaucrats, put it in Your back yard!!!

Sincerely
Maxine M. Jurich
George M. Jurich

P.S. Surely, in a Govt. of, by & for the people, someone should listen to tapes & citizens protest.

Response to Comment No. 657-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 658: LOVELL, MRS. WALTER R.

June 23, 1995
Puyallup, Wa
98371

Charles Head
Office of Spent Nuclear Fuel Management (EH-37)
U.S. Dept. of Energy
1000 Independence Ave. SW
Washington, D.C.
20585

Sir:

I am writing in regard to the proposed possibility of sending nuclear waste from other countries into our ports for transportation and storage -

I am against such an outrageous possibility of endangering our states with this harmful waste. It is crazy to contaminate our nation with harmful products.

I will fight this proposal in every way I can to see that this proposal does not come to fruition - We don't need mismanagement we need protection from do-gooders who would destroy our country with their pie-in-the-sky proposals.

Sincerely,
Mrs. Walter L. Lovell
6916 87th Ave E.
Puyallup, Wa
98371

658-1

RESPONSE TO COMMENT
COMMENTOR NO. 658: LOVELL, MRS. WALTER R.

Response to Comment No. 658-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 659: ARNESTAD, CAROL

6/12/95

TO: US Dept of Energy

RE: Proposed Site for Transportation of Nuclear Waste at Port of TACOMA, WA

I am a voting resident of Pierce County Washington whose husband has been a Longshoreman at the Port of TACOMA for 20 years. We depend on the activity and volume in the Port for our income. 659-1

HOWEVER, we do not want the Port of TACOMA to Accept and transport nuclear waste from other countries or store it in our country.

What possible benefit would we (the USA) have from such a dangerous endeavor. Theres so much wasted space in other countries Where spent nuclear rods could be stored but NOT IN THE USA. 659-2

I urge the Dept of Energy to re-evaluate this situation and to explore every avenue before you place the lives of our Children parents, friends and neighbors in any type of uncertain or needless danger 659-3

This is typical of our 659-2 (Cont'd)

RESPONSE TO COMMENT
COMMENTOR NO. 659: ARNESTAD, CAROL

Response to Comment No. 659-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 659-2

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). Pursuit of this goal will help insure that citizens of the United States may all benefit from the security and peace of mind associated curbing the possible spread of nuclear weapons to terrorists and irresponsible nations.

Response to Comment No. 659-3

The EIS evaluates a wide range of reasonable alternatives, including overseas management (Management Alternative 2, Section 2.3). Sections 4.2 and 4.5 of the EIS demonstrate that the risks to workers and the public at and near the Port of Tacoma would be low if the foreign research reactor spent nuclear fuel were received there.

COMMENTOR NO. 659: ARNESTAD, CAROL (CONT'D.)

Goverment to step in and save the world so to speak at the expense of millions of Americans.
I Know I dont want my tax dollars supporting such a foolish Acqusition.
I strongly opposed this and want to go on record for it.

659-2 (Cont'd)

659-1 (Cont'd)

Sincerely
Carol Arnestad
PO Box 688
Eatonville WA 98328

P.S. I would have attended the meeting in TACOMA on June 19 1995 but I was serving on a Planning Commission meeting in my town that conflicted with it.

RESPONSE TO COMMENT
COMMENTOR NO. 659: ARNESTAD, CAROL (CONT'D.)

NEPA TEAM

DOE/EIS-0218F
February 1996

Volume 3

FINAL ENVIRONMENTAL IMPACT STATEMENT

on a

Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Public Comments and Department of Energy Responses
Part 3b – Individuals (Pages 2.7-531 through 2.7-1080)

United States Department of Energy
Assistant Secretary for Environmental Management
Washington, DC 20585

Volume 3 is organized into three sections:

- Section 1 - Overview
- Section 2 - Written Comments and Responses
- Section 3 - Public Hearings

The Overview sets the tone for the document by summarizing the public comment process, by explaining how the receipt of written comments and the public hearing process were handled, and by summarizing the major issues raised by commentors and DOE's responses to these issues.

Section 2 of Volume 3, "Written Comments and Responses" contains all of the written comments received by DOE on the draft EIS. Upon receipt, these documents were assigned a sequential log number to be used in tracking during the comment response process. For presentation in Volume 3, these documents maintained their original log number, but were separated into the following seven distinct "affiliation" categories:

Section 2.1 - Federal Government
Section 2.2 - State Government
Section 2.3 - Local Government
Section 2.4 - Native American Groups
Section 2.5 - Non-Government Organizations
Section 2.6 - Foreign Entities
Section 2.7 - Individuals

Since these documents retained their original log number, the reader should note that while the documents in each respective section are in ascending order, their numbering therein is not sequential.

In order for a reader to find a specific document, a full "List of Commentors" has been included in each book (or part) of Volume 3, immediately following the "Table of Contents." This "List of Commentors" has been compiled alphabetically using either the commentors last name, the name of the submitting organization, or the name of a Federal, State, Tribal, or local government branch. City and State government bodies are listed under "City of" or "State of." Members of Congress are listed by the Senator's or Representative's name, with the government branch following.

To locate a document(s):

1. Find the "List of Commentors" and the name of the individual submitting the comment (or the name of the organization or agency if the comments were submitted on their behalf), and note the page number assigned to the first page of the comment document (i.e., a document from a Native American Group would be number 2.4-1, etc.).

2. Find the Volume 3 book (or part) that contains the section and page number for which you are looking and turn to the appropriate page to find a scanned copy of the document along with the responses to each of the comments delineated therein.

the written comments, the comments received during each of the 17 public hearings. Oral comments provided at these hearings have been summarized, rather than individually identified by each respective speaker. As such, there is not a list of speakers or identification of the commentors at the public hearings. A list of all registered attendees is provided immediately following the summary of each of the public hearings.

Public Comments and Department of Energy Responses

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Attachment 1

Transcript of Public Hearing Held in Tacoma, Washington on June 19, 1995 on the Draft Environmental Impact Statement on the Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel A.1

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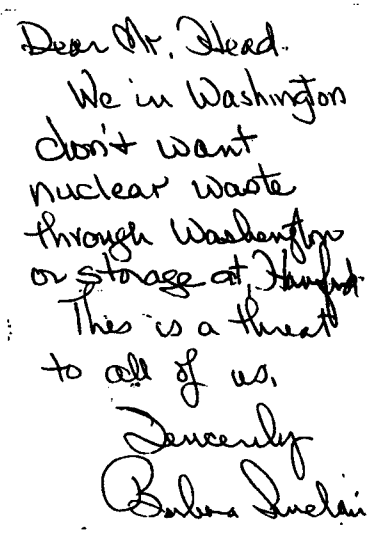
SECTION 2.7
INDIVIDUALS (CONT'D.)

COMMENTOR NO. 660: SINCLAIR, BARBARA



Dear Mr. Head.
We in Washington don't want nuclear waste through Washington or storage at Hanford. This is a threat to all of us.
Sincerely
Barbara Sinclair

660-1

RESPONSE TO COMMENT
COMMENTOR NO. 660: SINCLAIR, BARBARA

Response to Comment No. 660-1

The commentor's opposition to the transportation of foreign research reactor spent nuclear fuel through the State of Washington and its storage at Hanford Site is noted.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 661: EBERT, MRS. L. A.

June 23, 1995
Dear Mr Had,

As you must be aware, Tacoma residents do not want nuclear residuals shipped through our Port of Tacoma. Our right to be heard are just as important as citizens of the larger cities.

Yours truly,
Mrs. L.A. Ebert

661-1

RESPONSE TO COMMENT
COMMENTOR NO. 661: EBERT, MRS. L. A.

Response to Comment No. 661-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 662: SLOAGHTER, EVERETT

To whom this MAY concern!

No body WAnts Nucleor Waste in our state so stop this right now!

No Nuc leor Waste in or threw WAshing ton State!

662-1

Everett Sloaghter

of TACOMA, WA.

RESPONSE TO COMMENT
COMMENTOR NO. 662: SLOAGHTER, EVERETT

Response to Comment No. 662-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 663: THORNDIKE, LOUISE W.

Louise Weeks Thorndike
74 East Road North
Tacoma, Washington 98406
(206) 752-0647

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

Dear Mr. Head:

I work full time. My husband works full time. We have two teenagers. I only write political letters when issues threaten the welfare of my family and particularly my children.

The possibility of shipments of high-level nuclear waste through the Port of Tacoma threatens our lives. This is to tell you I oppose this. 663-1

We are not a high profile city such as Seattle or San Francisco or San Diego. But we have lives and precious loved ones who deserve our protection.

During the "cold war," I attended meetings on anti-nuclear weapons proliferation. I feared the Soviet Union then. Now it is individuals making decisions in my own country who threaten the welfare of my children.

Find another solution. Do not ship this deadly debris to our home town.

Sincerely,

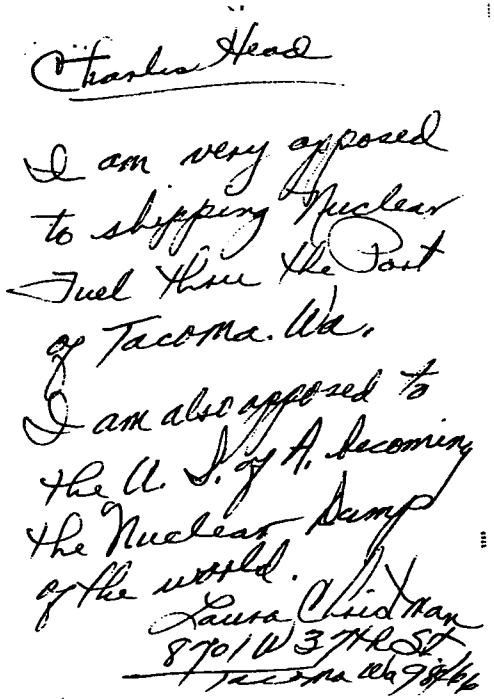
Louise Weeks Thorndike

RESPONSE TO COMMENT
COMMENTOR NO. 663: THORNDIKE, LOUISE W.

Response to Comment No. 663-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 664: CHRISTMAN, LAURA



Charles Head

I am very opposed
to shipping Nuclear
Fuel thru the Port
of Tacoma. Wa.
I am also opposed to
the U. S. of A. becoming
the Nuclear dump
of the world.
Laura Christman
8701 W 37th St
Tacoma Wa 98466

664-1

664-2

RESPONSE TO COMMENT
COMMENTOR NO. 664: CHRISTMAN, LAURA

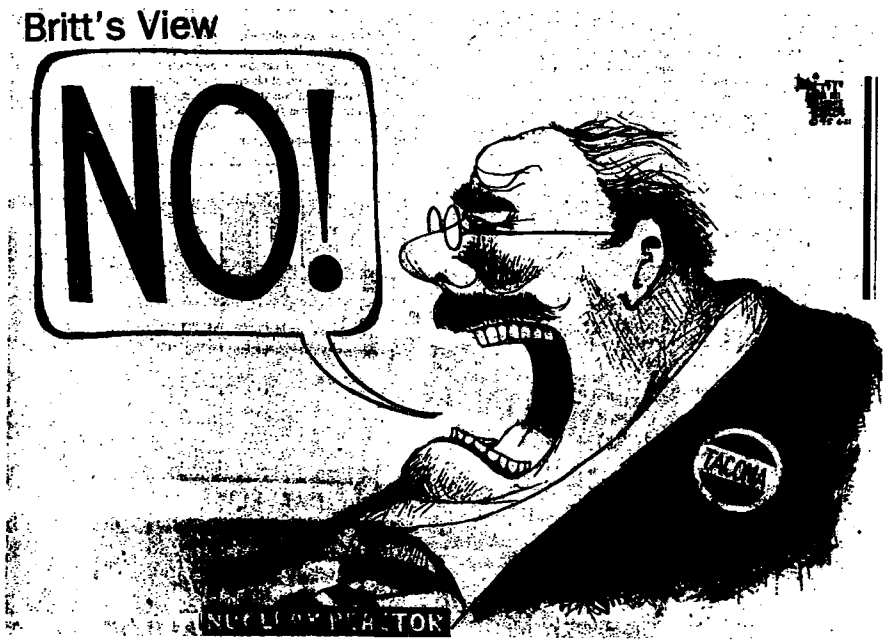
Response to Comment No. 664-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 664-2

The commentor's concern that the United States not become a dumping ground for nuclear wastes is noted. If foreign research reactor spent nuclear fuel is accepted into the United States it would be for a limited duration (Sections 2.2.1.1 and 2.2.2.2 of the EIS). The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

Commentor No. 665: Whitney



665-1

Response to Comment
Commentor No. 665: Whitney

Response to Comment No. 665-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 666: PROBST, JUDITH L.

6-23-95

Dear Mr. Head

I hope I don't waste a 32¢ stamp on not only one who doesn't have time to listen, but also on deaf ears.

Please read me loud and clear. NO high level nuclear waste through our Port of Tacoma. 666-1

Thank you,

Jud. Th L. PROBST
6923- 35th St. W.
Tacoma, Wa 98466

RESPONSE TO COMMENT
COMMENTOR NO. 666: PROBST, JUDITH L.

Response to Comment No. 666-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 667: REISER, JAMES H.

6/22/95

Charles Head
Office of Spent Nuclear Fuel
management (EM-37)
Dept. of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

Sir:

Our family is totally
opposed to allowing nuclear
waste into our Port of
Tacoma.

My husband was Fire
Chief and Harbormaster
for 13 years, so we are
all well aware of the
hazards.

Mrs. James H. Reiser
1322 Sunset Drive
Tacoma, Wa.
98465

667-1

RESPONSE TO COMMENT
COMMENTOR NO. 667: REISER, JAMES H.

Response to Comment No. 667-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 668: BRITTON, LUTHER & BARBARA

June 23, 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
1000 Independence Avenue S.W.
Washington, D.C. 20585

Mr. Head:

Back when the Atomic Energy Commission was first established we were told there would be practically no waste to speak of. What little there was would be easily taken care of with no danger of accidental contamination.

Now we are told that it is perfectly safe to ship tons and tons of nuclear waste from all around the world for "safe storage" in our country, and there would be no hazards.

We are not that unintelligent. We simply have no faith in much of anything concerned with the "safety" of nuclear energy any longer. There have been too many accidents!

The other countries should take care of their own nuclear waste. We sure do not need any more here! 668-1

Sincerely,

Luther C. Britton, Barbara A. Britton

Mr. and Mrs. L. C. Britton
3547 South Alder Street
Tacoma, Washington 98409-5710

RESPONSE TO COMMENT
COMMENTOR NO. 668: BRITTON, LUTHER & BARBARA

Response to Comment No. 668-1

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

COMMENTOR NO. 669: EFFINGER, G. & M.

Sirs:
Consider this forous input in
Nuclear Waste thru port of TACOMA
NO!
G & M Effinger

669-1

RESPONSE TO COMMENT
COMMENTOR NO. 669: EFFINGER, G. & M.

Response to Comment No. 669-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 670: RAY, ALICE V.

6/22/95

Mr. Hod

Please do not send spent nuclear fuel through the Port of Tacoma, Wa. There must be better ways to deal with this.

Accidents do happen, and this is a highly populated area. Our kids and grand children have a right to have a decent chance of life.

I'm getting pretty old, but I don't want to spend my life, or fear of nuclear energy happening to Tacoma.

Thank you for listening

Alice V Ray

670-1

RESPONSE TO COMMENT
COMMENTOR NO. 670: RAY, ALICE V.

Response to Comment No. 670-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 671: RICHARDS, MARY & WARREN

Mary E. Richards
Warren J. Richards
2623 Cherokee Blvd. SE
Puyallup, WA 98374-1636
Phone: (206) 770-1693
June 22, 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
1000 Independence Ave., S.W.
Washington, D.C. 20585

Dear Mr. Head:

The Port of Tacoma is surrounded by millions of people, from Everett to Olympia, from the Pacific Coast to the Cascade Mountains. We live ten miles from the Port, in Puyallup. I am a citizen, a voter, a wife, a mother, a grandmother, a daughter, a sister, and an aunt. My husband is a citizen, a voter, a father, a grandfather, a son, a brother, and an uncle. We do not want any of our family or friends put at risk over something that doesn't have to happen.

Our state has had to worry over Hanford for years. In spite of all precaution, accidents do happen. We don't want to have to worry about this too. It is time to listen to the people.

No to nuclear waste being shipped through the Port of Tacoma. ‖ *671-1*

Sincerely,

Mary E. Richards

Mary E. Richards

Warren J. Richards

Warren J. Richards

RESPONSE TO COMMENT
COMMENTOR NO. 671: RICHARDS, MARY & WARREN

Response to Comment No. 671-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 672: OWENS, BARBARA

4303 224th St. East
98387
Spanaway, Washington
June 23, 1995

Dear Mr. Head,

Our family is adamantly opposed to shipping highly radioactive nuclear waste through the Port of Tacoma. This is due mainly to the fact of the population density of this area, and the potential for accidents, now and in the future. 672-1

Our lives and livelihood depend on the fact that we have relatively clean air to breathe, and the addition of the nuclear waste doesn't seem to be one that can be conducive to the health of anyone. Our families hope to remain in this area for years into the future, after our two U.S. Navy Sons return here to raise there families. Naturally, they will be expecting to return to a safe, clean, environment to raise families, work, play, and contribute to society.

Our four family members Larry, Barbara, Jeff, Matt Owens join in opposition to this proposal.

Thank you for your time and energies, both in trying to present the facts, as well as welcoming input from Americans as to their opinions.

Barbara Owens

Three of the above are Registered Pierce County voters. The 4th is currently serving in the Persian Gulf aboard the U.S.S. Abraham Lincoln CVN72

RESPONSE TO COMMENT
COMMENTOR NO. 672: OWENS, BARBARA

Response to Comment No. 672-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 673: HRUZA, ANN

June 22, 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue S.W.
Washington, D.C. 20585

Re: Nuclear Waste through the Port of Tacoma

Dear Mr. Head:

I was recovering from the flu on Monday night and could not attend the meeting in Tacoma regarding the nuclear waste. I want to add my opinion.

NO!!! If the waste is too dangerous where it is, it is too dangerous to pass through our town of Tacoma or any other U.S. port. My husband and I have three grade-school age grandchildren and we want them to be able to live without that fear hanging over them. 673-1

An article in The News Tribune says that Great Britain and France operate plants capable of converting weapons-grade uranium into safe commercial-grade fuel. If they do not want it, the countries producing the waste could be encouraged to build a plant. We do not have to personally solve all the world's problems. 673-2

Sincerely,

Ann Hruza

Ann Hruza
3209 N. Bristol St.
Tacoma, WA 98407

RESPONSE TO COMMENT
COMMENTOR NO. 673: HRUZA, ANN

Response to Comment No. 673-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 673-2

The option suggested by the commentor is equivalent to Management Alternative 2, subalternative 1b. This alternative is discussed in Sections 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 674: LUND, SHIRLEY

June 21, 1995

To Charles Head,
Office of Spent Nuclear Fuel Management

We do not want any highly radio active nuclear waste to be shipped through our Port of Tacoma. 674-1

Sincerely,
Mrs. Shirley Gadd Lund
Robin Glenn Lund
Sandra M. Bell
Linda Jan Lund
Final Issued.

412 No. K St. apt 2
Tacoma, Wa. 98403

RESPONSE TO COMMENT
COMMENTOR NO. 674: LUND, SHIRLEY

Response to Comment No. 674-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 675: MCALLISTER, PHIL & COLLEEN

Dear Mr. Head,

We are writing, as a family of five, to register our objections to the passage of nuclear waste through the Port of Tacoma, Wash. One of us has been a Longshoreman in Tacoma for 32 years, another for 11 years and would benefit from the extra work but we do not feel that it's worth the risk of accidents.

The government has a habit of shoving their garbage down the throats of communities facing economic problems but we won't accept it here.

Phil & Colleen McAllister
Mike McAllister
Mike & Cindi Ryan

675-1

RESPONSE TO COMMENT
COMMENTOR NO. 675: MCALLISTER, PHIL & COLLEEN

Response to Comment No. 675-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 676: REIMER, NANCY

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Nancy Reimer Phone: _____

Title and Organization: Member of Fellowship of Reconciliation, Nyack, N.

Address: Box 74

City: Canyon State Calif Zip 94516

*** COMMENTS ***

I am opposed to bringing nuclear waste to and through the Bay Area, and also to providing nuclear materials to anyone, at home or abroad. The Clinton Administration claims to favor non-proliferation, but continues to send nuclear materials to other countries, where they could be used to make weapons. This is hypocritical, as is the assumption that only the U.S. and a few other countries can be trusted with nuclear weapons. Indeed, we have shown that we cannot be trusted with them, and that the nuclear industry is inherently unsafe. If we are serious about stopping the threats of nuclear war and other nuclear power, we must be consistent, and simply stop the production and use of nuclear materials. The countries we are bringing the nuclear wastes from are, for the most part, as well or better equipped to deal with it as the U.S. is. So why move it and expose many more people to the dangers? I am opposed to poisoning the Ward Valley, Indian Reservations, parts

676-1

676-2

676-3

676-4

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 676: REIMER, NANCY

Response to Comment No. 676-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is very low.

Response to Comment No. 676-2

The Energy Policy Act of 1992 prohibits the United States from selling HEU to foreign countries except under special conditions. Since enactment of this Act into law, no new export licenses for HEU have been issued by the United States. It is imperative for the United States to promote its nonproliferation policy by minimizing worldwide commerce in HEU, while concurrently continuing close cooperation with foreign research reactor operators. Failure to accept spent nuclear fuel from foreign research reactors would undermine confidence in the United States as a trustworthy partner in nuclear weapons nonproliferation efforts (Section 1 of the EIS).

Response to Comment No. 676-3

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

Response to Comment No. 676-4

The commentor's opposition to the management of foreign research reactor spent nuclear fuel in the United States, is noted. As discussed in Sections 4.2 and 4.5 of the EIS, the risk of adverse impacts to the environment associated with the management of the foreign research reactor spent nuclear fuel, in all management sites considered in the EIS, would be low.

COMMENTOR NO. 676: REIMER, NANCY (CONT'D.)

of Idaho or any where else with nuclear wastes. They exist; we must be dealt with – then, in the nearest, safest place to where they were used. And no more should be created, or this problem will continue to grow. The policy you propose perpetuates the problem and will make it worse by expanding the use of nuclear power while hiding the dangers of it. 676-4 (Cont'd) 676-5 676-6

Furthermore, now that the Ked seems about to resume nuclear testing, the nonproliferation policy (so-called) seems even more hollow. How can we ask other countries not to create nuclear weapons if we are, and not to test them if we do, and not to add to the problem if we continue to send them nuclear materials? 676-7

RESPONSE TO COMMENT
COMMENTOR NO. 676: REIMER, NANCY (CONT'D.)

Response to Comment No. 676-5

Spent nuclear fuel is created whenever research or other types of nuclear reactors are operated. The intent of the proposed action is to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium fuel in civil programs worldwide (Section 1.2 of the EIS). The proposed action supports continued operation of foreign research reactors, but with LEU fuel. Present and past nuclear weapons nonproliferation policies of the United States support nuclear technology for nations who agree not to construct nuclear weapons (Section 1.1 of the EIS). Because of the numerous applications of research reactors, nuclear research programs will continue with or without United States activities or completion of this program.

Response to Comment No. 676-6

The proposed action is to develop a policy to manage spent nuclear fuel from foreign research reactors (Section 2.1 of the EIS). The EIS evaluates environmental effects that would result from implementation of a variety of policy alternatives: management in the United States (Management Alternative 2; Section 2.2 of the EIS), overseas management (Management Alternative 2; Section 2.3), combined domestic and overseas management (Management Alternative 3; Section 2.4), and the No Action Alternative (Section 2.5). None of the alternatives address nuclear power reactors. As demonstrated by the analysis in Section 4 of the EIS, implementation of the proposed action poses no significant benefits or risks to human health or the environment.

Response to Comment No. 676-7

The topic of nuclear weapons testing is outside the scope of this EIS.

COMMENTOR NO. 677: BUTZ, ANDREW

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Andrew Butz Phone: (503) 621-9869

Title and Organization:

Address: 18820 NW Vista Lane

City: Portland State OR Zip 97231

*** COMMENTS ***

As stated orally at the May 25 D.O.E. hearing in Portland, I am opposed to any process of shipping foreign spent nuclear fuel to the United States. First, such proposed shipments would not improve global security. Instead, they would send a strong message to those nations holding spent fuel, that we do not trust them or their intentions to comply with the provisions of the nuclear non-proliferation treaty. This undermining of international trust will have damaging effects even if the physical hazards of shipments are somehow ~~n~~ 677-1

Second, when the D.O.E. projects/estimates risk of human/environmental exposure to radiation, they use figures that are widely considered to be out-of-date by the medical community. In other words, the latest research indicates that smaller doses of radiation are more harmful than the D.O.E. officially acknowledges. 677-2

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

P.S. I am appalled that the D.O.E. did not record (electronically) the proceedings of the May 25 Portland hearing. Is this the policy for all hearings? If so, it disy contempt for the process of substantive public participation. 677-3

RESPONSE TO COMMENT
COMMENTOR NO. 677: BUTZ, ANDREW

Response to Comment No. 677-1

The commentor's opposition to the management of foreign research reactor spent nuclear fuel in the United States, is noted. The suggestion that the nations considered under the policy may be offended by the proposed action is not realistic, as indicated in the discussion of Section 1.1 of the EIS.

Response to Comment No. 677-2

General radiological health effects are discussed in Section 4.1.3 and the specific impacts of each alternative are presented throughout Section 4 of the EIS. The radiation risk factors used in the analysis are endorsed and accepted by the NRC and the International Commission on Radiological Protection.

Response to Comment No. 677-3

DOE did request that comments be submitted in writing, however, all oral comments presented at each hearing were summarized and have been addressed along with the written comments in Volume 3 of the EIS. All comments, written and oral, are part of the public record. The format adopted by DOE for the public hearings held on the draft EIS is fully in compliance with the requirements of NEPA regulations and DOE's requirements for conducting such hearings.

COMMENTOR NO. 679: SKEA, JANE K.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: My [illegible] is [illegible]
It's a crazy idea [illegible] other countries
nuclear waste to [illegible]. The risk to
peoples health is [illegible] great a price. It
could also be a fire hazard. We do not want
to be [illegible] 679-1
Tho [illegible] comments
at public [illegible] number [illegible] 679-2

Name: Jane K. [illegible] Telephone: [illegible] 9927

Address: 1110 [illegible] City/State: [illegible], Wa. 98405

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, DC 20585

DEADLINE: [illegible], 1995

RESPONSE TO COMMENT
COMMENTOR NO. 679: SKEA, JANE K.

Response to Comment No. 679-1

The commentor's opposition to Management Alternative 1 to the proposed action is noted. If DOE decides to accept foreign research reactor spent nuclear fuel in the United States under the basic implementation of Management Alternative 1 (Section 2.2.1 of the EIS), DOE considers that the port selection criteria successfully identify those ports that possess the facilities for safe handling of foreign research reactor spent nuclear fuel (Appendix D, Section D.1.9 of the EIS). The analyses provided in the EIS indicate that the use of any of the facilities indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel or the population near the port (Section 4.2.2 of the EIS).

Response to Comment No. 679-2

DOE did request that comments be submitted in writing, however, all oral comments presented at each hearing were summarized and have been addressed along with the written comments in Volume 3 of the EIS. All comments, written and oral, are part of the public record.

COMMENTOR NO. 680: VAN BUSKIRK, JOHN

June 19, 1995

Charles Head
Office of Spent Nuclear Fuel Management
U.S. Department of Energy
1000 Independence Ave. SW
Washington DC, 20585

Dear Mr. Head

I am writing to express my concern that the Department of Energy is considering Tacoma as a possible port of entry for nuclear fuel shipments.

I am adamantly opposed to any nuclear fuel shipments coming through the Port of Tacoma. The beauty and the depth of Puget Sound is unique, and the potential for terrible destruction is great. *680-1*

Please reconsider the Department of Energy's proposal.

Sincerely,

John Van Buskirk
1528 N.Fife
Tacoma, WA 98406

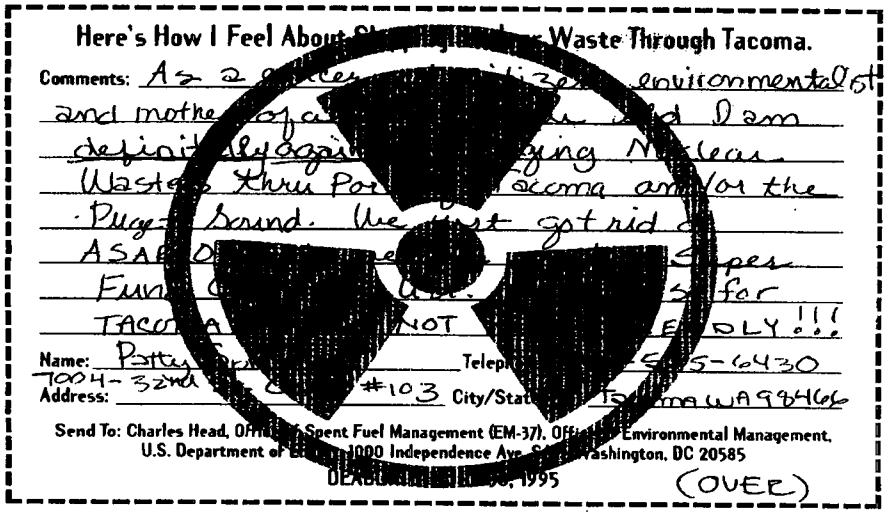
RESPONSE TO COMMENT
COMMENTOR NO. 680: VAN BUSKIRK, JOHN

Response to Comment No. 680-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 681: SPRINKER, PATTY

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



Here's How I Feel About Sh[illegible] Waste Through Tacoma.

Comments: As a [illegible] environmental[illegible]st and mothe[illegible] of a[illegible] and I am definitely[illegible] against Shipping Nuclear Waste Thru Port[illegible] Tacoma and/or the Puget Sound. We must get rid of ASAP. Our[illegible] Super Fund [illegible] for TACO[illegible] NOT [illegible] ONLY!!!

Name: Patty [illegible] Telep[illegible] 565-6430

Address: 7004-32nd [illegible] #103 City/State [illegible] Tacoma WA 98466

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, DC 20585

DEADLINE: June 30, 1995 (OVER)

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by **June 30, 1995**. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Ruston, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

681-1

RESPONSE TO COMMENT
COMMENTOR NO. 681: SPRINKER, PATTY

Response to Comment No. 681-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

P.S. If the Gov't insists on accepting waste NUKE fuels then bring it and store it on military sites. They have the equipment + manpower to deal with it. The government + military has pushed Nuclear Energy so let them deal with it!!

Don't ruin our Puget Sound and our over-populated area.

Nukes are the gov't / military's baby. Let them babysit it! Don't push it on civilian Long Shoreman, fireman + rescue units to deal with it!!! Why Wash. State??? Ship it to Wash. D.C.!!!

681-2

Response to Comment No. 681-2

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted. Sections 4.2.2.2 and 4.2.2.3 of the EIS provide the analysis on impacts of incident-free operation and consequences of port accidents, respectively.

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternative 1 or 3) there would be no storage of this material in the Port of Tacoma, any other port, or anyplace except for management sites. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

COMMENTOR NO. 682: MATTLEY, JULIA

JULIA MATTLEY
6411 S. G Street
Tacoma, WA 98408

June 20, 1995

Charles Head, Program Manager
U.S. Department of Energy EM37
1000 Independence Avenue
Washington, DC 20585

Sir:

Last night I listened and viewed the TV recording of the public meeting you held here in Tacoma regarding the transport of spent nuclear fuel through the Port of Tacoma. I agree with the general feelings expressed by the public at that meeting. I say "NO" we don't want to be the dumping ground of the world. We don't buy your political scheme. 682-1

It is not logical. How can any reasonable, thinking person even suggest such a thoughtless and impractical plan. It isn't a plan. It is not properly researched. Why should we be taxed with this burden when you can't even clean up the mess at Hanford? You say you are going to "dig a big hole and put it in it!" What will that do to our future generations' chances of having pure, clean water to drink? And you have not faced the problems of safety and emergency planning, financing, training, and transporting this lethal product to its destination. The damage you will do to our commercial business at the Port, as well as to our tourist trade, is irreplaceable. 682-2

We are a "small" community. Perhaps you feel that makes us vulnerable, but we will fight this to the end. If we go down as the spent fuel dump of the world, the whole world is going to know about it. So, Big Boy, put your thinking cap on and get real. We are reasonable people and will be glad to listen to, and yes, to cooperate in the finding of a practical, economical, logical and acceptable solution to this overwhelming world problem. But you must do your homework--use current statistics, maps, analyses, and research before you spring your plan on us. The proposal you presented last night is so flawed it is unthinkable that our government would allow such an ill-thought-out, poorly prepared scheme to be flaunted in the faces of Tacoma citizens.

Sincerely,

Julia Mattley

Julia Mattley

P.S. A logical plan for this venture would be to use our military bases already trained in nuclear handling -- or my suggestion -- Use Plan #2! 682-3

RESPONSE TO COMMENT
COMMENTOR NO. 682: MATTLEY, JULIA

Response to Comment No. 682-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 682-2

Foreign research reactor spent nuclear fuel shipments are subject to the same types of potential hazards as those of other ships carrying nonradiological hazardous materials.

DOE considers that there is adequate regulatory and emergency preparedness infrastructure to ensure the safe acceptance and transport to designated management sites if the foreign research reactor spent nuclear fuel is managed in the United States. Federal funding to State, Tribal, and local governments for maintaining emergency response programs is discussed in Section 2.7.1. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advise and assistance to the State, Tribal and local agencies involved with a radiological incident. Emergency preparedness, security, and coordination of DOE with local emergency response authorities, and security are discussed in general in Sections 2.7 and 2.8 of the EIS. Details would be contained in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipments and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

For each port considered, the impacts from activities related to the shipments of foreign research reactor spent nuclear fuel are evaluated in Section 4.2.2 of the EIS. The evaluation includes impacts from credible accidents, including shipboard fires. The risk to the environment that would result from these potential accidents is low.

Response to Comment No. 682-3

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted.

The commentor's preference for Management Alternative 2, overseas management, as discussed in Section 2.3 of the EIS is noted.

COMMENTOR NO. 685: ARTUSO, MARGARET & ANTHONY

June 19, 1995

Mr Charles R Head
Office of Spent Fuel Management
EM-37
US Dept of Energy
1000 Independence Ave SW
Washington, DC 20585-0001

Dear Mr Head,

As residents of Mt Pleasant, SC and living near the Wando Terminal we are very concerned about Wando Terminal being used as a port of entry for used nuclear fuel rods. We do not think that this kind of shipment should be coming through a predominantly residential neighborhood 685-1

We would like to be informed of any future meetings and any developments in the Dept of Energy's planning process in this matter.

Sincerely
Margaret J Artuso
Anthony Artuso

717 Wakendaw Blvd
Mt Pleasant, SC 29464

RESPONSE TO COMMENT
COMMENTOR NO. 685: ARTUSO, MARGARET & ANTHONY

Response to Comment No. 685-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Charleston Wando Terminal is noted. However, analysis in Sections 4.2.2 and 4.5 indicates that the risk associated with bringing spent nuclear fuel through the Wando Terminal, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 686: MAPASS, MR. & MRS. W., JR.

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Mr. & Mrs. W.E. Mapass Jr. Phone: 676-6388

Title and Organization: homeowner

Address: 128 Wellington Ave.

City: Clyde State CA Zip 94520

*** COMMENTS ***

We wish to record our opposition to the proposal to use Concord Naval Weapons Station as a transfer point for nuclear waste. First of all, the area is geologically and environmentally unsuitable. There are major fault lines close by, and the delicate balance of the marshlands is already pushed to its limit by local industry hazards. Secondly, why choose an area already so densely populated by both commerce and residence. It is highly visible and easily accessed posing a security risk. Thirdly, and most personally, we chose to live in this area with a measured amount of risk; ie. the Base, refineries, fault lines, toxic waste. We accept all this in exchange for a wonderful home and neighbors. Adding the fear and hazard of nuclear waste destroys this balance and leaves absolutely no peace of mind. 686-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 686: MAPASS, MR. & MRS. W., JR.

Response to Comment No. 686-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Concord NWS, or any of the ports analyzed in the EIS, is low.

The passage from San Francisco Bay to Concord meets the requirements of port selection Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2). Favorable transit from open ocean is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations such as port population, population along the route to the management site, port experience with handling containers, and port facilities would be considered in making the final selection of ports of entry. Appendix D, Section D.1.9 of the EIS provides details of the port selection process.

The port selection criteria do not consider the existence of land-based facilities such as refineries because they have no direct impact on the risk associated with the shipment of foreign research reactor spent nuclear fuel.

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Spent nuclear fuel transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the transportation cask. Further, the analyses of impacts associated with accidents involving foreign research reactor spent nuclear fuel presented in Section 4.2.2.3 demonstrate that the use of any of the selected ports will not pose any significant risk to the port personnel or the population near the ports.

COMMENTOR NO. 692: REHN, EMILY A.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: No [illegible] accept Europes [illegible] serious as this should be put to the vote of the people

692-1

Name: Emily A. Rehn Telephone: 206-536-3327

Address: 4611 So. 8th Loc. Wa City/State/Zip: Tacoma, Wa 98444

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, DC 20585

DEADLINE: JUNE 30, 1995

The strongest weapon against nuclear waste is right at your fingertips. Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by **June 30, 1995.** And let them know that Tacoma is not a place for nuclear waste. For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Boston, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

RESPONSE TO COMMENT
COMMENTOR NO. 692: REHN, EMILY A.

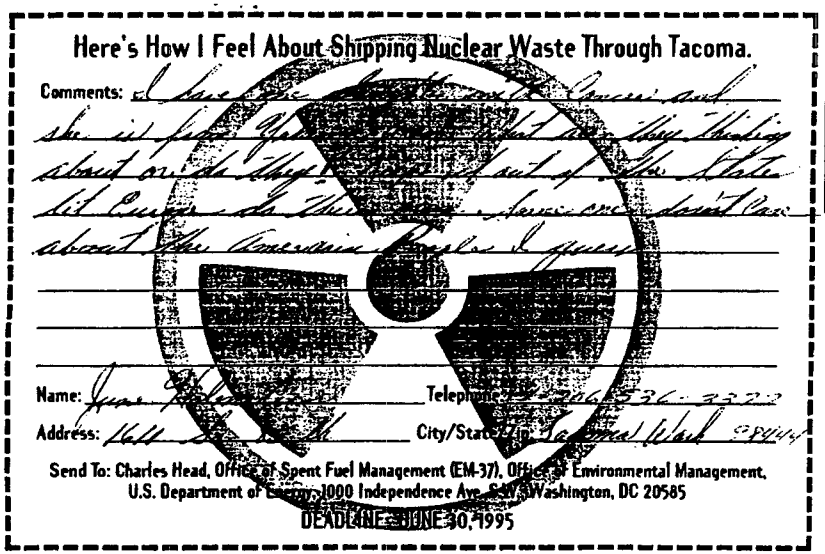
Response to Comment No. 692-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma, is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). Under policies established by the Administration and within all applicable laws and regulations, DOE has the responsibility for managing foreign research reactor spent nuclear fuel addressed by this Environmental Impact Statement. Current laws, regulations, and policies do not provide for a vote prior to the implementation of any of the management alternatives provided for in this EIS.

COMMENTOR NO. 693: HALMISTION, JUNE

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



693-1

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RESPONSE TO COMMENT
COMMENTOR NO. 693: HALMISTION, JUNE

Response to Comment No. 693-1

The commentor's opposition to acceptance of foreign research reactor spent nuclear fuel into the United States is noted. DOE considers that the port selection criteria successfully identify those ports that possess the facilities for safe handling of foreign research reactor spent nuclear fuel (Appendix D, Section D.1.9 of the EIS). The analyses provided in the EIS indicate that the use of any of the facilities indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel or the population near the port (Section 4.2.2 of the EIS).

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: I am [illegible] and do not want to have [illegible] in the U.S. at all and certainly not in Tacoma. This won't harm [illegible] but lets think of the future of the young folks

694-1

Name: Matilda [illegible] Telephone: [illegible]

Address: 1611 So. [illegible] City/State/Zip: Tacoma, WA 98444

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, DC 20585

DEADLINE: JUNE 30, 1995

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste.
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Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Ruston, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

Response to Comment No. 694-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 695: ANONYMOUS

Energy officials should heed outrage

We don't want nuclear waste anywhere in the U.S.

695-1

Tacomans, blame their hearts, tend to be on the sleepy side when it comes to the Great Issues of the Day.

That's one of their endearing qualities. Unlike their latte-sipping brethren to the north, they're largely indifferent to the political fads that emerge in endless succession from such cultural centers as Manhattan, Boston and the Bay Area. The Tacoma City Council never came out against the Pershing missile or signed a sister city agreement with Managua. The city has its share of people who think the nation is going to hell in a handbasket, but stridency isn't their style. They don't riot in the streets, throw rocks at police officers, bomb federal buildings or torch abortion clinics.

Patrick O'Callahan

So when the citizenry does get genuinely hotlathered up, when ordinary folk start shouting and waving and waving protest signs the way they did at the Department of Energy's radioactive waste hearing on Tuesday, watch out. Energy officials in Washington, D.C., have no doubt encountered really protesters in other cities as they've slapped around their proposal to import spent reactor fuel through U.S. ports. But they should understand that in Tacoma, a large, angry demonstration is roughly equivalent to the storming of the Bastille or the shelling of Fort Sumter.

Not since Earl Kenneth Shriner sexually mutilated a schoolboy in 1989 have I seen so many Tacomans vent so much raw anger in a public forum. Roughly 200 people had to be barred from the Tacoma Public Utilities building, where the hearing was held, because the big auditorium was packed with a standing-room-only crowd. Outside, they chanted, circulated petitions and waved signs that read, "Hell no, we won't glow."

One brave and very lonely dissenter had the temerity to suggest that the area could use the jobs that would come from unloading nuclear fuel at the Port of Tacoma. He was instantly embroiled in a shouting match that could be heard for blocks.

Inside, the hearing felt like a fevered revival meeting crossed with a '60s-style antiwar rally. The locals who took their turn at the microphone were unanimously opposed to the idea of bringing radioactive waste through the port; what chiefly distinguished them was the hysteria content of their remarks. Some seemed to think the Pacific Northwest was on the brink of unspeakable nuclear horrors. Others thought the proposal was just rotten policy and a raw deal for Tacoma. Any convincing outburst at the Energy Department was met with cries of "Amen!" from the audience.

The place swarmed with local politicians trying to get in front of the issue and the television cameras. There was Mike Kreidler, a Democratic congressman lately turned out of office, reminding everyone that he'd sponsored legislation that would have helped prevent this very thing. There was mayoral candidate Brian Ebersole – normally the soul of reason – addressing the room in a near shout, whipping up the crowd with a "Hell no, we don't want nuclear waste coming here."

There were city council members and port commissioners. There was a collection of state legislators who – apparently worried they wouldn't get to deliver their sound bites in prime time – foolishly asked if they could cut ahead of the ordinary citizens who were lined up to speak. The request was unceremoniously shouted down.

Sure, there was a measure of orchestration behind all the anger. In advance of the hearing, Port Commission President Pat O'Malley and other opponents of the shipments had run heavy-handed newspaper advertisements showing a baby with a forehead festooned with the radioactive danger symbol. Fliers urged Tacomans to attend.

But while the publicity may have alerted people to the issue, it couldn't have produced the heat and

> A good many seemed motivated by a heartfelt concern for a city that is finally emerging from the shadow of industrial blight and Superfund pollution – a city that doesn't need a new stigma to live down.

passion that were in the air Tuesday night. O'Malley and company may have tapped a nerve, but the nerve was there to be tapped.

Some of those who showed up were no doubt driven by old-fashioned, ignoble nuclear-phobia, the irrational fear of any enterprise that involves the atom. But a good many of them seemed motivated by a heartfelt concern for a city that is finally emerging from the shadow of industrial blight and Superfund pollution – a city that doesn't need a new stigma to live down.

The Department of Energy should be forewarned: These people aren't going to roll over. Splitting the atom could prove an easier feat than bringing the pieces through Tacoma's back yard.

RESPONSE TO COMMENT
COMMENTOR NO. 695: ANONYMOUS

Response to Comment No. 695-1

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States, is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

COMMENTOR NO. 696: SIRLES, ROBERT N.

Please --
Do not ship Radioactive Waste
thru the Port of Tacoma -

Robert N. Sirles
Marie Sirles
S.E. 181 Teagle Dr.
Shelton, Wa --
98584

2 VOTES NO

696-1

RESPONSE TO COMMENT
COMMENTOR NO. 696: SIRLES, ROBERT N.

Response to Comment No. 696-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 697: DURKIN, JUDY

June 17 1995

Dear Charles Head.

Please do not ship the spent nuclear fuel through Tacoma, Washington. I have a 4 year old daughter and I don't want any unnecessary danger anywhere near her.

Sincerely, Judy

697-1

RESPONSE TO COMMENT
COMMENTOR NO. 697: DURKIN, JUDY

Response to Comment No. 697-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 698: HADDOCK-PERRYMAN, GISELA M.

Gisela M Haddock Perryman
6319 S Fawcett
Tacoma, WA. 98408
Registered voter since 1938 (never miss. Calvary Baptist church)
Precinct # 29-741-

Charles Head, Prog. Mgr., O.S.N.F.M (EM-34)
U.S. Dept of Energy, 1000 Independence ave SW
WA. D.C. 20585

Dear Sir -
Do you have an open mind? Will you consider my protest against shipping nuclear waste through 10 U.S. ports especially Tacoma? I care, as many citizens do, about our great USA, now (today) and all of our future inheritors of this great land. Thank you, for a open mind and realization of a strong protest from all Citizens
Sincerely yours, Gisela M. Haddock Perryman

698-1

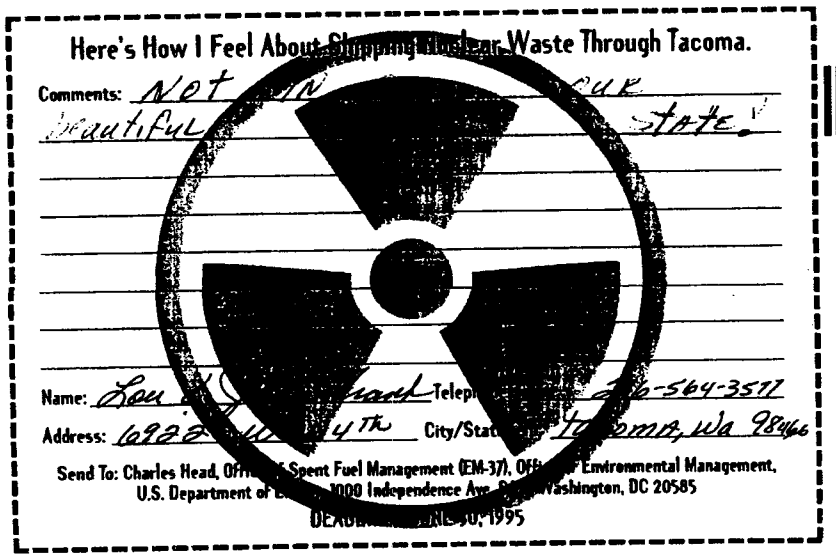
RESPONSE TO COMMENT
COMMENTOR NO. 698: HADDOCK-PERRYMAN, GISELA M.

Response to Comment No. 698-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 699: FRANK, LOU

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



699-1

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Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Ruston, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

RESPONSE TO COMMENT
COMMENTOR NO. 699: FRANK, LOU

Response to Comment No. 699-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 701: PECHA, A. & E.

We do not want radioactive Nuclear shipped through the Port of Tacoma

Andrew Pecha
Eleanor Pecha

701-1

RESPONSE TO COMMENT
COMMENTOR NO. 701: PECHA, A. & E.

Response to Comment No. 701-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 703: BECK, JOANNA

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Joanna Beck Phone: 206 859 1656

Title and Organization:

Address: 12422 SE 201st PL

City: Kent State WA Zip 98031

*** COMMENTS ***

I am very concerned about the possibility of nuclear waste being shipped to Washington state, and being transported through populated areas. I am surprised that the Department of Energy would encourage the public's agreement of this. From the information I have received it seems like an accident that is waiting to happen. I think that both the health of our environment and the health of the population should warrant further studies of any possible impact, no matter how slight. I am amazed that little or no information would be given to the towns and communities that would be effected. I don't think that it should be the responsibility of the state of Washington to become the nuclear waste garbage dump to the world! 703-1

703-2

703-3

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 703: BECK, JOANNA

Response to Comment No. 703-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. All population within a 50-mile radius of Tacoma was considered when analyzing the impact of both incident-free transport and the range of hypothetical port accidents. The risks were found to be low. The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS).

Response to Comment No. 703-2

DOE's policy is to freely distribute information about the foreign research reactor spent nuclear fuel program to anyone who is interested. The distribution of this EIS is one example of this policy.

As discussed in Section 2.6.4.2 of the EIS, the NRC regulations concerning route notification are set forth in 10 CFR Part 73. This regulation requires shippers to submit proposed routes for spent nuclear fuel shipments to NRC for approval, and NRC publishes a public information circular that lists routes that have been evaluated and approved for specific spent nuclear fuel shipments.

The regulation also requires DOE to inform the Governor of each State and any Tribal chair, or their designee, along the route at least seven days prior to shipment of hazardous cargos, including radioactive materials. The towns and communities along the ground transport route could be notified individually in advance of each shipment by the Governor of each State.

Response to Comment No. 703-3

The commentor's opposition to the ports or facilities located in the State of Washington, is noted. As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 704: SMYTH, ELIZABETH L.

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: ELIZABETH L. SMYTH Phone: 206 565-5238

Title and Organization: N/A

Address: 11408 S. WINNIFRED

City: TACOMA State WA Zip 98465

*** COMMENTS ***

I STRONGLY OPPOSE THE SHIPMENT OF HIGHLY ENRICHED URANIUM THROUGH ANY PART OF PUGET SOUND OR WASHINGTON STATE BECAUSE: 704-1

① THE DEPARTMENT OF ENERGY IS UNWILLING TO MEET THE MINIMAL SAFETY REQUESTS OF OUR PUBLIC OFFICIALS.

② THE D.O.E. WILL ASSUME NO FINANCIAL RESPONSIBILITY IN THE EVENT OF A CATASTROPHIC SPILL OF NUCLEAR WASTE. 704-2

③ THE ALTERNATIVE NUMBER 2, WHICH ALLOWS COUNTRIES TO STORE AND DILUTE THEIR OWN SPENT NUCLEAR FUEL, IS A MUCH BETTER AND SAFER PLAN. IT IS EVEN LESS EXPENSIVE. 704-3

④ I DO NOT BELIEVE THAT THE U.S. SHOULD BECOME THE NUCLEAR GARBAGE DUMP TO THE WORLD. IT SENDS THE MESSAGE TO OTHER COUNTRIES THAT THEY DON'T NEED TO MANAGE THEIR OWN NUCLEAR WASTE. 704-4

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 704: SMYTH, ELIZABETH L.

Response to Comment No. 704-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma, is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

All shipments of radioactive material are tightly regulated. Internationally, the International Atomic Energy Agency (part of the United Nations) and the International Maritime Organization regulate such shipments. In the United States, the U.S. Department of Transportation, DOE, and the NRC all have regulations and rules that apply to these shipments. Section 5 of the EIS presents a detailed description of the applicable laws, regulations and other requirements.

Response to Comment No. 704-2

Foreign research reactor spent nuclear fuel shipments are subject to the same types of potential hazards as those of other ships carrying nonradiological hazardous materials.

The commentor wants assurance from DOE that DOE, and not local governments, would assume costs related to the transshipment of casks, including costs arising from accidents. Under the Price-Anderson Act, DOE would provide indemnification for public liability with respect to spent nuclear fuel if there is a "nuclear incident," as defined under law. In pertinent part, a "nuclear incident" is one that causes, for example, injury or sickness or property damage, resulting from radioactive, toxic, explosive, or other hazardous properties of the material. DOE does provide funding to States and Tribes, as described in Section 2.7.3.1 of the EIS, for transportation related issues. Such funding can enhance a jurisdiction's emergency management and planning capabilities.

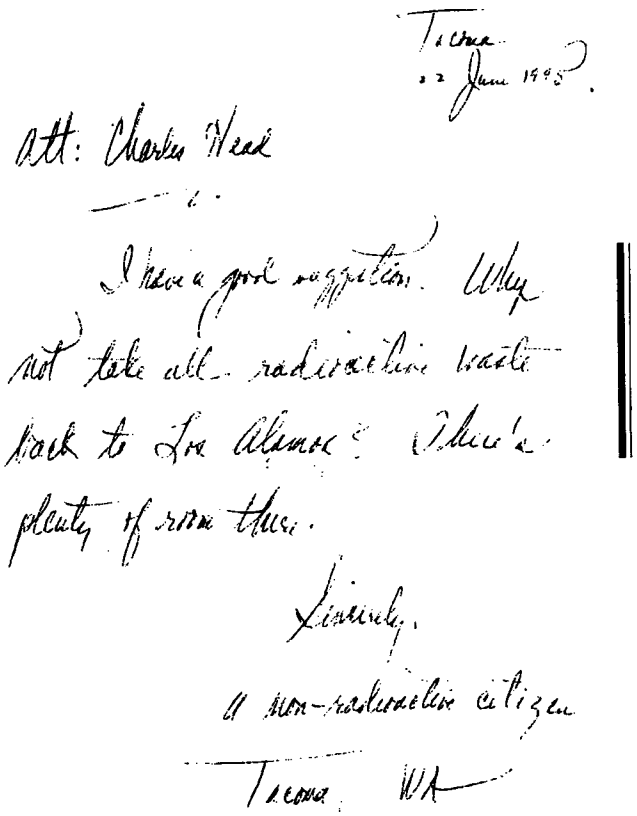
Response to Comment No. 704-3

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

Response to Comment No. 704-4

Prior to 1989, it was U.S. policy to accept foreign research reactor spent nuclear fuel for disposition in the United States (Section 1.1 of the EIS). Many foreign research reactor operators have no immediate means of disposing of their spent nuclear fuel (Section 1.2 of the EIS). Thus, the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). Ultimate disposition is a high-priority consideration which is discussed qualitatively in Section 4.2.7 of the EIS.

COMMENTOR NO. 705: CITIZEN



Tacoma
22 June 1995

att: Charles Head

I have a good suggestion. Why not take all radioactive waste back to Los Alamos? There's plenty of room there.

Sincerely,
a non-radioactive citizen
Tacoma WA

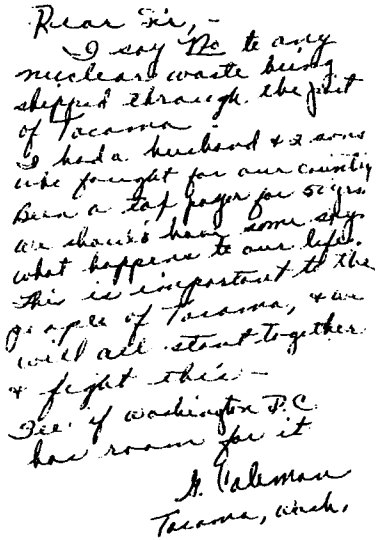
705-1

RESPONSE TO COMMENT
COMMENTOR NO. 705: CITIZEN

Response to Comment No. 705-1

The commentor's recommendation that Los Alamos be used for storage of all nuclear waste is outside the scope of this EIS.

COMMENTOR NO. 706: COLEMAN, G.



Dear Sir, -
I say No to any
nuclear waste being
shipped through the port
of Tacoma
I had a husband + 2 sons
who fought for our country
Been a tax payer for 52 yrs.
We should have some say
what happens to our life.
This is important to the
people of Tacoma, + we
will all stand together
+ fight this -
See of Washington D.C.
has room for it
G. Coleman
Tacoma, Wash.

706-1

RESPONSE TO COMMENT
COMMENTOR NO. 706: COLEMAN, G.

Response to Comment No. 706-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 707: EBERT, L.C.

6.22.95

Sir:

Tacoma citizens vehemently denounce any plans to ship any nuclear fuel/ waste through Tacoma or any city, town, burg in Washington State.

707-1

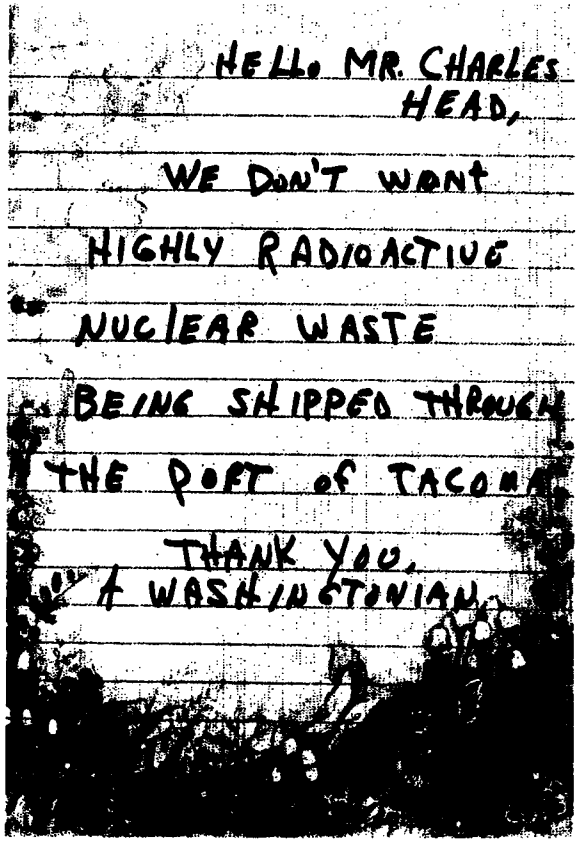
L. C. Ebert
1015 So. 64th
Tacoma, WA
98408

RESPONSE TO COMMENT
COMMENTOR NO. 707: EBERT, L.C.

Response to Comment No. 707-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 708: ANONYMOUS



708-1

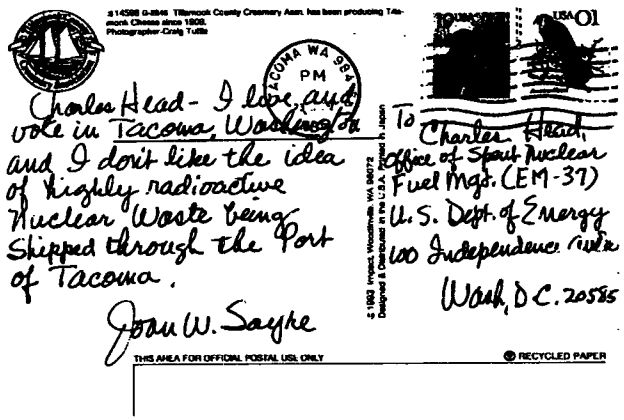
RESPONSE TO COMMENT
COMMENTOR NO. 708: ANONYMOUS

Response to Comment No. 708-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 709: SAYRE, JOAN W.

709-1


Charles Head - I live, and vote in Tacoma, Washington and I don't like the idea of highly radioactive Nuclear Waste being Shipped through the Port of Tacoma.

Joan W. Sayre

To Charles Head
Office of Spent Nuclear Fuel Mgt. (EM-37)
U.S. Dept. of Energy
100 Independence Ave
Wash, D.C. 20585

TACOMA WA 984 PM

USA 01

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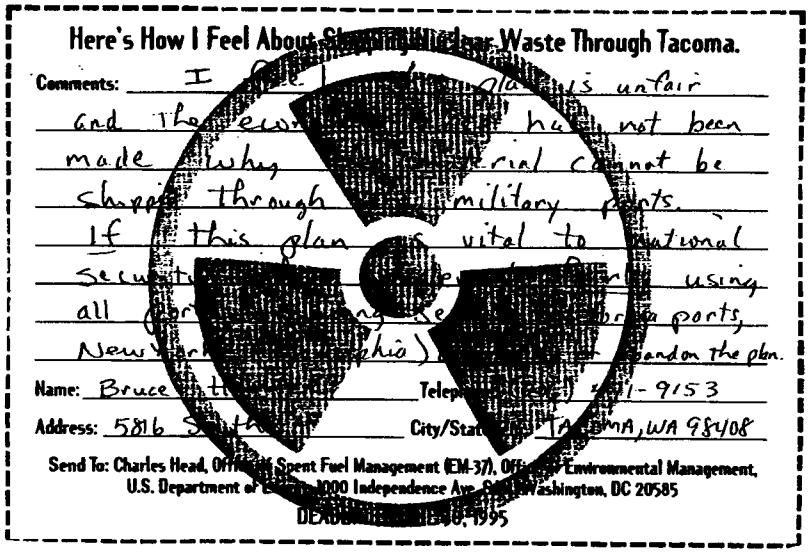
RECYCLED PAPER

RESPONSE TO COMMENT
COMMENTOR NO. 709: SAYRE, JOAN W.

Response to Comment No. 709-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 710: HAMMER, BRUCE



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: I [illegible] is unfair and the [illegible] has not been made why [illegible] cannot be shipped through [illegible] military ports. If this plan is vital to [illegible] using all [illegible] ports, New [illegible] abandon the plan.

Name: Bruce [illegible] Telep[illegible] 1-9153

Address: 5816 S[illegible] City/St[illegible] TACOMA, WA 98408

Send To: Charles Head, Off[illegible] Spent Fuel Management (EM-37), Off[illegible] Environmental Management, U.S. Department of [illegible] 1000 Independence Ave. [illegible] Washington, DC 20585

DEA[illegible] 30, 1995

710-1

RESPONSE TO COMMENT
COMMENTOR NO. 710: HAMMER, BRUCE

Response to Comment No. 710-1

As discussed in Appendix D, Section D.1 of the EIS, both commercial and military ports were evaluated. Environmental effects of Management Alternative 1 or 3 at candidate commercial and military ports were evaluated and found to be low (Sections 4.2.2 and 4.5 of the EIS). There is no reason to prefer commercial or military ports based on environmental consequences. As discussed in Appendix D of the EIS, there is no environmental basis for preferring military vessels to commercial vessels.

As a part of the overall evaluation of environmental impacts associated with the shipment of foreign research reactor spent nuclear fuel, the EIS identifies ports of entry in the U.S. that are acceptable for the receipt and handling of foreign research reactor spent nuclear fuel. In evaluating and selecting acceptable ports of entry, evaluation criteria were developed to use in determining the final selection of ports of entry (Appendix D, Section D.1.9 of the EIS). The criteria include such factors as transit from open ocean, port population, population along the route to the management site, port experience with handling containers, and port facilities.

COMMENTOR NO. 711: HINKSON, LEROY

6-23-95

I do not want Nuclear waste Shipped Through the Port of Tacoma, Washington 711-1

LeRoy Hinkson

RESPONSE TO COMMENT
COMMENTOR NO. 711: HINKSON, LEROY

Response to Comment No. 711-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 713: SALES, LILA

June 22, 1995

Mr. Charles Head:

What do you mean when you say your bosses don't have time to listen. I was under the impression the government is supposed to represent the people.

713-1

Surely you were able to see that the people of Tacoma, Wa. do not want nuclear waste shipped thru our Port of Tacoma. I earnest hope you are a good enough representative of your dept. to seriously consider presenting our views fairly.

713-2

Thank you.

Mrs. Lila Sales
4411 S. 124th St
Tacoma, Wa 98444

RESPONSE TO COMMENT
COMMENTOR NO. 713: SALES, LILA

Response to Comment No. 713-1

While it would be impractical for the Secretary of Energy to personally review and respond to all of the written and oral comments concerning this EIS, this information was reviewed by the Program manager and his staff. The Program Manager is responsible for relaying public views and concerns to the Secretary of Energy and her staff. The final EIS, including comments and responses, and Record of Decision are subject to approval by the Secretary of Energy. All comments received during the ninety day comment period are noted and answered in this document. Under NEPA and the environmental regulations of DOE (Section 5 of the EIS), public participation and comments are an integral part of the environmental process.

Response to Comment No. 713-2

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 714: HINKSON, NANCY

6-23-95

I do not want Nuclear Waste Shipped Through the Port of Tacoma, WAShington 714-1

Nancy Hinkson

RESPONSE TO COMMENT
COMMENTOR NO. 714: HINKSON, NANCY

Response to Comment No. 714-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 715: BENNETT, STEVE

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. SW
Washington, D.C. 20585

June 20, 1995

Dear Mr. Head

I am writing with regard to the shipment of high level nuclear waste through the Port of Tacoma. As a professional engineer who has been involved in many environmental impact statements I fully understand the nature of EIS's and the often disregard for the public comments contained within. Since you stated that the director and his staff "do not have the time to listen to the statements made by those testifying in regard to this plan", it seems to me that the director and his staff will have no idea how vociferous is the opposition to this plan. This area, from its Congressmen to its Mayors to its average citizenry, will not allow these shipments to take place. The fight will be waged both politically and in the courts. I believe you are wasting your time and our money by trying to push this down our throats. If you want a battle, you have one. You are looking at a losing proposition. 715-1 715-2

Sincerely,

Steve Bennett

Steve Bennett, P.E.

RESPONSE TO COMMENT
COMMENTOR NO. 715: BENNETT, STEVE

Response to Comment No. 715-1

While it would be impractical for the Secretary of Energy to personally review and respond to all of the written and oral comments concerning this EIS, this information was reviewed by the Program manager and his staff. The Program Manager is responsible for relaying public views and concerns to the Secretary of Energy and her staff. The final EIS, including comments and responses, and Record of Decision are subject to approval by the Secretary of Energy. All comments received during the ninety day comment period are noted and answered in this document. Under NEPA and the environmental regulations of DOE (Section 5 of the EIS), public participation and comments are an integral part of the environmental process.

Response to Comment No. 715-2

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 716: PIPER, EDNA

Dear Sirs:
Please do not send
nuclear waste thru
Tacoma waters. I
have 8 grandkids +
13 greats who are growing
up here.
Thank you
Edna M Piper.
1201-Mar Vista Dr #B
Fircrest, Wash. 98466

716-1

RESPONSE TO COMMENT
COMMENTOR NO. 716: PIPER, EDNA

Response to Comment No. 716-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

3807 N. Madison
Tacoma, Wa. 98407

Dear Sir,

We have just learned that our city is being considered as a port of entry for high level nuclear waste and this material will be trucked through the city toward a storage site.

We have grave concerns as to the safety of this process and the effect it will have on our city's development. We are joining with others in our community in objecting to this plan and requesting your agency to reconsider other more suitable port.

Sincerely
Harriet Cantor
(Mrs Louis Cantor)

717-1

Response to Comment No. 717-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 718: SABOL, NANCY J.

June 22, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-31)
U.S. Dept of Energy
Washington, D.C. 20585

Mr. Head,

We are residents and registered voters in Tacoma, Washington. We are strongly opposed to the proposed shipments of radioactive nuclear waste through the Port of Tacoma

Sincerely,

Nancy J. Sabol
Nancy T. Sabol

Nancy J. Sabol
Nancy J. Sabol
7822 Pacific Ave #14
Tacoma, WA 98408
(206) 472-0556

718-1

RESPONSE TO COMMENT
COMMENTOR NO. 718: SABOL, NANCY J.

Response to Comment No. 718-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 719: WRIGHT, ARLENE

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

* own Commercial Property in Tacoma and I dont want the negative image it would portray. [illegible]

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: The Port [illegible] a Vital part of the economic [illegible] the City Tacoma and should not [illegible] as a port of entry for worldwide [illegible] waste. This would only jeopardize the City's potential for Continued economic [illegible] that the people of T[illegible] have spent [illegible] time and money to [illegible] nuclear w[illegible] dangerous and would [illegible] negative [illegible] on the City Tacoma 719-1

Name: Arlene [illegible] Telephone: [illegible]

Address: 7817 [illegible] N.W. City/State: [illegible], Wa 98332

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W. Washington, DC 20585

DEADLINE: JUNE 30, 1995

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Ruston, Federal Way; Tacoma-Pierce County Visitor & Convention Bureau, Tacoma-Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

RESPONSE TO COMMENT
COMMENTOR NO. 719: WRIGHT, ARLENE

Response to Comment No. 719-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 720: WELLMAN, JEAN

Tell the Department of Energy what you think about nuclear waste coming through Tacoma.

"HELL NO. TACOMA DOES NOT WANT TO GLOW." NO RADIOACTIVE WASTE THROUGH OUR PORT. REVITALIZATION IS TAKING PLACE IN OUR TOWN. 1.) UW TACOMA 2.) HISTORICAL MUSEUM - 3.) THEA FOSS WATERWAY 4.) DOWNTOWN DEVELOPEMENT - DON'T DISTROY OUR DREAM CITY

Name and Address: Jean Wellman
919 S Fawcett #1415
Tacoma WA 98402

720-1

RESPONSE TO COMMENT
COMMENTOR NO. 720: WELLMAN, JEAN

Response to Comment No. 720-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 721: ENGEL, H.A.

DEAR SIR,
PLEASE "DO NOT" SEND
THE NUCLEAR WASTE THRU
OUR CITY -
YOURS
MR. + MRS. H. A. ENGEL
1444 E. FAIRBANKS
TACOMA, WA 98404

721-1

RESPONSE TO COMMENT
COMMENTOR NO. 721: ENGEL, H.A.

Response to Comment No. 721-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 722: STEIN, BEVERLY

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
1000 Independent Avenue S.W.
Washington, D. C. 20585

June 23, 1995

Dear Mr. Head:

It has come to my attention that the Department of Energy wants to transport radioactive waste through the Port of Tacoma. As a citizen of Tacoma, I am very opposed to this idea. This city is a large population center; if an accident were to occur, the health of thousands of people would be at risk. Remember Three Mile Island - accidents do happen! 722-1

Please do not ship spent nuclear fuel through Tacoma!

Thank you,

Beverly Stein

Beverly Stein

RESPONSE TO COMMENT
COMMENTOR NO. 722: STEIN, BEVERLY

Response to Comment No. 722-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 723: SCHALL, E.

Office of Spent Nuclear Fuel Management (EM-37)
attention: Charles Head
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington D.C. 20585

Dear Sirs

No, I do not want any nuclear waste shipped through the Port of Tacoma or the Port of Seattle or anywhere. 723-1

Let those countries take care of it themselves. 723-2

Really think greed is at the bottom of this stupid idea. 723-3

Our politicians are doing a poor job of protecting our health. God knows that President tries to do what is right.

Yours truly,
E. Schall
Tacoma, Wa

RESPONSE TO COMMENT
COMMENTOR NO. 723: SCHALL, E.

Response to Comment No. 723-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 723-2

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

Response to Comment No. 723-3

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). As demonstrated by the analyses in Section 4 of the EIS, the risks associated with implementation of the proposed action to human health or the environment, including economic benefits, would be low.

COMMENTOR NO. 725: SWEANEY, C.P.

6-22-95

Charles Head,
office of spent nuclear
fuel management (EM-37)
U.S. Dept. of Energy 1000 Ind. -
pendence ave. S.W. Wash. DC
20585

I do not want this
highly radioactive nuclear
waste shipped through
Port of Tacoma Wash. I am
70 year old and don't like
the happening since lived
here (forever).

Sincerely
C.P. Sweaney

725-1

RESPONSE TO COMMENT
COMMENTOR NO. 725: SWEANEY, C.P.

Response to Comment No. 725-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 727: THOMPSON, LORI

2608 S 379 Pl
Federal Way, WA 98003

6/22/95

Dear Mr. Head,

I'm writing to you concerning the shipment of nuclear waste through the Port of Tacoma. I believe nuclear waste should not be shipped through the Port of Tacoma. I think the risk of an accident is too great and that this spent nuclear waste should be dealt with in some other way. I grew up in the fear of nuclear war. I don't want my children to grow up in fear of a nuclear waste shipment leaking or spilling in their community. Thank you for your consideration.

727-1

Sincerely,
Lori Thompson

Matthew and Andrew Thompson

RESPONSE TO COMMENT
COMMENTOR NO. 727: THOMPSON, LORI

Response to Comment No. 727-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 728: SUTHERLIN, CALVIN J. & JEAN

Copy to:

Charles Head, EM37
US Dept. of Energy
1000 Independence Ave.
Washington, D.C. 20585

Bishop Calvin D. McConnell
2112 Third Ave., Suite 301
Seattle, WA 98121-2333
Phone: 206-728-7674

Dear Sir:

I write you as a citizen of the United States and a property owner (near Port of Tacoma owned land). I also am an honorably discharged veteran (25th Engr. Combat Battalion) with support troop service in 4 European Campaigns, Normandy through Central Europe, supplying the entire First Army with Heavy Equipment. (I was in administration and personnel, with a "spec" number of Chaplain's assistant. We had no chaplain assigned.)

My wife and I were at the Tacoma meeting on nuclear waste through the Port of Tacoma. We listened to TV tapes also for a total of 6 hrs. of the meeting in Tacoma, June 19th. You must be quite a hardy soul to have endured the release of pent-up feelings of frustration of many! Thank you for your patience!

For many years I have studied the subject of war, including military law itself. I have studied the published reports of the Technological Steering Panel of Hanford and the reports of the current cancer studies of which the Hutchinson Cancer Center is a partner; the Thyroid Studies.

My understanding is that your Dept. of Energy report or the EIS report presented alternative courses of action. I appreciate the complicated world picture leading to the Dept.s choosing Alternative #1, rather than Alternative #2 which the overwhelming majority of the audience favors. I have studied the Nth power problem, or the dangers of nuclear proliferation, and this, indeed is a problem. (Beyond Hanford releases/in the soil, the air and river.) or leakage

728-1

On the choice we have, I like the idea of making the 6 or 7 nations friendly to U.S., take their responsibility for the spent rods (70% of the high grade uranium in the world). These rods are in their hands. They would, under that plan, arrange for the reprocessing of that 70% of the world's supply. These nations are our friends.

728-2

Forty other nations in the world control the 30% of the spent rods of high grade uranium. These nations have been considered somewhat less stable in this context of nuclear possession, or might become so.

All this I gather from inferences deduced from attendance. I would benefit from an actual copy of the Environmental Impact Study. Could you send one to me? Or tell me where to get one? I am relying now on newspaper coverage.

RESPONSE TO COMMENT COMMENTOR NO. 728: SUTHERLIN, CALVIN J. & JEAN

Response to Comment No. 728-1

Draft and final versions of this EIS describe four alternatives for implementation of the proposed action: management in the United States (Management Alternative 1; Section 2.2 of the EIS), overseas management (Management Alternative 2; Section 2.3 of the EIS), combined management in the United States and overseas (Management Alternative 3; Section 2.4 of the EIS), and No Action (Section 2.5 of the EIS). The draft EIS did not identify a preferred alternative for management of spent nuclear fuel from foreign research reactors; however, this final EIS does contain a preferred alternative in Sections 2.9 and 4.7.

Response to Comment No. 728-2

The commentor's suggestion to have nations friendly to the United States arrange for overseas management of spent nuclear fuel from their foreign research reactors, while the United States continues to develop an appropriate policy to manage spent nuclear fuel from research reactors in the remaining nations, is noted. Section 2.4 of the EIS describes combined domestic and overseas management (Management Alternative 3) of spent nuclear fuel from foreign research reactors. Advantages and disadvantages of overseas management are discussed in Section 2.3 of the EIS.

COMMENTOR NO. 728:
SUTHERLIN, CALVIN J. & JEAN (CONT'D)

Then, the 40 nations with the 30% of spent rods would be studied and an appropriate policy be made to ship such spent rods to the Swedish or Idaho Engineering agencies, as the case might be, or even Savannah, Georgia. The D.O.E. would supervise. 728-2

This alternative would be more flexible than Proposal #1 which would be dangerously using Puget Sound-Tacoma, taking the chances of unrecoverable casks or canisters going down to more than 500 ft. of depth. (We can only be sure of recovery down to 200 ft., we are reliably told). Also, land masses in Puget Sound are too close to be safe from horizontal dangerous radiation on both sides of the channels. (Leakage or accident) Perhaps, as Rep. Campbell suggested, that there are alternative delivery systems for the spent rods than dangerous shipping by vessel and surface systems, rail or truck transportation in an already bongested and dangerously laden Pacific N.W. inland and earthquake threatened transportation corridor. 728-3

Thank you, and be certain of my wife's and my prayers for your importance and your function in our democratic government.

cc: Tacoma News Tribune

Calvin J. and Jean E. Sutherlin
19907 68th Ave. E.
Spanaway, WA 98387

Calvin J. Sutherlin
Jean E. Sutherlin

RESPONSE TO COMMENT
COMMENTOR NO. 728:
SUTHERLIN, CALVIN J. & JEAN (CONT'D.)

Response to Comment No. 728-3

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. Also, the environmental effects evaluated in the EIS determined that there would be no adverse ecological impacts to any of the ports that might be used to receive the material (Section 4.2.2). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 40 years of spent nuclear fuel shipments, no radioactive materials have ever been released from a spent nuclear fuel transportation cask even as a result of an accident (Section 2.6.2 of the EIS).

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Section 4.2.1.3 of the EIS has been modified to include this assurance of recovery in coastal waters. Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters. The impacts of a foreign research reactor spent nuclear fuel transportation cask sinking in coastal and deep waters are estimated in the EIS (Appendix C, Section C.5). The results of this analysis show that both the consequences and the risk of these accidents are low (Appendix C, Sections C.5.4 and C.5.5).

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2). Therefore, a seismic event, even if it caused structures at the Port of Tacoma to fail, is not expected to compromise the transportation cask. Further, the analyses of impacts associated with accidents involving foreign research reactor spent nuclear fuel presented in Section 4.2.2.3 demonstrates that the use of any of the selected ports will not pose any significant risk to the port personnel or the population near the ports.

COMMENTOR NO. 729: QUAINTANCE, JOE M.

JOE M. QUAINTANCE
ATTORNEY AT LAW
First Interstate Plaza
1201 Pacific Avenue, Suite 1202
Tacoma, Washington 98402

Admitted to practice
Washington
California
U.S. Supreme Court

Telephone
Seattle (206) 623-4541
Tacoma (206) 627-5056
Facsimile (206) 272-4515

June 20, 1995

Hazel O'Leary
SECRETARY OF ENERGY
1000 Independence Avenue
Washington, D.C. 20585

RE: Tacoma, Washington
Shipping of DOE nuclear waste

Dear Secretary O'Leary:

It is a serious mistake to ship nuclear waste through the Puget Sound area. Mr. Charles Head conducted a public hearing in Tacoma, Washington on June 19, 1995. The meeting was poorly publicized. Still, a notice of only hours resulted in an overflow crowd of 500 persons. Public officials from the Port of Tacoma, City of Tacoma, City of Seattle, City of Puyallup, City of Renton, and others recited unanimous opposition to this plan. The President of the Longshore Union warned that his workers would not offload this cargo. 729-1

Mr. Head should explain to you the political danger demonstrated by the public outrage accompanying the presence of nuclear waste in Puget Sound. This area is well known for its liberal, environmental bias. You will be surprised by the organization of opposition to Tacoma harbor handling and trucking of nuclear waste over Seattle freeways.

Please do not damage President Clinton or the Democratic Party. 70% of the 20 metric tons of enriched nuclear fuel waste is generated each year by France, Britain, Germany, Japan, Sweden and Switzerland. A processing facility in Scotland has expressed a desire to upgrade its ability to handle all three types of nuclear waste. Please more carefully explore Alternative 2 in your Environmental Impact Statement, which provides for the safe processing of nuclear waste closer to where it is created. 729-2

Sincerely,

JOE M. QUAINTANCE

cc: Bill Clinton

RESPONSE TO COMMENT
COMMENTOR NO. 729: QUAINTANCE, JOE M.

Response to Comment No. 729-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 729-2

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Section 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 732: WADE, MARIANNE

Honorable Hazel O'Leary
Department of Energy
1000 Independence Ave SE
Washington D.C. 20583

Hello H. Hazel O'Leary:

I have spent most of the last thirteen years in Washington state. Raised in California through the sixties and seventies I witnessed unbearable insults to the environment. I spent most of my childhood rationing water that was already so treated there could very well have been more fluoride than hydrogen. I thought everybody flushed their toilets only twice a day. And despite the beauty of San Francisco and the love I have for it, let's face it the city has only two seasons.

Needless to say, I have marveled at the Northwest. It has a wonderful ecosystem. Diversity of nature ranging from rainforest to desert, ocean to mountain. Even though much of the land has been decimated by logging, challenged by Mt. St. Helens, and abused by the ignorant, nature prevails here. Despite a busy port, here in Tacoma I have witnessed days of such clarity I could see the rooftops of houses miles away across the sound. Most of the residents here focus on the beauty and try to support the environment. Perhaps you are familiar with the recycling statistics from the Puget Sound, specifically the efforts of Tacomans?

I don't mean to drip with civic pride because frankly most of the local policies and politicians make me cringe. But the Department of Energy's proposal to utilize Tacoma as a point of entry for spent nuclear waste sickens me more. Even though I drive by the Port of Tacoma with a slight shrug and a grimace, I understand it brings in much needed revenue. The billows above the port are a constant visual reminder of how greatly humans threaten the environment. Ship traffic is heavy enough here. I don't want to see any enter loaded down with spent fuel rods.

Please reconsider the proposal. I understand Mick Shultz of the Port of Tacoma has been organizing a fact-finding action the results of which should have been held at the last DEIS meeting. I also understand the Port of Tacoma Commission officially registered its opposition to this proposal May 12. Have they received a response? I have to agree with Port Commission president Patrick O'Malley, this state has had its share of waste issues. Perhaps you followed the closure and current destruction of the Asarco smelter in the tiny arsenic-laden town of Ruston, nestled in the north-end of Tacoma. I witnessed the explosion of the stack myself from a distance reported as "safe from the arsenic cloud". Tacoma has enough to deal with.

I respect your position as Secretary, but I don't envy it. I realize the disposal of nuclear waste is a real issue that needs to be addressed. I know there are no easy answers. I just don't believe there are "acceptable levels" of nuclear waste. I believe the Earth to be one entity and in that sense it doesn't matter where nuclear waste is stored, we all share it and we'll all be affected by it. True, Tacoma is a smaller urban district than Seattle but it is still heavily populated with residents very near the port. Please reconsider this proposal. Have Tacoma removed as a possible point of entry. I wish you much luck in this endeavor and hope a creative alternative can be found. 732-1

Thank you for your time and consideration.

Sincerely,

Marianne Wade
302 N. Yakima #B3
Tacoma, WA 98403

RESPONSE TO COMMENT
COMMENTOR NO. 732: WADE, MARIANNE

Response to Comment No. 732-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 733: DEVIK, RUDOLF

RUDOLF DEVIK
2402 North Washington Street
Tacoma, WA 98406

(206) 752 6964

June 20, 1995

U.S. Department of Energy
1000 Independence Ave. SW
Washington DC 20585

Dear Mr. Secretary,

RE: TACOMA Nuclear Waste Port Facility

Please enter our objections to the Nuclear Waste project which would involve Tacoma as a port of entry. We ask that the following points be considered:

The geographic location of Tacoma means that the greater Seattle Tacoma population is included in this zone.

The economic impact of such a facility would preclude industrial development in this same area.

The environmental concerns of the greater Tacoma area would be violated and much good that has been done in "cleaning up" the Sound and the wetlands of the Tacoma tide flats and the Nisqually delta would be jeopardized.

733-1

The Department of Energy and its predecessors do not have track records in this State which offer much reassurance.

Please enter our disapproval of the plan.

Sincerely yours,

Barbara and Rudolf Devik

Copies: Mr. Charles Head, USDOE
The Hon. Bob Evans, Deputy Mayor, City of Tacoma, WA

RESPONSE TO COMMENT
COMMENTOR NO. 733: DEVIK, RUDOLF

Response to Comment No. 733-1

The commentor's opposition to the use of the Port of Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. Based on the port selection process described in Appendix D of the EIS, the Port of Tacoma is among the ten candidate ports listed in Section 2.2.1.6 of the EIS which could receive foreign research reactor spent nuclear fuel under Management Alternative 1 or 3. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3 of the EIS) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel casks are also low (Section 4.2.2.2 of the EIS).

DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' economic development. Nor should it contribute to any stigma based on the analysis in the EIS which demonstrates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and 4.8.4 and Appendix C, Section C.2 of the EIS). This is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions. As such, there should be no adverse cultural or economic reaction to the use of the port. Historically, there were no adverse economic or cultural impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma as noted by the commentor. The analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Based on over 30 years of spent nuclear fuel shipping, DOE considers that transportation casks passing through the Port of Tacoma, Commencement Bay, or any other port or waterway would not affect air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

COMMENTOR NO. 734: MIZNER, CHARLENE

5603 Cedarcrest St. N.E.
Tacoma, WA 98422

26 June 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

Dear Mr. Head:

NO ON THE SHIPMENT OF NUCLEAR WASTE THROUGH PORT OF TACOMA!!!!!! 734-1

Sincerely,

Richard Mizner

RESPONSE TO COMMENT
COMMENTOR NO. 734: MIZNER, CHARLENE

Response to Comment No. 734-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 735: MIZNER, RICHARD

5603 Cedarcrest St. N.E.
Tacoma, WA 98422

26 June 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

Dear Mr. Head:

NO ON THE SHIPMENT OF NUCLEAR WASTE THROUGH PORT OF TACOMA!!!!!! 735-1

Sincerely,

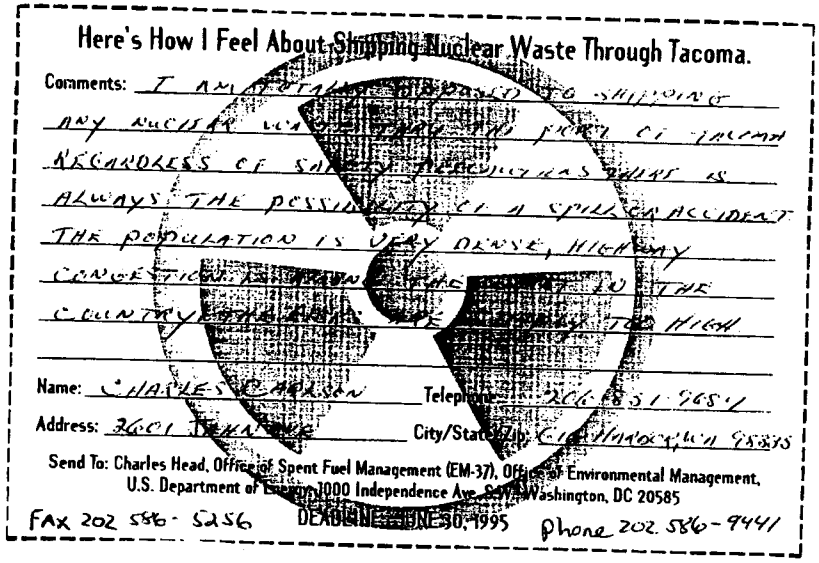
Richard Mizner

RESPONSE TO COMMENT
COMMENTOR NO. 735: MIZNER, RICHARD

Response to Comment No. 735-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 736: CARLSON, CHARLES



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: I AM OPPOSED TO SHIPPING OF ANY NUCLEAR WASTE THROUGH THE PORT OF TACOMA REGARDLESS OF SAFETY PRECAUTIONS THERE IS ALWAYS THE POSSIBILITY OF A SPILL OR ACCIDENT THE POPULATION IS VERY DENSE, HIGHWAY CONGESTION IS [illegible] TO THE COUNTRY [illegible] HIGH

Name: CHARLES CARLSON Telephone: 206 851 9654

Address: 2601 [illegible] City/State/Zip: [illegible] WA 98375

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. SW, Washington, DC 20585

FAX 202 586-5256 DEADLINE JUNE 30, 1995 Phone 202.586-9441

736-1

RESPONSE TO COMMENT
COMMENTOR NO. 736: CARLSON, CHARLES

Response to Comment No. 736-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 737: ANDREASEN, FLORENCE

June 21st. 1995

Dear Mr. Head.

Please Do not Consider the Port of Tacoma for the shipments of Nuclear Waste. It seems to me a mishap Could affect the major Population of Washington State. 737-1

Sincerely

Florence Andreasen

FLORENCE ANDREASEN
13303 30TH AVE E
TACOMA, WA 98446-1803

RESPONSE TO COMMENT
COMMENTOR NO. 737: ANDREASEN, FLORENCE

Response to Comment No. 737-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 738: RAUDEBAUGH, ROSE MARIE

530 Alexander
Tacoma, WA 98402
June 27, 1995

No
nuclear waste
through Tacoma!

Please do not ship
radioactive nuclear
waste through our
inland port. We have
almost cleaned up our
Superfund problems

Rose Marie Raudebaugh

738-1

RESPONSE TO COMMENT
COMMENTOR NO. 738: RAUDEBAUGH, ROSE MARIE

Response to Comment No. 738-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 739: LIVE, JULIE

6/22/95

Dear Charles Head,

I am sorry to have missed the meeting you were at in Tacoma tonight. I am very sick and not able to get out at nite. 739-1

I do not want the the highly radioactive Nuclear waste being shipped through the Tacoma port.

I believe we have enough nuclear waste deposits already on our own state at Hanford. I have just lost 2 friends in Vancouver Washington in the last year due to non treatable cancer. also both My folks have Cancer and I believe we have enough of our own Nations that we produced our selves. please keep out other Countries waste. we are not a dump for nuclear waste.

There must be $ involved that would be a great profit for some one, but I believe what ever the gain/profit is, it is not good enough to risk our lives and all the others in the process of shipping this nuclear waste 739-2

thank you

Julie Live
2415 S. Oakdale
Tacoma Wa 98405

RESPONSE TO COMMENT
COMMENTOR NO. 739: LIVE, JULIE

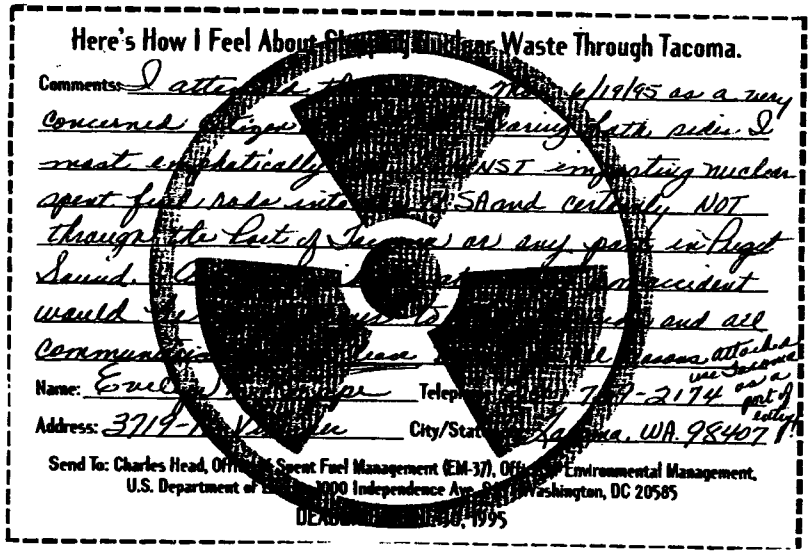
Response to Comment No. 739-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 739-2

An objective of the proposed action is to reduce the risk of weapons-grade uranium falling into the hands of a nation attempting to develop a nuclear weapons capability (Section 1.2 of the EIS). As demonstrated by the analysis in Section 4 of the EIS, the risks associated with implementation of the proposed action to human health or the environment would be low. Costs and financing of the alternatives are described in Section 4.9 of the EIS.

COMMENTOR NO. 740: RAPPE, EVELYN P.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: I atte... No... 6/19/95 as a very Concerned Citizen ... having both sides. I most emphatically ... NST importing nuclear spent fuel rods into ... USA and certainly NOT through the Port of Tacoma or any port in Puget Sound. ... accident would ... and all communities ... lives, attended the Tacoma ... as a part of ecology!!

Name: Evel... Telep... 7...-2174

Address: 3719-... City/Stat... Tacoma, WA. 98407

Send To: Charles Head, Off... Spent Fuel Management (EM-37), Off... Environmental Management, U.S. Department of E... 1000 Independence Ave., ... Washington, DC 20585

DEA... 30, 1995

740-1

RESPONSE TO COMMENT
COMMENTOR NO. 740: RAPPE, EVELYN P.

Response to Comment No. 740-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 741: HAUSAUER, NANCY

June 22, 1995

Mr. Charles Head
Office of Spent Fuel Management (EM-37)
Office of Environmental Management
U.S. Department of Energy
100 Independence Avenue S.W.
Washington, D.C. 20585

Dear Mr. Head:

I am writing to express my strong resistance to the DOE sending nuclear waste through the Port of Tacoma. I live in Tacoma, near the port, and I have some strong concerns, both about the DOE's environmental impact statement regarding the proposed shipments, as well as the concept in general.

First, the general concept. Why ship this dangerous stuff all around? It seems more vulnerable to accident or terrorist attack in transit than if it is kept where it is. Or, if it must be processed, why not process it in England or Europe, where I understand there are perfectly fine processing plants already in place. I do not understand the reasoning. I do not understand why we must accept the rest of the world's nuclear waste. Don't we have enough of our own? 741-1

Second, the EIS. I understand that it is full of misinformation and inadequate assessments. It seems that the following things were not adequately addressed: adverse economic impact on Tacoma; water depth in Puget Sound making recovery of lost waste difficult/impossible; security risks; fire and explosion risks; and the effects and costs on Tacoma if an accident did occur. I also understand that the DOE used outdated, incorrect information about the Port of Tacoma--which to my mind invalidates the entire EIS, not to mention the fact that such a grievous error hardly inspires confidence in the DOE overall, not to mention that to make such a mistake is a terrible insult to the citizens of Tacoma. IN SHORT, THE EIS SOUNDS LIKE A FARCE! 741-2 741-3

Finally, the reasoning for selecting Tacoma as a port of entry for the nuclear waste is not clear to me. I believe it is unclear because it is not reasoning, but a political decision. I suspect that you believe that we are too small a city to mount a major protest, such as Seattle, San Francisco and Los Angeles have proven themselves capable of doing. (But you are wrong.) An editorial in the Tacoma News Tribune stated that you cited Seattle as a non-viable candidate because its population is too large. TOO LARGE FOR WHAT? Too large to be an acceptable risk in case of an accident? But you steadfastly tell us an accident will not happen. Guess what--we notice that these two statements do not add up. 741-4

Are you aware that out here in the rest of the country, among ordinary Americans, the DOE has a reputation for gross dishonesty? And well-deserved it is, to my mind. I will resist shipments of nuclear waste through my city by all legal means available to me. And I will organize others to join with me. Do not try to ram this down our throats.

Sincerely,

Nancy Hausauer

Nancy Hausauer
704 Sixth Avenue
Tacoma, WA 98405

RESPONSE TO COMMENT
COMMENTOR NO. 741: HAUSAUER, NANCY

Response to Comment No. 741-1

Spent nuclear fuel from foreign research reactors is not an attractive target for terrorists because it is not flammable or explosive (Section 1.1 of the EIS). As shown in Section 4 of the EIS, radiological health and other environmental risks resulting from the transportation of foreign research reactor spent nuclear fuel are low. Consequences of sabotage and terrorist activities are discussed in Appendix D, Section D.5.9 of the EIS.

Reprocessing in overseas facilities is one of the alternatives evaluated in the EIS (Management Alternative 2, Section 2.3, Subalternative 1b of the EIS).

Prior to 1989, it was United States policy to accept foreign research reactor spent nuclear fuel for disposition in the United States (Section 1.1 of the EIS). Many foreign research reactor operators have no immediate means of disposing of their spent nuclear fuel (Section 1.2 of the EIS). Thus, the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). Ultimate disposition is a high-priority consideration which is discussed qualitatively in Section 4.2.7 of the EIS.

Response to Comment No. 741-2

DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' economic development. Nor should it contribute to any stigma based on the EIS analysis that indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2 of the EIS). This belief is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions. As such, there should be no adverse cultural or economic reaction to the use of the port. Historically, there were no adverse economic or cultural impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Section 4.2.1.3 of the EIS has been modified to include this assurance of recovery in coastal waters. Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

The security provided for the foreign research reactor spent nuclear fuel shipments would meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Appendix H has been added to the final EIS in response to public comments, to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site(s).

A paragraph has been added to Section 2.6.3.1 of the EIS to discuss why security beyond that required by 10 CFR Part 73 is not needed for the receipt of foreign research reactor spent nuclear fuel at commercial ports.

Appendix D, Section D.5.3.1 of the EIS describes several accident scenarios that involve fire. The results of the analysis of these accidents can be found in Appendix D, Section D.5.4. The analysis shows that even in the event of a severe ship fire, neither the consequences nor risks are great (Appendix D, Section D.5.5). The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS).

Response to Comment No. 741-3

Updated information on the terminals at the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS. The evaluated data on populations is from the 1990 census. Although corrected information has been included in the port information for the Port of Tacoma, the analyses provided in Sections 4.2.2 and 4.5 of the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port.

Response to Comment No. 741-4

The process used to identify potential ports of entry for the foreign research reactor spent nuclear fuel is discussed in Appendix D, Section D.1.9 of the EIS. Please see the response to comment 439-5 for an explanation of the role played by population of prospective ports of entry in the port selection process.

COMMENTOR NO. 742: PRICCO, ARTHUR V.

50% unbleached pulp and 50% post-consumer fibre paper

June 17, 1995

Public Comments-Draft FRR SNF EIS
Charles Head, Program Manager
Office of Spent Nuclear Fuel Management
Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

Dear Mr. Head,

I am opposed to the shipment of spent nuclear fuel rods through the San Francisco Bay area into Concord Naval Weapons Station for the following reasons.

-There is no data to show that a fuel cask can survive a prolonged fire such as in an oil fire.

742-1

-Nuclear laden vessels must pass under six bridges, past six refineries and several chemical plants to reach CNWS.

-There are numerous earthquake faults in and near Concord.

-Adjacent to CNWS is a school. In addition to these endangered students are approximately one million people who live along the Bay Area transport route.

-There is no permanent storage site in the US. The temporarily stored material will have to be moved again.

742-2

Require the countries that are producing this material to store it on-site under international safeguard. Most of the countries are Western Allies such as Sweden, Germany and Japan, and are fully capable of doing this. Take special measures with those countries with which there is concern of theft or diversion.

742-3

Sincerely,

Arthur V Pricco

Arthur V Pricco
24 St. Claire Ln.
Pleasant Hill, CA 94523

RESPONSE TO COMMENT
COMMENTOR NO. 742: PRICCO, ARTHUR V.

Response to Comment No. 742-1

The passage from San Francisco Bay to Concord NWS meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). Favorable transit from open ocean is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations such as port population, population along the route to the management site, port experience with handling containers, and port facilities would be considered in making the final selection of ports of entry.

Regarding the commentor's concern about a prolonged fire, the duration of a ship fire is directly related to the amount of combustibles carried on board. In spite of this potential, the number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicate that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures.

With respect to the impact a ship fire might have on a spent nuclear fuel transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the transportation cask would not be exposed for the entire duration of the fire. Second, a ship fire's intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it would be almost impossible for spent nuclear fuel inside the transportation cask to reach 900 Kelvin (1,160 degrees Fahrenheit), the melting point of research reactor spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (see Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ships's structure buckles at around 700 Kelvin (800 degrees Fahrenheit).

The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt foreign research reactor spent nuclear fuel. Appendix D, Section D.5.3 presents detailed discussion of accident probabilities and radioactive material source terms and Section D.5.4 presents the results of the analyses.

The port selection criteria do not consider the existence of land-based facilities such as

refineries because they have no direct impact on the risk associated with the shipment of foreign research reactor spent nuclear fuel. Section 4.2.2.3 of the EIS discusses the assumptions that went into the port accident analysis and the results of those analyses.

Regarding earthquake faults, the risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the transportation cask.

Response to Comment No. 742-2

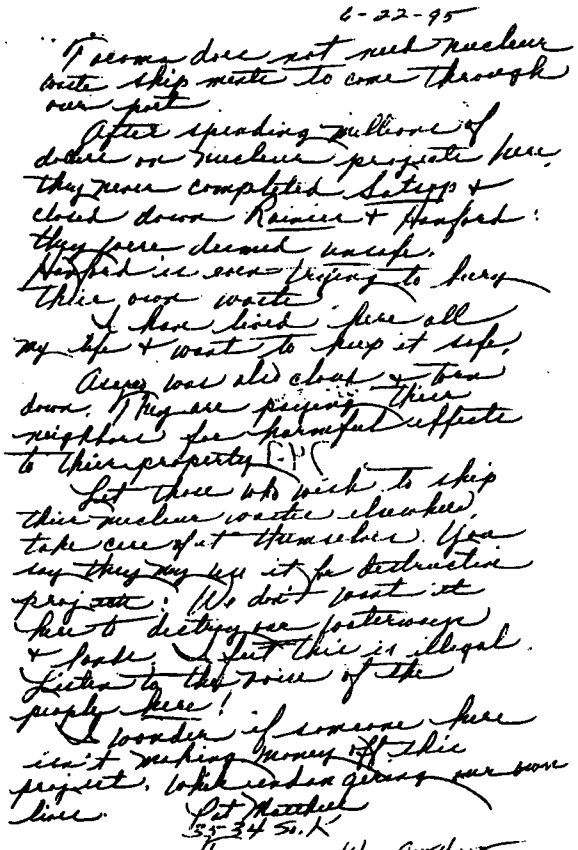
The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. A detailed, quantitative discussion of these impacts would have to be the subject of future NEPA documentation.

Appendix E and Section 4.2.3 of the EIS demonstrate that the risks associated with ground transport of the foreign research reactor spent nuclear fuel would be very low.

Response to Comment No. 742-3

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

COMMENTOR NO. 743: MATHEES, PAT



6-22-95

Tacoma does not need nuclear waste ship waste to come through our port.

After spending millions of dollars on nuclear projects here, they were completed, Satsop & closed down Rainier & Hanford: they were deemed unsafe. Hanford is even trying to bury their own waste.

I love birds, love all my life & want to keep it safe.

Please tear old cloak & burn down. They are prepared their neighbors for harmful effects to their property.

Let those who wish to ship their nuclear waste elsewhere, take care of it themselves. You say they may use it for destructive projects. We don't want it here to destroy our fisheries & lands. But this is illegal. Listen to the voice of the people here!

I wonder if someone here isn't making money off this project. Look under every rock.

Pat Mathees
35-34 So. K
Tacoma, Wa. 98418

743-1

743-2

RESPONSE TO COMMENT
COMMENTOR NO. 743: MATHEES, PAT

Response to Comment No. 743-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 743-2

The commentor's preference for Management Alternative 2 (overseas management, Section 2.3 of the EIS) or the No Action Alternative (Section 2.5 of the EIS) is noted.

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). As discussed in Section 4 of the EIS, the risks associated with implementation of the proposed action to health or the environment would be low.

6-22-95

Dear Charles Head:

We are property owners in nearby Tacoma and strongly, fiercely opposed to the shipment of spent nuclear fuel through the Port of Tacoma! Please don't do it!

744-1

Respectfully,

Rod & Margaret Cardwell
1319 - 11th Ave.
Fox Island, WA 98333

Response to Comment No. 744-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 745: SCALPH, ZONA

1903 E. 68th St.
Tacoma, WA 98404
June 21, 1995

Dear Mr. Head,

I am opposed to shipments of nuclear waste being sent not just through the Port of Tacoma from other countries, but being sent anywhere in the U.S. from abroad. 745-1

We as a country need to take care of our country. other countries need to take care of their own problems. 745-2

It's time we put America 1st. Isn't it correct that other countries can still build bombs even if the U.S. allows the nuclear waste storeage? 745-3

I worked with a girl for several weeks last fall who was sent here to try to clear her system from the effects of Chernobyl. Then she was

RESPONSE TO COMMENT
COMMENTOR NO. 745: SCALPH, ZONA

Response to Comment No. 745-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 745-2

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States is noted (Management Alternative 1, Section 2.2 of the EIS). Section 2.3 of the EIS describes other alternatives under consideration.

Response to Comment No. 745-3

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). The proposed action will not eliminate all weapons-grade material from possible diversion to a nuclear weapons program. However, implementation of the proposed action would reduce this material by an amount sufficient to manufacture several hundred nuclear weapons.

sent back to Russia. People there have died because of the accidents. If accidents happen, & they will sometime, where would Tacoma children be sent?

I feel the "common" American citizen may not understand the entire picture, but does know it's not an ideal world & trying to take care of everything will leave us with nothing. Americans have always been willing to give but fear & distrust of the government that doesn't listen seems to be growing.

Sincerely,

Zona Scalph

206-473-0422

XII 05 [illegible]

745

COMMENTOR NO. 746: FAIRBANKS, JOYCE

JOYCE FAIRBANKS
1035 Regents Blvd, Ste 289
Tacoma, WA 98466-6030

June 23, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
1000 Independence Avenue SW
Washington, DC 10585

Don't do it! You saw how angry the crowd in Seattle was. You heard us testify. Yet, we won't give up. We don't want your nuclear waste for Tacoma's port. Your proposal is insane & ill prepared & based on 1980 population figures. Joyce Fairbanks

I was one of numerous protestors at the June 19, 1995 public hearing on the U. S. Dept. of Energy's proposal to import high-level nuclear waste from other countries and ship it through the Port of Tacoma. I am strongly opposed to this proposal as well as importing nuclear waste for storage at Hanford, Washington. 746-1

There are many Port of Tacoma and City of Tacoma Risk Issues. The D.O.E. used outdated information. The state of Tacoma container terminals as well as the number is shown in a state of existence from the year 1980 or before. Given these errors in analyzing facilities for handling shipments it is very likely the population of Tacoma was shown as less than it is now. Tacoma is a major population center that merges with Seattle. Tacoma is the Number 2 size town in Washington.

Mt. St. Helens is about 100 miles from Tacoma. An active volcano, it erupted in 1980 and the tremors and ash spread throughout the state. Mt. Rainier and Mt. Baker are also active volcanoes that could erupt at any time.

This is earthquake country. Major fault lines run through the whole state. Scientists have been predicting some really big quakes. 746-2

Many anti-government neo-nazi para military groups call the Pacific Northwest home. Some of these groups are extremely volatile and could very easily sabotage nuclear waste shipments. Need I remind you of Oklahoma city? 746-3

Briefly, there are many issues not adequately considered in the draft environmental statement. The water depth in Puget Sound is over 200 meters deep in major shipping lanes to and from the Port of Tacoma. The D.O.E. did not recognize that Tacoma, specifically Commencement Bay and the Port of Tacoma are located in a federally designated Superfund site. This site is on the National Priority list for cleanup. D.O.E. did not recognize that the shipment of nuclear materials would contribute to the "dirty port" stigma. 746-4

The D.O.E. did not adequately consider severe fires/explosions. The D.O.E. did not adequately consider security issues. No provisions were made for upgrading and training local defense teams.

RESPONSE TO COMMENT
COMMENTOR NO. 746: FAIRBANKS, JOYCE

Response to Comment No. 746-1

Updated information on the terminals at the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS. The evaluated data on populations is from the 1990 census. Although corrected information has been included in the port information for the Port of Tacoma, the analyses provided in Sections 4.2.2 and 4.5 of the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port.

Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident, and thus affect the probability of such accidents; however, the number of earthquake-induced ship and road accidents is small compared to other causes.

Response to Comment No. 746-2

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Security measures for the transportation of foreign research reactor spent nuclear fuel are discussed in Section 2.8 of the EIS.

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk of such actions. Security would be provided for all shipments of foreign research reactor spent nuclear fuel, as required by the Code of Federal Regulations (10 CFR Part 73). The general security provisions are provided in the new Appendix H that has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders.

COMMENTOR NO. 746: FAIRBANKS, JOYCE (CONT'D.)

Bringing nuclear waste through Tacoma poses an incalculable risk to the whole Pacific Northwest. We have the right to request our area be kept free from hazards of nuclear accidents, that our children and future generations remain healthy and free from fear. Keep nuclear waste out of the Puget Sound area. Our families and communities are too precious to be tampered with. NO NUCLEAR WASTE FOR THE PORT OF TACOMA!

Joyce Fairbanks

746-5

RESPONSE TO COMMENT
COMMENTOR NO. 746: FAIRBANKS, JOYCE (CONT'D.)

Response to Comment No. 746-3

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Section 4.2.1.3 of the EIS has been modified to include this assurance of recovery in coastal waters. Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

A sentence has been added to Appendix D, Section D.2.1.9 of the EIS regarding Commencement Bay being a Superfund Site. The analysis of impacts associated with acceptance of the foreign research reactor spent nuclear fuel into the U.S. demonstrates that there would be no significant adverse impacts on the ports, people, or natural environment and the overall impacts to Commencement Bay would be unchanged by the various management alternatives.

Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma. Nor should it contribute to any "dirty port" stigma based on the EIS analysis that indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive contents have ever been released from a transportation cask, nor has a cask ever been punctured, even as a result of an accident. Based on this experience, DOE does not expect the casks to leak or affect air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

Response to Comment No. 746-4

The transportation casks that would be used for the foreign research reactor spent nuclear fuel are certified if their design meets certain tests, including a fire test, and if the individual casks pass periodic inspections (Section 2.6.2 of the EIS). These certification standards were developed for use of the casks on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. The duration of a ship fire is directly related to the amount of combustibles carried on board. In spite of this potential, the number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicates that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures.

COMMENTOR NO. 746: FAIRBANKS, JOYCE (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 746: FAIRBANKS, JOYCE (CONT'D.)

In respect to the impact a ship fire might have on a spent nuclear fuel transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship fire's intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it would be almost impossible for nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of foreign research reactor spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).

The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt research reactor nuclear fuel. Appendix D, Sections D.5.3 and D.5.4 present a detailed discussion of accident probabilities and radioactive material source terms and the results of the analyses, respectively. In conclusion, although long duration ship fires are possible, and have occurred, they are uncommon events. Analyses in the EIS indicate that even in the event of a severe ship fire involving a transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5 of the EIS)

Response to Comment No. 746-5

Section 4.2.3 of the EIS presents a discussion of the risks and impacts on the Tacoma port area from receipt of the foreign research reactor spent nuclear fuel. The analyses demonstrate that such risks and impacts would be very low, both for the Tacoma area, as well as for other ports of entry and management sites.

COMMENTOR NO. 747: BEELER, JOHN J.

27048 8th Ave S.
Kent, Wa. 98032
June 22, 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

Dear Mr. Head:

I just wanted to voice my opinion and let you know that I do not like the idea of highly radioactive nuclear waste, being shipped through the Port of Tacoma. If you happen to remember the city you were in last week, it was TACOMA, WASHINGTON--as in Washington State. 747-1

Your comment that, your bosses in the --other Washington--do not have time to listen to the public was not taken very well in this part of the United States. 747-2

I suggest you listen to all the letters and faxes you will receive on this subject. Please mark me down, as being opposed to these shipments. I hope you "listen."

Thank you very much,

John J. Beeler

John J. Beeler
27048 8th Ave. S.
Kent, Washington 98032
jbeeler@compumedia.com

RESPONSE TO COMMENT
COMMENTOR NO. 747: BEELER, JOHN J.

Response to Comment No. 747-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 747-2

While it would be impractical for the Secretary of Energy to personally review and respond to all of the written and oral comments concerning this EIS, this information was reviewed by the Program manager and his staff. The Program Manager is responsible for relaying public views and concerns to the Secretary of Energy and her staff. The final EIS, including comments and responses, and Record of Decision are subject to approval by the Secretary of Energy. All comments received during the ninety day comment period are noted and answered in this document. Under NEPA and DOE's environmental regulations (Section 5 of the EIS), public participation and comments are an integral part of the environmental process.

Overall, DOE's public interaction related to this draft EIS has been well in excess of the requirements set forth in NEPA and the environmental regulations of DOE. Seventeen public hearings were held in the locations determined to be most likely to be directly affected by the EIS alternatives. In addition to accepting public comments during the hearings, written comments were also encouraged. All oral and written comments are addressed in Volume 3 of the EIS.

COMMENTOR NO. 747: BEELER, JOHN J. (CONT'D.)

Date: Thu, 22 Jun 95 22:44:56 -0700
From: Earthquake Information <quake@geophys.washington.edu>
To: jbeeler@compumedia.com
Subject: Automatic mail response from quake account

The 'quake' account at geophys.washington.edu has been set up to provide a network (or dial-in) information service about earthquakes occurring in the Pacific Northwest. There are no other e-mail services other than the one page summary which is available on the InterNet with:
'finger quake@geophys.washington.edu'
or by dialing at 1200 baud to (206)685-0889, logging in as 'quake' same password
or by sending mail with any subject and or text to quake@geophys.washington.edu
On the Internet there is now also a WWW server with lots of information, maps, and earthquake details at URL: http://www.geophys.washington.edu

CURRENT INFORMATION:
The following catalog is is for earthquakes (M>2) in Washington and Oregon produced by the Pacific Northwest Seismograph Network, a member of the Council of the National Seismic System. Catalogs for various regions of the country can be obtained by using the UNIX program 'finger quake@machine' where the following are machines for different regions.

gldfs.cr.usgs.gov (USGS NEIC/NEIS world-wide), andreas.wr.usgs.gov (Northern Cal.), scec.gps.caltech.edu (Southern Cal.), fm.gi.alaska.edu (Alaska), seismo.unr.edu (Nevada), mbmgsun.mtech.edu (Montana), eqinfo.seis.utah.edu (Utah), sisyphus.idbsu.edu (Idaho) slueas.slu.edu (Central US), tako.wr.usgs.gov (Hawaii),

Additional catalogs and information for the PNSN (as well as other networks) are available using the World-Wide-Web (mosaic) system at URL:
'http://www.geophys.washington.edu/'
DATE-TIME is in Universal Time (UTC) which is PST + 8 hours. Magnitudes are reported as local magnitude (Ml). QUAL is location quality A-good, D-poor, Z-from automatic system and may be in error.

DATE-(UTC)-TIME	LAT(N)	LON(W)	DEP	MAG	QUAL	COMMENTS
yy/mm/dd hh:mm:ss	deg.	deg.	km	Ml		
95/05/26 19:35:39	46.16N	123.03W	14.3	2.0	C	8.7 km NW of Longview
95/05/30 19:05:01	46.95N	120.36W	2.3	2.6	C	12.9 km ESE of Ellensburg
95/06/08 16:32:21	48.46N	121.81W	5.4	2.6	B FELT	10.0 km SW of Concrete
95/06/12 01:48:24	46.40N	119.25W	0.9	3.3	B FELT	13.7 km W of Richland
95/06/13 03:09:11	45.91N	122.96W	24.7	3.0	B FELT	24.4 km S of Longview
95/06/17 [illegible]	46.83N	120.71W	0.7	2.4	B	22.2 km SW of Ellensburg
95/06/17 [illegible]	46.83N	120.71W	2.4	2.7	B	22.7 km SW of Ellensburg
95/06/17 [illegible]	46.83N	120.71W	0.8	2.3	B	22.2 km SW of Ellensburg
95/06/18 [illegible]	47.66N	117.46W	0.4	2.2	C FELT	5.6 km W of Spokane

6-22-95

MR. HEAD—

PLEASE NOTE THIS EARTHQUAKE INFORMATION FOR THE PACIFIC NORTHWEST. IF YOU HAVE AN E-MAIL ACCOUNT, I SUGGEST YOU SUBSCRIBE TO THE ABOVE ADDRESS. YOU CAN KEEP UP ON THE CONSTANT EARTHQUAKES IN THE PACIFIC NORTHWEST. — CHECK OUT THE ONES FOR RICHLAND & ELLENSBURG!!

JOHN BEELER.

747-3

RESPONSE TO COMMENT
COMMENTOR NO. 747: BEELER, JOHN J. (CONT'D.)

Response to Comment No. 747-3

The EIS evaluates the risk associated with marine port activities in Section 4.2.2. The port impacts are evaluated for both incident-free and accident conditions. Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident, and thus affect the probability of such accidents; however, the number of earthquake-induced ship and road accidents is small compared to other causes.

COMMENTOR NO. 748: CITIZENS (TACOMA AREA)

June 23,1995

Sir: Charles Head,

We, the undersigned greatly oppose the highly radioactive nuclear waste material from other countries being shipped through the Port of Tacoma, or any other Port of our Country.

We have the right to be free from fear. Our childern have the right to have a decent chance in life.

What ever happened to the goverment of " We the people for the People "

Sincerely,

Beverly K. Stone
Myrtle Kucera
Gail Mondoux
Deanna D. Plumb
Alberta Cunningham
Sally B. Sears

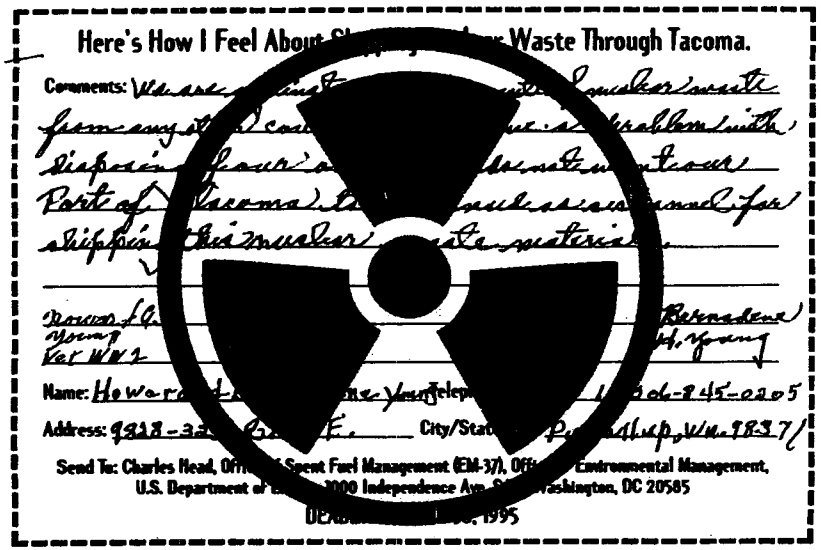
748-1

RESPONSE TO COMMENT
COMMENTOR NO. 748: CITIZENS (TACOMA AREA)

Response to Comment No. 748-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 749: YOUNG, HOWARD & BERNADENE



Here's How I Feel About Sh... Waste Through Tacoma.

Comments: We are ... nuclear waste ... problem with ... Port of Tacoma ... nuclear ... for shipping ... this nuclear ... waste material.

Howard & Bernadene Young
Ret WW2

Name: Howard ... Telep... 206-845-0205

Address: 9818 - 32... E. City/State ... Lkwd, Wa. 98377

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of ... 1000 Independence Ave. ... Washington, DC 20585

DE... 1995

749-1

749-2

RESPONSE TO COMMENT
COMMENTOR NO. 749: YOUNG, HOWARD & BERNADENE

Response to Comment No. 749-1

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States is noted (Management Alternative 1, Section 2.2 of the EIS). Section 2.3 of the EIS describes other alternatives under consideration.

Response to Comment No. 749-2

The commentor's further opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 750: FUDELL, IRIS

June 23, 1995

Charles Head
Office of Spent Nuclear Fuel Management
U. S. Department of Energy

Dear Mr. Head,

I am a resident of Tacoma, Washington. Recently you visited our city and held a forum. I was unable to attend and want to relaly my very strong objection to nuclear waste being transported through our port. I wholeheartedly agree with opponents of this plan and feel it would greatly endanger the health and well-being of residents in the Puget Sound area. *750-1*

Thank you,

Iris Fudell

Iris Fudell
5226 N. Dahl Dr.
Tacoma, Wa. 98406

RESPONSE TO COMMENT
COMMENTOR NO. 750: FUDELL, IRIS

Response to Comment No. 750-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 751: HINKSON, MOLLY

6-23-95

I do not want Nuclear waste Shipped Through the Port of Tacoma, WASHington. 751-1

Molly Hinkson

RESPONSE TO COMMENT
COMMENTOR NO. 751: HINKSON, MOLLY

Response to Comment No. 751-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 752: BRINKMAN , MRS. W.M.

1773 So 44th St.,
Tacoma Wa 98408
6-23-95.

My family and I strong object to shipping nuclear wastes thru' the Port of Tacoma. My husband is a maintenance mechanic for the Port of Tacoma. We don't want him exposed to anything like that. Accidents will, and do happen. And quite often. We, on the west coast have enough environmental problems already without shipping nuclear waste thru' here.

752-1

Mrs Wm Brinkman
and family

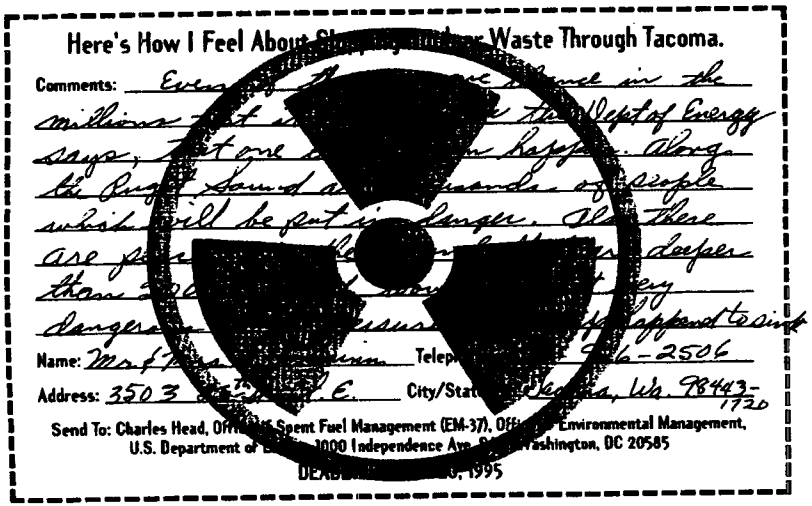
RESPONSE TO COMMENT
COMMENTOR NO. 752: BRINKMAN, MRS. W.M.

Response to Comment No. 752-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 753: GUINN, H.J.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



753-1

753-2

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by July 20, 1995. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Renton, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

RESPONSE TO COMMENT
COMMENTOR NO. 753: GUINN, H.J.

Response to Comment No. 753-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. xHowever, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low

Response to Comment No. 753-2

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Section 4.2.1.3 of the EIS has been modified to include this assurance of recovery in coastal waters. Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

COMMENTOR NO. 754: ROMO, LEO

22 June '95
Tacoma, WA.

Dear Sir:

In writing this letter, it is hoped that it may, in a small way, help you make a decision about the shippment of Spent Fuel Rods through the Port of Tacoma, and for that matter, any port in the United States for overseas usage of Radioactive material.

My way of thinking is that if they (the countries) that use the "material" then they should have an appropriate method of disposal in their own countries, and not ship it the thing to the United States.

They should have the same security measures that are

754-1

RESPONSE TO COMMENT
COMMENTOR NO. 754: ROMO, LEO

Response to Comment No. 754-1

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

COMMENTOR NO. 754: ROMO, LEO (CONT'D.)

-2-

employ to safeguard the material

754-1 (Cont'd.)

Thank you Sir for your time and I am hoping that the right decision is reached.

Respectfully

Leo Romo

P.S. I know it is a big job, but I know you can do it or you wouldn't be in the position that you are in now!

LR

RESPONSE TO COMMENT
COMMENTOR NO. 754: ROMO, LEO (CONT'D.)

COMMENTOR NO. 755: MCCONAGHY, HELEN

June 22 1995

Charles Head.
office Spent Nuclear
Fuel Mgt.

Dear Sir:

I am highly upset over your office of Spent Nuclear Fuel Management's plans to ship through Tacoma's Port. This must not happen to our city & Puget Sound. My great parents came to Tacoma in the 1880's so many generations have & call about this area & we do not want to have radioactive nuclear waste

755-1

RESPONSE TO COMMENT
COMMENTOR NO. 755: MCCONAGHY, HELEN

Response to Comment No. 755-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 755: MCCONAGHY, HELEN (CONT'D.)

alienating our beautiful
area + ruining it for future
generations.

Sincerely
Helen J. McConaghy
3674 Takoma Rd.
Tacoma Wa 98466

RESPONSE TO COMMENT
COMMENTOR NO. 755: MCCONAGHY, HELEN (CONT'D.)

COMMENTOR NO. 756: RINKER, SHEILA

June 22, 1995

Charles Head
Office of Spent Nuclear Fuel
Management (EM-37)
U. S. Dept. of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

Dear Mr. Head:

For the future of our area and for children
born or yet to be born, please reconsider the
plan to transport nuclear waste through the
Port of Tacoma and the surrounding area.

Regardless of the claims of safety, many
instances of disaster have already occurred
and will occur in the future the decision
to litter our state with nuclear waste from
foreign countries is definitely not a healthy
decision for current and future generations.

Please reconsider your plan to use (abuse)
the Port of Tacoma. As your statement in

756-1

RESPONSE TO COMMENT
COMMENTOR NO. 756: RINKER, SHEILA

Response to Comment No. 756-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 756: RINKER, SHEILA (CONT'D.)

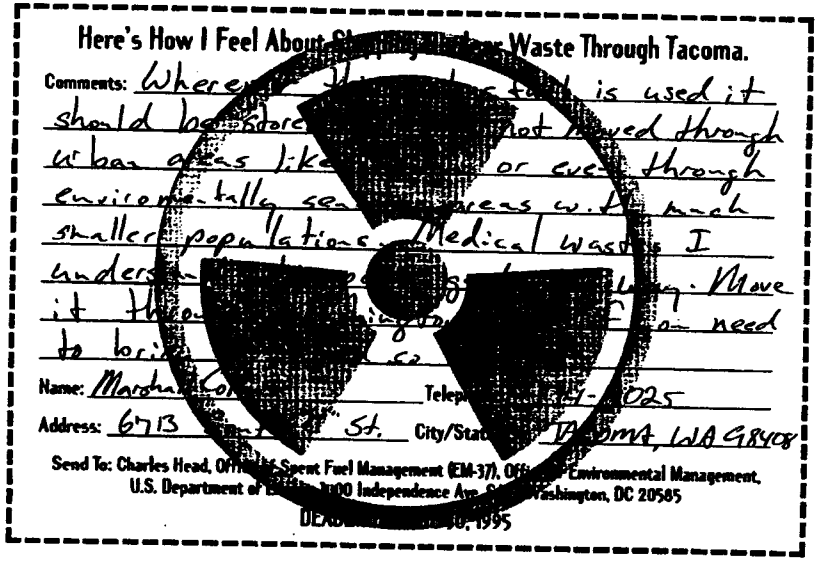
the Tacoma News Tribune appeared, "There's certainly a strong undercurrent of public opinion that is negative to this." - believe it, and do not want our beautiful state as a dumping ground for dangerous materials) - our country's as well as foreign countries'.

Respectfully,

Sheila A. Rinker
11712 112th Ave. Ct. E
Puyallup, WA 98374

RESPONSE TO COMMENT
COMMENTOR NO. 756: RINKER, SHEILA (CONT'D.)

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



Here's How I Feel About [illegible] Waste Through Tacoma.

Comments: Where [illegible] is used it should be [illegible] not moved through urban areas like [illegible] or even through environmentally sea[illegible] areas w. [illegible] much smaller populations. Medical waste [illegible] I understand [illegible]. Move it thro[illegible] on need to bri[illegible]

Name: Marsha[illegible] Telep[illegible]025

Address: 6713 [illegible] St. City/Stat[illegible] Tacoma, WA 98408

Send To: Charles Head, Off[illegible] Spent Fuel Management (EM-37), Off[illegible] Environmental Management, U.S. Department of [illegible] 1000 Independence Ave[illegible] Washington, DC 20585

DEA[illegible]0, 1995

757-1

757-2

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Renton, Federal Way; Tacoma-Pierce County Visitor & Convention Bureau, Tacoma-Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

Response to Comment No. 757-1

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

Response to Comment No. 757-2

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 758: CLEMENTS, FLORENCE

925 Ea. 63rd ST.
Tacoma, Wash - 98404
June 21, 1995

Mr. Charles Head:

We, in Tacoma do not want your spent Nuclear Fuel Coming Thru our ports -, and as Idaho is my birth State, I can't see putting it there to store. Look at the Hanford leaks, I feel terrible at the time Hanford was being built, and mentioned to my family of the underground streams that would be contaminated due to our government not caring.

Take the stuff to some desert Country where no one lives and no under ground streams - what's going to happen to our future generations here in our United States of America -

Please do not bring it into the Port of Tacoma.

Sincerely
Florence M. Clements

758-1
758-2
758-3
758-4

RESPONSE TO COMMENT
COMMENTOR NO. 758: CLEMENTS, FLORENCE

Response to Comment No. 758-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 758-2

The commentor's opposition to the use of Idaho National Engineering Laboratory as a management site for foreign research reactor spent nuclear fuel is noted.

Response to Comment No. 758-3

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 758-4

The commentor's preference for management of spent nuclear fuel from foreign research reactors in overseas, desert countries devoid of underground water is noted. Overseas management of foreign research reactor spent nuclear fuel is discussed in Sections 2.3 and 2.4 of the EIS.

As demonstrated by the analysis in Section 4 of the EIS, the risks associated with implementation of the proposed action to human health or the environment would be low.

COMMENTOR NO. 759: TATE, H.T.

DEAR MR. HEAD, June 21, 95

I'm not a citizen of TACOMA, I live in Puyallup, WA. but it has still come to my attention that somebody is pushing for Olympia's approval on shipping nucleor waste through the Port of Tacoma.

This must not happen.

It is an unsafe cargo and would devistate large surrounding areas if there were an accident.

Don't you people in our Government think things out before you begin bargaining?

Sincerly,

H. T. TATE
806 15th Ave S.E.
Puyallup, WA.
98372

No Nucleor WASTE !!

759-1

RESPONSE TO COMMENT
COMMENTOR NO. 759: TATE, H.T.

Response to Comment No. 759-1

The commentor's opposition to bringing spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risks associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 760: HELMER, MARIE A.

Marie A. Helmer
909 North J, #104
Tacoma, WA 98403

6/23/95

Dear Mr. Head,

I was a part of that large, animated gathering Mon. night (5/19/95) in Tacoma. However, I did not speak but was truly interested. Also want to commend you for your presentation and subsequent courtesy and attention.

It does not speak well for some of folks at the DOE that I saw at the gate — "They don't have time to listen". I hope you can carry the load!

A concerned Tacoman,
Marie A. Helmer

760-1

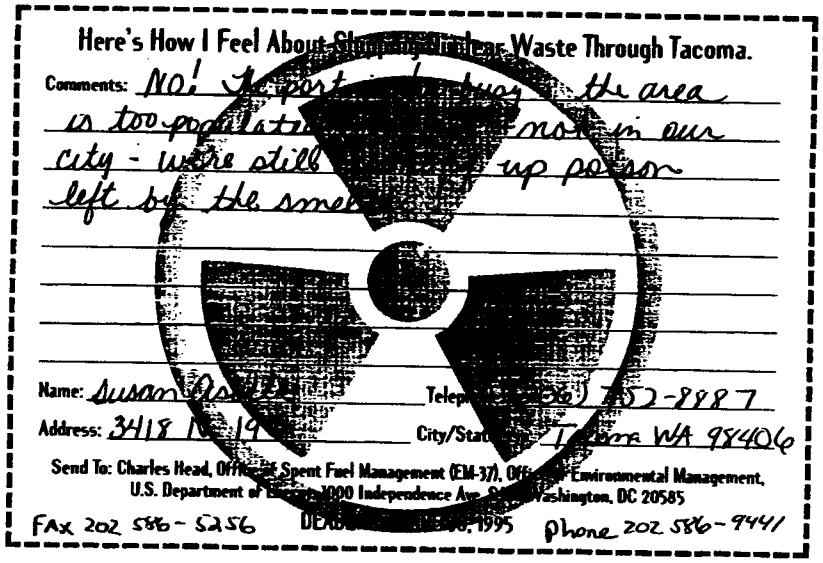
RESPONSE TO COMMENT
COMMENTOR NO. 760: HELMER, MARIE A.

Response to Comment No. 760-1

While it would be impractical for the Secretary of Energy to personally review and respond to all of the written and oral comments concerning this EIS, this information was reviewed by the Program Manager and his staff. The Program Manager is responsible for relaying public views and concerns to the Secretary of Energy and her staff. The final EIS, including comments and responses, and Record of Decision are subject to approval by the Secretary of Energy. All comments received during the ninety day comment period are noted and answered in this document. Under NEPA and the environmental regulations of DOE (Section 5 of the EIS), public participation and comments are an integral part.

COMMENTOR NO. 761: ASBELL, SUSAN

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: NO! I support [illegible] the area is too populated [illegible] not in our city - we're still [illegible] up poison left by the smel[illegible]

Name: Susan [illegible] Telep[illegible] 752-8887

Address: 3418 N [illegible] 19 City/State [illegible] Tacoma WA 98406

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of [illegible] 1000 Independence Ave. S[illegible] Washington, DC 20585

FAX 202 586-5256 DEADLINE: June 30, 1995 Phone 202 586-9441

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Ruston, Federal Way; Tacoma-Pierce County Visitor & Convention Bureau, Tacoma-Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

761-1

RESPONSE TO COMMENT
COMMENTOR NO. 761: ASBELL, SUSAN

Response to Comment No. 761-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 762: JENSEN, LAURA

Friday, June 23, 1995
Tacoma, Washington

Charles Head
Office of Spent Nuclear Fuel Management
(EM-37)
US Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585

To Charles Head:

As a person who has always been a citizen of Tacoma but could only feel dumbfounded by the sound of the extraordinary plan to ship highly radioactive uranium through the Port of Tacoma, I could only feel so very sympathetic with the many comments I heard at the meeting Monday at the Utilities Building in Tacoma. I felt convinced by the speaker who opposed the use of Tacoma because of the danger of shipboard fires and accidents in transport. I felt convinced by the speaker's questions about where information should be for all the citizens involved, their gratitude that at least a small flier had been issued from the NorthEnd Neighborhood Council, I felt sympathy. I felt more sympathy for the citizens from Federal Way who brought the resolution of their council that the environmental impact statement was not adequate in emergency planning and in consideration of the socio-economic base of the area.

The many speakers emphasized many more important reasons why this startling shipment of radioactive uranium should not go through the Port of Tacoma. I felt shocked by such news - and felt much sympathy with their intelligent comments. 762-1

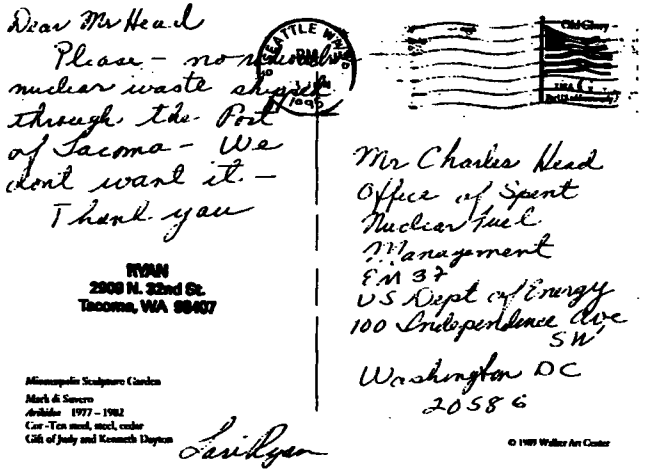
Truly, Laura Jensen
302 North Yakima C3
Tacoma, WA 98403-2213

RESPONSE TO COMMENT
COMMENTOR NO. 762: JENSEN, LAURA

Response to Comment No. 762-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 763: RYAN, LORI


Dear Mr Head
Please - no radioactive
nuclear waste should
through the Port
of Tacoma - We
dont want it. -
Thank you

RYAN
2909 N. 32nd St.
Tacoma, WA 98407

Mr Charles Head
Office of Spent
Nuclear Fuel
Management
EM 37
US Dept of Energy
100 Independence Ave SW
Washington DC
20586

Minneapolis Sculpture Garden
Mark di Suvero
Arbitder 1977 - 1982
Cor-Ten steel, steel, cedar
Gift of Judy and Kenneth Dayton

Lori Ryan

© 1989 Walker Art Center

763-1

RESPONSE TO COMMENT
COMMENTOR NO. 763: RYAN, LORI

Response to Comment No. 763-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 764: SCHUBLOM, CARL

Tacoma, Wash.
June 23, 1995

Dear Mr. Head,

I am writing to let you know that as a citizen of Tacoma, Washington, I am totally against shipping of Nuclear Waste through our Port.

No matter how securely encased those spent Nuclear Rods are, accidents are bound to happen in the planed 13 years of shipments.

Also, why should we in the United States be the dumping ground for European Countries Nuclear waste? We have trouble disposing of our own. No State wants it, period. Sincerly,

Mr. Carl E. Schublom

764-1

764-2

RESPONSE TO COMMENT
COMMENTOR NO. 764: SCHUBLOM, CARL

Response to Comment No. 764-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. Also, the environmental effects evaluated in the EIS determined that there would be no adverse ecological impacts to any of the ports that might be used to receive the material (Section 4.2.2). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive materials have ever been released from a spent nuclear fuel transportation cask as a result of an accident (Section 2.6.2 of the EIS).

Response to Comment No. 764-2

Prior to 1989, it was United States policy to accept foreign research reactor spent nuclear fuel for disposition in the United States (Section 1.1 of the EIS). Many foreign research reactor operators have no immediate means of disposing of their spent nuclear fuel (Section 1.2 of the EIS). Thus, the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). Ultimate disposition is discussed qualitatively in Section 4.2.7 of the EIS.

COMMENTOR NO. 765: ZARELLI, CARMEN

Carmen M. Zarelli
8620 Meadow Rd., S.W.
Tacoma, Wa. 98499
206-984-7985

Mr. Head,

I am writing to you to tell you how appauled I am at the idea of transpating High Level Nuclear Waste through Tacoma, Wash.. I have been a resident of Tacoma for 33 years. I was born and raised here and for someone like you who can try to take advantage of the people of Tacoma by putting our health and lives in ~~danger~~ danger by transpating such ~~a~~ Volitile chemicals makes my sick. I am here to tell you that I will fight you to the bone to keep it out of our town. What make Tacoma better than any other city? Nothing! There is no need to transport or even have such nuclear waste! Dispose of it on the site!

765-1

Carmen Zarelli

RESPONSE TO COMMENT
COMMENTOR NO. 765: ZARELLI, CARMEN

Response to Comment No. 765-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Commentor No. 766: Burwell, Ann & Robert

Here's How I Feel About [illegible] Waste Through Tacoma.

Comments: Don't ship [illegible] waste through Tacoma's port!!! [illegible] about the consequences of [illegible] on land or sea and how disastrous [illegible] would be for our people and land. We are not equipped to handle such a [illegible] the other countries take care of their [illegible] waste -- we do not want to be the dum[illegible]d.

Name: Ann Burwell Robert Bur[illegible] Telep[illegible] [illegible]872-9500

Address: 4224 [illegible] Bay Dr. NW City/Stat[illegible] Gig Harbor, WA 98335

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Off[illegible] Environmental Management, U.S. Department of [illegible] 1000 Independence Ave. [illegible] Washington, DC 20585

DEAD[illegible], 1995

766-1

766-2

Response to Comment

Commentor No. 766: Burwell, Ann & Robert

Response to Comment No. 766-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 766-2

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

COMMENTOR NO. 767: WARDLOW, DON & LEITHA

June 22, 1995

Don & Leitha Wardlow
3904 South Monroe Street
Tacoma, Washington 98409

Charles Head
Office Nuclear Fuel Management (EM37)
U. S. Department of Energy
1000 Independence Ave. S. W.
Washington, D. C. 20585

Sir:

Please do not recommend bringing nuclear waste material through the Tacoma, Washington Port. 767-1

You heard more than enough reasons at the public meeting held in Tacoma on Monday evening June 19, 1995.

Don Wardlow Sr.
Don Wardlow Sr.

Leitha Wardlow
Leitha Wardlow.

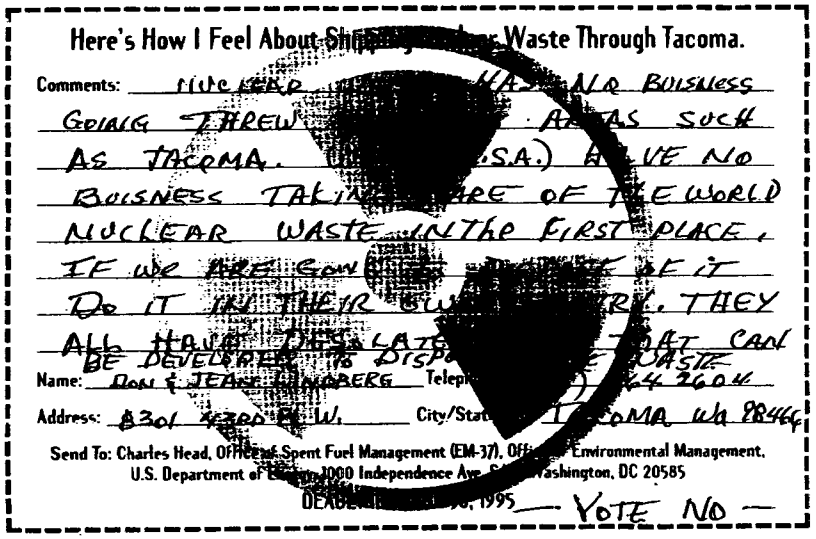
RESPONSE TO COMMENT
COMMENTOR NO. 767: WARDLOW, DON & LEITHA

Response to Comment No. 767-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 768: LINDBERG, DON & JEAN

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: PLEASE KEEP WA... NO BUISNESS GOING THREW ... AS SUCH AS TACOMA. ...U.S.A.) HAVE NO BUISNESS TAKING ... OF THE WORLD NUCLEAR WASTE. IN THE FIRST PLACE. IF WE ARE GOING ... IT DO IT IN THEIR ... THEY ALL HAVE ... THAT CAN BE DEVELOPED TO DISP... WASTE

Name: DON & JEAN LINDBERG Telep... 564 2604

Address: 8301 43RD ST W. City/Stat... TACOMA WA 98466

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Off... Environmental Management, U.S. Department of E... 1000 Independence Ave. S... Washington, DC 20585

DEADL... 1995 — VOTE NO —

768-1

768-2

768-3

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Ruston, Federal Way; Tacoma-Pierce County Visitor & Convention Bureau, Tacoma-Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

RESPONSE TO COMMENT
COMMENTOR NO. 768: LINDBERG, DON & JEAN

Response to Comment No. 768-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 768-2

Nuclear weapons nonproliferation is an important concern of the United States (Section 1.1 of the EIS). The proposed action is intended to reduce the risk of nuclear weapons-grade materials falling into the hands of nations who are seeking to develop a nuclear weapons capability (Section 1.2 of the EIS). Thus, the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

Response to Comment No. 768-3

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

COMMENTOR NO. 769: LOCHBURN JUNIOR HIGH SCHOOL

LOCHBURN JUNIOR HIGH SCHOOL
5431 Steilacoom Boulevard SW • Tacoma WA 98499
"Together We Make A Difference"

Georgia Dewhurst, *Principal*
Bradley R. Purvis, *Vice Principal*

Nanette Ewing
Lochburn Jr. High
5413 Steilacoom Blvd. S.W.
Tacoma, WA 98499

Charles Head
Office of Spent Fuel Management (EM-37)
Office of Environmental Management
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington, DC 20585

Dear Mr. Head:

My name is Nanette Ewing and I'm an 8th grade teacher at Lochburn Jr. High in Lakewood Washington. Lakewood is a suburb of Tacoma. Recently, Tacoma held a public hearing regarding the use of the port of Tacoma as a port of entry for the nuclear waste that is to possibly be shipped here. My 8th grade science classes became quite interested in the issue and some of them have written down their comments on how they feel about this happening in their area. I thought you might be interested in reading them.

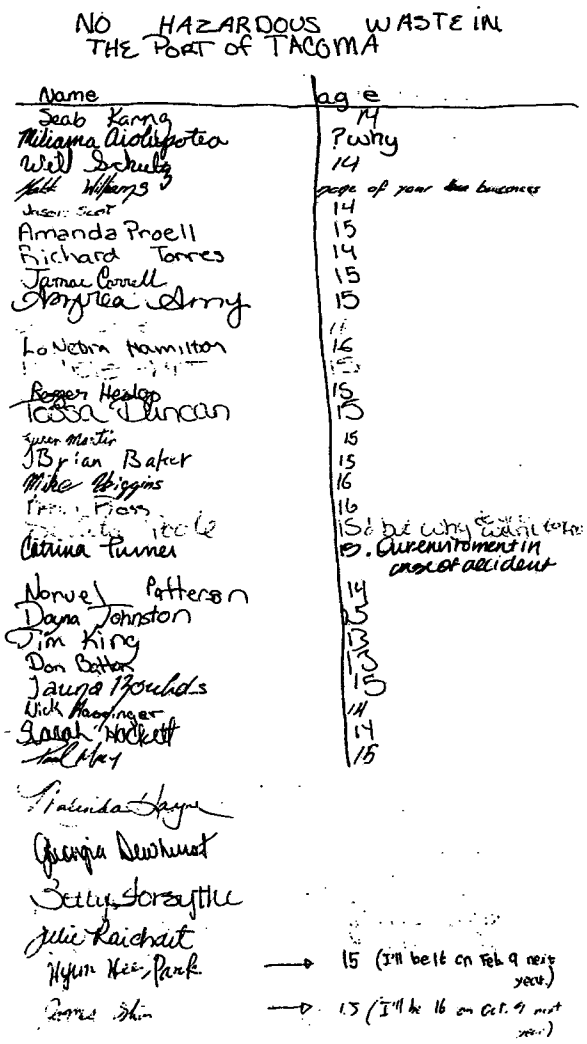
Sincerely,

Nanette Ewing

Nanette Ewing

RESPONSE TO COMMENT
COMMENTOR NO. 769: LOCHBURN JUNIOR HIGH SCHOOL

COMMENTOR NO. 769: LOCHBURN JUNIOR HIGH SCHOOL (CONT'D.)

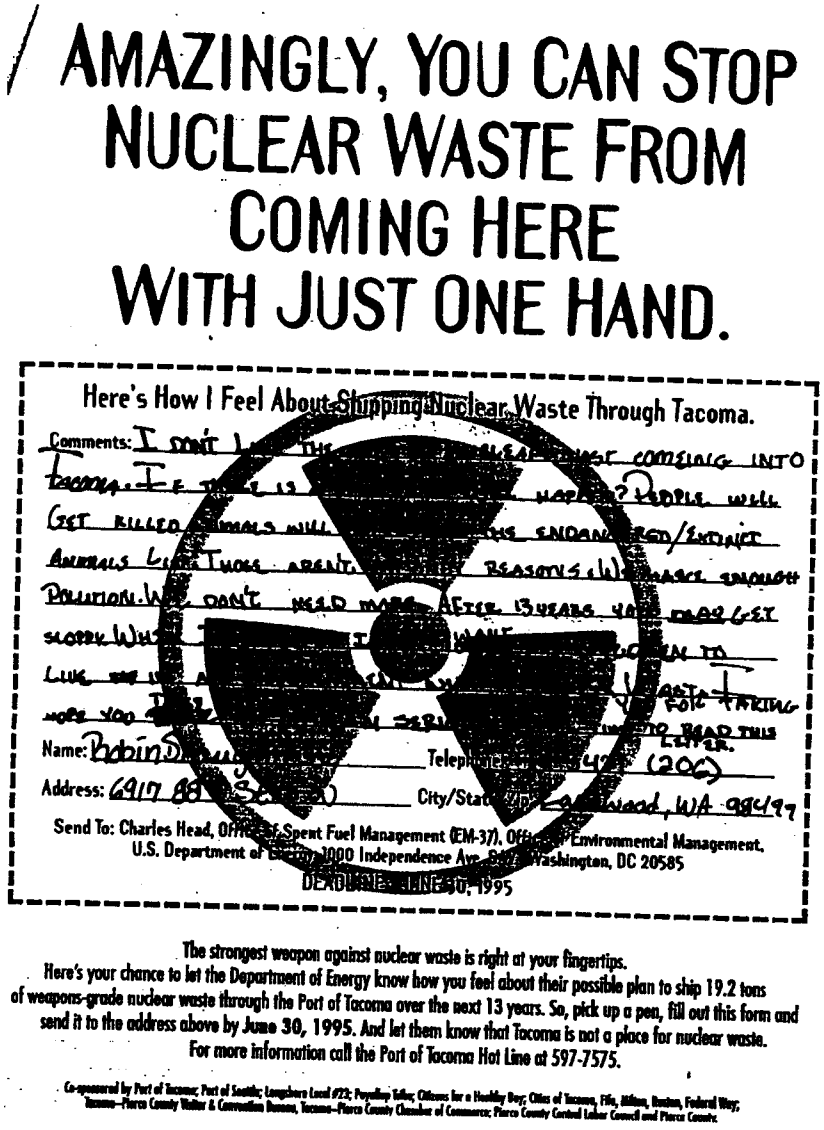


769-1

RESPONSE TO COMMENT
COMMENTOR NO. 769: LOCHBURN JUNIOR HIGH SCHOOL (CONT'D.)

Response to Comment No. 769-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.



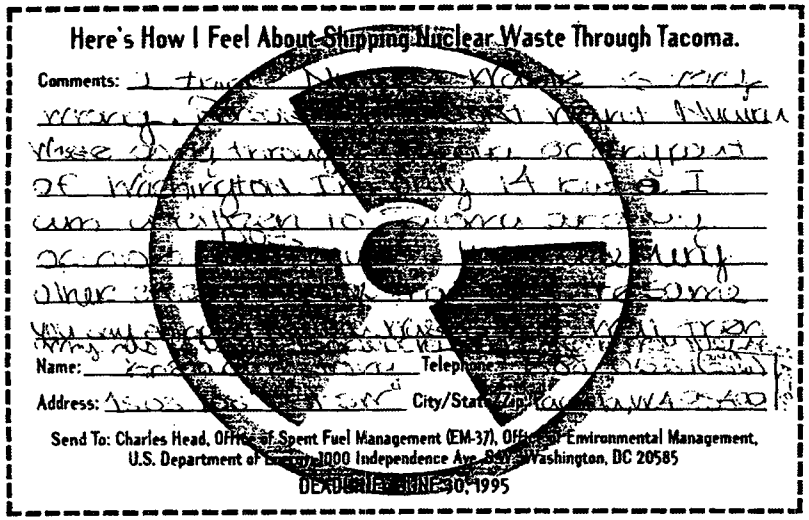
770-1

Response to Comment No. 770-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 771: ARMSTRONG, KRISTA

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



771-1

The strongest weapon against nuclear waste is right at your fingertips. Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste. For more information call the Port of Tacoma Hot Line at 597-7575.

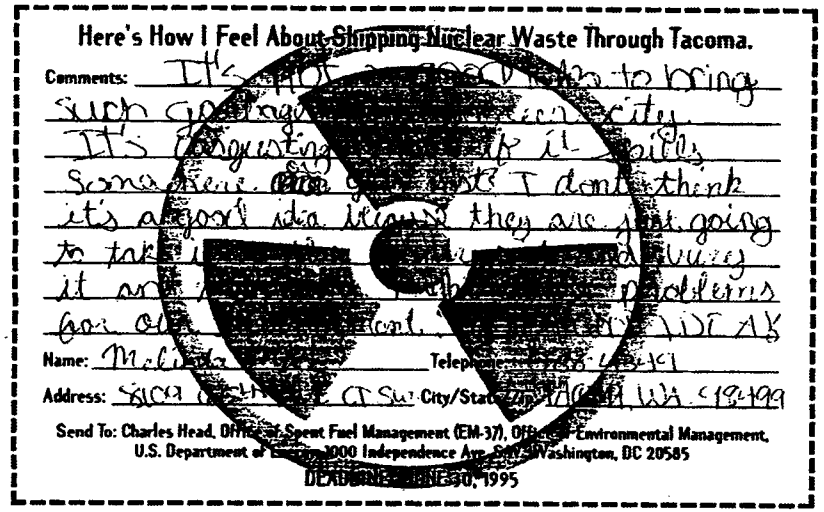
Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Renton, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

RESPONSE TO COMMENT
COMMENTOR NO. 771: ARMSTRONG, KRISTA

Response to Comment No. 771-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: It's not a good idea to bring such dangerous [illegible] city. It's dangerous if it spills. Some [illegible] don't think it's a good idea because they are just going to take it [illegible] it and [illegible] problems for our [illegible] DON'T DO IT!

Name: Melinda [illegible] Telephone: [illegible]

Address: [illegible] CT SW City/State/Zip: [illegible] WA 98499

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. SW, Washington, DC 20585

DEADLINE: JUNE 30, 1995

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772-1

Response to Comment No. 772-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 773: HILTON, JENNIFER

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: what if [illegible] there's a lot of "what if's" and [illegible] them by not letting [illegible] waste in our ports! So many lives are at risk so why take the risk. No waste should be brought through [illegible] one wrong it in our city. What if [illegible] what would you do if [illegible]

Name: Jennifer Hilton Telephone: (206) 591-3363

Address: 710 South [illegible] St SW City/State/Zip: Tacoma WA, 98499

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. SW, Washington, DC 20585

DEADLINE: JUNE 30, 1995

773-1

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RESPONSE TO COMMENT
COMMENTOR NO. 773: HILTON, JENNIFER

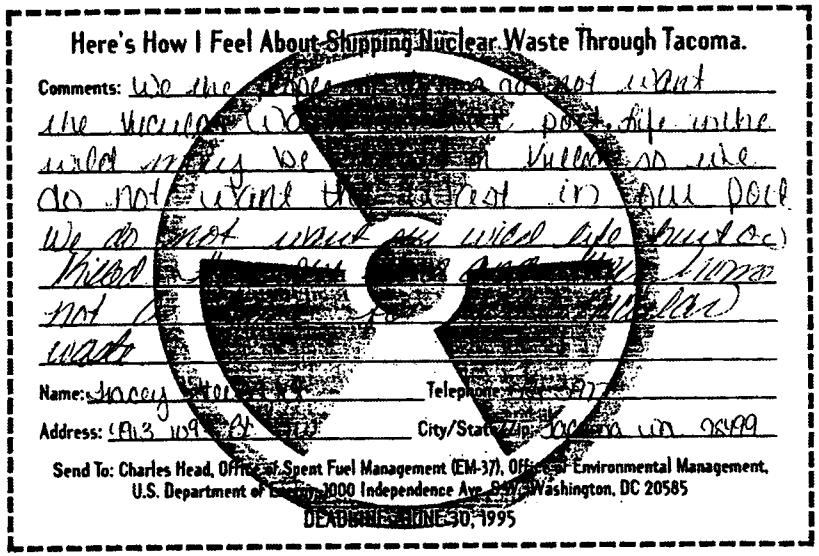
Response to Comment No. 773-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

The EIS did not address marine spills in Puget Sound or elsewhere because the spent nuclear fuel is solid metal that is shipped dry inside a transportation cask, thus there is nothing to spill. In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Section 4.2.1.3 of the EIS has been modified to include this assurance of recovery in coastal waters. Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters. The impacts of a foreign research reactor spent nuclear fuel transportation cask sinking in coastal and deep waters are estimated in the EIS (Appendix C, Section C.5). The results of this analysis show that both the consequences and the risk of these accidents are low (Appendix C, Sections C.5.4 and C.5.5).

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive contents have ever been released from a spent nuclear fuel transportation cask as a result of an accident.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: We the [illegible] do not want the nuclear [illegible] port, life in the wild might be [illegible] Nuclear as we do not want the threat in our port. We do not want our wild life [illegible] Tribal [illegible] not [illegible] waste

Name: Tracy [illegible] Telephone: [illegible]

Address: [illegible] City/State/Zip: Tacoma wa 98499

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. SW, Washington, DC 20585

DEADLINE: JUNE 30, 1995

774-1

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Renton, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

Response to Comment No. 774-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Commentor No. 775: Ogawa, Emily

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: I FEEL VERY [illegible] WANTING TO SHIP NUCLEAR [illegible] TACOMA'S PORTS. IF JUST ONE CONTAINER [illegible] SPILLED, WE COULD BE IN DANGER OF RADIOACTIVE CANCER, OR OTHER TOXIC WASTE PROBLEMS. I MAY BE JUST A THIRTEEN [illegible] MAKE A DIFFERENCE [illegible] HARBOR [illegible] TUNNELS!

Name: EMILY [illegible] Telephone: [illegible] 7789

Address: 6409 [illegible] DR SW City/State/Zip: TACOMA, WA 98499

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: JUNE 30, 1995

The strongest weapon against nuclear waste is right at your fingertips. Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste. For more information call the Port of Tacoma Hot Line at 597-7575.

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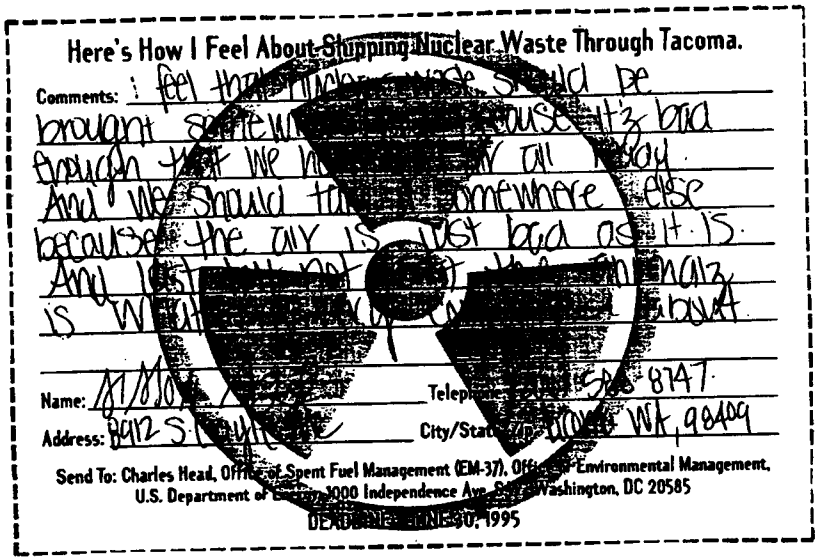
775-1

Response to Comment Commentor No. 775: Ogawa, Emily

Response to Comment No. 775-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 776: AGL, M.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: I feel that nuclear waste should be
brought somewhere because it's bad
enough that we have it all today.
And we should find somewhere else
because the city is just bad as it is.
And I just do not [illegible] is with [illegible]

Name: [illegible] Telephone: [illegible] 8747

Address: 3612 S [illegible] City/State/Zip: [illegible] WA, 98409

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: JUNE 30, 1995

776-1

RESPONSE TO COMMENT
COMMENTOR NO. 776: AGL, M.

Response to Comment No. 776-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 777: JASMIN, SANDY

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: I think that [illegible] be able to ship those [illegible] through the port of Tacoma because [illegible] could go wrong & it would harm the people of [illegible] & you would have to clean up all the mess. Besides that even though you've done this [illegible] (nuclear waste) doesn't mean [illegible] go wrong & spill all over. [illegible] feels about it.

Name: Sandy [illegible] Telephone: [illegible]

Address: 8211 [illegible] Tacoma Pl City/State/Zip: Orting, WA 98360

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: JUNE 30, 1995

& all the right thing and not be murderers.

777-1

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

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RESPONSE TO COMMENT
COMMENTOR NO. 777: JASMIN, SANDY

Response to Comment No. 777-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 779: ANONYMOUS

The News Tribune, Tacoma, 24 June 1995

Enough voices may awaken those who 'don't have time to listen'

"They don't have time to listen."

Charles Head, federal project manager for the environmental impact statement concerning shipments of high-level nuclear waste through the Port of Tacoma, sat patiently through the meeting Monday night.

Head sat, his face parked in objectivity. People spoke – more than 50 people – all against the proposed shipments.

A tape recorder heard it all. A facilitator made notes with multi-colored pens upon sheets of paper large enough for everyone to see. Hundreds in the audience watched politely. Speakers spoke their hearts.

Head sat, and when the meeting was over he talked about what happens next. He will offer a report to the director of the Office of Spent Nuclear Fuel Management. But the director will not see the colorful notes, nor will he hear the five hours of tape.

"They don't have time to listen," Head said. In Washington, D.C., at the Department of Energy, the people who will decide whether Tacoma becomes the port of entry for one of this planet's most dangerous substances will hear only from Head. He said he already has a fairly good idea what he'll say, but he's not yet ready to announce his decision.

He said of what he heard in Tacoma, "There's certainly a strong undercurrent of public opinion that is negative to this."

And it's too bad the public servants back at headquarters don't have time to hear how strong that undercurrent really is.

Too bad they won't hear from the speaker who said, "We have the right to be free from fear."

Too bad they won't hear what Allen Orahall, a Tacoma great-grandmother, had to say: "I want to leave a decent legacy for my kids. They have the right to have a decent chance in life."

That chance would be less decent by far should some of the spent nuclear fuel somehow leak, or spill, or otherwise contaminate Commencement Bay, Tacoma, Pierce County and much of Western Washington.

People spoke of Three Mile Island, the Exxon Valdez, Chernobyl, the leaks at Hanford, the O-rings on the Space Shuttle Challenger – of many accidents that could never happen, but did.

"They think we're not smart enough. They think they can put this over on us," said the gray-haired woman the neighborhood kids call "Miss Alice." She's talking about Charles Head. "We've given him pretty much to chew on. I hope he gets indigestion."

Legislators, port commissioners and members of the City Council spoke. Mothers and fathers – some angry enough to swear – spoke.

And it's too bad the bureaucrats have better ways to spend their time, rather than listening to what those people had to say. How easy it will be for them to ignore the comments – the anger, the fear and the anguish – of the people who were there on Monday night.

"When I was a kid, everybody told me Russia was going to drop the bomb. Now, it's the U.S. that's threatening me," said Melody Willhite, who drove down from Everett.

"I see this as a major threat," Tacoma Mayor Harold Moss said.

A citizen asked, "Do we really trust the federal government to do the right thing? We'll fight you. We the people say no. We will not stop."

"I take with a grain of salt the statistics and information you give us," Laureen Roth said.

"We will fight you. It won't happen," state Sen. Marilyn Rasmussen (D-Estacville) said. "I think you have heard from the people."

Which is nice, but they don't have time to listen in Washington, D.C.

Hundreds of people came. People spoke. Charles Head sat through it all, and when it was over, when asked what he thought of what the people said, he replied with a weary sir, "I was more impressed by the number of public officials."

Too perhaps Head and his bosses would take time to listen if the rest of us spoke a bit louder.

If you don't like the idea of highly radioactive nuclear waste being shipped through the Port of Tacoma, write, before June 30, to Charles Head, Office of Spent Nuclear Fuel Management (EM-37), U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, D.C. 20585. Or fax to (202) 586-5356.

If you don't care one way or the other, do nothing. If you haven't got the time to write a letter, then sit back and wait. Just you wait and see what happens next.

Your silence will be of great benefit to those who would rather not be bothered by whatever it is you have to say.

C.R. Roberts' column appears Sundays, Tuesdays and Thursdays. He can be reached at 597-8535, or by fax at 597-8274. Address TRIBnet e-mail to CR Roberts and Internet e-mail to crr@p.trimet.com

C.R. Roberts

This includes all my arguments against shipping of any level of nuclear waste through our area—land or water. Please listen to us.

779-1

RESPONSE TO COMMENT
COMMENTOR NO. 779: ANONYMOUS

Response to Comment No. 779-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 780: TAYLOR, KATHLEEN M.

June 22, 1995

Dear Mr. Charles Head,

Please count my voice among those who were not able to attend the meeting on June 19, 1995. I understand from the attached article that you were impressed by the elected & appointed officials who made it to this meeting. I am glad they were there and that it was made plain that citizens of Tacoma and surrounding areas DO NOT DESIRE to have used foreign country nuclear waste shipped through our town. I also am of that same opinion. Count this as a No thank-you!

780-1

Sincerely,
Kathleen M. Taylor
2914 ½ (upper) South 11th
Tacoma, Wa. 98405
(206) 272-4471

RESPONSE TO COMMENT
COMMENTOR NO. 780: TAYLOR, KATHLEEN M.

Response to Comment No. 780-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 781: YALE, LISA LANDKAMER

25 June 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave S.W.
Washington, D.C. 20585

Dear Mr. Head,

I am strongly opposed to the proposal that high-level nuclear waste be shipped through the Port of Tacoma.

781-1

Nuclear waste is an extremely hazardous substance; even after taking safety precautions, accidents can and do occur. Leaks or spillage could contaminate Puget Sound and adversely affect a very scenic, and very populated, area for generations to come. Transporting nuclear waste through this region is not worth the risk.

As a Pacific Northwest native and local resident, I am extremely concerned that our voices be heard as you make this critical decision. According to Tacoma News Tribune columnist C.R. Roberts, hundreds attended the public meeting in Tacoma last month; all fifty speakers were opposed to the plan. Please heed our words and disapprove the proposed program to ship nuclear waste through Tacoma.

Thank you for your work in protecting our environment.

Sincerely,

Lisa Landkamer Yale

Lisa Landkamer Yale
Concerned citizen of King County, Washington State

Cc: Director, Office of Spent Nuclear Fuel Management
Director, U.S. Department of Energy

RESPONSE TO COMMENT
COMMENTOR NO. 781: YALE, LISA LANDKAMER

Response to Comment No. 781-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 782: TRISKA, DEBBIE

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independent Avenue S.W.
Washington, D.C. 20585

Dear Mr. Head:

As a citizen of Tacoma, I am opposed to the idea of transporting nuclear waste through the Port of Tacoma. I have lived here all of my life and now work in the port area. I am very concerned about the safety of my family and the future of Tacoma. Don't we who live here have enough to worry about? Don't allow Tacoma to become a dumping ground through which deadly trash will be shipped. If you will refer to your geography, you will notice that Washington D.C. and Washington State are on opposite coastlines. No surprise that you would choose a location as far from yourselves as possible. Perhaps we should look at who we have working in this department, and get someone in there who care about all of us. Or maybe we could store some of it in your backyard so your children and grandchildren can enjoy it. Don't like that idea? Niether do we. 782-1

Have a nice day.

Debbie Triska

RESPONSE TO COMMENT
COMMENTOR NO. 782: TRISKA, DEBBIE

Response to Comment No. 782-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. Spent nuclear fuel is a solid metallic fuel that is shipped dry, thus, it can not spill or leak.

COMMENTOR NO. 783: KOEHNKE, NAN

483 Foxfire Rd.
Fox Island, WA 98333
June 24, 1995

Charles Head
Office of Spent Nuclear Fuel Mgmt.
(EM-37)
U.S. Dept. of Energy
1000 Independence Ave. S.W.
Washington D.C. 20585

Dear Mr. Head:

It is my wish to be emphatically included in the majority group from Tacoma, WA., that is vocal in its opposition to transporting nuclear waste products through, over, under, the Port of Tacoma or hiways surrounding Tacoma. 783-1

In fact, those responsible for the waste need to come up with a creative solution to this unbelieveable problem so that no community in America is asked to receive this deadly material. 783-2

It is inconceivable to me that this problem of waste disposal was not dealt with long before waste was a fact. Be that as it may, do not believe the people in Pierce County will stand by and allow this contamination to threaten our population.

Sincerely,

Nan Koehnke

Nan Koehnke

RESPONSE TO COMMENT
COMMENTOR NO. 783: KOEHNKE, NAN

Response to Comment No. 783-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 783-2

Environmental management, including safe waste disposal, is one of DOE's primary missions. The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS).

COMMENTOR NO. 785: PERRYMAN, EDWARD

Mr. Charles Head:

I do not like the idea of highly radioactive nuclear waste being shipped through the Port of Tacoma. I could go on and on, but my feelings are just the same — I do not like the idea of highly radioactive nuclear waste being shipped through the Port of Tacoma.

785-1

thank you
Edward S. Perryman

Have lived here all my life 78 yrs in Tacoma

RESPONSE TO COMMENT
COMMENTOR NO. 785: PERRYMAN, EDWARD

Response to Comment No. 785-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 786: RUSSELL, ERIC

Frank Russell Company
P.O. Box 1616
Tacoma Washington 98401
Telex 327431
Fax 206-591-3495
206-572-9500

June 22, 1995

Charles Head, Federal Project Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue Southwest
Washington, D.C. 20585
fax 202 586 5256

Re: Nuclear Waste being shipped through the port of Tacoma, WA.

Dear Mr. Head:

I would like to express my concern on this issue and say NO. Please do not ship "spent" nuclear fuel through Tacoma, WA. I am a registered voter and a copy of this letter is being sent to my member of Congress and my Senators. If you need any further clarification on my opinion on this issue, please contact me at the address below. 786-1

Thank you for your attention to this matter.

Sincerely,

Eric A. Russell
Director
Frank Russell Company

RESPONSE TO COMMENT
COMMENTOR NO. 786: RUSSELL, ERIC

Response to Comment No. 786-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 787: POPPE, MARY ELLEN

June 26, 1995

Dear Mr. Head,

I could hardly believe what I was hearing on T.V. the night of June 19 about nuclear waste being shipped to Washington State. But I should know better by now what our Federal Gov't. will do to people if they are not paying attention. It should be no surprise to the people inside Washington D.C. why people throughout the rest of the U.S. are cynical.

As you no doubt have surmised, I am against nuclear waste being shipped to Washington State or to any part of the U.S., especially from other countries! 787-1

I am a teacher, I've never been in jail, I don't belong to a militia group, I pay taxes and I am a responsible citizen that makes my voice heard at the voting booth. No wonder politicians are a bit perplexed and nervous (hopefully unelected bureaucrats, too), about the feeling in this country to make changes. It's coming from many people that have been quiet for too long.

Sincerely,

Mary Ellen Poppe

Mary Ellen Poppe
15726 118th Ave. Ct. E.
Puyallup, WA. 98374

RESPONSE TO COMMENT
COMMENTOR NO. 787: POPPE, MARY ELLEN

Response to Comment No. 787-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel to Washington State or any part of the United States, is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, would be low. Likewise, Sections 4.2.3 and 4.2.4 of the EIS demonstrate that the impacts of land transportation and storage at DOE management sites would be low.

COMMENTOR NO. 788: EDMUNDS, MRS. A.L.

525 BROADWAY # 102
TACOMA, WA. 98402
JUNE 26, 1995

MR. CHARLES HEAD
OFFICE OF SPENT NUCLEAR FUEL MANAGEMENT (EM 37)
U.S. DEPT. OF ENERGY
1000 INDEPENDENCE AVE. S.W.
WASHINGTON, D.C. 20585

DEAR SIR:

WE CERTAINLY DO NOT LIKE THE IDEA OF

YOUR SHIPPING HIGHLY RADIOACTIVE

NUCLEAR WASTE THROUGH OUR PORT OF

TACOMA!

788-1

WE STRONGLY OBJECT AND WILL

WATCH THE SITUATION CLOSELY!

Mrs. A. L. Edmunds

RESPONSE TO COMMENT
COMMENTOR NO. 788: EDMUNDS, MRS. A.L.

Response to Comment No. 788-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 789: CLEMENS, DON

JUNE 25 19[illegible]

AS I HAVE SEEN
WHAT CAN HAPPEN
WHEN BIG GOVERNMENT
DOES THINGS, PLEASE

DROP TACOMA
FROM THE LIST OF
PORTS THAT WOULD
RECEIVE ATOMIC SPENT
FUEL.

789-1

DON CLEMENS

RESPONSE TO COMMENT
COMMENTOR NO. 789: CLEMENS, DON

Response to Comment No. 789-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 790: MAXWELL, BARBARA

6-26-95

To whom it may concern,

I wish to make it known that I do not want nuclear waist brought threw our ports in Washington.

790-1

Sincerely
Barbara Maxwell
4316 McKinley Ave.
Tacoma, Wa. 98404

RESPONSE TO COMMENT
COMMENTOR NO. 790: MAXWELL, BARBARA

Response to Comment No. 790-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 791: HOMAN, ERMOND

1224 No. G St.
Tacoma, Wash.
98403
June 25, 1995

To Whom it may Concern.
I was born at Tenino Wash on Sept 25, 1916. My mother was born at Naparine Wash. OCT. 1-1, 1888 before it was a state. Therefore I consider myself a Native of the state and entitled to speak out against Shipping spent Nuclear fuel Through Tacoma Wash or any U.S. Port.

791-1

The alternatives are clear of Keeping it overseas and Processing it there for potential markets.

791-2

Thank you for not only your Consideration but for a decision NOT to Ship Through any U.S Ports.

Sincerely:
Ermond W. Homan

RESPONSE TO COMMENT
COMMENTOR NO. 791: HOMAN, ERMOND

Response to Comment No. 791-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or any U.S. port is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 791-2

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Section 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 794: CRANE, MARGIE

June 27. 1995

Sir;
I am against this
stupid idea -
of
Bringing spent Nuclear fuel
through 10 U.S. Ports -
Mainly the one in Tacoma
Washington

Margie Crane

794-1

RESPONSE TO COMMENT
COMMENTOR NO. 794: CRANE, MARGIE

Response to Comment No. 794-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 795: MULLINS, JULIE & STEVE

June 24, 1994

Dear Ms. Head,

I and my family are definately against the new proposal of Nuclear waste to be transported through our local ports and being stored here in any fashion. Why should we as local citizens risk our health and lives for the nuclear waste of other countries. I was truely disgusted by all the information else barned about the exposure my beautiful daughter and myself could have just sitting in traffic next to this poison. There's nothing we can do 10 years down the road when there's a high level of cancer through the community. Apologies don't save lives or change things: it is our right as Tacoma residents to make this decision — I'm sure it's very easy for the politicians in Washington D.C to decide. Let them this stuff should go — it won't kill them or their families, or children or grandchildren, they wouldn't be driving next to it, sleeping next to it, living with it.

Julie A. Mullins
Steve C. Mullins

over ↓

795-1

795-2

795-3

RESPONSE TO COMMENT
COMMENTOR NO. 795: MULLINS, JULIE & STEVE

Response to Comment No. 795-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 795-2

An objective of the proposed action is to reduce the risk of nuclear weapons-grade material falling into the hands of a nation with the technology and intent to develop a nuclear weapons capability (Section 1.2 of the EIS). As discussed in Section 4 of the EIS, risks associated with implementation of the proposed action to health and the environment would be low.

Response to Comment No. 795-3

DOE shares the commentor's concern about limiting radioactive exposures to the lowest levels achievable. Section 4.2.3 of the EIS discusses potential impacts to the general population from foreign research reactor spent nuclear fuel transport and demonstrates that the human health effects would be low. Please note that the analyses in the EIS used very conservative assumptions about radiation exposures and that the likely effects would be much lower.

COMMENTOR NO. 795: MULLINS, JULIE & STEVE (CONT'D.)

Other suggestions

1) Storing in remote areas that are densly populated. — 795-4

2) People handling or transporting the material are highly qualified in nuclear waste management and know the danger. — 795-5

3) When a place is found and decided upon, it is brought in by airplane so as not to accidentally pollute the waterways and create a catastrophe. That would also prevent unnecessary exposure to hundred of thousands of people in the process. From what I understand that's been an option, its just more expensive — I don't think nuclear waste is the area to cut corners! — 795-6

Julie & Steve L. Mullins
101 EAST 64th ST
TACOMA WA 98404
(206) 475-4144

RESPONSE TO COMMENT
COMMENTOR NO. 795: MULLINS, JULIE & STEVE (CONT'D.)

Response to Comment No. 795-4

The commentor's suggestion that foreign research reactor spent nuclear fuel should be stored in remote areas is noted. Spent nuclear fuel from foreign research reactors would not be stored at any of the candidate ports (Section 2.6.3.2 of the EIS). Candidate management sites are described in Section 3.3 of the EIS.

Response to Comment No. 795-5

Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the transportation casks would be low. Appendix D, Section D.4 of the EIS demonstrates that the radiation dose that anyone would receive while handling or being near a cask is less than the limit that is allowed to the public in an unrestricted area by NRC regulations (10 CFR Part 20). As discussed in Section 4.2.2.5 of the EIS, to avoid radiation doses which may exceed public dose limits, DOE would establish administrative procedures and maintain records to track individual exposures. Otherwise, no special handling or loading/unloading procedures would be required for the foreign research reactor spent nuclear fuel when it is contained in standard shipping containers.

Response to Comment No. 795-6

The commentor's preference for use of airplanes to transport the foreign research reactor spent nuclear fuel to DOE management sites is noted. The option of air transport was considered, but dismissed for the reasons given in Section 2.10 of the EIS.

COMMENTOR NO. 796: WEATHERFORD, JAMES A.

NUCLEAR WASTE SHIPMENT
PORTEST

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

Sir,

I have been following the on-going controversy of the shipment of waste nuclear fuel through my home town, TACOMA WA, and I can say without hesitation I do not want it shipped through here. It has even been mentioned that Scotland wants the stuff to use in their power production system. If no american wants this waste in his/her backyard and you have a useful place for it to go that wants it, why is there any discussion? 796-1 796-2

DO NOT SHIP THIS WASTE THROUGH ANY U.S. PORT!!! LET SCOTLAND HAVE IT!!!

WE DON'T WANT IT IN TACOMA WASHINGTON!!!

James A. Weatherford 4/26/95

JAMES A. WEATHERFORD
Tacoma resident and VOTER

RESPONSE TO COMMENT
COMMENTOR NO. 796: WEATHERFORD, JAMES A.

Response to Comment No. 796-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 796-2

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Section 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 797: BRYSON, ROBERT

Dear Mr. Head;

I am writing to you as a concerned and frightened citizen of the Tacoma area. I am sure that you are well aware that there are many people who live in this highly populated area of Washington state. Most of the people in this area are very much opposed to shipping nuclear waste through our city and our already ecologically strained Puget Sound waterways. I have heard about the fine job that the people in the Spent Nuclear Fuel Management Department do in making sure that this waste does not leak or contaminate during shipment. There hasn't been an incident in forty years of transporting this highly toxic and hazardous material. Quite frankly, it isn't the shipment of this material that concerns me as much as what we are doing to this our environment and ultimately to our future generations by accepting this material into our state. As you are well aware, there are two things of which we can be certain. One is that nothing manmade lasts forever except the radio active contaminates contained in the shipments of this material. The containers will deteriorate before the contained material loses the ability to contaminate the area in which it is stored. Two, accidents are human nature. There is no way that you or any other person or department can positively guarantee that an accident or act of terrorism will not happen in a populated area during the shipment of this material. People blow up Federal buildings,airplanes, and ships to make statements for their beliefs. What if some mentally unstable person wanted to make a statement of his own with a handy little nuclear device supplied by your department? It could happen!!! I don't know where you live sir, but I live here in the Tacoma area. It is my back yard that will be contaminated should any of this material leak into the air that I am breathing. It is my body and my friends and my family that is at risk. It is the water that we drink and the air that we breathe and the food that we eat that is at risk. It is our world that is at risk. This is the only world we have sir. If we keep filling it full of this kind of garbage we will leave a legacy to our future generations like no other plague or war or natural catastrophe has ever wrought upon this planet. If you just could take a quiet hour to contemplate and visualize even fifty years into the future, what this area would be like with the tremendous volume of radioactive waste that is being stockpiled,not only from our own reactors,but those of other countries as well. What kind of hell on Earth are you and your department creating for our children? There is absolutely no positive vision that can be derived other than the fact that it is out of sight out of mind "for now". Where is the vision of our leaders? Where is the concern for America? This is the most beautiful country in the world and Washington is the most beautiful state in this country. It is full of natural wonders and wildlife and wonderful people who appreciate this beauty for what it is. No one wants it to become a garbage dump for the worlds "spent nuclear fuel" except those who don't live here and don't want it in their back yard. It is time for you pro nuclear power people to wake up and smell the roses while there are still roses to smell. Sometimes we run into situations where the solutions (ie:nuclear power) are just too costly(ie:the environment) to pursue.

797-1

797-2

797-3

797-4

RESPONSE TO COMMENT
COMMENTOR NO. 797: BRYSON, ROBERT

Response to Comment No. 797-1

It is true that some of the nuclide in the spent nuclear fuel remains radioactive and toxic for a long time, but it is also true that this material can be stored safely. There is no intention to store the spent nuclear fuel in the transportation cask forever. The EIS proposes that the intact spent nuclear fuel be stored for a maximum of 40 years at a DOE management site. Experience at the Savannah River Site has shown an excellent storage capability concerning foreign research reactor spent nuclear fuel for lengths of more than 20 years. The research reactors, with the lifetime cores, keep the same fuel in the reactor pool for approximately 40 years. Others as indicated in Appendix F, Section F.2.9 of the EIS, have experience in safe storage of spent nuclear fuel in dry storage for more than 30 years. DOE proposes to store the foreign reactor spent nuclear fuel in dry storage after the receipt and characterization of the spent nuclear fuel. The EIS concluded that the risks of storing the foreign research reactor spent nuclear fuel in dry storage at any of the five potential management sites are low (Section 4.2.4, and Appendix F, Section F.4).

Response to Comment No. 797-2

Section D.5.9 has been added to Appendix D of the EIS to address the issue of attack by disgruntled persons or terrorists.

Response to Comment No. 797-3

Section 4.2.3 of the EIS presents a discussion of the human health risks and impacts on port areas, including Tacoma, from receipt of the foreign research reactor spent nuclear fuel. The analyses demonstrate that such risks and impacts would be low, both for ports of entry, as well as for the proposed management sites.

Response to Comment No. 797-4

As discussed in Sections 2.2 through 2.5 of the EIS, none of the policy alternatives would compel the United States to act as a permanent repository for spent nuclear fuel from foreign research reactors. If foreign research reactor spent nuclear fuel were accepted into the United States, it would be for a limited period of time. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). Under Management Alternative 2 (Section 2.3 of the EIS), the United States would assist foreign research reactor operators in overseas management of their spent nuclear fuel. Management Alternative 3 (Section 2.4 of the EIS) would provide a combination of domestic and overseas management.

COMMENTOR NO. 797: BRYSON, ROBERT (CONT'D.)

I realize that this is a plea for curtailed nuclear power as well as a plea and a demand that you do not use Tacoma or the Puget Sound area for shipment of nuclear waste. It does not matter what you do or where you plan to put the waste. It will still contaminate the earth and the logical alternative is to curtail the production of this waste by curtailing the production of nuclear power. It is the only answer. I would rather live in darkness twelve hours a day and be secure that the earth was safe, than to live in the light of nuclear power and find that the future generations will be trying to live on a planet ravaged by radioactivity. Please think about cause and effect. We don't want it, we don't need it, and we won't accept it!!! 797-5 797-6

Sincerely,

Robert Bryson

RESPONSE TO COMMENT
COMMENTOR NO. 797: BRYSON, ROBERT (CONT'D.)

Response to Comment No. 797-5

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 797-6

As discussed in Sections 2 and 4 of the EIS, spent nuclear fuel from foreign research reactors can be safely stored with little risk of contamination at one or more of the five candidate management sites pending final disposition. Foreign research reactors are not used for production of commercial power. They do have applications in medicine, materials research, and agriculture which are described in Section 1.1 of the EIS.

COMMENTOR NO. 798: CATTON, WILLIAM R., JR.

22 June 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue S.W.
Washington, DC 20585

Dear Sir:

This letter is meant to convey my very strong objection to using the port of Tacoma for shipping spent nuclear fuel.

I live near the city of Tacoma, and do not welcome the possibility of nuclear materials passing through this area. 798-1

Although I recognize that extreme measures would be taken to prevent accidents, no safeguard can be absolutely perfect. There will be some risk inherent in the very process of transferring shipments from ocean-going vessels to trains or trucks, and there is no way to reduce to zero the risk of railroad or highway accidents as the material moves on from the port.

Officials and the public in this area have expressed themselves as strongly opposed to incurring these risks. They should be listened to.

This country (and others) did an extremely unwise thing in plunging into an era of atomic power generation without having worked out in advance the requirements for safe disposition (I will not say disposal) of ensuing radioactive hazardous waste. I say this with benefit of hindsight, of course; as a young sailor aboard an aircraft carrier in the waters near Japan at the end of World War II, I was as cheered as were my shipmates by the imminence of the end of hostilities when we learned of the atomic bomb. But that was then, this is now. 798-2

I remember a time when the plumbing system on our ship was shut down for a prolonged time. We were, accordingly, not supposed to use the "heads." The physiology of sailors, like that of other organisms, goes on generating waste even when there is no means for disposing of it..... Imagine the situation and you have a small analogy for the predicament of a world that began half a century ago to accumulate radioactive materials for which it still lacks the equivalent of an effective "head."

A naval architect who consistently omitted that facility in every ship he designed would not be allowed to continue designing ships. But we entered the age of atomic power generation in a way as reckless as a navy committed to using designs with that glaring defect!

Please spare the port of Tacoma, and this still livable corner of the country.

Sincerely,

William R. Catton, Jr.

William R. Catton, Jr.
25307 103rd Ave. E.
Graham, WA 98338

RESPONSE TO COMMENT
COMMENTOR NO. 798: CATTON, WILLIAM R., JR.

Response to Comment No. 798-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.3, and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 798-2

Environmental management, including safe waste disposal, is one of DOE's primary missions. The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS).

COMMENTOR NO. 799: LICKTEIG, L. JEFFREY

June 26, 1995

Charles Head, Program Manager
Off of Spent Nuclear Fuel Mgt (EM-37)
US Department of Energy
1000 Independence Avenue SW
Washington DC 20585

In re: Port of Tacoma, Washington

Hello Mr. Head:

I recently learned of the aforesaid port being considered as a possible port of entry for shipment of spent nuclear fuel.

As a citizen in good standing and property owner/tax payer in the county of said city, I direct you to cease considering the Port of Tacoma, Washington as a port of entry for the shipment of spent nuclear fuel as I fear for my family's safety and health. 799-1

In the alternative, I appeal to you to cease plans involving the aforesaid port for the shipment of spent nuclear fuel at least until the considerations in the enclosure attached are met with.

Good day.

L. Jeffrey Lickteig
12908 - 97th Avenue NW
Gig Harbor WA 98329
(360) 753-7372

ljl
Encls.

RESPONSE TO COMMENT
COMMENTOR NO. 799: LICKTEIG, L. JEFFREY

Response to Comment No. 799-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 800: PITTS, JULIE ANN

6-25 95

Dear Charles Head, Program Manager,
I would like to see Tacoma's
Port dropped from the list of
ports to receive up to 42,000 pounds
of Spent Fuel
I oppose this plan.

800-1

Thank you,
Sincerely,
Julie Ann Pitts

RESPONSE TO COMMENT
COMMENTOR NO. 800: PITTS, JULIE ANN

Response to Comment No. 800-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 801: KELLER, BARBARA J.

Charles Head
Office of Spent Fuel Management(EM-37) 6/23/95
US Department of Energy
1000 Independence Ave., SW.
Washington, DC. 90585

Dear Mr. Head,

I didn't go to your meeting on Monday, June 19th. I baby-sat so my son and his wife could go. But I did read a piece in the Tacoma newspaper and I got the very definite impression that it doesn't really matter what we think about this 'spent fuel' issue. You're going to do it anyhow. 801-1

I realize the need for policing the nuclear 'spent fuel', but please police it where it originates! I understand the arguement, 'if we store it here, the crazies won't blow us up with it'. This is wrong! Where there's a will, there is a way...Oklahoma City! 801-2

We cannot deal properly with our own nuclear mess, (ie; Hanford) and we should import someone else's?

Please!!!!! Keep Washington State green.... not Washingtonians!!!

Thank you.

Sincerely,

Barbara J. Keller

Barbara J. Keller
21717 130th St. E.
Sumner, WA. 98390

RESPONSE TO COMMENT
COMMENTOR NO. 801: KELLER, BARBARA J.

Response to Comment No. 801-1

Under NEPA (Section 5.2.1 of the EIS) and applicable DOE environmental regulations (Section 5.2.3 of the EIS), public participation is an important component of the environmental process. All comments submitted during the comment period have been reviewed and responded to in Volume 3 of the EIS.

This EIS evaluates environmental effects of three alternatives for management of spent nuclear fuel from foreign research reactors: management in the United States (Management Alternative 1, Section 2.2 of the EIS), overseas management (Management Alternative 2, Section 2.3 of the EIS), and a combination of domestic and overseas management (Management Alternative 3, Section 2.4 of the EIS). A No Action Alternative, which means that the United States would not adopt a policy for managing spent nuclear fuel from foreign research reactors, was also evaluated (Section 2.5 of the EIS). None of the policy alternatives were found to result in significant benefits or risks to human health or the environment.

Response to Comment No. 801-2

As discussed in Sections 2.2 through 2.5 of the EIS, none of the policy alternatives would compel the United States to permanently act as a repository for spent nuclear fuel from foreign research reactors. If Management Alternative 1 (management in the United States, Section 2.2 of the EIS) is adopted, foreign research reactor spent nuclear fuel would be accepted for a limited period of time. This alternative would give foreign research reactor operators time to arrange for disposition of their spent nuclear fuel, while avoiding reactor shut downs and encouraging the use of LEU fuel in research reactors. Under Management Alternative 2 (Section 2.3 of the EIS) the United State would assist foreign research reactor operators in overseas management of their spent nuclear fuel. Management Alternative 3 (Section 2.4 of the EIS) would provide a combination of domestic and overseas management.

COMMENTOR NO. 802: LEAKE, WILLIAM S.

[redacted]
32[redacted] SW 1[redacted] St. & W.
FEDERAL WAY, WA 98023-[redacted]

6/26/95

MR CHARLES HEAD
US DEPARTMENT OF ENERGY
1000 INDEPENDENCE AVE. SW
WASHINGTON D.C. 20585

DEAR MR HEAD:

AS A PRIVATE CITIZEN, LIVING JUST EAST OF THE PORT OF TACOMA, I AM ALARMED AT THE THOUGHT OF HAVING NUCLEAR MATERIAL STORED & SHIPPED "JUST DOWN THE HILL FROM US"!

WE ARE NOT EQUIPPED IN THE TACOMA ETC AREA TO HANDLE THIS MATERIAL & THE POTENTIAL (GOD FORBID) EMERGENCY THAT COULD ARISE IF SOMETHING GOES WRONG!

IT WOULD SEEM TO ME THAT THE BEST & LOGICAL SOLUTION TO THE HANDLING, STORING ETC OF THE MATERIAL IS TO KEEP IT OVER SEAS WHERE IT CAN BE REPROCESSED - WE DON'T SEEM TO HAVE ADEQUATE REPROCESSING FACILITIES IN THE U.S.

ANYWAY, WE DON'T WANT IT IN OUR AREA!!

SINCERELY
W. S. LEAKE

802-1

802-2

802-3

RESPONSE TO COMMENT
COMMENTOR NO. 802: LEAKE, WILLIAM S.

Response to Comment No. 802-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

If the foreign research reactor spent nuclear fuel is accepted into the United States, there would be no storage of this material in the Port of Tacoma, or any other port. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

Response to Comment No. 802-2

Foreign research reactor spent nuclear fuel shipments are subject to the same types of potential hazards as those of other ships carrying nonradiological hazardous materials.

DOE considers that there is adequate regulatory and emergency preparedness infrastructure to ensure the safe acceptance and transport to designated management sites if the foreign research reactor spent nuclear fuel is managed in the United States. Federal funding to State, Tribal, and local governments for maintaining emergency response programs is discussed in Section 2.7.1. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advise and assistance to the State, Tribal and local agencies involved with a radiological incident. Emergency preparedness, security, and coordination of DOE with local emergency response authorities, and security are discussed in general in Sections 2.7 and 2.8 of the EIS. Details would be contained in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordination with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

Response to Comment No. 802-3

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Section 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 803: WARREN, ALICELIA & ROBERT

June 24, 1995

Robert and Alicelia Warren
2122 Bridgeport Way W.
Tacoma, WA 98466

Charles Head
U.S. Dept. of Energy
Washington, D.C. 20585

Dear Mr. Head:

We urge you to drop consideration of the Port of Tacoma as a place through which other nations' spent nuclear fuel is transported. We understand that another country (Scotland?) can safely convert this waste and get more use out of it, thereby reducing further the amount of nuclear waste in the world. Let's give priority to their request. Second priority should be given to the U.S. naval port that's being considered. 803-1 803-2 803-3

Sincerely,
Alicelia R. Warren
Robert Warren

RESPONSE TO COMMENT
COMMENTOR NO. 803: WARREN, ALICELIA & ROBERT

Response to Comment No. 803-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 803-2

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

Response to Comment No. 803-3

Ten ports that are considered to be able to safely receive foreign research reactor spent nuclear fuel were identified using the port selection criteria discussed in Appendix D, Section D.1.9 of the EIS. Either military or commercial ports, if they meet the selection criteria, are equally acceptable. Risks associated with accidents in both military and commercial ports are discussed in Appendix D, Section D.5.5 of the EIS.

COMMENTOR NO. 804: SWANSON, MARGARET

Margaret Swanson
11218 Butte Dr. SW
Tacoma, WA 98498

Mr. Charles Head
Office Of Spent Nuclear Fuel Mgmt(EM-37)
U.S. Department of Energy
1000 Independence Ave. SW
Washington, DC 20585

23 June 95

Dear Mr. Head,

My name is Margaret Swanson. I'm 27 years old, and I have lived in Tacoma all my life. I also have a daughter named Rhiannon, who will be two in a couple of weeks. She's also a Tacoma native.

I want to tell you about my new responsibities as a fairly new mom. It's my job to protect her from harm and watch out for her. When she's in the car, she's in a car seat; in the summer she has sunscreen to protect her skin from too much sun. Her food is cut into small pieces, my cabinets have child latches on them; I have a child harness on her out in public so she won't wander off. Being a good parent also means being a good role model. We wear seatbelts, we recycle, we drive the speed limit, we give to local and national charities to help our neighbors and fellow citizens. We try to do what's in the best interest of our children and our fellow Americans.

Having nuclear waste enter thru the Port of Tacoma IS NOT in our best interest. The financial gain to Tacoma by allowing this access will never be enough to compensate the loss of the Puget Sound and all it offers us- marine and wildlife, the livelihood of thousands of people, and just the serene beauty of it. All lost by one mishap by one human. The loss of two major military installations- Ft. Lewis and McChord AFB- due to radioactive contamination would be a devastating blow to the region, not to mention the Federal government. 804-1

The newly incorporated city of Lakewood where I live is the 6th largest in the state- where are you going to put us if we are displaced by an accident? 804-2

RESPONSE TO COMMENT
COMMENTOR NO. 804: SWANSON, MARGARET

Response to Comment No. 804-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS).

Response to Comment No. 804-2

The commentor's concern about a catastrophic accident associated with the ground transportation of foreign research reactor fuel, regardless of its probability of occurrence is noted. The risk to the environment and the health and safety of the public associated with the ground transportation of foreign research reactor spent nuclear fuel under Management Alternative 1 is discussed in Section 4.2.3 of the EIS.

COMMENTOR NO. 804: SWANSON, MARGARET (CONT'D.)

By now, I'm sure you must think I'm one of those NIMBY people- Not In My Back Yard. I'm not. I'm more concerned about those of you in Washington who think the chances are slim to none this plan of yours will be a problem. Let me tell you about chances.

When my daughter was born two years ago, she was diagnosed with achondroplasia; she's a dwarf. The chances of an average man and woman with no history to reproduce a dwarf is 1: 40,000. I am that one. It took higher odds than me for Chernobyl, for Three Mile Island, for Love Canal, for Phoupal, India, for Prince William Inlet to occur. I don't like your odds.

It just takes one.

We have more to lose- much, much, much more as a community than we do to gain in financial opportunity.

thank you.

A Concerned Registered Voter,

Margaret A. Swanson

Margaret A. Swanson

RESPONSE TO COMMENT
COMMENTOR NO. 804: SWANSON, MARGARET (CONT'D.)

COMMENTOR NO. 805: KINZNER, DELORES J.

6-24-95

Please do not ship radioactive nuclear waste through the Port of Tacoma!

805-1

Thank you

Delores J Kinzner

RESPONSE TO COMMENT
COMMENTOR NO. 805: KINZNER, DELORES J.

Response to Comment No. 805-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 806: ERICKSON, BARBARA

6-25-95

Sir: I am writing to advise you that I am against nuclear waste passing through the Port of Tacoma. 806-1

Tacoma's waterfront is highly polluted and we do not need any further possible contamination to the City or its people. Tacoma already has a bad name for the pollution from the pulp mills etc. because of the odor from these businesses. 806-2

Surely you can find another port closer to your "dump site". 806-3

Nuclear waste as you well know is very dangerous and if a spill occurred the damage to the people of the City of Tacoma would be horrendous. 806-4

Thank you for your consideration.

Sincerely,

Barbara Erickson

Barbara Erickson
6515 Five Views Rd.
Tacoma, Wa. 98407

RESPONSE TO COMMENT
COMMENTOR NO. 806: ERICKSON, BARBARA

Response to Comment No. 806-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 806-2

Based on the evaluation of impacts presented in Section 4.2.2 of the EIS, the risk that activities associated with the transportation of foreign research reactor spent nuclear fuel affecting current environmental conditions at any of the ports considered is low.

Response to Comment No. 806-3

The distance from the port to the management site(s) is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations such as port population, route population, port experience with handling containers, and access to the ocean would be considered in making the final selection of ports of entry. Appendix D, Section D.1.9 of the EIS presents details of the port selection process.

Response to Comment No. 806-4

For the general public in a port area, there would be no measurable radiation exposure at all unless there was an accident that released some radiological material from the spent nuclear fuel transportation cask. The frequency of such an accident multiplied by the consequences of such an accident yields the risk of that accident. The risk of such an accident to the general public in the Tacoma area is given in Table 4-7 of the EIS, and it is shown to be far less than one LCF.

If an accident did occur, however, the consequences would not be horrendous, as suggested by the commentor. The estimated consequences of severe port accidents are presented in Table 4-6 of the EIS, and the worst consequence for the Port of Tacoma would be 0.8 latent cancer fatalities.

Commentor No. 807: Pethbone, Mrs. J. L.

I want my country to stay looking
like the front of this card - not
ugly like you want to risk it to be

Mrs. J. L. Pettibone
864 So 138th
Tacoma Wa 98444

reg. voter!

Dear Mr. Head -

I do not want highly radio
active nuclear waste being
shipped through the Port of
Tacoma —

I want my great grand
children to grow up healthy
and beautiful Washington to
stay beautiful for generations
to come —

807-1

Response to Comment
Commentor No. 807: Pethbone, Mrs. J. L.

Response to Comment No. 807-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 808: KERRONE, CLARA

Tacoma Wash
6/26/95

C Parks Head.

I have been a resident of Tacoma since 1924 and I would like to see Tacoma & all other ports dropped from the list of having the Nuclear come here. Keep the Nuclear Fuel oversees! We dont want it! 808-1

Thankyou for listening 808-2

Clara Kerrone
3110 Nicker Ave N.E.
Tacoma Wa 98422.

RESPONSE TO COMMENT
COMMENTOR NO. 808: KERRONE, CLARA

Response to Comment No. 808-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 808-2

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

COMMENTOR NO. 809: ANONYMOUS

Mr. Head June 24 1995

You know the reason we don't want ~~want~~ the Port of Tacoma used. We don't have to tell you. We stand with our friends family and neighbors in sounding a really big NO!

We will fight. We won't sit still for this.

We vote for alternative #2. Even better, stop this insanity altogether. We are destroying ourselves.

Sincerely

Mr. and Mrs.

Tacoma resident

809-1

809-2

RESPONSE TO COMMENT
COMMENTOR NO. 809: ANONYMOUS

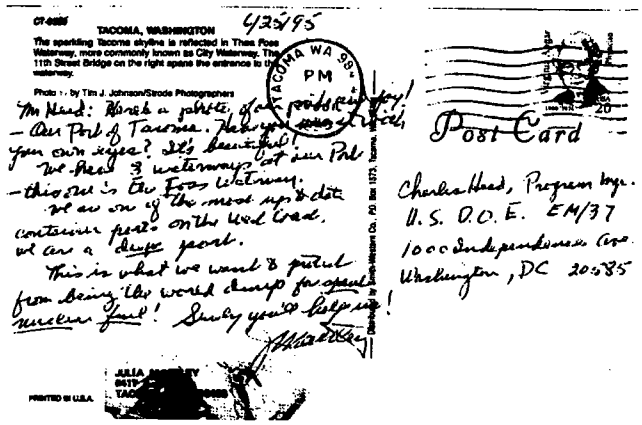
Response to Comment No. 809-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 809-2

The commentor's preference for the overseas management alternative is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

COMMENTOR NO. 810: MATTLEY, JULIA



810-1

RESPONSE TO COMMENT
COMMENTOR NO. 810: MATTLEY, JULIA

Response to Comment No. 810-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 811: WYNAUS, NELDAMAE

6/22/95

Charles Head;
Dear Sir;
I am a woman 83 ye ars old so was not able to attend the meeting in Tacoma to keep nuclear waste out of our Tacoma port or any other port on Puget Sound. There must be a safer way it can be found. Do hope it can be found.

Sincerely
Neldamae Wynaus

811-1

RESPONSE TO COMMENT
COMMENTOR NO. 811: WYNAUS, NELDAMAE

Response to Comment No. 811-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 812: GOODMAN, L.

6/27/95

I am truly surprised to learn that you don't care what the people think about Nuclear waste being shipped through Tacoma. This is America and the people should not have to worry about having their city destroyed by an "accident". 812-1

Should you go ahead with the proposed plan, do you want to apologize in advance for any accident that may occur, since no one will be around to receive the apology later?

You will be surprised to learn that many, many people are scared of your plan. Please reconsider.

L. Goodman

L. Goodman
5213 PACIFIC HWY E.
TACOMA, WA 98424

RESPONSE TO COMMENT
COMMENTOR NO. 812: GOODMAN, L.

Response to Comment No. 812-1

DOE does care what the people of Tacoma think about the proposed action, as evidenced by the measures taken to obtain public comments. DOE's public interaction related to this draft EIS has been well in excess of the requirements set forth in NEPA and DOE's environmental regulations. Seventeen public hearings were held in the locations determined to be most likely to be directly affected by the EIS alternatives. In addition, the period of acceptance for written comments was extended from June 20 to July 20, 1995. However, the analyses presented in the EIS indicate that the risk of an accident resulting from the transport of the foreign research reactor spent nuclear fuel through Tacoma, or any of the other potential ports of entry, is low. Nevertheless, DOE notes the commentor's opposition to the use of Tacoma as a port of entry for foreign research reactor spent nuclear fuel.

COMMENTOR NO. 813: CAMPBELL, GLENN & ROBERTA

18 June 1995

Tacoma Public Utilities Department
3628 South 35th Street
Tacoma, Washington

Dear Sir or Madam:

We DEFINITELY OPPOSE bringing FOREIGN NUCLEAR WASTE into the PORT OF TACOMA OR INTO OUR COUNTRY !!!!!!!! 813-1

Glenn and Roberta Campbell

Glenn and Roberta Campbell
5008 South K Street
Tacoma, Washington

RESPONSE TO COMMENT
COMMENTOR NO. 813: CAMPBELL, GLENN & ROBERTA

Response to Comment No. 813-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 814: TUGER, JOYCE

Joyce Tuger Manager

PARKHURST APARTMENTS
5202 SO. 12TH ST.
TACOMA, WA 98465

No Make Naval
Tacoma has enough Rubbish.

814-1

RESPONSE TO COMMENT
COMMENTOR NO. 814: TUGER, JOYCE

Response to Comment No. 814-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 815: PUGH, PAMELA S.

Pamela S. Pugh
4137 "L" St
Bremerton, Wa. 98312.

June 20-95

Dear Sir;

I was not able to attend the meeting on 6/19/95 in regards to the deposit of nuclear waste into this country from Europe. I am really against this action even though the government tells us it would not be a problem - I believe it would be! Two or three years ago the U.S.A. wanted to dump their solid waste into the empty coal mines of Britain, or specifically England, + they understandably rebelled against it. Why does not each country take care of its own? Whether its people, garbage nuclear waste or whatever? Hopefully you had a good turnout at the meeting, I was encouraged to express my feelings on the matter in this manner. I would appreciate hearing the outcome of this situation.

Thank You - Sincerely
Pamela S. Pugh

815-1

815-2

RESPONSE TO COMMENT
COMMENTOR NO. 815: PUGH, PAMELA S.

Response to Comment No. 815-1

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States is noted. Section 2.3 of the EIS describes other alternatives under consideration.

Response to Comment No. 815-2

The commentor's preference for the No Action Alternative is noted. The No Action Alternative is discussed in Sections 2.5 and 4.6 of the EIS.

Many foreign research reactor operators cannot store their spent nuclear fuel within their own country at this time due to existing regulatory or financial constraints. Management alternatives described in Sections 2.2 through 2.4 of the EIS are intended to provide foreign research reactor operators with time to arrange for disposition of their spent nuclear fuel. (Section 1.2 of the EIS).

COMMENTOR NO. 816: BRADY, AUDREY L.

June 10, 1993

I am against the Nuclear
Waste comming Through The Port
of Tacoma.

Audrey L Brady

816-1

RESPONSE TO COMMENT
COMMENTOR NO. 816: BRADY, AUDREY L.

Response to Comment No. 816-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 817: MART, ROBERT & KATHLEEN

6/26/95

Mr. Head,

This letter is to protest the planned shipping of radioactive nuclear waste through any of the ports in the United States and especially the Port of Tacoma, Washington. We join with many concerned citizens in believing this waste should not enter the United States at all. 817-1 817-2

Robert Hart
Kathleen Hart

ROBERT D. & KATHLEEN M. HART
6901 EASTSIDE DR. N.E.
TACOMA, WA. 98422
206 927 9141

RESPONSE TO COMMENT
COMMENTOR NO. 817: MART, ROBERT & KATHLEEN

Response to Comment No. 817-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 817-2

The commentor's opposition to acceptance of spent nuclear fuel from foreign research reactors into the United States is noted (Management Alternative 1, Section 2.2 of the EIS). Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

COMMENTOR NO. 819: MUNSON, LEONA S.

June 23, 1995

Mr. Charles Head
Dear Mr Head:

The elaborate public meeting held in Tacoma a few days ago was presented to the wrong audience. All those beautiful charts and recordings never will be seen or heard by the persons trusted with making the important decision of whether highly radioactive nuclear waste should be shipped through The Port of Tacoma. As you said your self "they dont have time to listen"

Would you want them deciding to move such hazardous material through your home area? And who has the right to cause The Tacoma area to live in constant fear of a Nuclear disaster?

Please give this problem some Seriors thought

Sincerely,
Leona S. Munson

819-1

819-2

RESPONSE TO COMMENT
COMMENTOR NO. 819: MUNSON, LEONA S.

Response to Comment No. 819-1

While it would be impractical for the Secretary of Energy to personally review and respond to all of the written and oral comments concerning this EIS, this information was reviewed by the Program Manager and his staff. The Program Manager is responsible for relaying public views and concerns to the Secretary of Energy and her staff. The final EIS, including comments and responses, and the Record of Decision are subject to approval by the Secretary of Energy. All comments received during the ninety day comment period are noted and answered in this document. Under NEPA and the environmental regulations of DOE (Section 5 of the EIS), public participation and comments are an integral part of the environmental process.

Response to Comment No. 819-2

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 820: MCCLINTIC, JAMES M.

Mr. Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
1000 Independence Avenue, S. W.
Washington, D. C. 20585

June 26, 1995

RE: Draft Environmental Impact Statement (EIS) on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

The purpose of this letter is to express to you my unalterable opposition to the Department of Energy's proposal to make the Port of Tacoma, Washington a port of entry for spent foreign reactor fuel because I was unable to do so at the public hearing held on June 19, 1995. I very much wanted to add my voice to those opposing the proposal, but was unable to do so. In fact, I couldn't even get in the hearing room.

The proposal as outlined in the reference is not acceptable. I am employed by a small corporation engaged in the wholesale and retail seafood business, I am thoroughly familiar with and intimately dependant upon the seafood industry of Puget Sound and the coastal waters of Washington State.

Your proposal completely ignores the impact that an accidental discharge of radiation in the coastal waters, Straits of Juan De Fuca or Puget Sound proper would have on the seafood industry, let alone the lives of all of us who make the area our home. In so many other areas involved in the handling of radioactive materials, safeguards have not been effective. The "accident" that could not happen, has always managed to happen. I need only cite Chernobyl, Hanford and Three Mile Island to prove my point. 820-1

I strongly recommend that you do not select Tacoma as a Port of Entry for this program, in fact, I believe you need to drop the whole idea of importing other people's nuclear waste. I think you need to think this one through a little more. Your department is about to feel the bite of the budget axe, and I think you're trying to make one last attempt at justifying your department. You can't fool the American people for long Charlie. We're on to you.

Sincerely,

JAMES M. McCLINTIC
8017 65th St. Ct. W.
Tacoma, WA 98467-3944

RESPONSE TO COMMENT
COMMENTOR NO. 820: MCCLINTIC, JAMES M.

Response to Comment No. 820-1

The commentor's opposition to the use of the Port of Tacoma for the receipt of foreign research reactor spent nuclear fuel is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk of bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. Based on over 30 years experience shipping spent nuclear fuel, DOE considers that spent nuclear fuel transportation casks passing through the Port of Tacoma, or any other port or waterway, would not release their radioactive contents, thus would not affect water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

COMMENTOR NO. 821: LUNDSTROM, NORMAN & CYNTHIA

Mr. Charles Head
Office of Spent Nuclear Fuel
1000 Independence Ave. (EM-37)
Washington D.C. .20585

Mr. and Mrs. Norman H. Lundstrom
6711 Whitman St. N.E.
Tacoma, Washington 98422

June 27, 1995

Dear Mr. Head,

We strongly oppose the shipping of nuclear waste in the waters of Puget Sound or any other part of the Pacific Northwest. The Puget Sound basin and its surrounding land areas is comprised of high density population centers. Puget Sound and the Pacific Northwest is a fragile natural environment already struggling to survive the selfish impact of human kind. 821-1

We are extremely concerned about the potential catastrophic effect associated with shipping toxic/radioactive nuclear waste through our precious land and waterways. The reality of a natural disaster, an act of terrorism, or human ignorance does indeed exist! The Three Mile Island catastrophe, leakage at the Hanford storage site, and a number of published incidents at Rocky Flats support the above statement. Please carefully reconsider the shipping of deadly nuclear waste through Puget Sound and the Port of Tacoma, and for that matter anywhere else in the Pacific Northwest before it is too late. We very vividly recall Dixie Lee Ray spouting out all of the statistics which strongly suggested minimal concern for the potential of nuclear power plant disasters. Shortly afterward, this nation was faced with the Three Mile Island catastrophe. 821-2

In closing, please find the letter that our 8 year old nephew has written to you. This child does not stand alone. We are very concerned and you should be too.

If you would be kind enough to send us a copy of the environmental impact statement concerning this matter, we would appreciate it. Please keep us up to date on all aspects of this very critical matter.

Respectfully,

Mr. Norman H. Lundstrom
Mrs. Cynthia A.Lundstrom

encl.

RESPONSE TO COMMENT
COMMENTOR NO. 821: LUNDSTROM, NORMAN & CYNTHIA

Response to Comment No. 821-1

The commentor's opposition to the use of the Ports of Portland, Seattle, or Tacoma to receive foreign research reactor spent nuclear fuel is noted. The port selection criteria discussed in Appendix D, Section D.1.9 of the EIS identify ports that can safely handle foreign research reactor spent nuclear fuel. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma or Portland, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Section 4.2.2.2).

It should also be noted that Section 3151 of Public Law 103-160 (the National Defense Authorization Act for the Fiscal Year 1994), requires that "the Secretary of Energy shall, if economically feasible and to the maximum extent practicable, provide for the receipt of spent nuclear fuel...at a port of entry in the United States which...had the lowest human population in the area surrounding the port of entry..." Public Law 103-160 was signed on November 30, 1993, which is after completion of the scoping process for this EIS. DOE included consideration of Section 3151 of Public Law 103-160 by including Criterion 5 in the port selection criteria for this EIS (Appendix D, Section D.1.9.5). Application of this criterion resulted in cities such as Seattle being dropped from the list of proposed ports of entry, while Tacoma stayed on the list.

Response to Comment No. 821-2

The human health risks due to accidents involving the transportation and management of the foreign research reactor spent nuclear fuel are discussed in Section 4 of the EIS. The results of the analyses of the credible accidents involving foreign research reactor spent nuclear fuel demonstrate that the risk of the proposed action would be low. Due to differences in the nature of the foreign research reactor spent nuclear fuel from the situation at Three Mile Island (e.g., Three Mile Island involved an operating power reactor versus the foreign research reactor spent nuclear fuel which is metallic and is shipped dry), there would be no accidents involving the foreign research reactor spent nuclear fuel that could approach the severity of the Three Mile Island accident.

COMMENTOR NO. 822: RINKER, ROY V.

June 22 '95

Office of Spent Nuclear Fuel
Management (EM-37)
U.S. Department of Energy
Washington, D.C.

Dear Sirs

This is a letter of protest against the Governments selection of the Port of Tacoma as a possible unloading point in the distribution and storage of spent nuclear fuel. Your agency has made great claims as to the safety in handeling spent fuel containers. But we all know about, and have seen evidence of, the claimed infallibility of anything man has made. Accidents can and do happen.

822-1

We ask that your agency not use Northwest ports to offload spent fuel or our state to store them. Thank you.

Sincerely
Roy V. Rinker

RESPONSE TO COMMENT
COMMENTOR NO. 822: RINKER, ROY V.

Response to Comment No. 822-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 823: RYSTEDT, JANET

July 23 '95

Dear Mr Head:

Please please do not send possible disaster to our land water & mostly our people

Sincerely

Janet Rystedt

823-1

RESPONSE TO COMMENT
COMMENTOR NO. 823: RYSTEDT, JANET

Response to Comment No. 823-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 824: CITIZEN

JUNE 1995

CHARLES HEAD
OFFICE OF SPENT NUCLEAR FUEL MANAGEMENT (EMS37)
DEPARTMENT OF ENERGY
1000 INDEPENDENCE AVE. S.W.
WASHINGTON, D.C. 20585

SPENT NUCLEAR FUEL/PORT OF TACOMA, WASHINGTON

MR. HEAD:

I AM WRITING AT THE PERSUATION OF A FRIEND WHO I BELIEVE MAY HAVE FORMED AN OPINION OUT OF IGNORANCE AND FEAR. THIS FRIEND IS TOTALLY AGAINST ANYTHING TO DO WITH NUCLEAR ENERGY. TO FORM AN OPINION OF MY OWN, I MUST HAVE SCIENTIFIC FACT. THEREFORE, IF IT IS TRULY PROVEN THE SAFETY OF BRINGING SPENT NUCLEAR FUEL TO THE PORT OF TACOMA IS 100% I HAVE NO OPINION PRO OR CON. IF IT IS TRULY EVEN A HALF A PERCENTAGE POINT UNSAFE, I AM OPPOSSED. 824-1

MRS. H.
TACOMA, WASHINGTON

RESPONSE TO COMMENT
COMMENTOR NO. 824: CITIZEN

Response to Comment No. 824-1

Based on the analyses of impacts associated with accidents and incident-free operations involving foreign research reactor spent nuclear fuel, DOE considers that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low (Sections 4.2.2.3 of the EIS presents the consequences of port accidents and Section 4.2.2.2 presents impacts of incident-free operation).

COMMENTOR NO. 825: DUPUIS, RUTH A.

6/22/95

Mr Charles Head,

I am very much against the idea of radioactive nuclear waste being shipped thru the Port of Tacoma. I hope you listen to the voice of the people. I see this as a major threat.

Please listen to us.

No shipping of nuclear waste thru Port of Tacoma.

Mrs R. Dupuis

825-1

RESPONSE TO COMMENT
COMMENTOR NO. 825: DUPUIS, RUTH A.

Response to Comment No. 825-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 826: EGELAND, LINDA

June 26, 1995

Mr. Charles Head,

I don't like the idea of radioactive nuclear waste being shipped to the Port of Tacoma. I agree with the editors of The Tacoma News Tribune when they said, "As critics have pointed out, though, there's no obvious reason the spent fuel has to come to America, let alone Tacoma. The U.S. can only store this material under armed guard, but Great Britain and France operate plants capable of converting weapons-grade uranium into safe commercial-grade fuel."

826-1

826-2

Linda Egeland
4809 75th St. E.
Tacoma, WA 98443

RESPONSE TO COMMENT
COMMENTOR NO. 826: EGELAND, LINDA

Response to Comment No. 826-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 826-2

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 827: MARKIEWICZ, MICHELE C.

Tacoma Wa
June 1995

Charles Head,
DOE
Wash, D.C.

Dear sir

One of the attendees locked out of the recent public meeting for consideration of Tacoma as a port of entry for global nuclear waste, I would like to express my opposition to the proposal, and to urge you in your official capacity, in your social and personal consciences, in your ecological awareness, to work toward a cessation of the production of spent nuclear fuel.

Given the half-life of said material, you will not be able to work toward elimination of your own job, through lack of (eventual) necessity, but you might, as a PUBLIC official, 1) discourage proliferation of nuclear devices, 2) encourage research into and commitment to the safest, most isolated handling of such materials as already exist, handling to include transport mode, storage facilities, and security from theft.)

827-1

827-2

RESPONSE TO COMMENT
COMMENTOR NO. 827: MARKIEWICZ, MICHELE C.

Response to Comment No. 827-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 827-2

Implementation of the proposed action would support U.S. nuclear nonproliferation policy seeking to reduce and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). As discussed in Section 4 of the EIS, the risks associated with implementation of the proposed action to human health or the environment at candidate ports, along representative transportation routes, and at interim management sites would be low (Sections 4.2.2, 4.2.3, and 4.2.4 of the EIS respectively).

The DEIS from your office reflects neither of these approaches, and therefore, seeming lack of information and concern regarding the enormous responsibility which your title implies, carries. On behalf, not only, of the people of Tacoma, but of the present and future globe, please gather and use the most current and comprehensive knowledge available in your decision making, with one eye, daily, to rapid changes in the knowledge bank, and so to the need for quick adaptability. We, and posterity depend on it.

Sincerely and respectfully,

Ms. Michele C. Markiewicz
4131 N. 29th
Tacoma, WA 98407
(206) 627-8215 work 756-6975 home

COMMENTOR NO. 828: HALE, STEVEN M.

Tacoma meeting 26 June 95

Mr Head

I watched you presentation and most of the speakers later on.

I believe the size of the group was about right for a town meeting. Perhaps what was needed was about 5 or 6 of these for a City our size.

What a miscalculation on your offices part to believe there would be so meager a response.

My wife was in the parking lot with many others trying to get into the small Place. In fact you could have filled a 3-5,000 place but then no more persons could have talked in just one mtg.

Here are my reasons your technically flawed plan as it is should

828-1

RESPONSE TO COMMENT
COMMENTOR NO. 828: HALE, STEVEN M.

Response to Comment No. 828-1

As evidenced by DOE's agreement to schedule a second meeting in the Tacoma area, DOE encouraged the input of the individuals, organizations, and State and local representatives who wished to voice their position on the proposed action. The facility used for this meeting was selected and provided by the City of Tacoma, not DOE.

Response to Comment No. 828-2

The passage from the Straight of Juan de Fuca to Tacoma, meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection. Appendix D, Section D.1.9.2 of the EIS presents details of the criterion and how it is applied. The favorable transit from open ocean is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations such as port experience with handling containers, port facilities, access to land transportation, and population in the port and along the route to the management site(s), have also been considered in making the final selection of ports of entry. Appendix D, Section D.1.9 of the EIS presents details of the overall port selection process.

COMMENTOR NO. 828: HALE, STEVEN M. (CONT'D.)

Come here. I speak as a citizen a pwa police office and a medical army officer with years of intimate experience with nuclear weapons.

- Puget Sound is a narrow deep inherently busy transit pattern for big ship and small.

828-2

- There are a lot of radical self regulated self styled WacKo's in this area that could cause havoc easily. I mean easily, They aren't dumb.

828-3

- In looking at a map of the area it seems a route along the Columbia R.V.A. would be much easier to decontaminate if god forbid something should happen.

828-4

I believe we probably do need to recapture some of these materials but let us not alienate the intelligent citizenry.

Sincerely Steven M Hale

RESPONSE TO COMMENT
COMMENTOR NO. 828: HALE, STEVEN M. (CONT'D.)

The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (port selection Criterion 2; Appendix D, Section D.1.9.2 of the EIS). Appendix D, Section D.5.3.1.3 presents a discussion of the determination of the probability of ship accidents used in the EIS. In regard to the size of vessels, increased volumes of hazardous cargos, say gasoline, would not change the accident consequences because the most severe accidents analyzed already assumed a collision with a tanker and that the resulting fire was not limited by quantity of fuel available (Attachment D5 to Appendix D).

Response to Comment No. 828-3

The commentor's opinion about the presence of fringe groups in the Puget Sound area is noted. Section D.5.9 has been added to Appendix D of the EIS to address terrorism and sabotage. This section concludes that, while certain terrorist and sabotage attempts cannot be precluded, theft would be. DOE considers that the foreign research reactor spent nuclear fuel can safely be received at the ports and transported to the managements sites, if the foreign research reactor spent nuclear fuel is accepted into the United States. The security measures employed would meet or exceed all the security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. DOE supports these regulations as being adequate to protect the foreign research reactor spent nuclear fuel.

Appendix H has been added to the final EIS in response to public comments to better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

Response to Comment No. 828-4

The analyses provided in Sections 4.2.2 and 4.5 of the EIS indicate that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS). Use of the Columbia River would have no direct impact on the risk associated with the shipment of foreign research reactor spent nuclear fuel, if foreign research reactor spent nuclear fuel is accepted into the United States.

COMMENTOR NO. 829: PYFROM, LEON

Leon Pyfrom
524 119 Ave. E.
Puyallup, Wa.
98372
June 26, 95

Dear Charles Hedl,

Let the foreign countries get rid of their nuclear waste in their own countries we don't want it here. Who got paid off on this deal. Its really disgusting that the United States is willing to take other countries nuclear waste. I'll vote everyone out of office if this goes through. 829-1

No Nuclear Waste In The U.S.A From Any Other Country. Especially in Tacoma water. 829-2

Sincerely,
Leon Pyfrom

RESPONSE TO COMMENT
COMMENTOR NO. 829: PYFROM, LEON

Response to Comment No. 829-1

The commentor's preference for the alternative of overseas management is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

Response to Comment No. 829-2

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma, or any U.S. port, is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 830: GIANELI, GREG

June 27, 1995

Dear Sir:

I am writing this letter concerning the use of the Port of Tacoma as a destination for nuclear waste. I feel that you should look for a smaller port that would easier for security and one that needs the business. 830-1

I am not totally against the transport of the waste from other countries, as I worry about security in the other countries against terrorist. I feel we should help the other countries build their own depositories and supply them with some of our armed forces for security. 830-2

If it must come to the U.S. maybe you should build a handling facility on the Columbia near Hanford. That way the waste will be in shallow water on most of its transport and easier to retrieve in case of an accidental spill. 830-3

I feel the best thing to do is find a very remote place in the world and put it all there with a U.N. type of armed forces guarding it. 830-4

Thank you very much for listening to mine and other peoples ideas.

Sincerely,
Greg Gianeli

RESPONSE TO COMMENT
COMMENTOR NO. 830: GIANELI, GREG

Response to Comment No. 830-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 830-2

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a which is discussed in Sections 2.3 and 4.4.1 of the EIS.

Response to Comment No. 830-3

Commentor's recommendation to build new port facilities on the Columbia River for handling the foreign research reactor spent nuclear fuel was not considered by DOE. New port facility construction would be costly and time consuming, and would not accomplish the goal of timely return of the foreign research reactor spent nuclear fuel. DOE evaluated 161 ports (153 commercial and eight military ports) against selection criteria, resulting in 10 ports that met all of the criteria. Appendix D, Sections D.1.8 and D.1.9 of the EIS present a detailed discussion of the process and results.

Response to Comment No. 830-4

The commentor's preference for overseas storage in a remote location is noted. Under Management Alternative 2, Subalternative 1a (Sections 2.3 and 4.4.1 of the EIS), the United States would assist foreign research reactor operators in storing their spent nuclear fuel in their own country or some other location outside of the United States. The disadvantages of storage in remote locations include costs of constructing suitable storage facilities and the difficulty of providing security. This option would leave a concentrated quantity of highly enriched (weapons-grade) uranium outside of the United States. As discussed in Section 4 of the EIS, the risks associated with implementation of the proposed action to human health or the environment would be low.

COMMENTOR NO. 831: SAMUELSON, DOREEN

Dear Mr. Head-

I advertised the June 19th meeting in my church bulletin because it is so shocking that 41 counties want to use us as a nuclear dumping ground - and our government is open to it.

1. What politicians and their cronies are profiting from this? There can be no other reason than under the table payoffs & over the table profiteering. This adds to public cynicism which is widespread about political corruption. 831-1

2. We have enough debate in our own country as to where we can dispose of our own waste. 831-2

3. This is another example of no regard for the devastating effects nuclear waste will have on future generations. #now is their only concern. 831-3

4. Whoever promotes this will suffer at election time.

Sincerely,

[redacted]

Doreen Samuelson

Fox 13

RESPONSE TO COMMENT
COMMENTOR NO. 831: SAMUELSON, DOREEN

Response to Comment No. 831-1

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). Many foreign research reactor operators have no immediate means of disposing of their spent nuclear fuel. This EIS evaluates the environmental effects that would result from implementation of three alternatives for management of spent nuclear fuel from foreign research reactors: management in the United States (Management Alternative 1, Section 2.2 of the EIS), overseas management (Management Alternative 2, Section 2.3), and combined domestic and overseas management (Management Alternative 3, Section 2.4). The No Action Alternative (take no action regarding foreign research reactor spent nuclear fuel, Section 2.5) is also evaluated in the EIS. Implementation of any of these alternatives would pose no significant benefits or risks to human health or the environment. While implementation of the proposed action offers no financial gain for the United States Government or its officials, it would reduce the risks of diversion of weapons-grade materials to a nuclear weapons program.

Response to Comment No. 831-2

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. A detailed, quantitative discussion of these impacts would have to be the subject of future NEPA documentation. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of state to consider other means of dealing with the spent nuclear fuel (Section 1.1. of the EIS).

Response to Comment No. 831-3

Contrary to the commentor's assertion, the purpose of preparing this EIS is to evaluate and determine what significant impacts to the environment would occur if the proposed action were implemented. Sections 4.2.2., 4.2.4 and 4.5 of the EIS present a discussion of the risks and impacts on port areas and potential management sites, which demonstrates that such risks and impacts would be low. The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS), not to economically benefit anyone.

COMMENTOR NO. 832: BUTLER, DAVE

06-21-95

PORT OF TACOMA, WASHINGTON — shipments of spent nuclear fuel rods.

Good Morning,

Respectfully, you have no idea what you are dealing with on this issue.

Washington State residents will not permit transport of such materials through the heart of our Puget Sound, forests, mountains, cities and our homes.

You would have a greater chance of success receiving those shipments up the Potomac River, through WA D.C., through your neighborhood, past your home.

It will never happen here! If legal avenues to prevent this from happening are blocked:
- Private boats will blockade the Sound - logging trucks and autos will clog the highways - people will sit in front of these nuclear shipments...

... TACOMA/Washington State will be more trouble than its worth as a port of entry!

DCB

832-1

RESPONSE TO COMMENT
COMMENTOR NO. 832: BUTLER, DAVE

Response to Comment No. 832-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 833: BARRETT, HAROLD R.

13011 Meridian E.,D-202
Puyallup WA 98373-9460
June 26, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Mgt.(EM-37)
United States Department of Energy
1000 Indepence Avenue. S.W.
Washington DC 20585

Dear Sir:

I am unalterably opposed to using the Port of Tacoma for transhipping foreign nuclear wastes into this country. As a matter of interest, I am also opposed to the entire concept of foreign nuclear wastes being buried in the USA. Our experience at Hanford should convince us that we have quite enough difficulty with our own nuclear wastes. 833-1 833-2

Lest you write me off as just another anti-nuke environmental whacko, let me clarify. For 24 years, I was involved with nuclear weapons and nuclear reactors. I am thoroughly convinced of the validity of both programs. At the end of my nuclear "career"(1986-1990), I was employed shipping radioactive material in general and spent fuel in particular from Mare Island Naval Shipyard, Vallejo, California. I know what procedures and precautions must be taken. I was using CFR 49 on a daily basis as well as appropriate EPA and OSHA regulations along with the applicable Naval Reactors Directives and Manuals. I have zero confidence that our foreign counterparts will observe or even have the equivalent procedures. The State of Idaho has already indicated their unwillingness to act as a nuclear dump. Most of us have already figured out that,"I'm from the government, I'm here to help!", is not a particularly credible statement. Let us completely re-think this entire plan--remembering, always, that Murphy was an optimist. 833-3

Thank you for taking the time to read this.

Sincerely,

Harold R. Barrett

HAROLD R. BARRETT

RESPONSE TO COMMENT
COMMENTOR NO. 833: BARRETT, HAROLD R.

Response to Comment No. 833-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 833-2

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States is noted (See Management Alternative 1, Section 2.2 of the EIS). Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

Response to Comment No.833-3

DOE understands this comment to refer to the regulations that would apply to the possible transportation of foreign research reactor spent nuclear fuel to the United States. All such shipments entering the United States would be required to comply with United States Department of Transportation and NRC regulations prior to entry into the United States. This process has been demonstrated to work well over the past 30 plus years of foreign research reactor spent nuclear fuel shipments to the United States.

COMMENTOR NO. 834: KENDALL, STEPHANIE A.

June 27,1995

To: Mr.Charles Head
Office of Spent Nuclear Fuel Management.

Dear Mr.Head.

I'm not a political activist,nor do I picket or protest for or against what happens to be the popular "crisis" of the moment.I've never felt compelled to vent my opinions in an angry letter to the editorial page of our local newspaper.Everyone has opinions and the right to express those opinions.But,as the enclosed article states,who takes the time to listen,or read,what someone feels very strongly about?

And that can be very sad,and in this instance,very dangerous. You represent a political group that cannot,or will not,consider the health and safety of the residents of this area.It's ludicrous to think that this group can say,without reservation,shipping spent nuclear fuel is safe and absolutely risk free.It's a crap shoot,and these idiots are holding the dice, ready to roll in our direction. 834-1

I don't like the idea of this group,or any other group,controlling my future,the future of my grandchildren,and the future of this area.I've lived in western Washington all of my life,and I wish to die peacefully in this great state.I do not want to see it become a nuclear wasteland,nor do I want to leave it before my time is up.Ship this waste to England or France where thier scientists can recycle into low grade fuel to power electricity. 834-2

Stop and think;would you want this kind of risk fall upon your home town and state?Would you be willing to to gamble with the lives of your family,and what has to be something you feel strongly about? Have you lost your human decency?I hope not,for all our sakes.

There's a new rallying phrase that says it all;NOT IN MY BACK* YARD!!

Sincerly,

Stephanie A.Kendall
A very concerned Tacoma resident.

Stephanie A. Kendall

RESPONSE TO COMMENT
COMMENTOR NO. 834: KENDALL, STEPHANIE A.

Response to Comment No. 834-1

This EIS does not state that transport of foreign research reactor spent nuclear fuel would be risk free, but rather that these risks would be low. Analysis in Sections 4.2.2, 4.2.3 and 4.5 of the EIS indicates that the risk associated with transporting the foreign research reactor spent nuclear fuel would be low for persons living near a port like Tacoma or along a transportation route.

Response to Comment No. 834-2

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 837: COUTURE, GLORIA

JUNE 24, 1995

CHARLES HEAD
OFFICE OF SPENT NUCLEAR MANAGEMENT
(EM-37) U.S. DEPT. OF ENERGY,
1000 INDEPENDENCE AVE. S.W.
WASHINGTON, D.C. 20585

NO, NO, NO. I don't want to even think about the idea of a highly radioactive nuclear waste being shipped through the port of Tacoma. I can't image tolerating such an idea. I remember as a child being so scared in the 3rd. grade, living near McCord Air Force Base during the Korean War. I just knew one day those planes were not going to be ours. They would be Korean and they would bomb us and we would just be like every other country in the world. But my parents re-assured me this wouldn't happen. They had gone thru WW-11 and people we're patriotic, loved their land and country and fellow man, and yet they could take me out in public and I would be frightened again because people in conversation would say "mark my words, Russia will bomb us". 837-1

Well, now I've grown up and these things and these people don't scare me anymore. But have we learned anything, but greed, and power, and corruption, I think not.

My husband and I have twenty grandchildren, born and raised in the Puget Sound area, the majority of them are educated here, will marry here, work and live their lives here. I have never written to a public official in my life, but now is the time. I am damm angry. I will not sit by and watch my children suffer and die over a long period of time because you people are so efficient that accidents or things don't happen. I have lots of animosities about this country and its political activities, but I go with the flow. But when you put one of my children in jeopardy of their life, I get angry. What gives you this right, surley not our vote, I hope.

When you were in Tacoma, you were quoted as saying " I was more impressed with the number of officials at this meeting than the public". Well, we are the public. I still would like to think, I love my country, even tho we've been sold out by our government. I honor the history of my country, and truly feel in debt to the men & women who died to keep our land free. But now I am not ashamed to say I would not die for my country or expect my children or grandchildren to give their lives for this country, since Vietnam.

RESPONSE TO COMMENT
COMMENTOR NO. 837: COUTURE, GLORIA

Response to Comment No. 837-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 837: COUTURE, GLORIA (CONT'D.)

Please, Mr. Head, when you make your decisions, and present your ideas, imagine at the same time of having a child, or grand child living in the Puget Sound Area. While doing so, don't destroy the glorious gift of God has given all of us.

Gloria Couture

Sincerely
Gloria Couture

THE CITISENS OF THE UNITED STATES OF AMERICA.

Tamara G. Meade
Teresa J. Meade
Merrill Rockwell
Gamer Couture

RESPONSE TO COMMENT
COMMENTOR NO. 837: COUTURE, GLORIA (CONT'D.)

* This is the best available copy of this comment document.

COMMENTOR NO. 839: SULLIVAN, MAURA E.

Maura E. Sullivan
4440 Memory Lane West
Tacoma, WA 98466

June 22, 1995

Mr. Charles R. Head, Program Manager
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

Dear Mr. Head:

I am writing to offer my comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (DEIS). First, I strongly believe that there should be no importation of Spent Nuclear Fuel from nations that do not pose a proliferation risk. This alone would greatly reduce the amount of waste that must be transported internationally and stored in the U.S. at our expense. There should also be no importation of Low Enriched Uranium wastes that can not be used in weapons production. Where the use of dry cask storage is feasible and would allow for international inspection, we should store the waste on site in the foreign nation. Other nations must pay their own financial, health and environmental costs for their nuclear programs. 839-1 839-2 839-3

Second, the use of commercial freighters or public ports in large cities puts longshore workers and the public, both on our roads and in the event of a shipboard fire, at risk. I urge you to use only military or dedicated ships and Department of Defense ports. That way, only employees who are highly skilled in hazardous waste transport will be in contact with the shipments. Also, the casks should be inspected before arriving at the port and the trucks and rail cars should be inspected before departure to the storage site. 839-4 839-5 839-6

Third, Hanford should not be chosen as a viable temporary storage site. Hanford's nuclear fuel cooling basins are already leaking and subject to massive failure in case of an earthquake. U.S. Department of Energy is presently having trouble funding safety upgrades and fuel removal from K-Basin. The problem should not be worsened by adding more waste to the site. 839-7

Fourth, safety and security issues were not adequately addressed in the DEIS. Shipboard fires pose a real threat because the casks have only been tested to 1475 degrees for 30 minutes while real fires may have a higher temperature for a longer duration. Also, the cask has been tested to a depth of 50 feet for 8 hours while depths in international waters and Puget Sound greatly exceed that amount. DOE wrote in the DEIS that it would be impossible to recover casks from a depth greater than 200 meters in case of an accident. 839-8

RESPONSE TO COMMENT
COMMENTOR NO. 839: SULLIVAN, MAURA E.

Response to Comment No. 839-1

The commentor's opposition to acceptance of foreign research reactor spent nuclear fuel from countries that do not pose a proliferation risk and the commentor's opposition to the acceptance of LEU from any country are noted.

As discussed in Section 2.10 of the EIS, publicly identifying a country as a proliferation risk would have adverse diplomatic and political consequences, and would severely diminish cooperation between the designated country and the United States. This option was considered, but was dismissed as unrealistic.

Response to Comment No. 839-2

The commentor's opposition to accepting foreign research reactor spent nuclear fuel from nations where dry storage is feasible is noted. As explained in Section 2.3 of the EIS, the opportunities for expanded spent nuclear fuel storage at foreign research reactor sites are limited or nonexistent.

Response to Comment No. 839-3

The EIS evaluates a number of financing arrangements for management of the foreign research reactor spent nuclear fuel in the United States. As discussed in Section 2.2.1.2 and 2.2.2.3 of the EIS, several financing options have been considered, ranging from collection of fees from the research reactor operators that would pay all of the costs of the program to full subsidization of the program by DOE. A compromise between these extremes would be for developed countries to be charged a competitive fee and the costs for developing countries would be subsidized by the United States for the acceptance and management of their spent nuclear fuel. Section 2.2.2.3 of the EIS discusses alternative financing arrangements, which include full subsidization for all countries, charging all countries the full cost of management, and subsidizing developing countries, but charging developed countries a full-cost recovery fee. The reasons the United States would pay some of the costs for other countries are: 1) some countries would be unable to afford the costs of the proposed action and would have no safe alternative means of managing their spent nuclear fuel (i.e., the developing countries); and 2) some countries would continue to use and trade weapons-grade nuclear material indefinitely unless the United States charges a competitive fee and absorbs any costs above that fee (i.e., most of the Western European countries).

Response to Comment No. 839-4

Based on the analyses of impacts associated with accidents and incident-free operations involving foreign research reactor spent nuclear fuel, DOE considers commercial ports,

COMMENTOR NO. 839: SULLIVAN, MAURA E. (CONT'D.)

Several areas in Puget Sound used as major shipping lanes exceed 200 meters. DOE has no provision for funding the training of local fire fighters or for law enforcement officers. 839-9

I urge you to enter into a more detailed analysis in the DEIS and a careful review of the program to import these High-Level Nuclear Waste materials from abroad. The DEIS insufficiently covers the above issues which may profoundly effect our lives here in the Pacific Northwest.

My phone number is 206-564-1653 in case you have any questions regarding my comments. I also request a copy of the Final EIS when it is available.

Sincerely,

Maura E. Sullivan

Maura E. Sullivan

cc: The Editor, The News Tribune
Governor Mike Lowry
Representative Norm Dicks
Senator Patty Murray
Senator Slade Gorton

RESPONSE TO COMMENT
COMMENTOR NO. 839: SULLIVAN, MAURA E. (CONT'D.)

facilities, and freighters to represent acceptable options for the receipt and transportation of foreign research reactor spent nuclear fuel (Sections 4.2.2.3 and 4.5 of the EIS present the consequences of port accidents and Section 4.2.2.2 of the EIS presents impacts of incident-free operation).

Response to Comment No. 839-5

Commentor's recommendation to use only military ports and dedicated or military ships for the transport of foreign research reactor spent nuclear fuel is noted. However, Section 4.2 of the EIS demonstrates that commercial ports and facilities represent an acceptable option for the transportation of foreign research reactor spent nuclear fuel.

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security provided for the foreign research reactor spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

Whether the shipments come as cargo on a scheduled carrier or on a chartered ship, no special precautions are expected to be required by the Coast Guard or any other authority. As such, there need be no additional requirements to use dedicated or military ships, nor any adverse consequences to the use of the commercial ships or facilities.

Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the transportation casks used to transport it would be low. No special handling or loading/unloading procedures would be required for the foreign research reactor spent nuclear fuel when it is contained in approved shipping containers; experience with handling containers is sufficient. Therefore, no special training of longshoremen would be required.

Response to Comment No. 839-6

The foreign research reactor spent nuclear fuel containers would be inspected daily while onboard the ship (Appendix C, Section C.4.1 of the EIS), and trucks or railcars would be inspected under existing Federal, State and local transportation regulations prior to departing the port.

Response to Comment No. 839-7

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho

COMMENTOR NO. 839: SULLIVAN, MAURA E. (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 839: SULLIVAN, MAURA E. (CONT'D.)

National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 839-8

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security provided for the spent nuclear fuel shipments is required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk of such actions. Security would be provided for all shipments of foreign research reactor spent nuclear fuel, as required by the Code of Federal Regulations (10 CFR Part 73). The general security provisions are provided in the new Appendix H that has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit.

The transportation casks that would be used for the foreign research reactor spent nuclear fuel are certified if their design meets certain tests, including a fire test, and if the individual casks pass periodic inspections (Section 2.6.2 of the EIS). These certification standards were developed for use of the transportation casks on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. The duration of a ship fire is directly related to the amount of combustibles carried on board. In spite of this potential, the number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicate that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures.

In respect to the impact a ship fire might have on a spent nuclear fuel transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship's fire intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it would be almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of the foreign research reactor spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (see Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).

The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt foreign research reactor spent nuclear fuel. Appendix D, Section D.5.3 of the EIS presents detailed discussion of accident probabilities and radioactive material source terms and Section D.5.4 presents the results of the analyses.

In conclusion, although long duration ship fires are possible, and have occurred, they are uncommon events. Analyses in the EIS indicate that even in the event of a severe ship fire involving a spent nuclear fuel transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5 of the EIS). Although the nonradiological effects of such a catastrophic accident would obviously impact the local environment, no additional impacts are predicted due to the presence of foreign research reactor spent nuclear fuel.

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

Response to Comment No. 839-9

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through

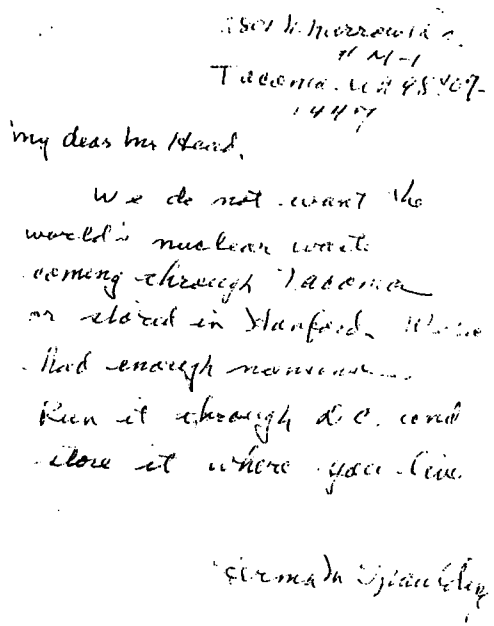
COMMENTOR NO. 839: SULLIVAN, MAURA E. (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 839: SULLIVAN, MAURA E. (CONT'D.)

DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

Appendix H of the EIS contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

COMMENTOR NO. 840: SPAULDING, HERMA



1507 N. Narrows Dr.
#M-1
Tacoma, Wa 98407-
1447

My dear Mr Heard,

We do not want the
world's nuclear waste
coming through Tacoma
or stored in Hanford. We've
had enough nuclear...
Run it through D.C. and
store it where you live.

Sincerely, Herma Spaulding

840-1

RESPONSE TO COMMENT
COMMENTOR NO. 840: SPAULDING, HERMA

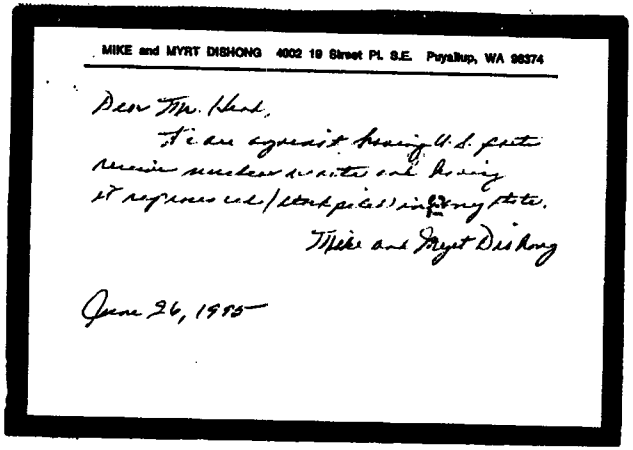
Response to Comment No. 840-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford site.

* This is the best available copy of this comment document.

COMMENTOR NO. 841: DISHONG, MIKE & MYRT



MIKE and MYRT DISHONG 4002 19 Street Pl. S.E. Puyallup, WA 98374

Dear Mr. Hunt,

I am against having U.S. ports receive nuclear wastes and having it regenerated/distributed in my state.

Mike and Myrt Dishong

June 26, 1995

841-1

RESPONSE TO COMMENT
COMMENTOR NO. 841: DISHONG, MIKE & MYRT

Response to Comment No. 841-1

The commentor's opposition to accepting nuclear wastes into the United States is noted. Sections 2.3, 2.5, and 4.5 of the EIS describe other alternatives under consideration.

COMMENTOR NO. 842: HITSON, MARY JEAN

June 27, 1995

Charles Head, Office of Spent
Nuclear Fuel Management (EM-37)
U. S. Department of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

Dear Mr. Head:

In response to the proposed shipments of high-level nuclear waste through the Port of Tacoma, I am in agreement with the negative response you heard recently at the meeting in Tacoma, Washington. 842-1

Also, regarding "They don't have time to listen" statement made by you, they also probably won't take time to read this or any other letters. Hopefully, the amount of letters received will have an impact as to the will of the people... 842-2

My vote is a "No"!

Respectfully,

Mary Jean Hitson

Mary Jean Hitson
2909 North Lawrence
Tacoma, WA 98407

RESPONSE TO COMMENT
COMMENTOR NO. 842: HITSON, MARY JEAN

Response to Comment No. 842-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 842-2

While it would be impractical for the Secretary of Energy to personally review and respond to all of the written and oral comments concerning this EIS, this information was reviewed by the Program Manager and his staff. The Program manager is responsible for relaying public concerns and issues to the Secretary of Energy and her staff. As indicated by this document, all comments received from the public were noted and taken seriously. Under NEPA and DOE's environmental regulations (Section 5 of the EIS), public participation and comments are an integral component of the environmental process.

COMMENTOR NO. 843: CITIZENS (TACOMA AREA)

May 27, 1995

Mr. Charles Head
Office of Spent Fuel Management, EM-37
US Department of Energy
1000 Independence Ave, SW
Washington DC 20585-0001

Mr. Head;
I attended the Public Review of the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel, held on May 26 at the Radisson Hotel, SeaTac, Washington. Although I made no critical statements concerning this document at the review, I was in deep empathy with those who did. This document is not only inadequate, it is flawed in its basic assumption. The assumption is that shuffling deadly waste from one location to another somehow deals with the real problem. Never mind spent fuel from foreign nuclear reactors. What are you going to do with the 30,000 tons of radioactive waste that is already bursting from storage space at American reactor sites and storage areas, and what will you do with the additional 55,000 tons of American waste that is expected to be generated in the next 15 years? Our esteemed federal senators tell us that existing contamination at the Hanford Site in Washington State cannot be cleaned up by any amount of funding on any conceivable time table. DOE's plans for long term storage at Yucca Mountain appears to be on the scrap heap. 843-1 843-2 843-3

If the Corporate Republic of America truly wanted nonproliferation, there would be no spent nuclear fuel to move. No one would be generating it; no one would be selling it. Sales of this material to hostile countries would be considered an act of treason. It is clear that the nuclear power industry wants limitless profit without accepting any responsibility. The real question with respect to the DEIS on spent nuclear fuel from foreign reactors, is, in my opinion, which states will stumble and fall in the stampede to escape the influence of the nuclear power industry; acting through the DOE, the courts, and the congress; which states will have ever more nuclear contamination shoved down their throats. The state perspective is gaining recognition at the nuclear administrative level. An article by Robert Loux, director of the Nevada Agency for Nuclear Projects, which oversees the DOE's high level waste program in Nevada, appeared in the June 1 Seattle Post-Intelligencer. Mr. Loux acknowledges the DOE's failure to deal with the fundamental problem, and calls for a national reassessment of the handling of nuclear waste. We keep hearing this call for reassessment every few years. 843-4 843-5

RESPONSE TO COMMENT
COMMENTOR NO. 843: CITIZENS (TACOMA AREA)

Response to Comment No. 843-1

Based on the amounts cited, the radioactive waste to which the commentor is referring appears to be spent nuclear fuel from commercial nuclear power plants. Spent nuclear fuel from power reactors is outside the scope of this EIS. Due to the significant difference in the size and weight of the commercial power reactor spent nuclear fuel and the foreign research reactor spent nuclear fuel (see Figure 2.5 in Section 2.6.1 of the EIS), the facilities used to handle and store the foreign research reactor spent nuclear fuel cannot be used for management of the power reactor spent nuclear fuel. Even if these two different spent nuclear fuel types could be managed in the same facilities, the maximum amount of foreign research reactor spent nuclear fuel covered by the proposed action is less than 20 MTHM (Sections 2.2.1.3 and 2.2.2.1 of the EIS), significantly less than the 30,000 MTHM cited by the commentor as already being in storage in the United States. This small amount of additional foreign research reactor spent nuclear fuel would be unlikely to affect the programs required to manage the 30,000 MTHM.

Response to Comment No. 843-2

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 843-3

Yucca Mountain, NV, is a candidate site for disposal, not long-term storage. As discussed in Section 4.2.7, Yucca Mountain is still the candidate site for a geologic repository for disposal.

Response to Comment No. 843-4

As discussed in Section 4 of the EIS, the risks associated with implementation of the proposed action to the human health and environment, including economic benefits would be low. The management alternatives described in Sections 2.2, 2.3, and 2.4 of the EIS

I believe that once friendly foreign nations take possession of nuclear fuel, they should be required to retain it permanently. Spent fuel required to be returned to the United States for reasons of national security should not be imported on commercial freighters into public ports; nor transported on public highways by nonspecialists. I suggest that it be transported by military or technical specialists to those responsible for its manufacture, who then should be assigned the technical problem of finding a way to decontaminate it. 843-6 843-7 843-8 843-9

In case you have not yet gotten the picture, I remind you of the question asked by the young lady representing Mothers Against Nuclear Proliferation at the May 26 review: "What part of NO don't you understand?" I do not want this material in my back yard; or in my neighbors back yard. I do not want this material in my state, or in my country. City councils and longshoremen do not want it. The State of Washington doesn't want it. We do not want it. Do you understand? 843-10

Endorsed by:

Sincerely;

Al Kinney
916 NE 72nd St.
Seattle WA 98115

Dottie Smith
PO Box 372
Woodinville WA 98072

Richard Pado
9015 NE 139th
Kirkland WA 98034

Rodger Herbst
PO Box 372
Woodinville WA 98072
483-2664

Rick Roberts
PO Box 2462
Redmond WA 98073

Judy Quackenbush
17917 NE 157th
Woodinville WA 98072

Ray Gwinn
1618 9th Ave West
Seattle WA 98119

Salie Rossen
1618 9th Ave West
Seattle WA 98119

Rich Carter
1107 Federal Ave E
Seattle WA 9102

Barbara Price
15024 SE 14th St.
Bellevue WA 98007

Jeanne Simmons
2060 214th St. SW
Brier, Wa. 98036

Anthony Bartling
2060 214th st SW
Brier, wa. 98036

cc:
Dan Silver
Wash. Dept. of Ecology
PO Box 47600
Olympia WA 98504-7600

Michael Bauer
WEC
1100 Second Ave. #102
Seattle WA 98101

Gerald Pollet
HeartOf AmericaNW
1305 Fourth Ave #208
Seattle WA 98101

James S. Mattoch
2906 36th Ave
Seattle Wa
98199

encourage the use of LEU fuel in civilian programs, rather than highly enriched (weapons-grade) uranium fuel. Foreign research reactors are not used for the production of commercial power. Research, medical, industrial, and agricultural applications for research reactors are described in Section 1.1 of the EIS. Activities of the nuclear power industry are unrelated to the proposed action and management alternatives evaluated in this EIS.

Response to Comment No. 843-5

The commentor's concerns about nuclear waste and support for a national reassessment of the handling of nuclear waste are noted. However, these matters are outside of the scope of the EIS (Section 1.3 of the EIS). As discussed in Section 4 of the EIS, implementation of the proposed action, including interim management of spent nuclear fuel from foreign research reactors at one or more of the interim DOE management sites, would result in no significant benefits or risks to human health or the environment.

Response to Comment No. 843-6

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

Response to Comment No. 843-7

Based on the analyses of impacts associated with accidents and incident-free operations involving foreign research reactor spent nuclear fuel, DOE considers that commercial ports, facilities and commercial freighters represent an acceptable option for the transportation of foreign research reactor spent nuclear fuel (Section 4.2.2.3 of the EIS presents the consequences of port accidents and Section 4.2.2.2 presents impacts of incident-free operation). Ground transport of the foreign research reactor spent nuclear fuel would be accomplished by specialized trucking firms.

Response to Comment No. 843-8

Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the transportation casks would be low. No special handling or loading/unloading procedures would be required for the foreign research reactor spent nuclear fuel when it is contained in standard shipping containers; experience with handling containers is sufficient. Therefore, no special training of longshoremen or other transportation personnel would be required; however, truck transport of the foreign research reactor spent nuclear fuel would use specialized firms whose drivers have been specially trained.

COMMENTOR NO. 843: CITIZENS (TACOMA AREA) (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 843: CITIZENS (TACOMA AREA) (CONT'D.)

Response to Comment No. 843-9

Foreign research reactor spent nuclear fuel does not require transportation by specialists. The spent nuclear fuel would be returned to the United States in standard shipping containers that would require no special handling or precautions.

Returning foreign research reactor spent nuclear fuel to its manufacturers is not a practical solution because the manufacturers of fresh nuclear fuel do not have to deal with radiation at the level associated with spent nuclear fuel. Therefore, fresh fuel manufacturers do not have the facilities to handle spent nuclear fuel.

As explained in Section 2.6.5 of the EIS, only five sites were considered for management of the foreign research reactor spent nuclear fuel: the Savannah River Site, the Idaho National engineering Laboratory, the Hanford Site, the Nevada Test Site, and the Oak Ridge Reservation. The potential impacts of managing the spent nuclear fuel are discussed in Section 4.2.4 of the EIS. The main driver behind the proposed policy to manage foreign research reactor spent nuclear fuel is a concern to limit the possibilities of the proliferation of nuclear weapons. In the long term, the question of managing foreign research reactor spent nuclear fuel will be addressed as this country develops a policy regarding nuclear waste.

Response to Comment No. 843-10

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, Section 4.2.2 demonstrates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 844: LASCELLES, JEAN & FRED

June 27, 1995

Charles Head
Office of Spent Nuclear Fuel Management
(EM-37)
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington, DC 20585

Dear sir,

As citizens of Pierce County, we are totally opposed to shipment of nuclear waste through the Port of Tacoma. 844-1

We hope you have listened to our voices.

Jean A. Lascelles

Mr. and Mrs. Fred Lascelles
P.O. Box 438
Graham, WA 98338-0438

RESPONSE TO COMMENT
COMMENTOR NO. 844: LASCELLES, JEAN & FRED

Response to Comment No. 844-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 846: CANFIELD, KERRY

610 — 2nd Ave. W. #110
Seattle, WA 98119-4419

June 28, 1995

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

Dear Mr. Head:

If one can believe the fact sheet distributed by Heart of America Northwest, I am still not convinced that USDOE has adequately prepared shipment handlers or potentially involved communities for the nuclear waste shipments it proposes. Moreover, in evaluating potential ports, the department seemingly ignored the obvious (given the nature of urban civilization): that a port with adequate facilities will have a high population density. This is not a minor matter, and deserves more serious consideration. 846-1

The USDOE simply asserts that nothing will go wrong and asks that we trust them. Yet in view of my earlier observation, and in view of current moves in Congress to curtail citizen oversight of official and commercial activities, I am not convinced that a climate of trust exists. Moreover, the need for these shipments cannot possibly be overwhelming, since the countries from whom it is proposed we should accept waste shipments are not true proliferation risks—and from the countries that actually are risks we probably can't expect to get the stuff back anyway! What's wrong with this picture? 846-2

The bottom line is that still the best means of dealing with nuclear waste seems to be canning it, shipping it somewhere, burying it, and managing the P.R. to keep the locals from protesting too much. This procedure has never been and is not now a solution to the nuclear waste problem. It is not improved by incorporating yet more bad ideas into it. 846-3

As for the most recent hearing about this matter in Seattle, I do not at all like the manner in which it was conducted. I don't like that potential protesters of USDOE policy were *a priori* cast in the roles of troublemakers, sufficient that security goons actually followed people around the meeting area. I do not like that public comment was not *recorded* and was instead only "summarized" on paper. Regardless of whether the public adequately understands the science, the policies, or the politics, we have a right to be taken seriously when we express concern about activities that can seriously impact our lives. The USDOE *still* needs to do a lot better! 846-4

Sincerely,

Kerry Canfield

Kerry Canfield

RESPONSE TO COMMENT
COMMENTOR NO. 846: CANFIELD, KERRY

Response to Comment No. 846-1

DOE considers that the port selection criteria successfully indicate those ports that can safely handle foreign research reactor spent nuclear fuel. DOE further considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel or the population near the port. The analysis in the EIS indicates that the risk associated with an accident would be low (Section 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel casks would also be low (Section 4.2.2.2).

As the port selection process section (Appendix D, Section D.1 of the EIS) explains in detail, Tacoma and the other nine ports all meet the criteria and hence are considered to be able to safely handle the foreign research reactor spent nuclear fuel. The experience criterion used in the port selection process (Appendix D, Section D.1.9.1) evaluates the port's experience in handling containerized cargo, not in dealing with radioactive material. Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the casks used to transport it would be low, so no special handling is required; experience with handling containers is sufficient. The Port of Tacoma has significant experience handling containers, so it met the experience selection criterion.

Response to Comment No. 846-2

Prior to 1989, it was a policy of the United States to accept spent nuclear fuel from foreign research reactors for disposition in the United States (Section 1.1 of the EIS). Many foreign research reactor operators, including those among our stable allies, have no immediate means for disposing of their spent nuclear fuel (Section 1.2 of the EIS). The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). If the research reactors were forced to shut down, the United States would likely to be accused, rightly or wrongly, of failing to live up to its obligations under the Treaty on the Non-Proliferation of Nuclear Weapons to assist nonnuclear weapons states with peaceful applications of nuclear technology. If the reactors switch back to (or continue) the use of HEU as fuel, the move towards elimination of the civil use of HEU would be severely diminished.

As stated in the EIS, the U.S. has an obligation under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) to assist nonnuclear weapons states with peaceful applications of nuclear energy. Actions which compel a country to shut down a peaceful nuclear research program, or to seek reprocessing, could cast doubt on U.S. commitment to NPT principles. Any perception that the U.S. does not support the NPT, which is the foundation of the entire international nuclear nonproliferation regime, would make it that much harder to negotiate further nuclear nonproliferation agreements.

Response to Comment No. 846-3

The commentor's opposition to disposal in a geologic repository is noted. The Nuclear Waste Policy Act of 1982 (as amended, enacted as Public Law 97-425) specifies that spent nuclear fuel and high level radioactive waste shall be disposed of by emplacing it in a geologic repository.

Response to Comment No. 846-4

DOE does not consider that commentors at public hearings are "troublemakers." However, DOE must ensure that meetings are conducted in an orderly and safe manner and, therefore, sometimes security may be necessary due to numerous factors, such as the number of participants at a meeting or the controversial nature of a given proposed Federal action. There is no requirement under NEPA or the regulations that comments given orally at public hearings under NEPA be recorded electronically. NEPA does require that the public be afforded the opportunity to comment on draft EISs and that such comments be considered in the final EIS. Therefore, DOE summarized these comments so that such comments could be considered in the development of the final EIS.

COMMENTOR NO. 847: HENNUM, KARL I.

12419 16th Ave S
Seattle WA 98168-2249
June 28, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
Department of Energy
1000 Independence AVE S W
Washington DC 20585

Dear Mr. Head:

I vigorously oppose the proposal that the United States accepts any nuclear (or hazardous) waste from any foreign country. The very consideration of such a proposal is incomprehensible. 847-1

It is madness to import highly radioactive waste when we don't know what to do with what we have and are still generating. And it is irresponsible for any government to subject it's citizens to the health threat posed by trans-shipment of such waste, assuming it reaches port. 847-2 847-3

I hope reason and logic prevale and this proposal be rejected.

Yours in peace,

Karl I. Hennum

RESPONSE TO COMMENT
COMMENTOR NO. 847: HENNUM, KARL I.

Response to Comment No. 847-1

The commentor's opposition to management of nuclear wastes from foreign research reactors in the United States (Management Alternatives 1 or 3; Sections 2.2 and 2.4 of the EIS) is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

Response to Comment No. 847-2

Alternatives described in Sections 2.2 through 2.4 of the EIS support nuclear weapons nonproliferation policies of the United States. The intent of the proposed action and management alternatives is to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide. If a policy to accept spent nuclear fuel from foreign research reactors is adopted, the analyses in Section 4 of the EIS demonstrate that no significant human health or other environmental effects would result from implementation of the policy. As discussed in Section 2 and Appendix F of the EIS, foreign research reactor spent nuclear fuel can be safely stored at interim management sites pending final disposition (Section 4.2.7 of the EIS).

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1 of the EIS).

Response to Comment No. 847-3

Sections 4.2, 4.3, and 4.4 of the EIS presents the risks and consequences of accepting foreign research reactor spent nuclear fuel into the United States. The analyses demonstrate that there would not be any significant risks to human health, safety, or the environment from transport and management of the foreign research reactor spent nuclear fuel in the United States.

COMMENTOR NO. 848: PERRIN, BETTY J.

JUNE 28, 1995

Dear Sir:

I am against radioactive nuclear waste being shipped through the Port of Tacoma. 848-1

My late husband was a Longshoreman at the Port of Tacoma. He died in December 1983 from lung cancer.

Sincerely,

Betty J. Perrin

Betty J. Perrin

RESPONSE TO COMMENT
COMMENTOR NO. 848: PERRIN, BETTY J.

Response to Comment No. 848-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 850: SAWHILL, MRS. MERRY JERRY STEEL

14556 NE 31st #G-204
Bellevue, WA 98007
June 29, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management, EM-37
U. S. Department of Energy
1000 Independence Avenue S. W.
Washington D. C. 20585

Dear Mr. Head:

This letter is in response to an editorial which appeared in the Sunday, June 25, 1995 edition of the Tacoma News Tribune regarding the proposed nuclear fuel waste shipments destined for the Port of Tacoma located at Tacoma, Washington.

Although I am a native citizen of the City of Tacoma where I obtained my public education in Washington Elementary School, Mason Junior High School and Stadium High School, I was also married in Tacoma to Mr. Roy Bond Sawhill in St. Lukes's Memorial Church on December 19, 1943. Mr. Roy B. Sawhill and myself are both graduates of the University of Washington where he was a full professor of Civil Engineering for over two decades. We had three children and lived at 3808 42nd Avenue South in Seattle, Washington 98118 during his tenure with the University of Washington. Both of our families are from Tacoma where my mother, Mrs. Violet W. Steel was a public school teacher for 35 years and where my father, Mr. Horace Stanley Steel was a prominent Real Estate broker. We both have had profound friendships with our civic and personal relationships in Tacoma and feel that the nuclear fuel waste stock pile materials and their shipments should be accommodated and processed overseas where they originate. I am also a close friend of former Governor Dixie Lee Rae of Tacoma who was once employed by the U. S. Department of Energy and I am convinced she would most regrettably insist that the nuclear storage is a port environmental impact issue which would virtually undermine Tacoma's Stadium High School as a "French chateau" historical monument, the Washington State Historical Museum and it's Society and the pristine qualities for which Tacoma is famous. 850-1

Thank you for your opportunity to lobby for an alternative plan to keep the nuclear fuel wastes overseas where it is not an American responsibility to provide for it's keep. (Professor Roy B. Sawhill, myself and our three children spent an academic year abroad during 1996-1997 and feel that charity most assuredly begins at home!) 850-2

Sincerely yours,

(Mrs.) Merry Jerry Steel Sawhill

(Mrs.) Merry Jerry Steel Sawhill

RESPONSE TO COMMENT
COMMENTOR NO. 850: SAWHILL, MRS. MERRY JERRY STEEL

Response to Comment No. 850-1

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

Response to Comment No. 850-2

DOE considers that the use of any of the ports indicated by the port selection process, including Tacoma, would not impact any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2). Therefore, it should not impact economic or cultural development, or normal commercial operations. This belief is based on the fact that the foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that would require no special handling or precautions. Historically, there were no adverse economic or cultural impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

COMMENTOR NO. 851: MCKINNICK, SUSAN G.

Charles Head
Office of Spent Nuclear Fuel Management
(EM 37)
US Department of Energy
1000 Independence Ave. S.W.
Washington D.C., 20585

NO! NO! NO! NO! NO! NO! NO! NO! NO! NO! NO! NO! NO! NO! NO! NO!

Mr. Head, I am letting you know that I am against Spent Nuclear Fuel being shipped through Puget Sound, the Tacoma area and the Port of Tacoma. 851-1

I think shipping Spent Nuclear Fuel through Tacoma is not an acceptable solution to the problem.

NO! NO! NO! NO! NO! NO! NO! NO! NO! NO! NO! NO! NO! NO! NO! NO!

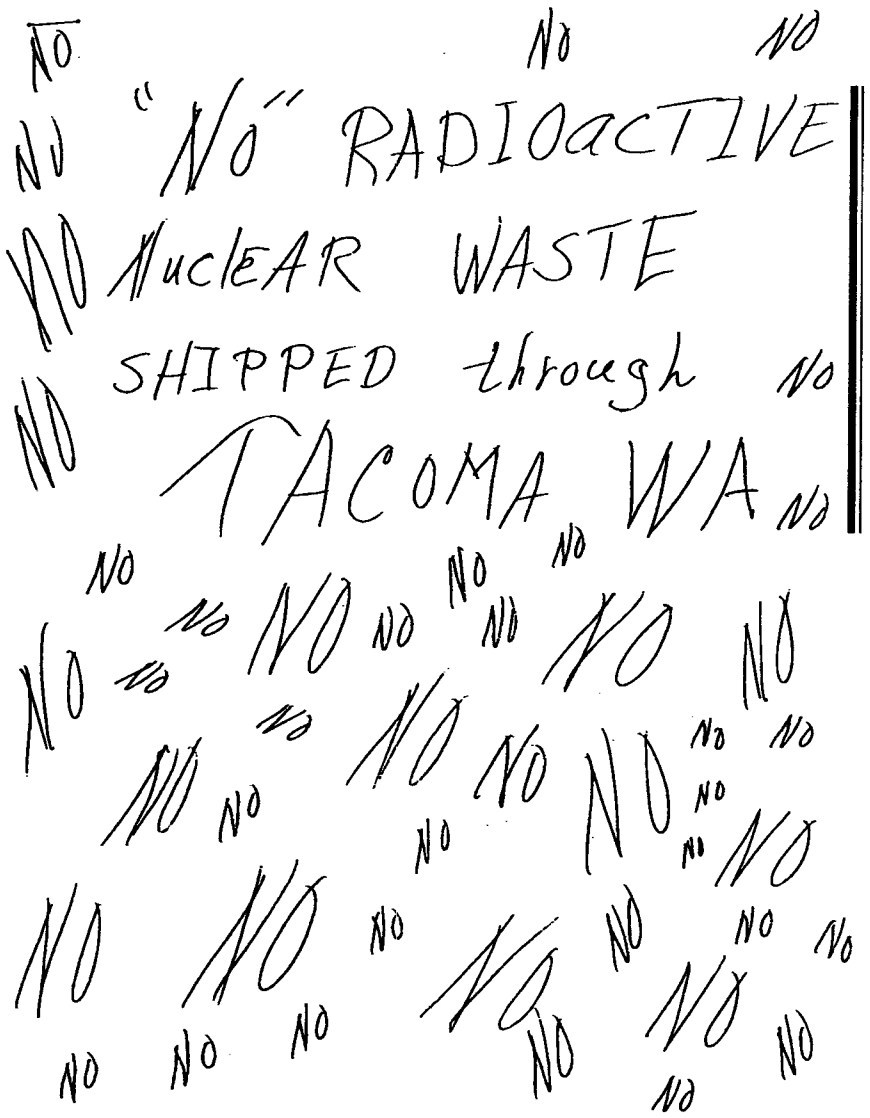
Susan G McKinnick
Susan G. McKinnick
226 SO. 55th Street
Tacoma, Washington
98408

RESPONSE TO COMMENT
COMMENTOR NO. 851: MCKINNICK, SUSAN G.

Response to Comment No. 851-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 852: BITTERLING, MR. & MRS. C.E.



852-1

RESPONSE TO COMMENT
COMMENTOR NO. 852: BITTERLING, MR. & MRS. C.E.

Response to Comment No. 852-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 853: BAILEY, MRS. VIRGIL

Tacoma, Washington
June 29, 1995

Charles Head
Office of Spent Nuclear Fuel Management
U.S. Dept of Energy (EM 37)

Dear Sir:

We are very, very concerned with the idea of highly radioactive Nuclear waste (possibly) being shipped through any of our ports - especially our home port - the Port of Tacoma. We definitely do not want this to take place.

So please give this great thought and consideration. Anything you can do to prevent this from happening - we are most grateful to you.

Sincerely
Mrs Virgil N Bailey
4309 North 19th St
Tacoma, Washington
98406-4311

Keith Bailey - Same address

853-1

RESPONSE TO COMMENT
COMMENTOR NO. 853: BAILEY, MRS. VIRGIL

Response to Comment No. 853-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

* This is the best available copy of this comment document.

COMMENTOR NO. 854: VANCE, RACHEL

6-26-95

The city of Tacoma does not need
any more hazardous waste and
the potential for disaster in the
waters of Puget Sound + Commence-
ment Bay. Our city is trying
valiently to clean up it's waters
and it's shoreline and this kind
of traffic would not help!
Say no to the ploy to ship this materia
thru our port.
Rachel Vance

854-1

RESPONSE TO COMMENT
COMMENTOR NO. 854: VANCE, RACHEL

Response to Comment No. 854-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 855: KITTLESON, ALBERTA H.

308 Ea. 123rd Street
Tacoma, WA 98445
June 29, 1995

Dear Mrs Charles Head,

The Port of Tacoma should definately not be considered for nuclear fuel shipments of waste. 855-1

The information the DOE has on the port is not up to date.

The depth of Puget Sound would make it a bad place to consider because if a cask fell over it would be impossible to retrieve it. 855-2

There could be serious fires and explosions.

Businesses would be ruined.

Our Port of Tacoma is on the Natl Priority list for cleanup under the Comprehensive Environmental Response, Compensation and Liability Act.

Sincerely,
Alberta Kittleson

I would have written sooner but I had an infection in my right hand.

I wrote to Sec. of Dept. of Energy some time ago.

RESPONSE TO COMMENT
COMMENTOR NO. 855: KITTLESON, ALBERTA H.

Response to Comment No. 855-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Updated information on the terminals at the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS.

Response to Comment No. 855-2

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1000 feet). Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

COMMENTOR NO. 855: KITTLESON, ALBERTA H. (CONT'D.)

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: If yo[illegible] study the [illegible] Tacoma you will realize it should not be used for receiving any [illegible] of nuclear spent [illegible]

Name: Alberta [illegible]son Telephone: [illegible]-7797

Address: 308 [illegible] 3rd City/State: [illegible] WA 9844[illegible]

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. SW, Washington, DC 20585

DEADLINE: [illegible] 30, 1995

RESPONSE TO COMMENT

COMMENTOR NO. 855: KITTLESON, ALBERTA H. (CONT'D.)

COMMENTOR NO. 856: RHOADS, DEBORAH

June 26, 1995

Mr. Charles Head
Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave., S.W.
Washington, D.C. 20585

Dear Mr. Head,

I am writing to voice my opposition to DOE's proposal to ship spent nuclear reactor rods through the Port of Tacoma. I oppose the proposal for several reasons: 856-1

- Tacoma is at the heart of a rapidly increasing population base, which would be endangered by any release of radiation.
- Tacoma has been struggling to overcome a negative image and is on the verge of a long-awaited and much-needed economic renewal; this plan would seriously impede the City's efforts to attract clean industry and tourism.
- Too little effort has been made to identify alternatives that do not require shipping spent fuel rods to the United States. For example, has DOE seriously examined the feasibility and relative cost of constructing secured fuel reprocessing centers in carefully chosen locations overseas? 856-2
- If these rods must be stored in the United States, they should not enter through ports on the west coast, where prevailing winds would carry any contamination over heavily populated areas. Does anyone remember Mt. St. Helens? 856-3
- Outdated notions of international relations should not be used to justify endangering the lives of countless citizens of the United States. 856-4
- There is no acceptable plan for storing or reprocessing these fuel rods once they are in the United States. Will we find that the rods are being "stored" in perpetually moving railroad cars, forever seeking a place to unload their cargo? 856-5

I cannot believe that DOE has explored all the possible alternatives in this critically important decision.

Sincerely,

Deborah Rhoads

Deborah Rhoads, J.D., Ph.D.
838 S. State St.
Tacoma, Washington 98405

RESPONSE TO COMMENT
COMMENTOR NO. 856: RHOADS, DEBORAH

Response to Comment No. 856-1

DOE's analyses indicate that the risks associated with receipt of foreign research reactor spent nuclear fuel, even through the most heavily populated ports in the United States, would be minimal (Section 4.2.2.3 of the EIS). Nevertheless, in the National Defense Authorization Act for Fiscal Year 1994, Congress indicated that low port population should be a criteria for use in port selection, where economically feasible (Appendix D, Section D.1.6 of the EIS). It should be noted that even the National Defense Authorization Act for Fiscal Year 1994 did not make low port population an absolute requirement. Accordingly, the population of Tacoma was considered both during both the port selection process (Appendix D, Section D.1.9.5 of the EIS) and during the analyses of potential impacts from the proposed action (Section 4.2.2.3 of the EIS). The analyses demonstrate that the proposed action does not pose any significant risk to either port personnel, the local environment, or the population near the port.

Due to the absence of significant risks or impacts on the potential ports of entry, there should not be any impact on tourism or the business environment. In fact, historically there was no impact on these items for the ports that served as ports of entry for foreign research reactor spent nuclear fuel during the approximately 30 years when DOE previously accepted this spent nuclear fuel.

Response to Comment No. 856-2

The option of overseas management is Management Alternative 2 and is discussed in Sections 2.3 and 4.4 of the EIS. DOE could not construct reprocessing centers in other countries because each country has sovereignty over its own territory.

Response to Comment No. 856-3

The local meteorology and prevailing winds were taken into account when the impacts of accidents were calculated (Appendix D, Section D.5.3.3 of the EIS). The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3, "Consequences of Port Accidents"). The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 856: RHOADS, DEBORAH (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 856: RHOADS, DEBORAH (CONT'D.)

Response to Comment No. 856-4

As discussed in Section 1.2 of the EIS, the proposed action is intended to reduce international commerce in weapons-grade materials, and hence support the nuclear weapons nonproliferation policies and goals of the United States. The proposed action supports the renewed Treaty on the Non-Proliferation of Nuclear Weapons, which was extended indefinitely under the auspices of the United Nations in May 1995, which encourages the use of LEU for civilian applications and reduces the potential spread of nuclear weapons to nonnuclear nations.

During preparation of this EIS, the analysis of impacts associated with the proposed action determined that the radiological or nonradiological risks to human health or the environment (Section 4 of the EIS) are low.

Response to Comment No. 856-5

The plan for the storage or chemical separation of foreign research reactor spent nuclear fuel if accepted in the United States is explained in Section 2.2 of the EIS. As discussed in Section 2.6.5.1 and 2.6.5.2, the technology for safely storing or processing spent nuclear fuel has been in use for over 40 years in the nuclear industry.

COMMENTOR NO. 858: YOMES, LORRAINE T.

To: Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

From: Lorraine T. Yomes
5402 N. 46th St.
Tacoma, Wa 98407

As a life long resident of Tacoma, I am greatly distressed by the thought of highly radioactive nuclear waste being shipped through the Port of Tacoma. I feel the time has come to make my feelings known.

I am appalled to know that the people who will ultimately make the decision about Tacoma's future are not even going to take the time to listen to the tapes or watch the video coverage. Yes you are going to make a report to the director of the Office of Spent Nuclear Fuel Management, but how can I be sure that the report will convey how deeply the citizens of Tacoma feel about not having nuclear waste shipped here. I think it is ludicrous for people who do not even live here to base their decision on your report alone. The least they could do is make the time to read the testimony or watch the tapes before they make a decision that has the potential to change the future destiny of Tacoma. I hope that in your report you truthfully express how strong the resistance to this proposed plan is. I urge you to convince these people that sending nuclear waste to Tacoma is not only a harmful idea but it is also the wrong decision. Is it not enough that the United States of America takes in thousands of foreigners every year, sends money and military troops when ever and where ever it is needed? Now we are expected to take on their nuclear waste also. You see accepting nuclear waste is not just a harmful idea for Tacoma; it is a harmful idea for our country. The time has come for the United States to stop bailing out the world. I as a citizen of this country and state have the right to be free from fear. Believe me the fear the wrong decision will be made is strong. The time has come for you the public servant to stand up and say the United States of America is not going to become the toxic waste dump for the world. Let the countries that produce the waste stand up and take responsibility for the proper disposal of their own nuclear waste. Tell them that the people of Tacoma have the right to live in a city where we do not have to fear what could happen if something went wrong. The chances of something going wrong are real. If you do not believe that just remember Three Mile Island, the Exxon Valdez, Chernobyl, the leaks at Hanford and the Challenger Space Shuttle. There is a place for nuclear waste but that place in not my hometown, in my backyard. Not Tacoma! So please for the sake of me, my family and the citizens of Tacoma, do the right thing. Make the only decision that can be made. Under no circumstance allow highly radioactive nuclear waste to be shipped through the Port of Tacoma. Make the bureaucrats listen, make them take the time. My future is riding on it!

858-1

858-2

858-3

Sincerely;

Lorraine T. Yomes

Lorraine T. Yomes

RESPONSE TO COMMENT
COMMENTOR NO. 858: YOMES, LORRAINE T.

Response to Comment No. 858-1

The commentor's opposition to the use of the Port of Tacoma is noted.

While it would be impractical for the Secretary of Energy to personally review and respond to all of the written and oral comments concerning this EIS, this information was reviewed by the Program Manager and his staff. The Program Manager is responsible for relaying the public views and concerns to the Secretary of Energy and her staff. The final EIS, including comments and responses, and Record of Decision are subject to approval by the Secretary of Energy. All comments received during the ninety day comment period are noted and answered in this document. Under NEPA and DOE environmental regulations (Section 5 of the EIS), public participation and comments are an integral part of the environmental process.

As discussed in Section 2.6.3 of the EIS, spent nuclear fuel from foreign research reactors would not be stored in the Port of Tacoma or any other candidate port. Each spent nuclear fuel shipment would be expected to remain in the port less than twenty-four hours. The analyses presented in Section 4 of the EIS indicate that the risk of acceptance of foreign spent fuel would result in no significant benefits or risks to human health or the environment (See especially Tables 4-6 and 4-7 of the EIS).

Response to Comment No. 858-2

If implemented, the proposed action would benefit the United States because it would reduce the risks of weapons-grade materials being diverted to a nuclear weapons program. This EIS describes four basic policy options for managing spent nuclear fuel from foreign research reactors: management in the United States (Management Alternative 1, Section 2.2 of the EIS), overseas management (Management Alternative 2, Section 2.3), combined domestic and overseas management (Management Alternative 3, Section 2.4), and the No Action Alternative (adopt no policy for management of foreign spent fuel, Section 2.5). The analysis of environmental effects which would result from implementation of these alternatives included evaluations of severe accidents at the candidate ports (Section 4.2.2). As shown in Tables 4-6 and 4-7 of the EIS, the risk associated with accepting foreign research reactor spent nuclear fuel at the candidate ports, due to severe accidents, would be low.

Response to Comment No. 858-3

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 859: RONAN, BERNADETTE

2802 N Mason
Tacoma WA 98407
FAX: 206-752-8547

Office of Spent Fuel Management
Office of Environmental Management
United States Department of Energy
1000 Independence Ave. SW
Washington, DC 20585
FAX: 202- 586- 5256

Dear Mr. Head,

I am a 42 year old woman residing in Tacoma, Washington. Since 1993 I have been diagnosed with breast cancer two different times. I do believe environmental pollution is partly responsible for the breast cancer epidemic that is killing 42,00 American women every year.
As a country we are in over our heads with environmental problems that will not be fully understood or corrected for many years to come. To suggest we accept foreign nuclear waste at the Port of Tacoma,or any other US port, is unthinkably reckless and void of both logic and compassion.
Remember: we are all downwinders.

859-1

Sincerely,

Bernadette Ronan

Bernadette Ronan

RESPONSE TO COMMENT
COMMENTOR NO. 859: RONAN, BERNADETTE

Response to Comment No. 859-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 860: OTTO, MARY & EUGENE

6117 93rd St. S.W.
Tacoma, Wa. 98499
June 24, 1995.

To whom it may concern:

We are definitely opposed to Nuclear waste being shipped thru the Port of Tacoma — or any Port for that matter. The chances of accidents are far too high. We have already managed to contaminate quite a bit of our atmosphere and the dangers of compounding the situation are astronomical.

We all know they have a tiger by the tail (nuclear waste) and don't know how to let go (get rid of it) — but with all the resources our government has, there certainly has to be another alternative.

Sincerely
Mary & Eugene Otto

860-1

RESPONSE TO COMMENT
COMMENTOR NO. 860: OTTO, MARY & EUGENE

Response to Comment No. 860-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 861: DENZER, FREDERIC F.

22 JUNE 95

DEAR MR (KNUCKLE) HEAD;

WHEN ARE YOU MAGGOTS IN DC GOING TO QUIT CRAPPING ON THE AMERICAN CITIZENS?? WHOSE REAR ARE YOU KISSING OVERSEAS? WHY DO WE HAVE TO TAKE A CHANCE ON SOME CEO AND HIS JERK-OFFS, MAKING A "SMALL" MISTAKE.

WHY ARE YOU CLOWNS SO INTERESTED IN KEEPING SOME LOW LIFE FOREIGN COUNTRIES SAFE. OIL?? GOLD?? IMPORT MARKETS?

AND JUST WHAT IS YOUR INTEREST IN FIGHTING TO PUT THAT CRAP THROUGH WASHINGTON STATE. YOU AND DIP SHIT LOWERY GOT A SCAM GOING. I KNOW, SHIP THE STUFF INTO THE EAST COAST AND THEN TO "ARKANSAS." SEE HOW THE GOOD OLE BOY LIKS THAT. IF YOU DONT LIKE THIS LETTER, WIPE YOUR BUREAUCRATIC, BUNGLING BUTT WITH IT.

SINCERELY,
Frederic F. Denzer WASH. ST.

861-1

861-2

861-3

RESPONSE TO COMMENT
COMMENTOR NO. 861: DENZER, FREDERIC F.

Response to Comment No. 861-1

An objective of the proposed action is to reduce international commerce in highly enriched (weapons-grade) uranium (Section 1.2 of the EIS). Civilian uses of HEU are discouraged because HEU can be used to construct nuclear weapons which could fall into the hands of terrorists or irresponsible nations.

Response to Comment No. 861-2

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 861-3

The commentor's preference for acceptance of spent nuclear fuel from foreign research reactors at ports located on the east coast is noted. As discussed in Section 2.2.1.6 (See Figure 2-3) and Appendix D of the EIS, six ports on the east coast were selected as candidate ports of entry for acceptance of foreign research reactor spent nuclear fuel. Figure 2-3 of the EIS also shows the location of potential DOE management sites. No suitable management site exists in Arkansas, and it would not be cost-effective to construct one in that state.

COMMENTOR NO. 862: LOTH, PATRICIA K.

June 23, 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. SW
Washington, DC 20585

Dear Mr. Head:

As long-time residents of the city of Tacoma, Washington, we are writing to oppose highly radioactive nuclear waste being shipped through the Port of Tacoma.

We have lived in Tacoma for over 40 years, have raised our children here, and now our grandchildren. We are very conscious of our environment and this beautiful country. However, we suffered through the ASARCO Smelter spewing sulphur, and now the aftermath of the arsenic, lead, and cadmium deposits in soil in most of the yards in North and West Tacoma. Chemists tested the soil and water constantly for contaminants, which was kept from the general public until the facts were brought out. The smelter is now gone, but the contamination is not and never will be.

We protest any more opportunities to possibly contaminate this area. Frankly, we do not trust the U.S. Government to be truthful or as careful as it proposes to be. **Accidents do happen, have happened, and are covered up.** We have seen unqualified people working in very dangerous, technical capacities, sometimes compounding potential problems by drug and alcohol use. It has been proven in some instances that the government covered up dangerous and/or lethal situations with no regard for citizens. 862-1

Again,we, and our co-workers and neighbors, plead **that you do not ship radioactive nuclear waste through the Port of Tacoma.** We urge you to keep the radioactive nuclear waste away from the United States in a safe place.

Sincerely,

Donald G. Loth
Patricia K. Loth

Patricia K. Loth
Donald G. Loth
2537 N. Fremont
Tacoma, WA 98406

RESPONSE TO COMMENT
COMMENTOR NO. 862: LOTH, PATRICIA K.

Response to Comment No. 862-1

The commentor's opposition to Management Alternative 1 and bringing foreign research reactor spent nuclear fuel through the Port of Tacoma are noted. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel casks are also low (Section 4.2.2.2).

DOE intends to fully cooperate with local, State and other Federal authorities who will oversee the safe transportation of the foreign research reactor spent nuclear fuel and DOE does not intend to hide any information relevant to the proposed action.

COMMENTOR NO. 863: REIMER, EVERETT

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Everett Reimer Phone: 935-6732

Title and Organization:

Address: 2946 Hillsdale, Pleasant Hill, Calif. 94523

City: Pleasant Hill State CALIF Zip 94523

*** COMMENTS ***

In the late 1940s I was a consultant to the Atomic Energy Commission, which, I understand, has since been incorporated into the Department of Energy. It is deeply disappointing [redacted] to learn that the high hopes we had at that time of containing the dangers of nuclear use, that Albert Einstein, among others, fervently warned against, have been steadily dissipated. It is even more disappointing to realize that our own government policies have led to this result and continue, apparently, to make matters worse. The role of private profits accruing to some of our largest corporations is a disillusioning feature of the whole history of the past fifty years of nuclear build-up and proliferation . The secrecy and lies employed to cover up this feature and other (over)

863-1

To Mail in Comments, Address Correspondence to:

Ms. Hazel O'Leary
Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 863: REIMER, EVERETT

Response to Comment No. 863-1

As discussed in Section 1.1 of the EIS, shortly after the end of the Second World War, the United States Government realized that it must take action to prevent the spread of nuclear weapons. Thus, the United States adopted policies which would encourage peaceful applications of nuclear technology, while discouraging the spread of nuclear weaponry. Those same general goals remain in effect today. An objective of the proposed action is to reduce international commerce in weapon-grade materials, and to encourage the use of LEU fuel in foreign research reactors (Section 1.2 of the EIS).

aspects of our policies make things even worse, while the fact that this [redacted] effort to bamboozle the American public continues is the most frightening of all. Isn't it time to reverse course, fly right and tell people the truth? 863-1 (Cont'd.)

David Lilienthal, the first head of the Atomic Energy Commission and the former head of the Tennessee Valley Authority, was chosen by FDR and by Truman for his high ethics, good character and idealism The idea was that he would be the man to contain this dangerous substance. Now, the U.S. government's pretense of containment is a fraud. It is shipping and flying and otherwise transporting the stuff all over the world. Most of the spent fuel being returned to the U.S. is from countries like Canada and European ones that are as technologically advanced as we, as able to deal with it and less exposed to crime and terrorism. Furthermore, recent headlines indicate that the U.S. intends to resume the testing of nuclear weapons, which undermines and undoes much of the progress that has been made to [redacted] stop the arms race, which could kill us all. 863-1 (Cont'd.)

Please help resist this madness and [redacted] follow the right course. To the extent that you have, we thank you.

COMMENTOR NO. 864: MALLINSON, VALERIE

Valerie Mallinson
959 Harrison St., #101
Seattle, WA 98109
(206) 282-7429

July 3, 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
US Department of Energy
1000 Independence Ave SW
Washington DC 20585

FAX (202) 586-5256

Dear Mr. Head:

I read an article in the Tacoma News Tribune that I could not believe. The article said that you and others like you in Washington 'Didn't have the time to listen' to those of us who live in and near Tacoma regarding the importing of nuclear waste. 864-1

I was stunned, and now that I've recovered, am furious that this "little" issue just isn't worth your time. A decision of this magnitude could detrimentaly effect millions of lives of U.S. citizens, and you don't have the time?????

The government's inability to clean up the already existing Superfund sites leaves me with no doubt that this action of importing yet another problem is completely beyond your ability to manage safely. 864-2

What I don't understand is why this is even an issue. Why are we considering importing this deadly material in the first place? Why is it our responsibility to clean up other's messes? Perhaps you can help clear this up for me. 864-3

Please listen now, and refuse this waste from ever entering our shores. Don't wait to listen to the screams and tears of those dying of radiation poisoning. If listening to us is not a valuable enough use of your time, perhaps spending a day in a children's leukemia ward would be a better alternative. It might give you a clue of the potential suffering you would be so casually endorsing lest you think I and others like me are exaggerating or being alarmist. 864-4

Thank you for your precious time.

Sincerely,

Valerie Mallinson

Valerie Mallinson
Concerned Local Citizen

RESPONSE TO COMMENT
COMMENTOR NO. 864: MALLINSON, VALERIE

Response to Comment No. 864-1

While it would be impractical for the Secretary of Energy to personally review and respond to all of the written and oral comments concerning this EIS, this information was reviewed by the Program Manager and his staff. The Program Manager is responsible for relaying public views and concerns to the Secretary of Energy and her staff. The EIS, including comments and responses, and Record of Decision are subject to approval by the Secretary of Energy. All comments received during the ninety day comment period are noted and answered in this document. Under NEPA and DOE's environmental regulations (Section 5 of the EIS), public participation and comments are an integral part of the environmental process.

Response to Comment No. 864-2

Spent nuclear fuel from foreign research reactors has been safely managed in the United States for nearly four decades (Section 1.1 of the EIS). However, the commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

Response to Comment No. 864-3

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). The objective is to make it less likely that a terrorist group or irresponsible nation could obtain a nuclear weapon.

Response to Comment No. 864-4

The estimated human health effects of the proposed action are presented throughout Section 4 of the EIS. In all cases the human health effects are shown to be low.

COMMENTOR NO. 866: GOULETTE, WALTER & VIRGINIA

117 Tacoma Ave. N., #101
Tacoma, WA 98403

June 26, 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Dept. of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

RE: PORT OF TACOMA

Dear Mr. Head;

We are writing to you to **protest** the shipping of highly radioactive nuclear waste through the Port of Tacoma. We do not think it wise to transport such toxic material in such a highly populated, earthquake-prone area. 866-1

Why should the United States bear the cost of disposing of these materials when their are plants in Europe which can make better use of them? 866-2

Have you considered the alternative of shipping this material to England, for example, where they have plants to convert it for electrical use.? They might even pay us for it! 866-3

Thank you for your consideration of our input.

Sincerely,

Walter & Virginia Goulette

Walter & Virginia Goulette
(25-year residents of Tacoma)

RESPONSE TO COMMENT
COMMENTOR NO. 866: GOULETTE, WALTER & VIRGINIA

Response to Comment No. 866-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. Also, the environmental effects evaluated in the EIS determined that there would be no adverse ecological impacts to any of the ports that might be used to receive the material (Section 4.2.2 of the EIS).

Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident, and thus affect the probability of such accidents; however, the number of earthquake-induced ship and road accidents is small compared to other causes.

Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures in Tacoma to fail, is not expected to compromise the spent nuclear fuel transportation cask. Further, the analyses of impacts associated with accidents involving foreign research reactor spent nuclear fuel presented in Section 4.2.2.3 of the EIS demonstrate that the use of any of the selected ports would not pose any significant risk to the port personnel or the population near the ports. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive materials have ever been released from a spent nuclear fuel transportation cask as a result of an accident (Section 2.6.2).

Response to Comment No. 866-2

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons grade) uranium in civil programs worldwide. U.S. subsidization of the costs associated with shipping and managing this spent nuclear fuel in the U.S. is one of several options; other options include charging these nations either a competitive fee or the full cost for these activities. Reprocessing this spent nuclear fuel at existing European facilities is also an alternative under consideration in this EIS (Management Alternative 2; Sections 2.3 and 4.4.2 of the EIS).

Response to Comment No. 866-3

Yes. The overseas reprocessing option is Management Alternative 2, Subalternative 1b which is discussed in Section 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 867: RICHARDSON, MARGARET J.

June 26, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
1000 Independence Ave. S. W.
Washington D. C. 20585

I am appalled at the proposal to have nuclear waste shipped to the Port of Tacoma - or in fact any other port. 867-1

When there are alternatives such as its being reprocessed in friendly nations such as Scotland, Great Britain, etc. to a useable product, why in the world should it be stored anywhere in this country? 867-2

No matter how safe these containers are supposed to be, how many tragic accidents have there been in supposedly safe endeavors such as transporting noxious gasses by train - oil spills, etc. Not only that but it appears that we have more and more violent people in this country who could conceivably cause untold damage with this stuff being around - super safe as it might be. 867-3

It doesn't make sense to ship it across an ocean and/or continent when there are other options. Sadly, it seems like there is less and less common sense in evidence these days - in government - business - justice - it's heart-breaking. 867-2 (Cont'd.)

Please keep the stuff away from the Port of Tacoma and consider more viable options.

Thank you.

Margaret J. Richardson

M. J. Richardson
4301 South 11th
Tacoma Wa 98405-1546

RESPONSE TO COMMENT
COMMENTOR NO. 867: RICHARDSON, MARGARET J.

Response to Comment No. 867-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or any other port is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 867-2

The commentor's preference for the overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b which is discussed in Section 2.3 and 4.4.2 of the EIS.

Response to Comment No. 867-3

The spent nuclear fuel transportation casks are described in Appendix B, Section B.2 and Section 2.6.2 of the EIS. They are designed to survive severe accidents without releasing their radioactive contents.

Terrorists can commit violent acts in America. They could cause far greater damage if they were able to make a nuclear weapon. The whole purpose of this proposed action is to deny such people access to weapons-grade nuclear material and thus reduce the threat of a nuclear catastrophe.

COMMENTOR NO. 868: HOBBS, EMMETT & PATRICIA

June 24, 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Dept. of Energy
1000 Independence Avenue SW
Washington, D.C. 20585

Dear Mr. Head:

This letter is being written to inform you that we are opposed to having radioactive nuclear waste shipped through Tacoma. We were unable to attend the meeting here last week, but will do whatever is necessary to stop this proposal. 868-1

Sincerely,

Emmett W. Hobbs

Patricia A. Hobbs

Emmett and Patricia Hobbs
5415 63rd Avenue Ct. W.
Tacoma, WA 98467

RESPONSE TO COMMENT
COMMENTOR NO. 868: HOBBS, EMMETT & PATRICIA

Response to Comment No. 868-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or any other port is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 869: REDLER, GERALD C.

Charles Head
Off. of Spent Nuc. Fuel Mngmt (EM-37)
US Dept. of Energy
1000 Independence Ave. S.W.
Washington D.C. 20585

Dear Sir:
I really do not believe that it is right to bring contaminants especially of nuclear nature thru the Port of Tacoma. 869-1

This waste stuff should be sealed as best as possible right where it sits & not dirty our shores at all. 869-2

Thanks for listening
Jean G. Redler

P.S. After working many years to develope the atom & fission etc., there must be somewhere if searched for long enough, a way to cleanse - partially at least, the waste products. 869-3

RESPONSE TO COMMENT
COMMENTOR NO. 869: REDLER, GERALD C.

Response to Comment No. 869-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or any other port is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 869-2

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

Response to Comment No. 869-3

Unfortunately, due to the basic nature of the spent nuclear fuels and the fission products they contain, there is no "magic bullet" known today that will make them go away. The accepted disposal mechanism, as specified by United States Public Law 97-425, is to isolate the spent nuclear fuel in a geologic repository. The actions evaluated in this EIS are preparatory to such disposal (Section 4.2.7 of the EIS).

* This is the best available copy of this comment document.

COMMENTOR NO. 870: PIDCOCK, MARVIN & ELNORA

June 25, 1995

Dear Mr. Mead,

I'm writing this to ask you to please refrain from bring Nuclear Waste thru' our port, just why is it actually needed?

Enough is being done to destroy our natural resources without adding more destructive problems to our area & future generations as is!

I'm sure you have good intentions of cargo being stored safely, as have oil & chemicals in the past but have destroyed lots of waters plus fish & wild fuel as well.

Accidents are bound to happen-----

Sincerely,
Marvin & Elnora Pidcock
6121 So. "G" St.
Tacoma, WA. 98408

870-1

RESPONSE TO COMMENT
COMMENTOR NO. 870: PIDCOCK, MARVIN & ELNORA

Response to Comment No. 870-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any port analyzed in the EIS, is low. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

COMMENTOR NO. 871: NEIGHBOR, HELEN

June 26/1998

NO! to radioactive nuclear waste to be shipped through the Port of Tacoma.

We do not trust the Federal Government. We do not believe anything you say about safety.

You are our hired help paid for with our Tax Money. Your actions lead us to believe you have forgotten this.

Helen Neighbor
41806 Meridian
Estrville WA 98328

871-1

RESPONSE TO COMMENT
COMMENTOR NO. 871: NEIGHBOR, HELEN

Response to Comment No. 871-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 872: ODENTHAL, ALLISON A.

2615 N. Starr St.
Tacoma, WA 98403

25 June 1995

U.S. Dept. of Energy
EM-37
1000 Independence Ave. SW
Washington, DC 20585

Dear Mr. Head;

I am writing to express my disapproval of the plan to ship expended nuclear waste through the Port of Tacoma. I have three main reasons for objecting to this proposal:

1) the Port of Tacoma already suffers from massive environmental waste, including heavy metal residue, sunken junk, and industrial runoff.

2) the Puget Sound area is very heavily populated..

3) my own personal economic interest - I own a home in downtown Tacoma and fear real estate value could decline if there is even the smallest mishap. Not to mention potential damage to the ongoing plans to renovate/upgrade downtown Tacoma.

I cannot offer any suggestions of other ports to use, but would suggest you try to find a port in a less heavily populated region.

Sincerely,

Allison A. Odenthal

872-1

RESPONSE TO COMMENT
COMMENTOR NO. 872: ODENTHAL, ALLISON A.

Response to Comment No. 872-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS).

Shipment of foreign research reactor spent nuclear fuel would not jeopardize the significant cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma as noted by the commentor. Nor should it contribute to any "dirty port" stigma because the analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2 of the EIS). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Based on over 30 years experience shipping spent nuclear fuel, DOE considers that spent nuclear fuel transportation casks passing through the Port of Tacoma, Commencement Bay, or any other port or waterway would not affect air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and emphasize the no-impact nature of these shipments on air and water quality.

COMMENTOR NO. 873: DOLSON, PATRICIA F.

June 25, 1995
Gig Harbor,WA

Dear Mr. Head;

As a U.S.citizen and resident of Washington State I strongly object to having nuclear waste shipped through the Port of Tacoma. This appears to be an irresponsible act on the part of our government and the people of Washington state are not going to sit back and take it. 873-1

The people of Russia did not have the freedom to speak. We do. Listen to us.

A part of the"Silent Majority"

Patricia F. Dolson

RESPONSE TO COMMENT
COMMENTOR NO. 873: DOLSON, PATRICIA F.

Response to Comment No. 873-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or any other port is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 874: CASTANHA, LESLIE

JUNE 26, 1995

LESLIE CASTANHA
1105 SPRING ST # 707
SEATTLE, WA 98104

CHARLES HEAD
PROGRAM MANAGER
OFFICE OF SPENT NUCLEAR FUEL MANAGER
US DEPT OF ENERGY
1000 INDEPENDENCE AVENUE SW
WASHINGTON DC. 20585

DEAR MR HEAD,

I WASN'T ABLE TO ATTEND THE HEARING ON THE NUCLEAR WASTE PROPOSAL OF THE PORT OF TACOMA. THE INFORMATION THAT I RECEIVED WAS ON THE LOCAL NEWS + THE TACOMA CITY COUNCIL. I WOULD LIKE TO GIVE YOU MY VOICE ON WHY I STRONGLY DISAGREE ON THE TRANSPORTATION + BURYING OF NUCLEAR WASTE IN WASHINGTON STATE.

I GREW UP 30 MILES FROM HANFORD NUCLEAR PLANT AND NOW I AM IN MY LATE TWENTIES. A COUPLE OF HANDFULS OF PEOPLE MY AGE HAVE DIED OR ARE DYING AS WE SPEAK OF CANCER. BIRTH DEFECTS (INCLUDING MY SISTER'S BABY) + PEOPLE MY PARENT'S AGE HAVE ALL SORTS OF TUMORS + CANCERS WHICH IS A LITTLE TOO COMMON WHEN I GO BACK HOME FOR A VISIT.

IF YOU PLAN TO USE THE PORT OF TACOMA TO BRING TONS OF NUCLEAR WASTE INTO OUR STATE BY BOAT FROM OTHER FOREIGN COUNTRIES THAN TRANSPORT IT VIA TRUCK AND/OR TRAIN TO BE BURIED SOMEWHERE. WHO'S TO SAY THERE WON'T BE AN ACCIDENT OR CONTAMINATION OF THE WATER, LAND, FISH, WILDLIFE + PEOPLE. THE GOVERNMENT CAN NOT GUARANTEE THE PEOPLE AN ACCIDENT WON'T EVER HAPPEN W/O ANY EFFECT. WHO IS TO SUFFER?

HANFORD NUCLEAR PLANT IS ONE OF THE SUPER FUND CLEAN UP PROJECT, WHICH IS PAID BY THE TAX PAYERS AT A PRICE OF $1 MILLION AN HOUR FOR THE NEXT 30 YEARS

- CONTINUE -

874-1

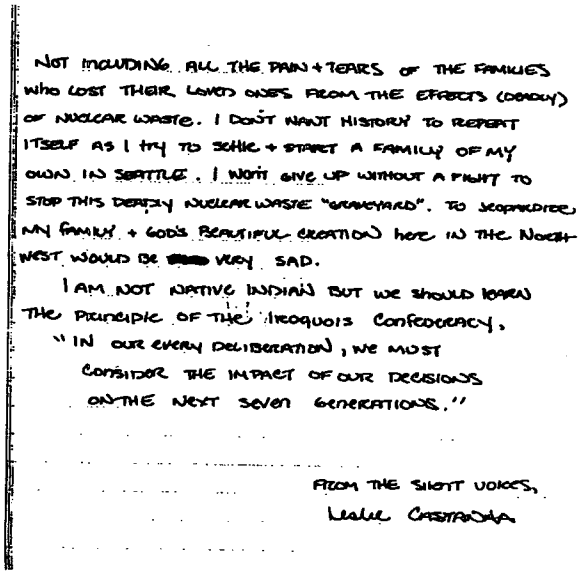
RESPONSE TO COMMENT
COMMENTOR NO. 874: CASTANHA, LESLIE

Response to Comment No. 874-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or any other port is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 874: CASTANHA, LESLIE (CONT'D.)



NOT INCLUDING ALL THE PAIN + TEARS OF THE FAMILIES WHO LOST THEIR LOVED ONES FROM THE EFFECTS (DEADLY) OF NUCLEAR WASTE. I DON'T WANT HISTORY TO REPEAT ITSELF AS I TRY TO SCHOOL + START A FAMILY OF MY OWN IN SEATTLE. I WON'T GIVE UP WITHOUT A FIGHT TO STOP THIS DEADLY NUCLEAR WASTE "GRAVEYARD". TO JEOPARDIZE MY FAMILY + GOD'S BEAUTIFUL CREATION HERE IN THE NORTH-WEST WOULD BE [redacted] VERY SAD.

I AM NOT NATIVE INDIAN BUT WE SHOULD LEARN THE PRINCIPLE OF THE IROQUOIS CONFEDERACY,

"IN OUR EVERY DELIBERATION, WE MUST CONSIDER THE IMPACT OF OUR DECISIONS ON THE NEXT SEVEN GENERATIONS."

FROM THE SILENT VOICES,
LESLIE CASTANHA

RESPONSE TO COMMENT
COMMENTOR NO. 874: CASTANHA, LESLIE (CONT'D.)

COMMENTOR NO. 875: LICHTBLAU, ANDREAS

Andreas Lichtblau
P.O. Box 211106
Crescent Valley
Nevada, 89821

Attn;
Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

June 27th, 1995

Dear Charles Head,

I received the 'DOE/EIS-0218D March 1995' about a month ago, I do have some questions concerning the DEIS.

In Volume 1, page 3-119, under **3.3.5.6 Land Use**, it says in the fourth paragraph, "There are no onsite areas subject to Native American Treaty rights or that contain any prime or unique farmland (PIC, 1992)." As for there being no Farmlands, I too would not start a Farm / Ranch in an area where Nuclear bombs are detonated not too far away. As for the 'Treaty' part, it is my understanding that these lands were never ceded to the U.S. In fact, while researching this matter, the Western Shoshone were able to provide me with a copy of the Treaty of Ruby Valley of 1863. This treaty was and still is of 'Peace and Friendship' between the two Nations (The Western Shoshone and The U.S. Government). The Treaty explains what rights the U.S. has on Western Shoshone Lands, the treaty does not say anything about 'Nuclear Testing or Storage of Nuclear Waste'. The Western Shoshone have also told me that there never was an agreement stating otherwise. 875-1

Could you please clarify for me who actually has rights to these lands that the U.S. Government plans to use as a Facility to store Spent Nuclear Fuel. Could you also send me a copy of any document stating the the Western Shoshone actually did sell or cede the land to the U.S. Government. Any land title exchange should have happened between the signing of the Treaty Of Ruby Valley of 1863 and the present date (1995).

2.)

DOE/EIS-0218D March 1995 Volume 1
Page 3-99 **3.3.4.3.2 Groundwater**

Groundwater Quality: The first paragraph, second sentence states that the ground water is already contaminated, what have the responsible people done to correct this disaster, be it ever so small or big. Are the people who live there still able to use their ground water to drink, irrigate with, water their animals, quench a child's thirst, how about future children? What will happen to the surrounding area in-case of an accident? Right now all this advertising is being done about how safe the 'Transportation Casks' are, I have seen footage of these tests, and the general public was not told that during these test the Casks did crack and leak water. What will happen when these casks crack and there is spent nuclear fuel in them instead of water. Is the area then going to be called "Chernobyl II"? 875-2 875-3

RESPONSE TO COMMENT
COMMENTOR NO. 875: LICHTBLAU, ANDREAS

Response to Comment No. 875-1

As stated in Section 3.3.5.6 of the EIS, it is DOE's contention that there are no onsite areas of the Nevada Test Site subject to Native American Treaty rights.

Response to Comment No. 875-2

The main portion of potable water supplies at the Oak Ridge Reservation is provided by surface rather than groundwater sources. Because of the abundance of surface water and its proximity to the points of use, almost no groundwater is used at the Oak Ridge Reservation. Although some groundwater contamination has been observed at the Oak Ridge Reservation, data indicate that most contamination remains relatively close to the source. In 1989, the Oak Ridge National Laboratory implemented an off-site residential drinking water quality monitoring program to document the groundwater quality near the Oak Ridge Reservation and to monitor the potential impact of operations on groundwater quality. Radionuclides and organics have been detected in some of the off-site monitoring wells, however, concentrations have been below drinking water standards. Section 3.3.4.3.2 of the EIS has been revised to include and document the response to the comment.

Response to Comment No. 875-3

Contrary to the commentor's statement, the prototype spent nuclear fuel transportation cask crash tests were conducted under conditions of complete openness. The public was invited, and attended each of the tests. The water leak after the crash test is a widely known subject, as documented in DOE/RW-0065, "Transporting Spent Nuclear Fuel: An Overview," March 1986. This report clearly indicates that there was some water leakage after a cask carried on a tractor-trailer crashed into a concrete block (10 feet thick) at 61 miles per hour. The crash did not damage the cask, and the same cask was later used for an 84 mile per hour crash test. The test was done with an old style spent nuclear fuel transportation cask which used liquid coolant. According to the report, the leakage, which was a very small amount (a total of about a cup of dyed water), started when the cask was hoisted free of the wreckage, and stopped when the cask was put on a different trailer for transport. The very small leak by the cask seal was due to strains placed on the cask subsequent to the crash test. The leakage was well within the NRC regulatory limit. The use of coolant in spent nuclear fuel transportation casks has been discontinued. In addition, the foreign research reactor spent nuclear fuels are intact solid fuel rods or plates, and if a cask were to break in an improbable accident, there is no radioactive liquid that could leak out and cause ground water contamination.

COMMENTOR NO. 875: LICHTBLAU, ANDREAS (CONT'D.)

3.)

Why is it the U.S.'s problem to store 'Foreign Spent Nuclear Waste'? I thought that the U.S has enough of it's own waste. It is also my understanding that if some of the U.S. reactors can't store the Spent Fuel Rods very soon, because their own storage places are almost full, that these Nuclear Reactors will have to close down, meaning that energy cannot be provided anymore. I know that a great percentage of the U.S. population would like to see these Nuclear Reactors close down and go to alternative power. Has the Government ever thought of doing what the public has asked? The U.S. Governments moto is " For the Public, of the Public", but I haven't really seen the Government actually consider doing what the Public asks them to do. Could you please explain to me why the DOE has not tried to use Wind and/or Solar energy to produce the energy that we need. Even a single Lightning Bolt would give us a substantial amount of electricity. In this day and age I would think it possible for the sceinentists to contain a single Bolt of Lightning. This would be very clean for Land-Water-Air. There would be no fear of contamination. Air quality would improve. *875-4* *875-5*

I have yet to finish reading the DEIS, but in the meantime if you would please answer my questions for me I would be thankful.

Sincerely

Andreas Lichtblau

RESPONSE TO COMMENT
COMMENTOR NO. 875: LICHTBLAU, ANDREAS (CONT'D.)

Response to Comment No. 875-4

An objective of the proposed policy is to reduce the amount of HEU available in international commerce and to encourage the use of LEU in research reactors (Section 1.2 of the EIS). The basic problem addressed in the EIS is the reduction of weapons-grade material which could be diverted for the manufacture of nuclear weapons. As discussed in Section 2.2.1.3 of the EIS, acceptance of foreign research reactor spent nuclear fuel would increase the DOE's current inventory of spent nuclear fuel approximately one percent by mass and ten percent by volume.

Due to the major differences in size (see Figure 2.5), the facilities that would be used to handle and store the foreign research reactor spent nuclear fuel cannot be used for management of power reactor spent nuclear fuel and thus would have no effect on the availability of storage space for this spent nuclear fuel.

Response to Comment No. 875-5

Consideration of alternative energy sources is outside the scope of this EIS. However, it is important to note that as part of its mission, DOE currently has ongoing programs that are seeking to develop and promote use of such alternatives, including solar and wind.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: I thi[illegible] stupid stupid" or I [illegible] heard. Are you paranoid? O[illegible] countries would use this for something instead of terror. We certainly don't need other countries so c[illegible]. If you [illegible] Washington D.C. where it [illegible] to y[illegible] then you can keep [illegible] st.

Name: Olive [illegible] Telep[illegible]506

Address: [illegible] City/Stat[illegible] Wa 98406

Send To: Charles Head, Offi[illegible] Spent Fuel Management (EM-37), Off[illegible] Environmental Management, U.S. Department of E[illegible] 1000 Independence Ave. S[illegible] Washington, DC 20585

DEAD[illegible]30, 1995

876-1

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by **June 30, 1995**. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Renton, Federal Way; Tacoma-Pierce County Visitor & Convention Bureau, Tacoma-Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

Response to Comment No. 876-1

The commentor's opposition to the acceptance of spent nuclear fuel from foreign research reactors is noted. Acceptance of foreign research reactor spent nuclear fuel for management in the United States, as described in Section 2.2 of the EIS, is one of the management alternatives evaluated in this EIS. Others include overseas management (Management Alternative 2; Section 2.3 of the EIS), combined domestic and overseas management (Management Alternative 3; Section 2.4 of the EIS), and the No Action Alternative (adopt no policy for management of spent nuclear fuel, Section 2.5 of the EIS). The proposed action supports nuclear weapons nonproliferation policies of the United States (Sections 1.1 and 1.2 of the EIS).

COMMENTOR NO. 877: COOPER, PAMELA R.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: Plea[illegible] to ship it thru a[illegible] area. I have 3 small children that I need to protect. Big business and the United States government may think [illegible] plan, but I [illegible] something [illegible] of my kids, I will. 877-1

Name: Pamela [illegible] Telephone: [illegible]-3846

Address: 259 [illegible] Ave. City/State/Zip: F[illegible]rest, WA 9846[illegible]

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. SW, Washington, DC 20585

DEADLINE: JUNE 30, 1995

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

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RESPONSE TO COMMENT
COMMENTOR NO. 877: COOPER, PAMELA R.

Response to Comment No. 877-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or any other port is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Sh[illegible] Waste Through Tacoma.

Comments: I urge [illegible] oppose the shipping the wastes [illegible] are not handling the wastes [illegible] production too well - and we really [illegible] afford to absorb wastes other than our own - but before [illegible] about the [illegible] wastes and we were [illegible] did - and we can't [illegible] this matter.

Name: Evelyn [illegible] Telep[illegible] 627-1795

Address: 909 No[illegible] S[illegible] 106 City/Sta[illegible] oma 98403

Send To: Charles Head, Offi[illegible] Spent Fuel Management (EM-37), Offi[illegible] Environmental Management, U.S. Department of E[illegible] 1000 Independence Ave. S[illegible] Washington, DC 20585

DEAD[illegible] 1995

878-1

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Ruston, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

Response to Comment No. 878-1

The commentor's opposition to accepting nuclear wastes into the United States (Management Alternatives 1 or 3; Sections 2.2 and 2.4 of the EIS, respectively) is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

COMMENTOR NO. 879: PERRY, JOHN

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: No, No, No - T[illegible] is [illegible]t an oceanside port - there is [illegible] Puget Sound waterway to navigate thr[illegible] too much opportunity for sp[illegible] and/or mishap between the ocean and Tacoma railway/ loading [illegible] - rather direct[illegible] to [illegible]se [illegible] port closer [illegible] point [illegible] arrival.

879-1

Name: John Perry Telephone: 206 597-6231

Address: P.O. Box 22[illegible]5 City/State/Zip: Tacoma, WA 98401

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, DC 20585

DEADLINE: JUNE 30, 1995

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RESPONSE TO COMMENT
COMMENTOR NO. 879: PERRY, JOHN

Response to Comment No. 879-1

The passage through Puget Sound to the Port of Tacoma does meet the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). The favorable transit from open ocean is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations such as port population, population along the route to the DOE management site, port experience with handling containers, and port facilities have also been considered in making the final selection of ports of entry. Appendix D, Section D.1.9 presents details of the port selection process.

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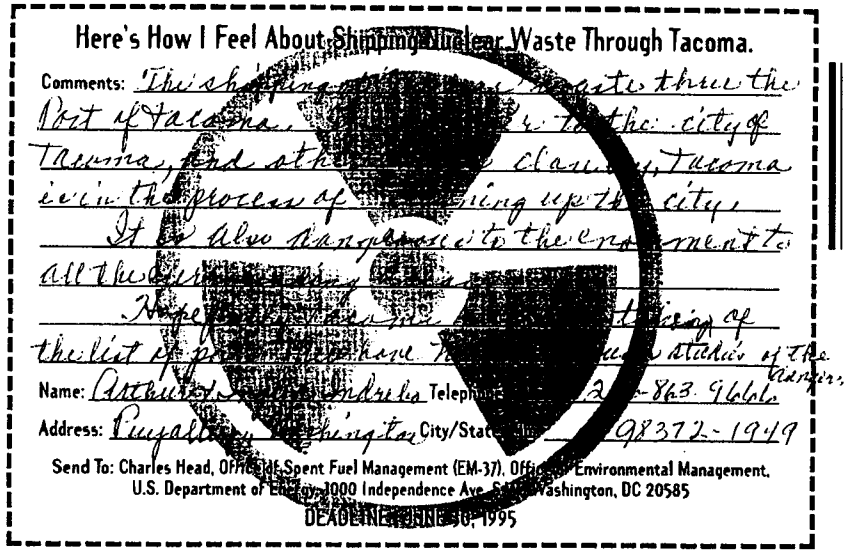

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: This shipping of waste thru the Port of Tacoma, ... to the city of Tacoma, and at the ... Tacoma is in the process of ... cleaning up the city. It is also dangerous to the environment to all the ... The ... of the list of ... have ... studies of the dangers.

Name: Arthur ... Telephone: ... 863-9666

Address: Puyallup, Washington City/State/Zip: 98372-1949

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, DC 20585

DEADLINE: JUNE 30, 1995

880-1

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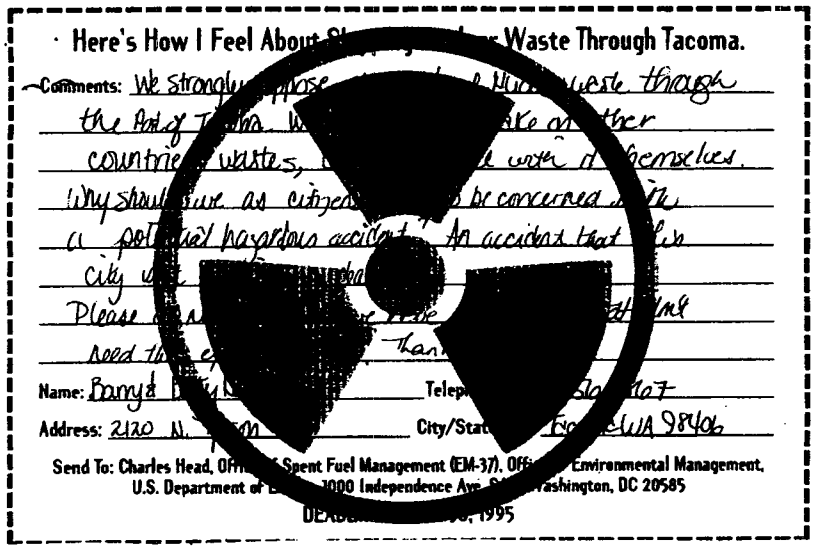
Response to Comment No. 880-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. Also, the environmental effects evaluated in the EIS determined that there would be no adverse ecological impacts to any of the ports that might be used to receive the material (Section 4.2.4.2.8 of the EIS).

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures in Tacoma to fail, is not expected to compromise the transportation cask. Further, the analyses of impacts associated with accidents involving foreign research reactor spent nuclear fuel presented in Section 4.2.2.3 of the EIS demonstrate that the use of any of the selected ports would not pose any significant risk to the port personnel or the population near the ports. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive materials have ever been released from a spent nuclear fuel transportation cask as a result of an accident (Section 2.6.2 of the EIS).

COMMENTOR NO. 881: LEWIS, BARRY & BETTY



· Here's How I Feel About S[illegible] Waste Through Tacoma.

Comments: We strongly [illegible] waste through the Port of Tacoma. [illegible] countries wastes, [illegible] themselves. Why should we as citizens [illegible] be concerned [illegible] a potential hazardous accident. An accident that [illegible] City [illegible] Please [illegible] Need [illegible] Thank [illegible]

Name: Barry & [illegible] Telep[illegible]

Address: 2120 N. [illegible] City/State [illegible] WA 98406

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, DC 20585

DEADLINE: [illegible], 1995

881-1

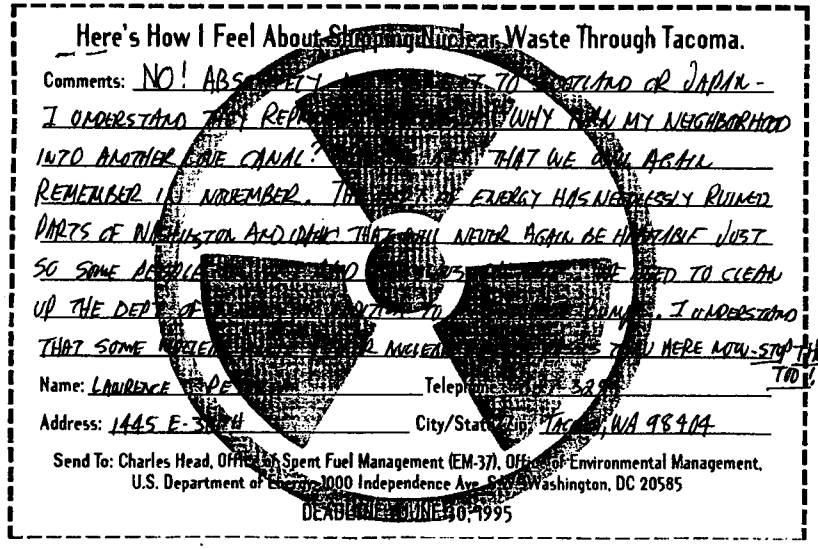
RESPONSE TO COMMENT
COMMENTOR NO. 881: LEWIS, BARRY & BETTY

Response to Comment No. 881-1

The commentor's opposition to Management Alternative 1 to the proposed action is noted. The analyses provided in the EIS indicate that the use of any of the facilities indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel or the population near the port (Sections 4.2.2 and 4.5 of the EIS).

Although response to emergencies is a local function, the Federal government, including DOE, would assist State and local governments in preparation for emergencies. Money for equipment, training programs and other assistance is supplied. In addition, DOE has emergency support teams that would be available to assist in an emergency that involved foreign research reactor spent nuclear fuel (Section 2.7 of the EIS).

COMMENTOR NO. 882: PETERSON, LAWRENCE C.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: NO! ABS[illegible] TO [illegible] OR JAPAN - I UNDERSTAND THAT REP[illegible] WHY RUIN MY NEIGHBORHOOD INTO ANOTHER ERIE CANAL? [illegible] THAT WE CAN ALL REMEMBER IT NOVEMBER. THE [illegible] OF ENERGY HAS NEEDLESSLY RUINED PARTS OF WASHINGTON AND I KNOW THAT WILL NEVER AGAIN BE HABITABLE JUST SO SOME PEOPLE [illegible] NEED TO CLEAN UP THE DEPT OF [illegible]. I UNDERSTAND THAT SOME [illegible] NUCLEAR [illegible] HERE NOW-STOP THAT TOO!

Name: LAWRENCE [illegible] Telephone: [illegible]

Address: 1445 E-[illegible] City/State/Zip: TACOMA, WA 98404

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: JUNE 30, 1995

882-1

882-2

RESPONSE TO COMMENT
COMMENTOR NO. 882: PETERSON, LAWRENCE C.

Response to Comment No. 882-1

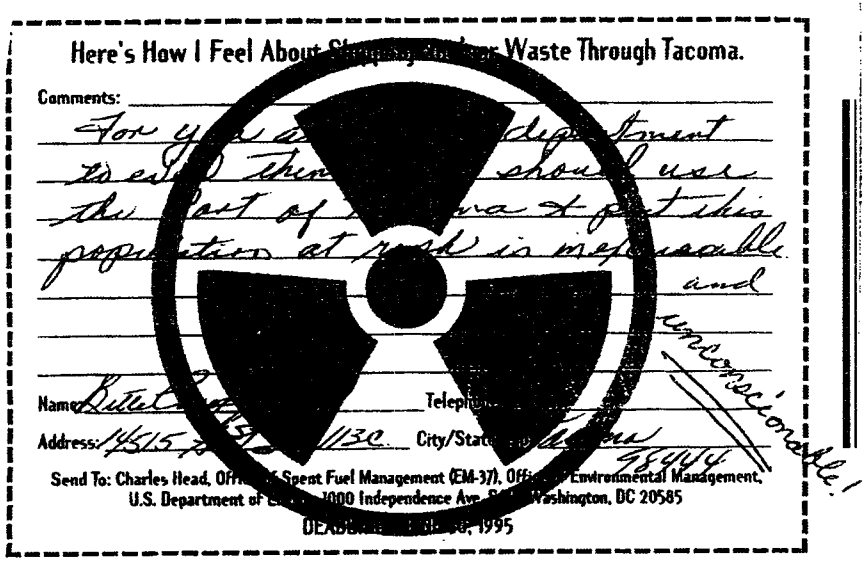
The commentor's preference for the overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b which is discussed in Section 2.3 and 4.4.2 of the EIS.

Response to Comment No. 882-2

The commentor's opposition to management of the foreign research reactor spent nuclear fuel in either the State of Washington or Idaho, is noted. As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

DOE is committed to the cleanup and restoration of several sites contaminated during the nuclear weapons development and production program. This has been the subject of other documents issued, or expected to be issued by DOE, in compliance with the requirements of NEPA. Spent nuclear fuel from foreign research reactors, which is the subject of this EIS, has been safely managed in the United States, including at the Idaho National Engineering Laboratory, for nearly four decades (Section 1.1 of the EIS). As discussed in Section 4.2 of the EIS, the risk to the environment and human health and safety of the public associated with the transportation and management of foreign research reactor spent nuclear fuel, would be low.

COMMENTOR NO. 883: CAUFFMAN, BETTE


Here's How I Feel About [illegible] Waste Through Tacoma.

Comments:

For your department to establish [illegible] should use the port of [illegible] at this population at risk is unreasonable and unconscionable!

Name: Bette [illegible] Telephone: [illegible]

Address: 4515 [illegible] 1130 City/State: [illegible] 98446

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: [illegible], 1995

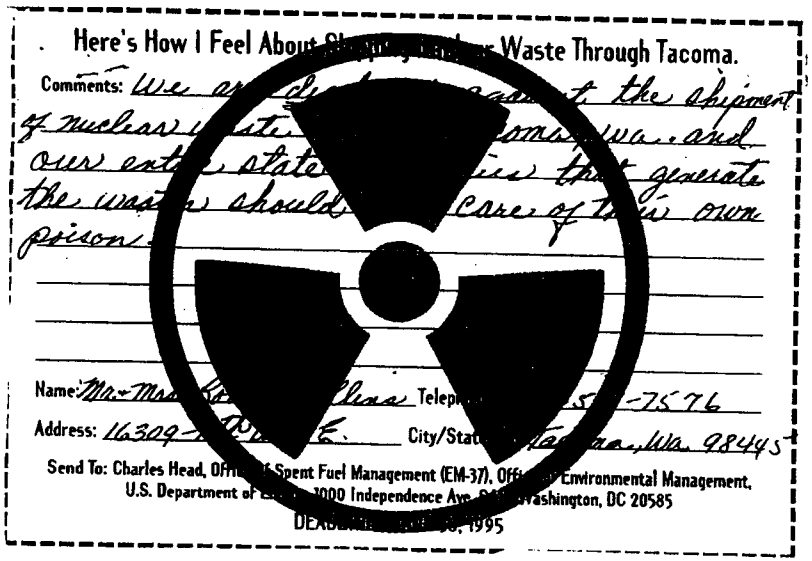
883-1

RESPONSE TO COMMENT
COMMENTOR NO. 883: CAUFFMAN, BETTE

Response to Comment No. 883-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or any other port is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 884: ROLLINS, ROBERT



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: We are dead set against the shipment of nuclear waste through Tacoma, Wa. and our entire state. Utilities that generate the waste should take care of their own poison.

Name: Mr. Mrs. Robert Rollins Telephone: 565-7576

Address: 16309 - 40th Ave E. City/State: Tacoma, Wa. 98446

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: [illegible], 1995

884-1

884-2

RESPONSE TO COMMENT
COMMENTOR NO. 884: ROLLINS, ROBERT

Response to Comment No. 884-1

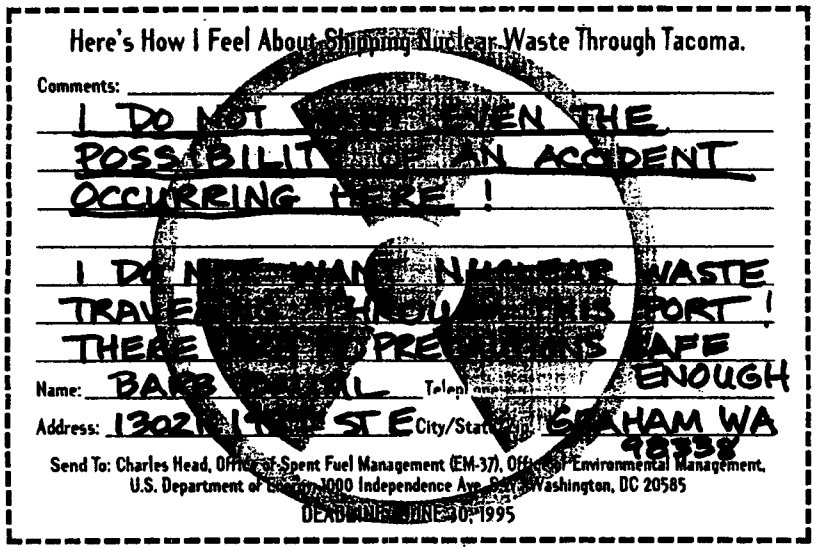
The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or any other port is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 884-2

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

COMMENTOR NO. 885: BAUML, BARB

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: I DO NOT [illegible] EVEN THE POSSIBILITY OF AN ACCIDENT OCCURRING HERE!

I DO NOT [illegible] NUCLEAR WASTE TRAVEL [illegible] THIS PORT! THERE [illegible] PRECAUTIONS [illegible] SAFE ENOUGH!

Name: BARB [illegible] Telephone: [illegible]

Address: 1302 [illegible] ST E City/State/Zip: GRAHAM WA 98338

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: JUNE 30, 1995

885-1

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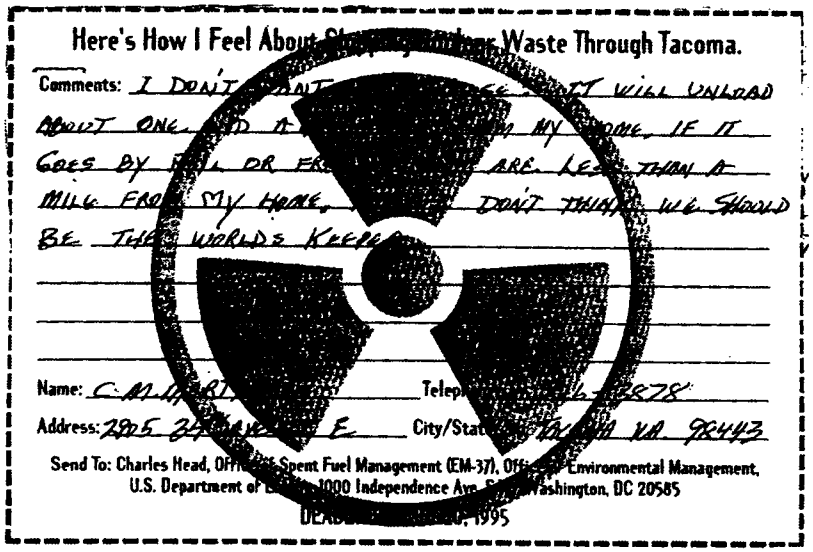
RESPONSE TO COMMENT
COMMENTOR NO. 885: BAUML, BARB

Response to Comment No. 885-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or any other port is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 886: MARTINSON, C.M.



Here's How I Feel About [illegible] Waste Through Tacoma.

Comments: I DON'T [illegible] IT WILL UNLOAD ABOUT ONE [illegible] MY [illegible] IF IT GOES BY [illegible] ARE LESS THAN A MILE FROM MY HOME. I DON'T THINK WE SHOULD BE THE WORLD'S KEEPER

Name: C.M. [illegible] Telephone: [illegible]878

Address: 2905 34th [illegible] E City/State: [illegible] WA 98443

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, DC 20585

DEADLINE: [illegible], 1995

886-1

RESPONSE TO COMMENT
COMMENTOR NO. 886: MARTINSON, C.M.

Response to Comment No. 886-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or any other port is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 887: OLINE, LARRY

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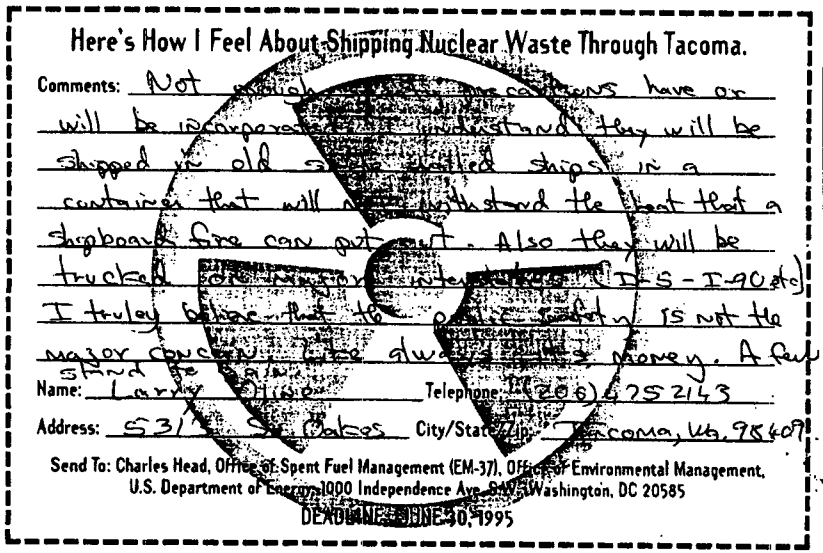

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: Not enough precautions have or will be incorporated. I understand they will be shipped in old [illegible] ships in a container that will not withstand the heat that a shipboard fire can put out. Also they will be trucked [illegible] I-5 - I-90 etc.) I truly believe that the public safety is not the major concern [illegible] money. A few [illegible]

Name: Larry Oline Telephone: (206) 475 2143

Address: 531 [illegible] St. Bakes City/State/Zip: Tacoma, Wa. 98409

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. SW, Washington, DC 20585

DEADLINE: JUNE 30, 1995

887-1

887-2

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RESPONSE TO COMMENT
COMMENTOR NO. 887: OLINE, LARRY

Response to Comment No. 887-1

The transportation casks that would be used for the foreign research reactor spent nuclear fuel are certified if their design meets certain tests, including a fire test, and if the individual casks pass periodic inspections (Section 2.6.2 of the EIS). These certification standards were developed for use of the casks on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. The duration of a ship fire is directly related to the amount of combustibles carried on board. In spite of this potential, the number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicate that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures.

In respect to the impact a ship fire might have on a spent nuclear fuel transportation cask, there are three facts that would mitigate the potential damage. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship fire's intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which at a minimum would keep fires well below the extreme temperatures needed to damage the transportation cask. For these reasons, it would be almost impossible for spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160 degrees F), the melting point of research reactor fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).

The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt research reactor nuclear fuel. Appendix D, Section D.5.3 and D.5.4 present a detailed discussion of accident probabilities and radioactive material source terms and the results of the analyses, respectively.

In conclusion, although long duration ship fires are possible, and have occurred, they are uncommon events. Analyses in the EIS indicate that even in the event of a severe ship fire involving a transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5 of the EIS).

Response to Comment No. 887-2

The commentor's concern about using major interstate highways is noted. The U.S. Department of Transportation requires the use of major interstates because they are safer than smaller roads for trucks carrying heavy loads. DOE agrees with the Department of Transportation on this issue.

COMMENTOR NO. 888: HULL, MARGARETE A.

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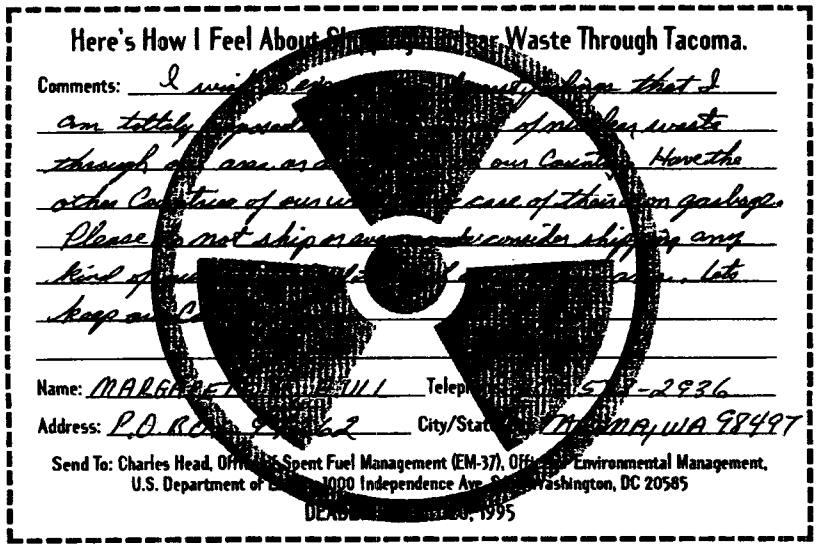

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: I wish there were a stronger word than that I am totally opposed to shipping nuclear waste through or near our County. How the other Countries of our world take care of their own garbage. Please do not ship or even consider shipping any kind of nuclear waste here. Let keep our

Name: MARGARETE A. HULL Telephone: 582-2936

Address: P.O. Box 2 City/State: Tacoma, WA 98497

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: July 20, 1995

888-1

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RESPONSE TO COMMENT
COMMENTOR NO. 888: HULL, MARGARETE A.

Response to Comment No. 888-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

The commentor's preference for the overseas management alternative is also noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

COMMENTOR NO. 889: HULL, PHILLIP

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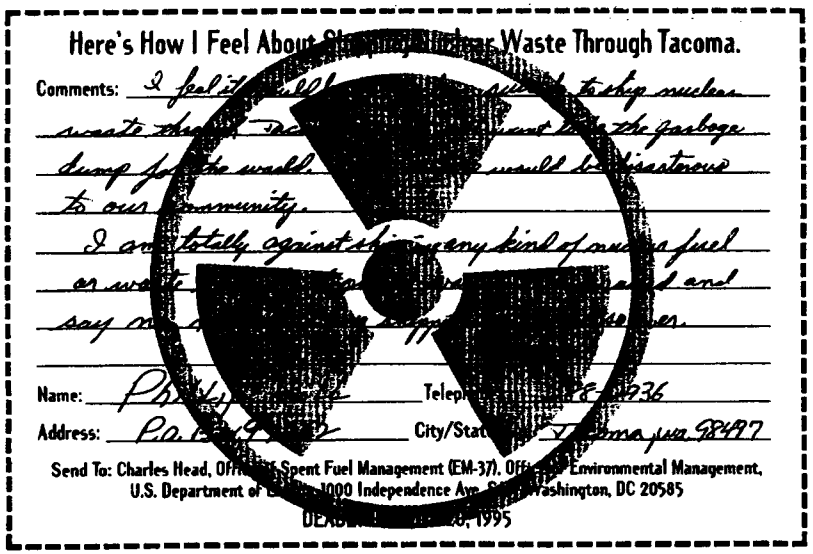

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: I feel it would be a mistake to ship nuclear waste through Tacoma and use the garbage dump for the world. It would be disasterous to our community.

I am totally against shipping any kind of nuclear fuel or waste through Tacoma and say no to shipping nuclear waste.

Name: Phillip Hull Telephone: 588-1936

Address: P.O. Box 97[illegible] City/State: Tacoma, WA 98497

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: July 20, 1995

889-1

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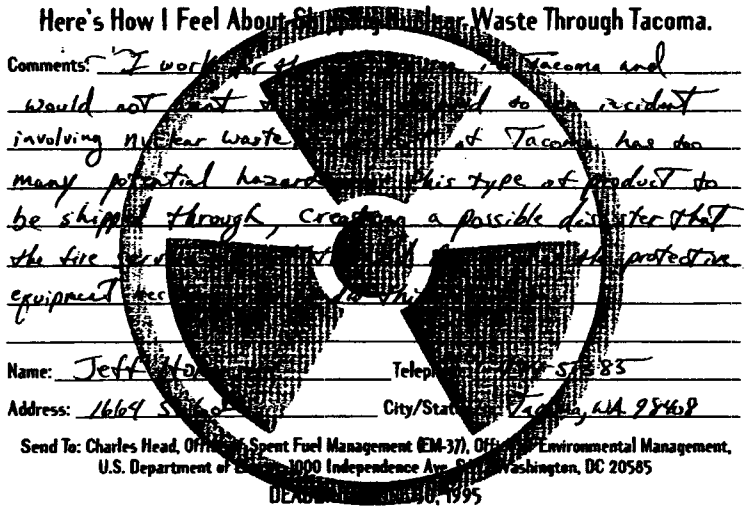
RESPONSE TO COMMENT
COMMENTOR NO. 889: HULL, PHILLIP

Response to Comment No. 889-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 890: HOKENSON, JEFF



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: I work for [illegible] in Tacoma and would not [illegible] to an accident involving nuclear waste [illegible] of Tacoma has too many potential hazards for this type of product to be shipped through, creating a possible disaster that the fire [illegible] protective equipment [illegible]

Name: Jeff [illegible] Telep[illegible]5183

Address: 1669 S[illegible] City/State: Tacoma, WA 98408

Send To: Charles Head, Off[illegible] Spent Fuel Management (EM-37), Off[illegible] Environmental Management, U.S. Department of [illegible] 1000 Independence Ave. [illegible] Washington, DC 20585

DE[illegible]30, 1995

890-1

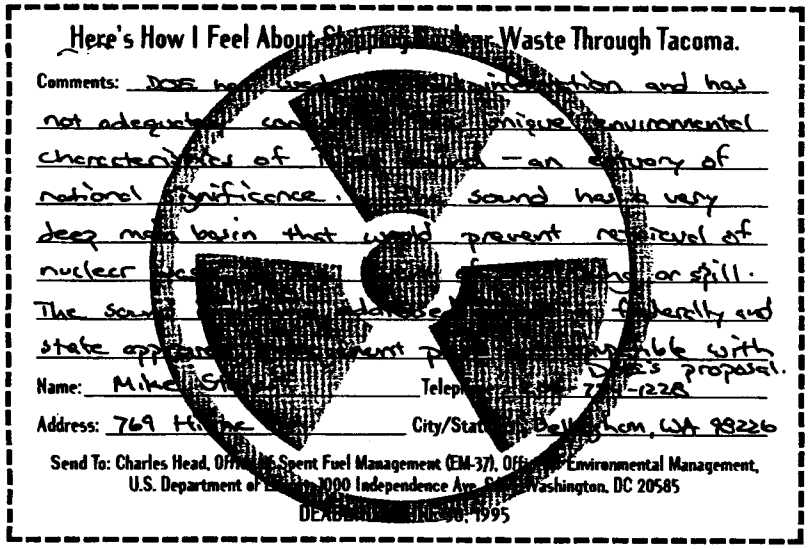
RESPONSE TO COMMENT
COMMENTOR NO. 890: HOKENSON, JEFF

Response to Comment No. 890-1

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE-sponsored meetings, informal discussions, and informational materials.

Appendix H, which was added to the final EIS in response to public comments, contains the general provisions for emergency preparedness and security measures associated with the transportation of foreign research reactor spent nuclear fuel in the United States. The provisions include an interface between DOE and State, Tribal, and local authorities, prior to the implementation of the policy, for the identification and resolution of emergency management and security issues specific to the communities that would be affected. These issues include capabilities and training of first emergency responders. Funding for special needs, if necessary, would be addressed during this interface.

Commentor No. 891: Stoner, Mike



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: DOE has [illegible] information and has not adequately [illegible] unique environmental characteristics of [illegible] — an estuary of national significance. [illegible] sound has a very deep main basin that would prevent retrieval of nuclear [illegible] or spill. The Sound [illegible] federally and state appropriate [illegible] with DOE's proposal.

Name: Mike Stoner Telephone: [illegible]-1228

Address: 769 H[illegible] City/State: Bellingham, WA 98226

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: June 30, 1995

891-1

891-2

Response to Comment
Commentor No. 891: Stoner, Mike

Response to Comment No. 891-1

Updated information on the terminals at the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS. The evaluated data on populations is from the 1990 census. Although corrected information has been included in the port information for the Port of Tacoma, the analyses provided in the EIS demonstrate that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port.

The analysis in Sections 4.2.2 and 4.5 of the EIS indicate that the risk of bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. The analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports, bays, or waterways that the material might pass through or near. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on water quality.

Response to Comment No. 891-2

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1000 feet). Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

COMMENTOR NO. 892: KLEIN, CARL

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: Question: Why [illegible] waste? Seems odd that this [illegible] material has laid under cover since time began.

Are we too scared to be placed where this item has been?

Our [illegible], any more problems [illegible] charged for a problem [illegible] handle. 892-1

Name: Carl [illegible] Telephone: [illegible]

Address: [illegible] City/State/Zip: [illegible] WA [illegible]

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, DC 20585

DEADLINE: JUNE 30, 1995

RESPONSE TO COMMENT
COMMENTOR NO. 892: KLEIN, CARL

Response to Comment No. 892-1

Spent nuclear fuel refers to enriched uranium fuel that has been used in a nuclear reactor. Because spent nuclear fuel is radioactive, it is transported in casks which shield the surroundings from radiation (Section 2.6.2 of the EIS). As noted in Section 4.2.3, spent nuclear fuel has been transported along highways and railways of the United States for over four decades without radiological incident. Analyses provided in Section 4 of the EIS indicate that no significant human health or other environmental effects are expected to result from implementation of the proposed action at the Port of Tacoma or other candidate ports.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: Why do we have to store military facilities where safety, security, individual are already available - I don't want nuclear waste - where I live -

* Ship it to the Sun *

Name: Steven R [illegible] Telephone: [illegible]965

Address: 9801 Ke[illegible] City/State: Tacoma Wa 98498

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., Washington, DC 20585

DEADLINE: June 30, 1995

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Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Renton, Federal Way; Tacoma-Pierce County Visitor & Convention Bureau, Tacoma-Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

893-1

Response to Comment No. 893-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or any other port is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 894: REED, JOE

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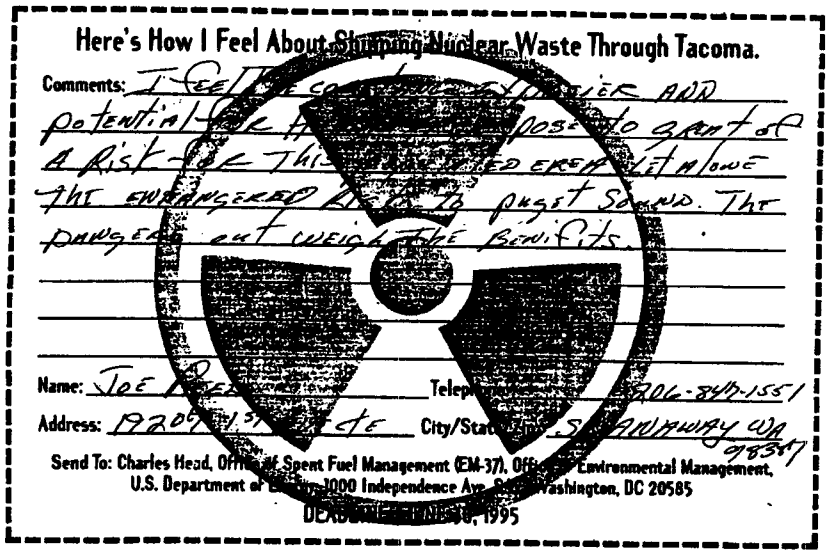

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: I FEEL [illegible] AND POTENTIAL [illegible] TO GRANT OF A RISK FOR THIS [illegible] EVEN LET ALONE THE ENDANGERED [illegible] PUGET SOUND. THE DANGERS OUT WEIGH THE BENIFITS.

Name: JOE REED Telephone: 206-847-1551

Address: 8206 [illegible] City/State: S[illegible] HWAY WA 98387

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: June 30, 1995

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894-1

RESPONSE TO COMMENT
COMMENTOR NO. 894: REED, JOE

Response to Comment No. 894-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or any other port is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

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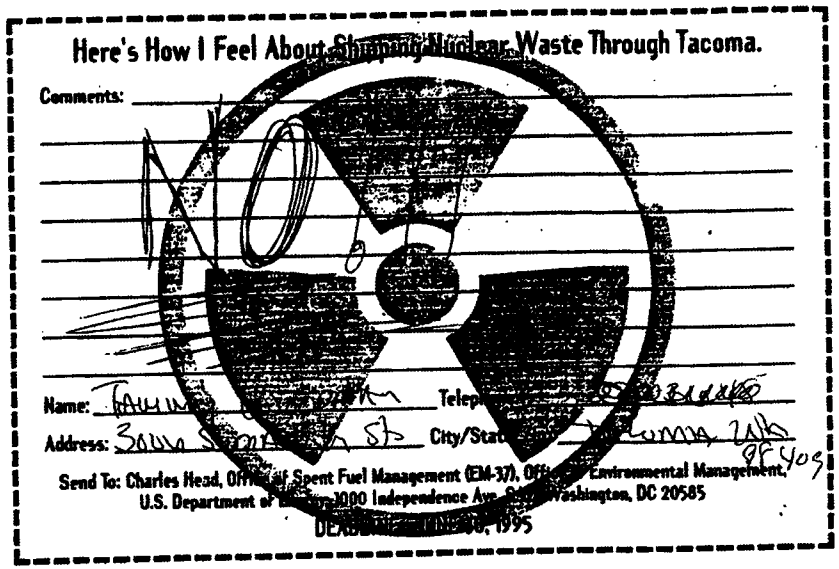

895-1

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Response to Comment No. 895-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or any other port is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 896: DUNIGAN, STEVEN R.

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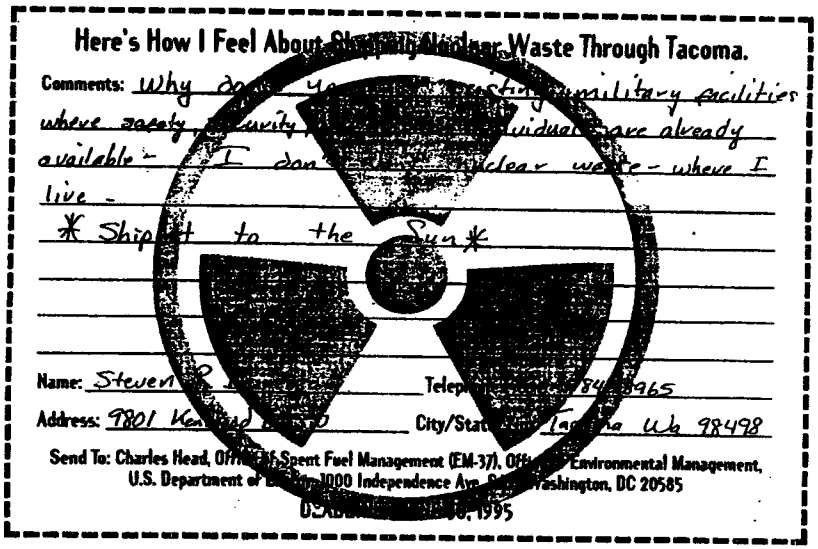

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896-1

RESPONSE TO COMMENT
COMMENTOR NO. 896: DUNIGAN, STEVEN R.

Response to Comment No. 896-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted.

Based on the analyses of impacts associated with accidents and incident-free operations involving foreign research reactor spent nuclear fuel, DOE considers that commercial ports and facilities and commercial freighters represent an acceptable option for the transportation of foreign research reactor spent nuclear fuel (Section 4.2.2.3 of the EIS presents the consequences of port accidents and Section 4.2.2.2 presents impacts of incident-free operation).

To address several comments, DOE has added a paragraph to Section 2.6.3.2.1 of the EIS to discuss why special security is not needed for the receipt of foreign research reactor spent nuclear fuel at commercial ports.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: ISN'T IT OBVIOUS ?!!

Name: Michelle Baurdeau Telephone: (206) 581 1855

Address: 11815 Gravelly Lk Dr SW City/State: Tacoma, WA 98499

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. SW, Washington, DC 20585

DEADLINE: June 30, 1995

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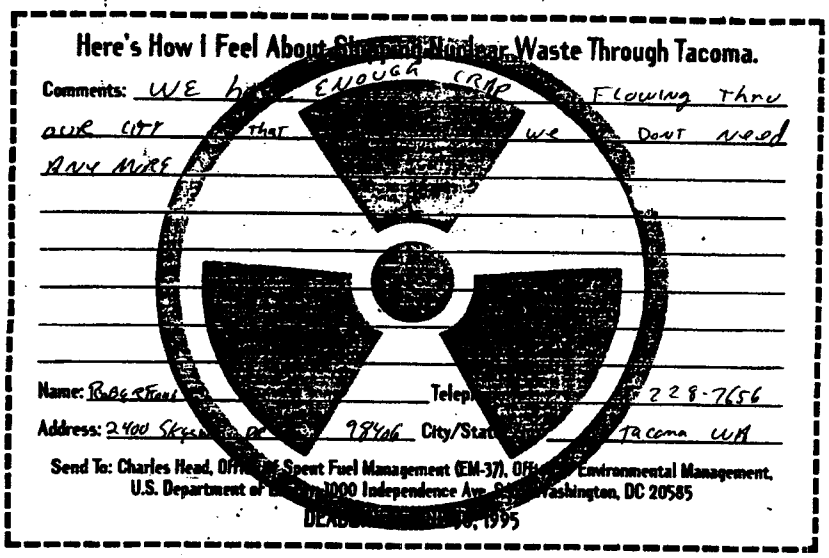
897-1

Response to Comment No. 897-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 898: RHONE, ROB

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: WE have ENOUGH CRAP Flowing Thru
our CITY That we DONT NEED
ANY MORE

Name: ROBERT RHONE Telephone: 228-7656

Address: 2400 Sky... 98406 City/State: Tacoma WA

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

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898-1

RESPONSE TO COMMENT
COMMENTOR NO. 898: RHONE, ROB

Response to Comment No. 898-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

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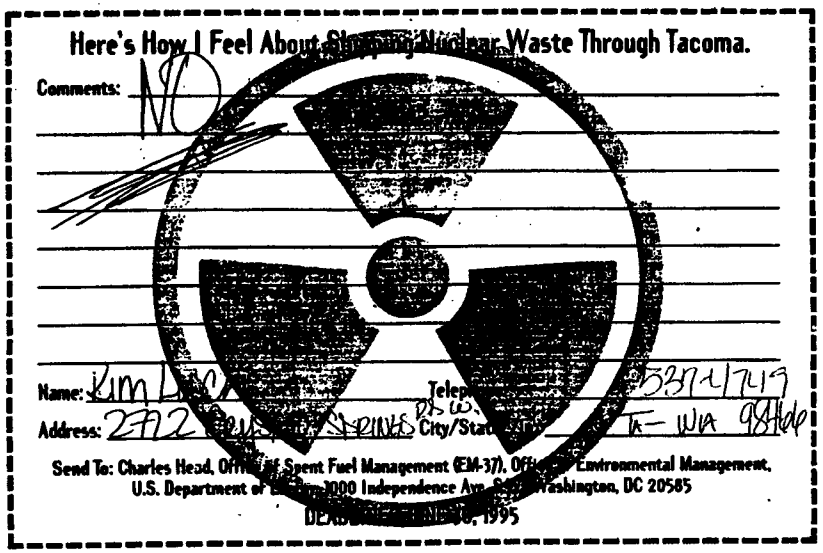

899-1

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Response to Comment No. 899-1

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COMMENTOR NO. 900: OBE, PATY

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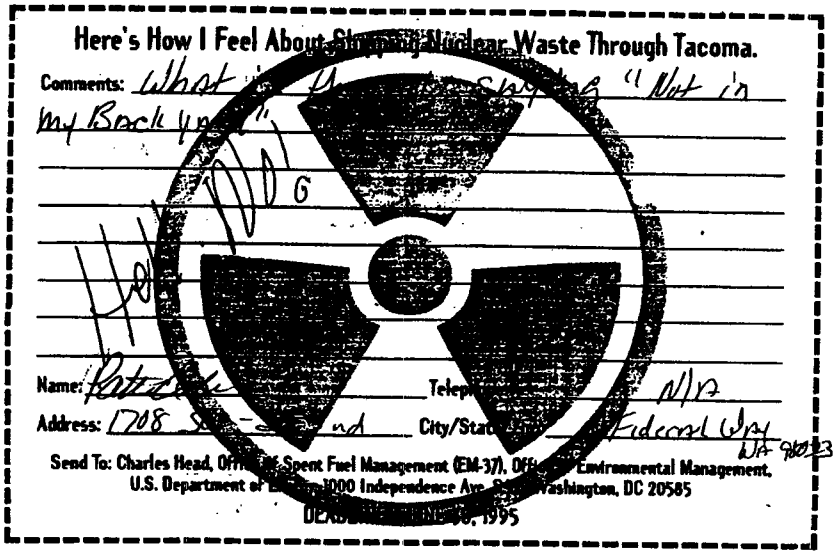

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: What [illegible] shipping "Not in my Back Yard"

Name: [illegible] Telephone: N/A

Address: 1708 S[illegible]nd City/State: Fideral Way WA 98023

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: June 30, 1995

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900-1

RESPONSE TO COMMENT
COMMENTOR NO. 900: OBE, PATY

Response to Comment No. 900-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 901: PARKINSON, WINDSOR

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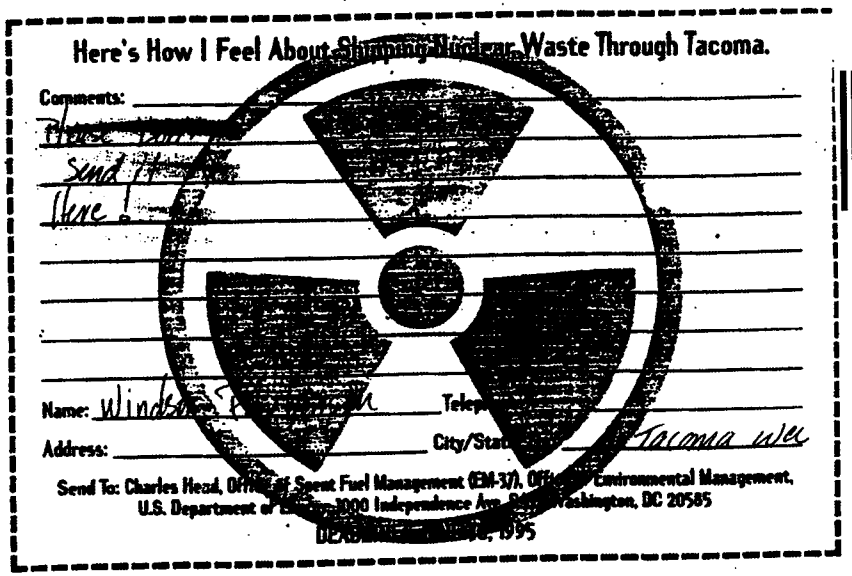

901-1

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RESPONSE TO COMMENT
COMMENTOR NO. 901: PARKINSON, WINDSOR

Response to Comment No. 901-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 902: SMITH, ANTHONY

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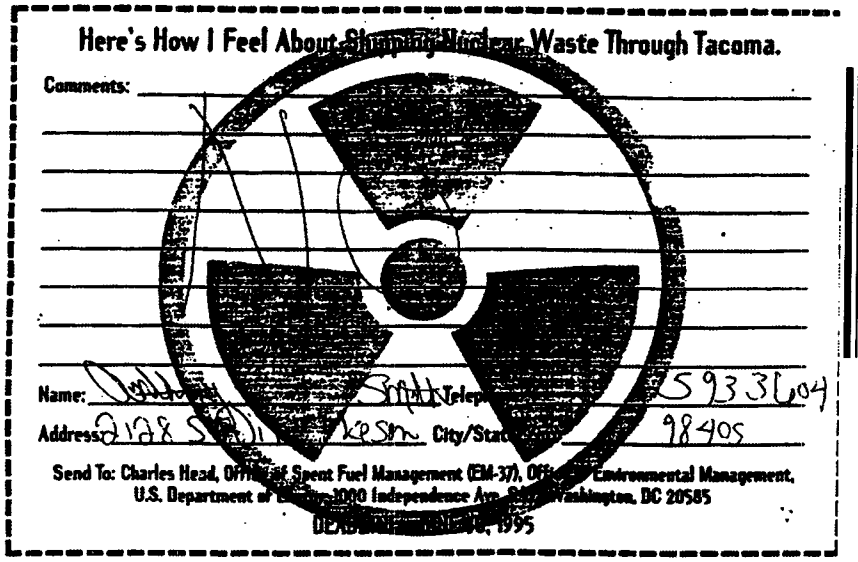

902-1

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RESPONSE TO COMMENT
COMMENTOR NO. 902: SMITH, ANTHONY

Response to Comment No. 902-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

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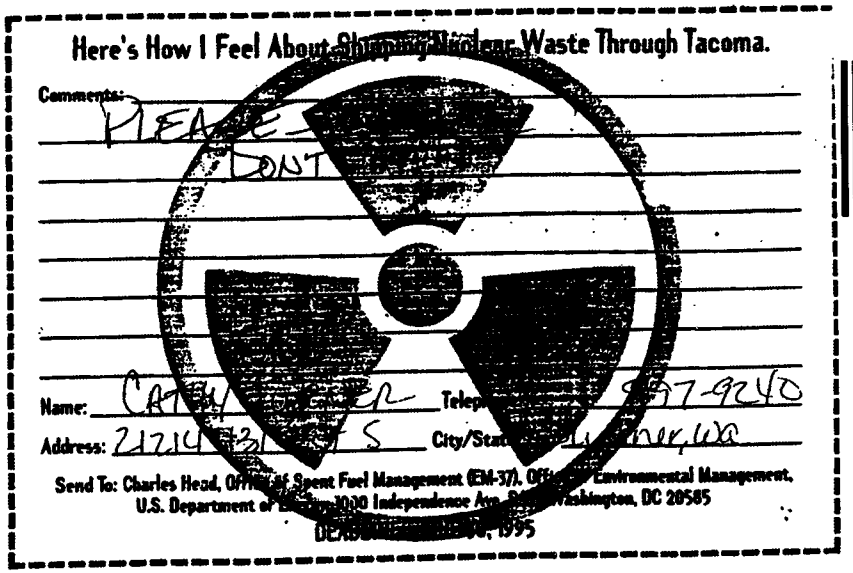

903-1

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Response to Comment No. 903-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 904: DUNIGAN, SUE

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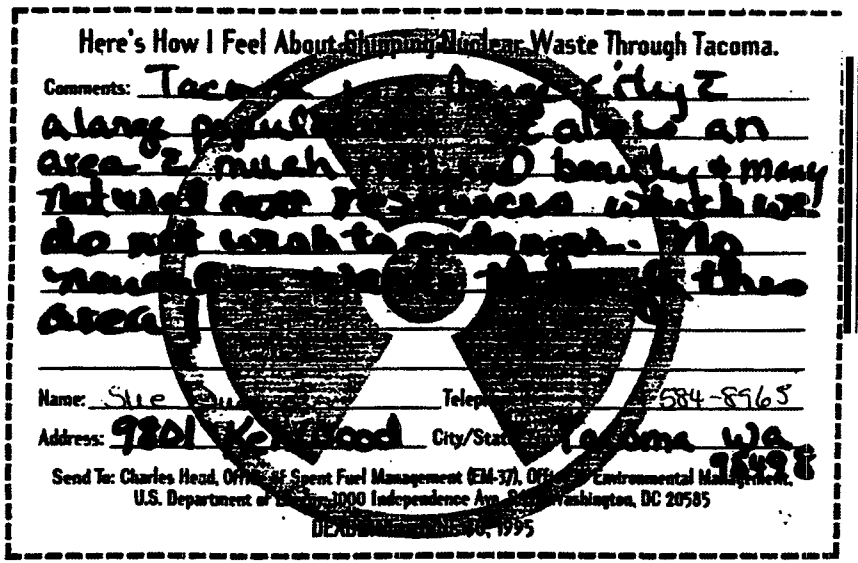

904-1

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RESPONSE TO COMMENT
COMMENTOR NO. 904: DUNIGAN, SUE

Response to Comment No. 904-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

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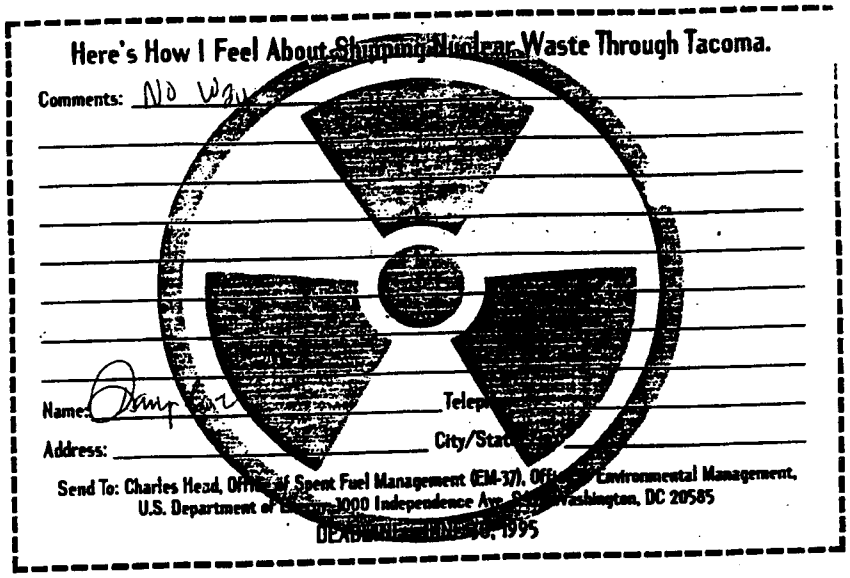

905-1

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For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Renton, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

Response to Comment No. 905-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 906: GOOCH, DANA

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Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: No NOT HERE I have Kids and DO Not Care for an accident that may cause harm due to the possibility of contamination. Yes it can happen that's why they are called ACCIDENTS!

Name: [illegible] Telephone: (206) 759-0932

Address: 3722 [illegible] City/State: Tacoma, Wa. 98406

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: June 30, 1995

906-1

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RESPONSE TO COMMENT
COMMENTOR NO. 906: GOOCH, DANA

Response to Comment No. 906-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

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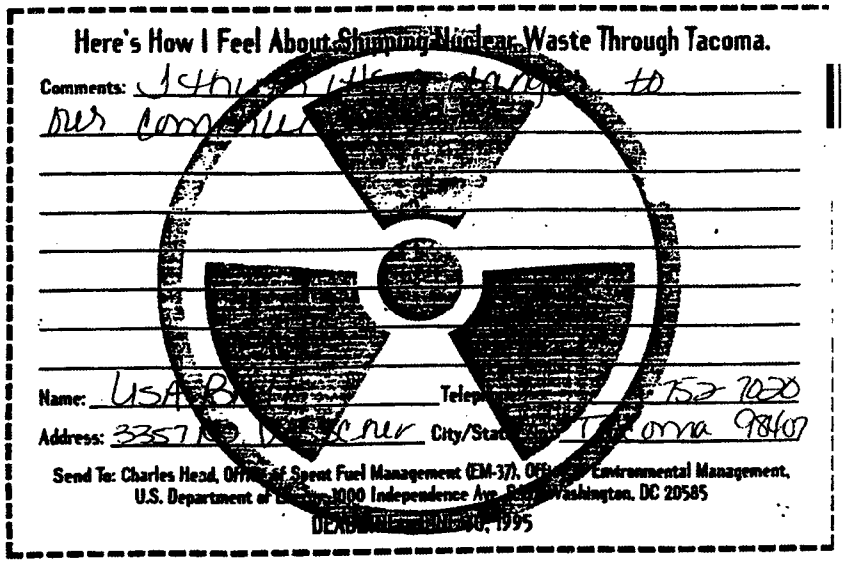

907-1

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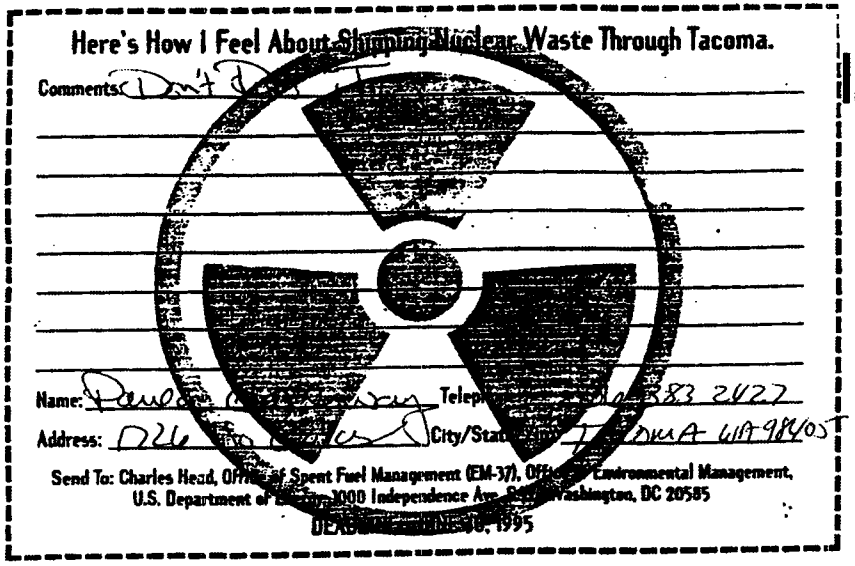
Response to Comment No. 907-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 908: GALLOWAY, PAULA

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



908-1

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RESPONSE TO COMMENT
COMMENTOR NO. 908: GALLOWAY, PAULA

Response to Comment No. 908-1

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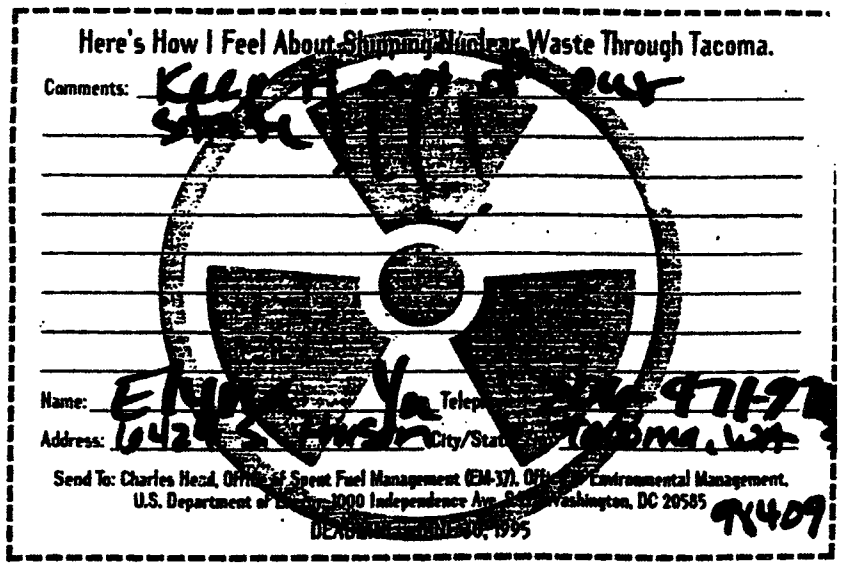

909-1

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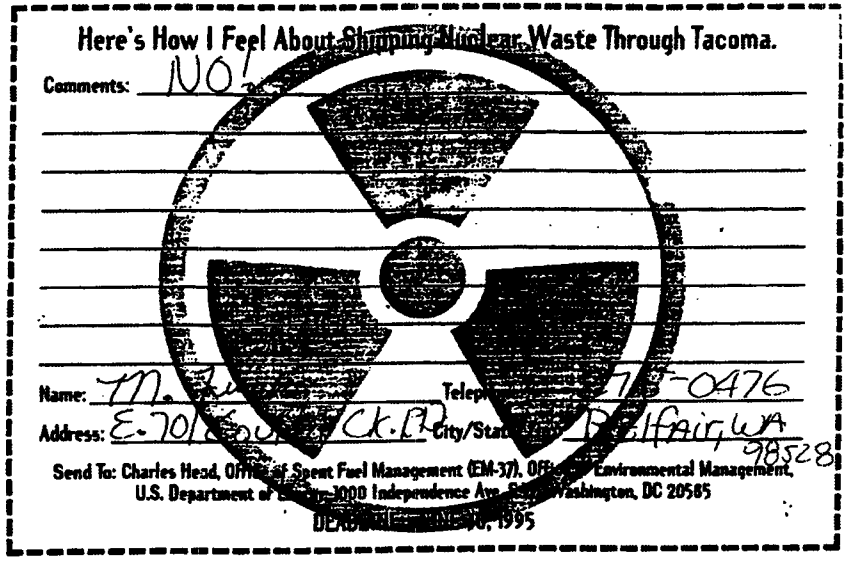
Response to Comment No. 909-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 910: FUSKI, M.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



910-1

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RESPONSE TO COMMENT
COMMENTOR NO. 910: FUSKI, M.

Response to Comment No. 910-1

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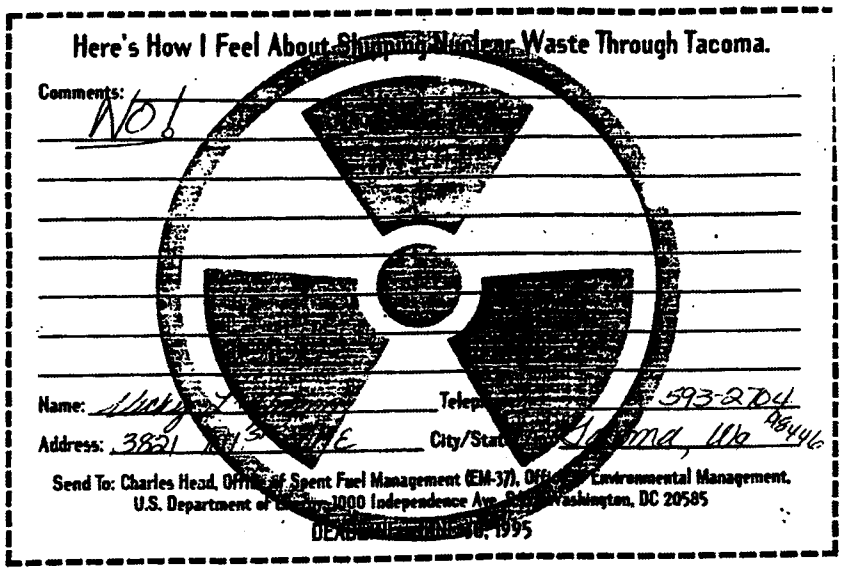

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: NO!

Name: [illegible] Telep[illegible] 593-2704

Address: 3821 [illegible] E City/Stat[illegible] Tacoma, Wa 98446

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of [illegible] 1000 Independence Ave. [illegible] Washington, DC 20585

DEA[illegible] 30, 1995

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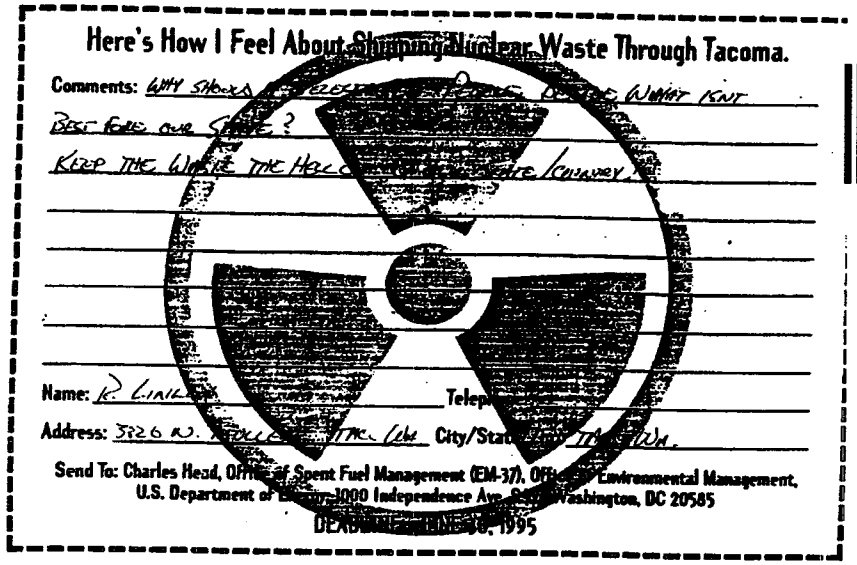
911-1

Response to Comment No. 911-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 912: LINLEY, R.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



912-1

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RESPONSE TO COMMENT COMMENTOR NO. 912: LINLEY, R.

Response to Comment No. 912-1

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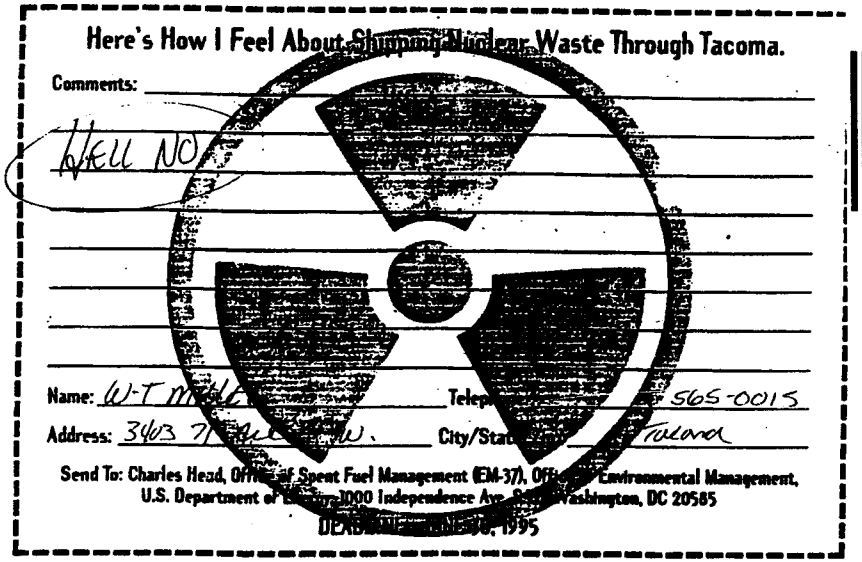

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: HELL NO

Name: W-T M[illegible] Telep[illegible] 565-0015

Address: 3403 7[illegible] W. City/Stat[illegible] Tacoma

Send To: Charles Head, Offi[illegible] of Spent Fuel Management (EM-37), Offi[illegible] Environmental Management, U.S. Department of E[illegible] 1000 Independence Ave. S[illegible] Washington, DC 20585

DEA[illegible] [illegible], 1995

913-1

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Response to Comment No. 913-1

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COMMENTOR NO. 914: VILLA, DEXTER

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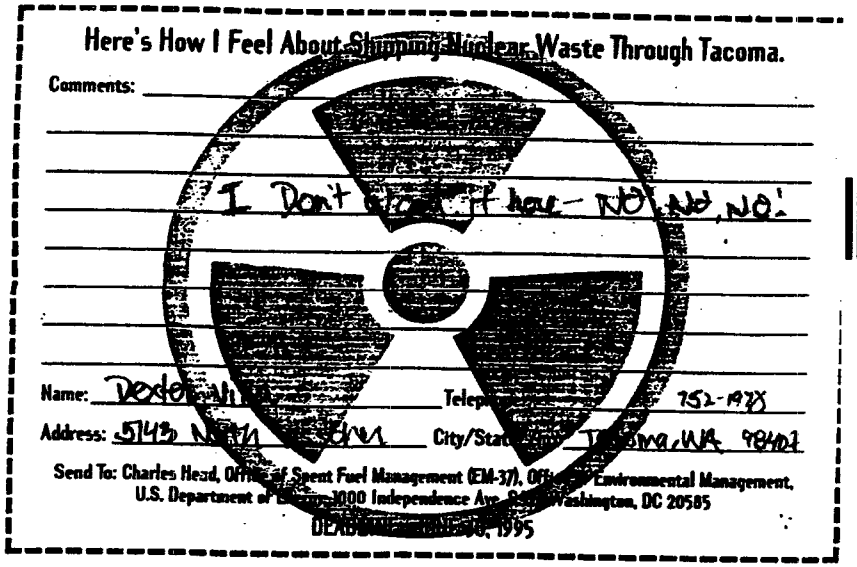

914-1

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RESPONSE TO COMMENT
COMMENTOR NO. 914: VILLA, DEXTER

Response to Comment No. 914-1

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Commentor No. 915: Wood, Chiara

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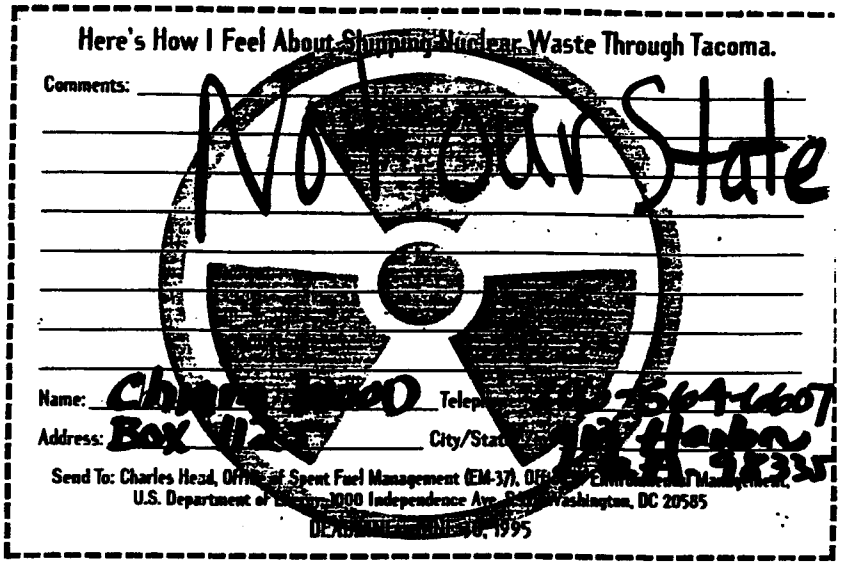

915-1

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Response to Comment
Commentor No. 915: Wood, Chiara

Response to Comment No. 915-1

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COMMENTOR NO. 916: GAFFINEY, COREY

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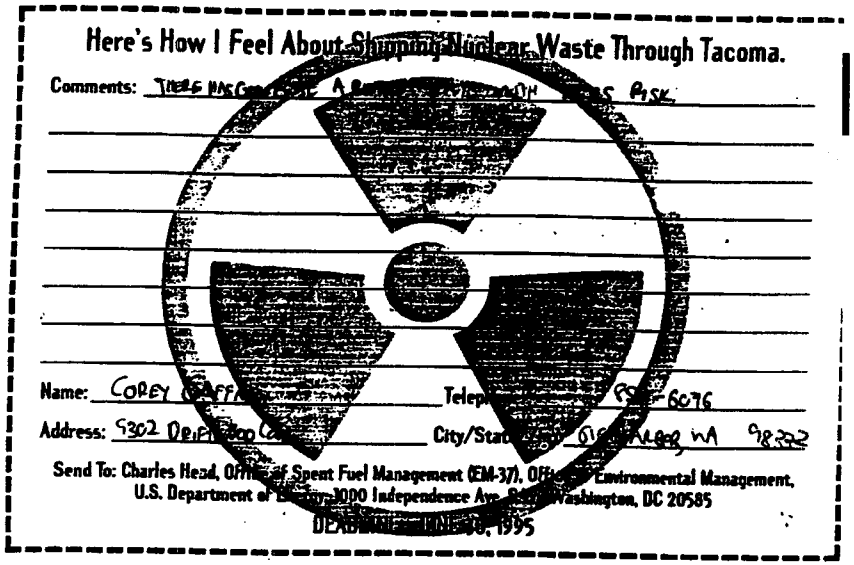

916-1

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RESPONSE TO COMMENT
COMMENTOR NO. 916: GAFFINEY, COREY

Response to Comment No. 916-1

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COMMENTOR NO. 917: LARSON, KRISTEN J.

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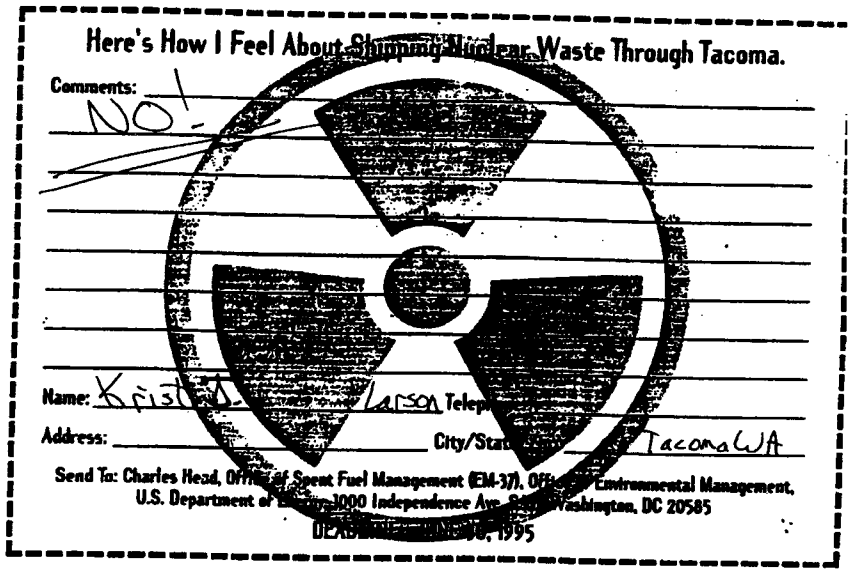

917-1

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RESPONSE TO COMMENT
COMMENTOR NO. 917: LARSON, KRISTEN J.

Response to Comment No. 917-1

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COMMENTOR NO. 918: MOOS, JESSIE M.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: Definately No No No

Name: Jessie M [illegible] Telep[illegible] 564-2453

Address: [illegible] City/Sta[illegible]

Send To: Charles Head, Offi[illegible] of Spent Fuel Management (EM-37), Offi[illegible] Environmental Management, U.S. Department of [illegible] 1000 Independence Ave. S[illegible] Washington, DC 20585

DE[illegible] [illegible], 1995

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RESPONSE TO COMMENT
COMMENTOR NO. 918: MOOS, JESSIE M.

Response to Comment No. 918-1

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918-1

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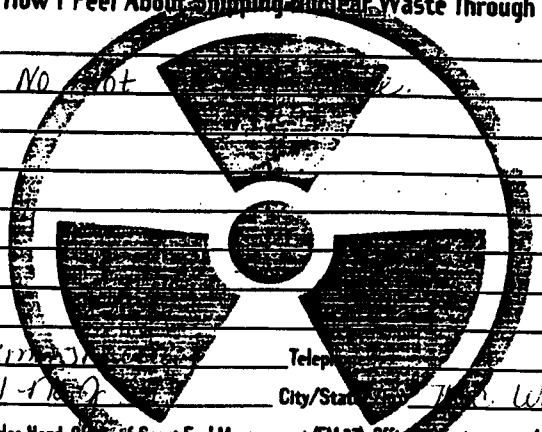
Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: No Not



Name: Norma

Address: 911 N

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: June 30, 1995

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919-1

Response to Comment No. 919-1

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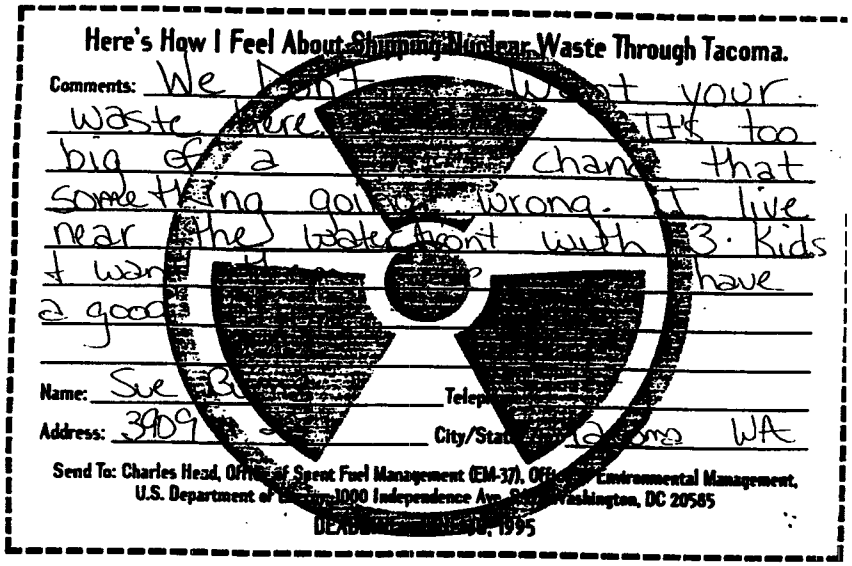
COMMENTOR NO. 920: BURNS, SUE

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: We Don't Want your waste here. It's too big of a chance that something goes wrong. I live near the Waterfront with 3 Kids I want them to have a good

Name: Sue B... Telep...

Address: 3909 ... City/State ... Tacoma WA

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: June 30, 1995

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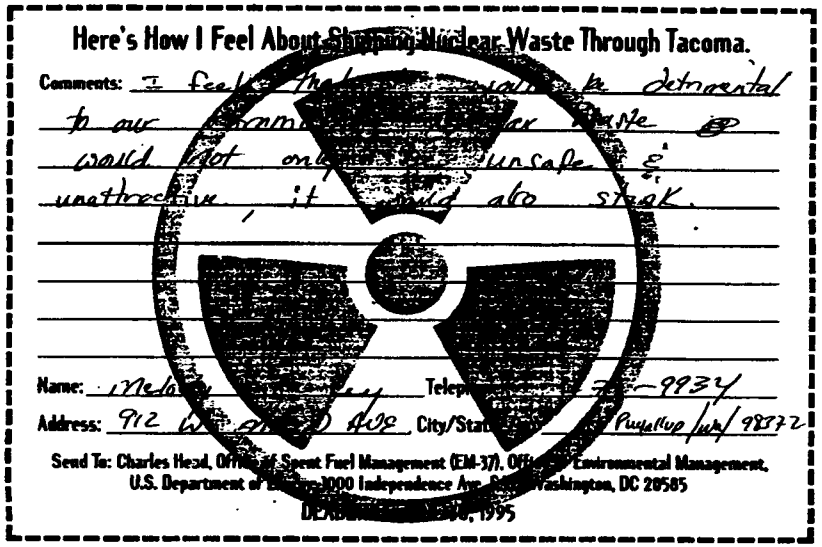
920-1

RESPONSE TO COMMENT
COMMENTOR NO. 920: BURNS, SUE

Response to Comment No. 920-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: I feel [illegible] detrimental to our [illegible] waste & would not only be unsafe & unattractive, it would also stink.

Name: Melody [illegible] Telephone: [illegible]-9934

Address: 912 W [illegible] Ave City/State: Puyallup WA 98372

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: June 30, 1995

The strongest weapon against nuclear waste is right at your fingertips. Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste. For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Renton, Federal Way; Tacoma-Pierce County Visitor & Convention Bureau, Tacoma-Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

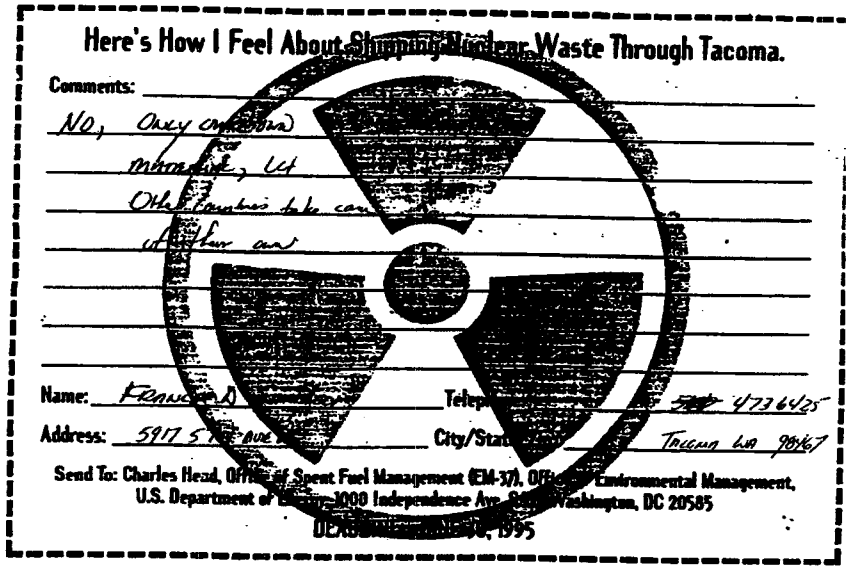
921-1

Response to Comment No. 921-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 922: STANLEY, FRANCIS D.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



922-1

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RESPONSE TO COMMENT
COMMENTOR NO. 922: STANLEY, FRANCIS D.

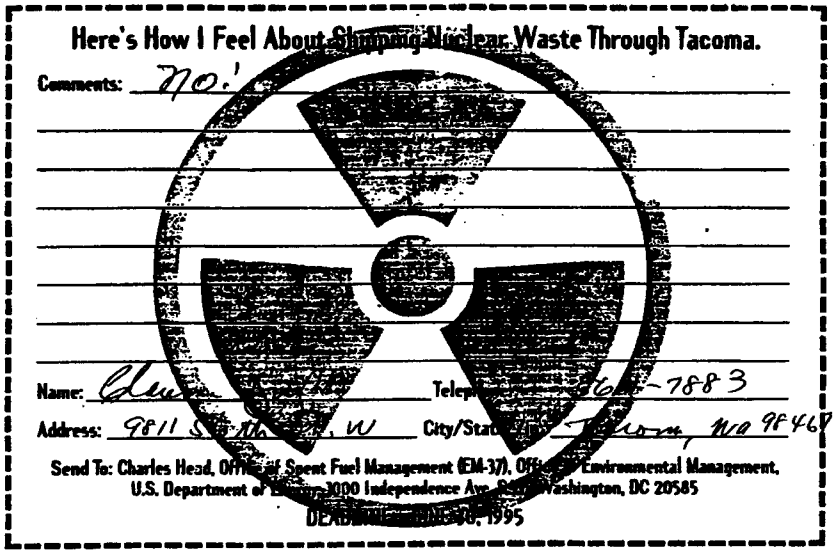
Response to Comment No. 922-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

The commentor's preference for letting other countries take care of their own material is also noted. The alternatives that relate to this option are Management Alternative 2 (overseas management, discussed in Sections 2.3 and 4.4 of the EIS) and the No Action Alternative (Section 2.5 of the EIS).

COMMENTOR NO. 923: GULFT, CLARESA

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



923-1

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RESPONSE TO COMMENT
COMMENTOR NO. 923: GULFT, CLARESA

Response to Comment No. 923-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 924: ROSS, PATRICIA

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: NOT IN

924-1

Name: PATRICIA ROSS Telephone: 565-2052

Address: 1233 OLIVE City/State: FIRCREST, WA

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: June 30, 1995

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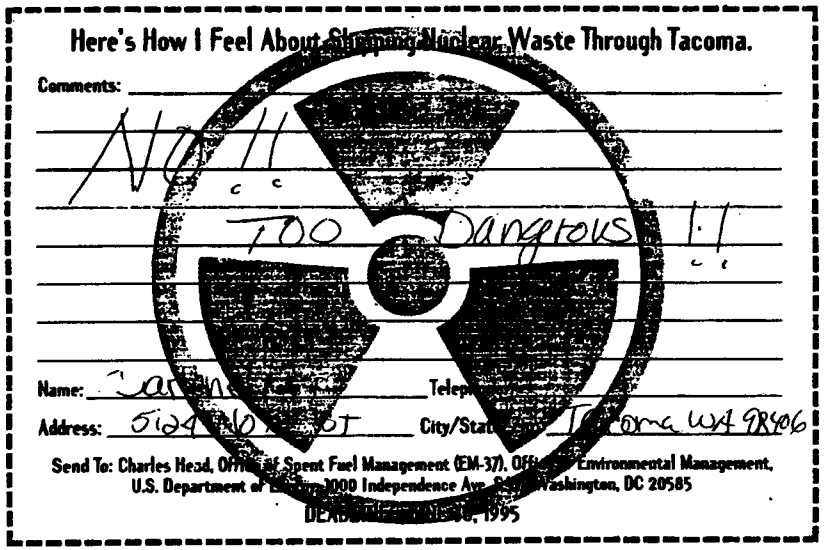
Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Ruston, Federal Way; Tacoma-Pierce County Visitor & Convention Bureau, Tacoma-Pierce County Chamber of Commerce, Pierce County Central Labor Council and Pierce County.

RESPONSE TO COMMENT
COMMENTOR NO. 924: ROSS, PATRICIA

Response to Comment No. 924-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



925-1

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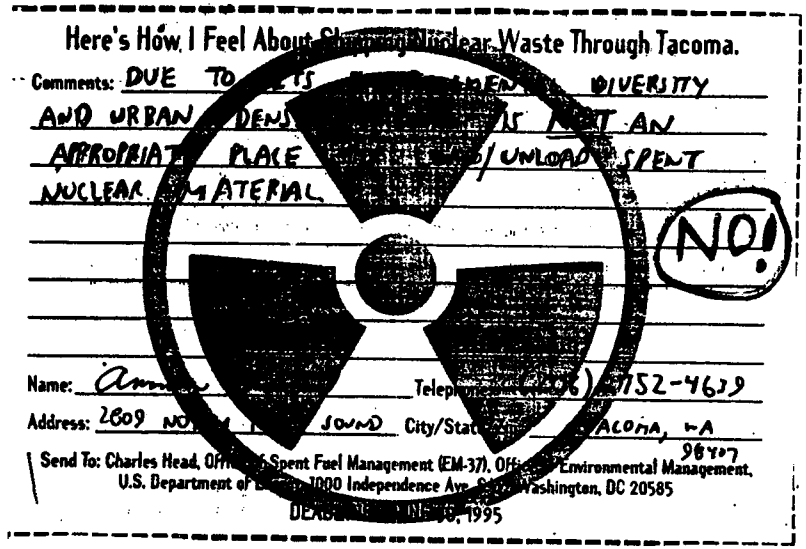
Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Auburn, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

Response to Comment No. 925-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 926: ADAMS, AMANDA



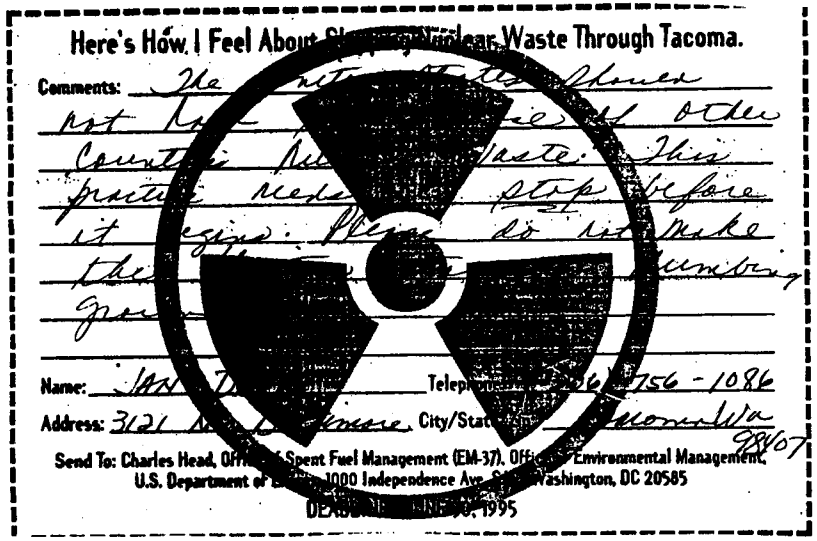
926-1

RESPONSE TO COMMENT
COMMENTOR NO. 926: ADAMS, AMANDA

Response to Comment No. 926-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 927: DAVIS, JAN



Here's How I Feel About [illegible] Nuclear Waste Through Tacoma.

Comments: [illegible] not [illegible] other countries [illegible] waste. This practice needs to stop before it begins. Please do not make the [illegible] Tacoma

Name: [illegible] Telephone: [illegible] 756-1086

Address: 3121 [illegible] City/State: [illegible] Wa 98407

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, DC 20585

DEC 30, 1995

927-1

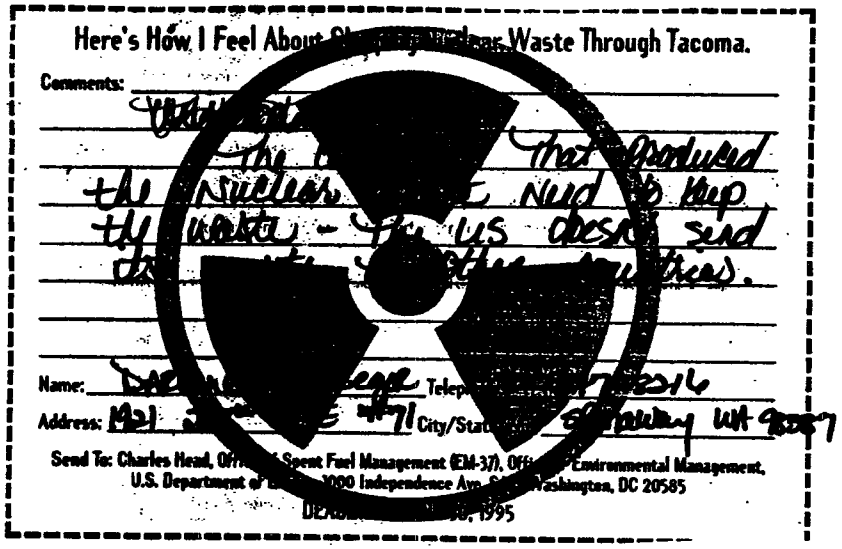
RESPONSE TO COMMENT
COMMENTOR NO. 927: DAVIS, JAN

Response to Comment No. 927-1

The commentor's opposition to acceptance of spent nuclear fuel from foreign research reactors in the United States is noted. As discussed in Section 1.1 of the EIS, foreign research reactor spent nuclear fuel has been accepted for disposition in the United States for over 30 years. During that time, no radiological release from a transportation cask containing foreign research reactor spent nuclear fuel has occurred (Section 4.2.3 of the EIS).

This EIS evaluates three alternatives for management of foreign research reactor spent nuclear fuel: management in the United States (Management Alternative 1, Section 2.2), overseas management (Management Alternative 2, Section 2.3), and a combination of domestic and overseas management (Management Alternative 3, Section 2.4). None of these management alternatives compel the United States to permanently serve as a repository for foreign research reactor spent nuclear fuel.

COMMENTOR NO. 928: MCGREGOR, DARLENE



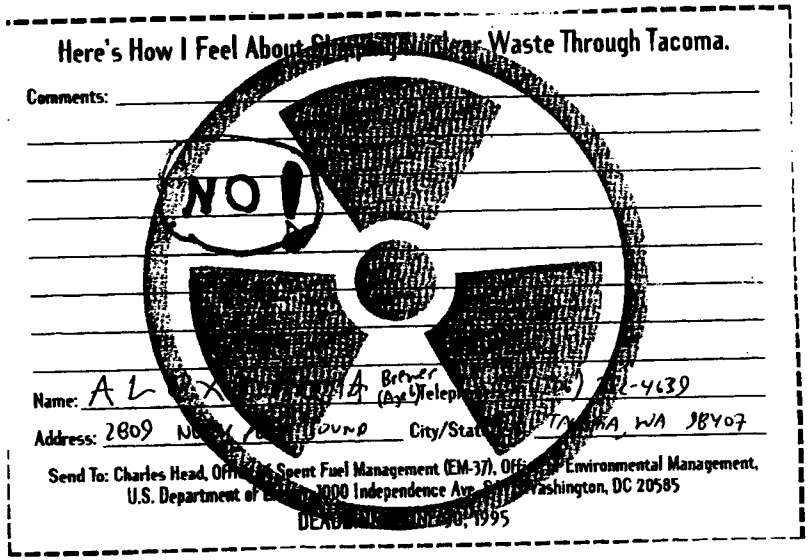
928-1

RESPONSE TO COMMENT
COMMENTOR NO. 928: MCGREGOR, DARLENE

Response to Comment No. 928-1

The commentor's preference for overseas management of spent nuclear fuel from foreign research reactors is noted (Section 2.3 of the EIS). As discussed in Section 1.2 of the EIS, many of the foreign research reactor operators cannot store their spent nuclear fuel in their country due to existing regulatory or financial constraints. Thus, the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

COMMENTOR NO. 929: BREWER, ALEXANDREA



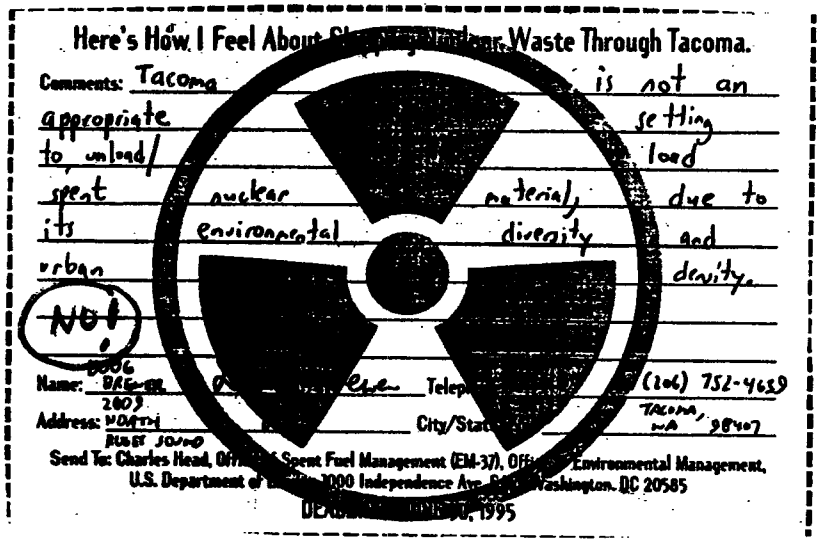
929-1

RESPONSE TO COMMENT
COMMENTOR NO. 929: BREWER, ALEXANDREA

Response to Comment No. 929-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 930: BREWER, DOUG



Here's How I Feel About [illegible] Waste Through Tacoma.

Comments: Tacoma is not an appropriate setting to unload/load spent nuclear material due to its environmental diversity and urban density.

NOT

Name: BREWER [illegible] Telep (206) 752-4659

Address: NORTH 2809 PUGET SOUND City/State TACOMA, WA 98407

Send To: Charles Head, Off[illegible] Spent Fuel Management (EM-37), Off[illegible] Environmental Management, U.S. Department of [illegible] 1000 Independence Ave. [illegible] Washington, DC 20585

DE[illegible]30, 1995

930-1

RESPONSE TO COMMENT
COMMENTOR NO. 930: BREWER, DOUG

Response to Comment No. 930-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: As a [illegible] worker dealing with radioactive [illegible] concerned about shipping nuclear waste through [illegible] While shipping techniques may have a 80% safety [illegible] I would be more concerned with a 20% accident rating (in unsure of current figures) It appears [illegible] both [illegible] to handle the waste.

Un AGAINST [illegible] TACOMA PORT for Nuclear Waste

Name: Jerry Beckendorf Telephone: (206) 581-6257

Address: 12118 - 106th Ave CtE City/State/Zip: Puyallup WA 98374-2607

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: June 30, 1995

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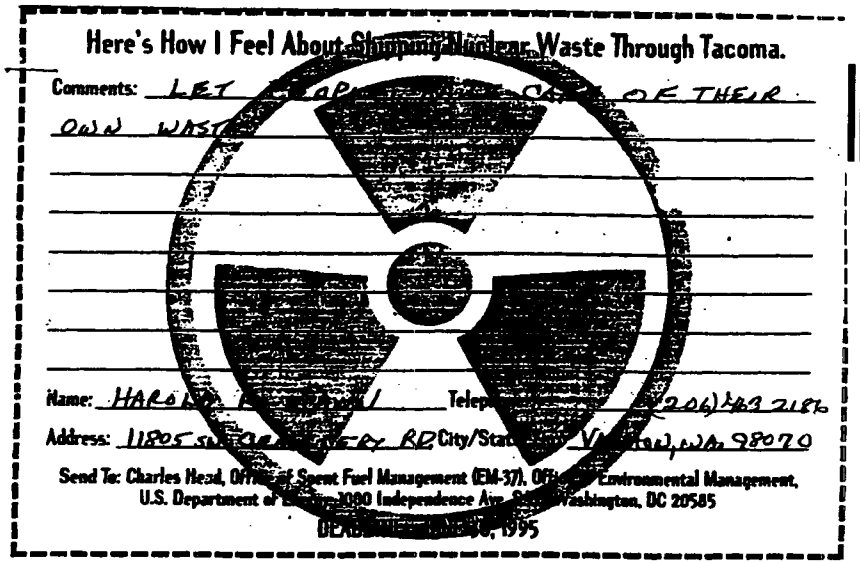
931-1

Response to Comment No. 931-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 932: MANN, HAROLD R.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: LET [illegible] CARE OF THEIR OWN WAST[illegible]

Name: HARO[illegible] Telep[illegible] (206) 463 2186

Address: 11805 SU[illegible] RD City/Stat[illegible] WA, 98070

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. SW, Washington, DC 20585

DEADLINE: June 30, 1995

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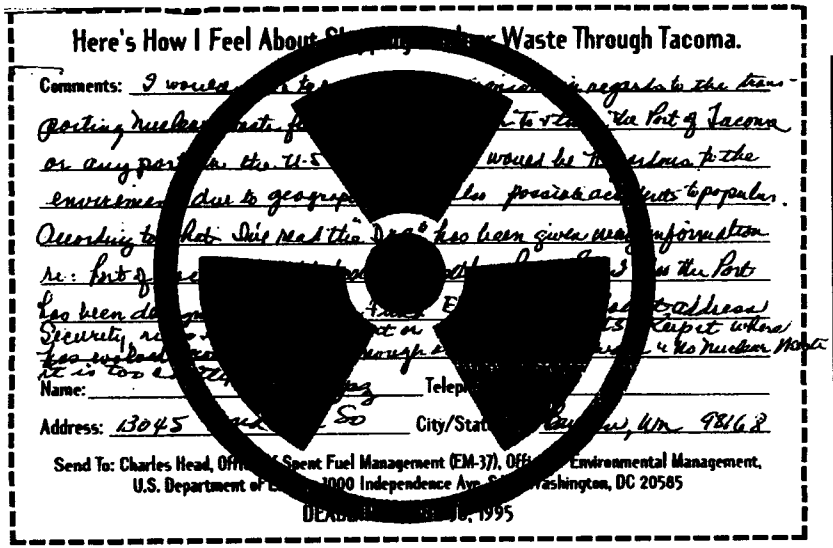
932-1

RESPONSE TO COMMENT
COMMENTOR NO. 932: MANN, HAROLD R.

Response to Comment No. 932-1

The commentor's preference for overseas management of spent nuclear fuel from foreign research reactors is noted (Sections 2.3 and 4.4 of the EIS). As discussed in Section 1.2 of the EIS, many of the foreign research reactor operators cannot store their spent nuclear fuel in their country due to existing regulatory or financial constraints. Thus, the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

COMMENTOR NO. 933: LOPEZ, G.A.



Here's How I Feel About Sh... Waste Through Tacoma.

Comments: I would ... regards to the tran-
porting nuclear ... Port of Tacoma
or any port ... the U-S ... would be ... to the
environment ... due to geograp... possible ac... to popula...
According to ... this read the ... has been given wr... information
re: Port ... as the Port
has been d... address
Security, re... Report where
has worked ... & No Nuclear Mate
it is too e...

Name: ... Telep...

Address: 13045 ... So City/Stat... WA 98168

Send To: Charles Head, Offi... Spent Fuel Management (EM-37), Offi... Environmental Management,
U.S. Department of E... 1000 Independence Ave... Washington, DC 20585

DEA... 1995

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933-1

RESPONSE TO COMMENT
COMMENTOR NO. 933: LOPEZ, G.A.

Response to Comment No. 933-1

The commentor's opposition to the use of the Port of Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. Based on the port selection process described in Appendix D of the EIS, the Port of Tacoma is among the ten candidate ports listed in Section 2.2.1.6 of the EIS which could receive foreign research reactor spent nuclear fuel under Management Alternative 1 or 3. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Sections 4.2.2.3 and 4.5 of the EIS) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel casks are also low (Sections 4.2.2.2 and 4.5 of the EIS).

Updated information on the terminals at the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS. The evaluated data on populations are from the 1990 census.

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Section 4.2.1.3 of the EIS has been modified to include this assurance of recovery in coastal waters. See Appendix C, Section C.5.5 of the EIS for information on the probability of a cask sinking in coastal and deep ocean waters. The impacts of a foreign research reactor spent nuclear fuel transportation cask sinking in coastal and deep waters were estimated in the EIS (Appendix C, Section C.5). The results of this analysis show that both the consequences and the risk of these accidents are low (Appendix C, Sections C.5.4 and C.5.5).

The acceptance of foreign research reactor spent nuclear fuel through the Port of Tacoma would neither affect the activities being conducted in Commencement Bay as a result of being a "Superfund Site," nor would it add any additional burden to this designation. The transport of the spent nuclear fuel on the Bay would not add any hazardous material to the Bay or the environment. DOE has added a sentence to Appendix D, Section D.2.1.9 of the EIS recognizing the designation of the Commencement Bay as a Superfund Site. The notion that the spent nuclear fuel shipments, but not other more hazardous material shipments, passing through the Port of Tacoma would add to the designation "stigma" is an unjustified fear.

COMMENTOR NO. 933: LOPEZ, G.A. (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 933: LOPEZ, G.A. (CONT'D.)

Section 2.8 of the EIS addresses the security measures that would be taken to ensure that there would be no unacceptable risks of terrorism or theft of materials. DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security such as might be present at military bases. The security measures employed at any port would meet or exceed all the security requirements in the Code of Federal Regulations (10 CFR Part 73). If the port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide additional security. DOE supports these regulations as being adequate to protect the foreign research reactor spent nuclear fuel in any commercial port. To better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel, Appendix H has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.

June 25, 1995

Charles Head
Office of Spent Nuclear Fuel Mgmt.
U.S. Department of Energy
Washington DC 20585

Dear Mr. Head:

I absolutely do not want radioactive nuclear waste shipped through the Port of Tacoma. 936-1

Thank you.

Kevin Gilmore

Kevin Gilmore
928 East 55th Street
Tacoma WA 98404-2621

Response to Comment No. 936-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 937: LEONARD, EILEEN M.

JUNE 26, 1995

CHARLES HEAD
PROGRAM MANAGER
OFFICE OF SPENT NUCLEAR FUEL
MANAGEMENT (EM-37)

WE DO NOT WANT
NUCLEAR WASTE SHIPPED
THROUGH THE PORT OF
TACOMA

Thomas R. Leonard
THOMAS R. LEONARD
6042 SO. PROSPECT
TACOMA WA 98409

Eileen M Leonard

937-1

RESPONSE TO COMMENT
COMMENTOR NO. 937: LEONARD, EILEEN M.

Response to Comment No. 937-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 938: BOWMAN, CHILTON A.

Jan 26-95

Charles Head
Project Manager
Spent Nuclear Fuel Managment

Dear Sir:

As a property owner living in the Tacoma area, we protest the shipping of nuclear waste through the Port of Tacoma or via Railroads in the City. We are opposed to it being sent to Hanford also.

Please find some other way and place to dispose of it.

Very truly,

Frances K. Bowman
Chilton A. Bowman

938-1

938-2

RESPONSE TO COMMENT
COMMENTOR NO. 938: BOWMAN, CHILTON A.

Response to Comment No. 938-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or using rail transport within the City of Tacoma, is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. Also, Section 4.2.3 demonstrates that the risk associated with ground transport is also low.

Response to Comment No. 938-2

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 939: DUDLEY, OLIVIA J.

To Whom It May Concern:

RE: Transportation of Nuclear Wastes Through Tacoma

Since 1975 I have been a resident and taxpayer in this city. I do not consider myself to be an 'activist' but I am very fond of my home, have raised my sons here and participated in community and school events in the process. I hope to see my grandchildren raise yet another generation. However, during the last two decades, I have witnessed the death of my mother and her sister, both as a result of diseases related to ecological toxicity.

At best, our region's environment has been tenuous for nearly half a century. Why else would we have been designated as a Super-Fund cleanup site?

To even consider transporting highly toxic chemical and/or waste materials across our county at this point, after all our efforts to maintain a better quality of air, water and life, goes beyond ambiguity -- it is sheer hypocrisy! The risks involved far outweigh any possible benefit to the citizens of our area. 939-1

Very truly yours,

Olivia J. Dudley

O. J. Dudley
2021 East Sherman Street
Tacoma, WA 98404

RESPONSE TO COMMENT
COMMENTOR NO. 939: DUDLEY, OLIVIA J.

Response to Comment No. 939-1

The risks and consequences of the proposed action are discussed in Section 4.2 of the EIS. The analysis indicates that the risk associated with implementation of the proposed action to human health, safety, or the environment would be low. As discussed in Section 1.2 of the EIS, the proposed action would provide national and global benefits by reducing the risks of nuclear weapons proliferation.

COMMENTOR NO. 940: CLEMENS, NANCY D.

June 26, 1995

Dept of Energy..

Please drop Tacoma from The plan to store nuclear waste.

IT will impact many areas in many ways — all negative

Thank you
Nancy D. Clemens

940-1

RESPONSE TO COMMENT
COMMENTOR NO. 940: CLEMENS, NANCY D.

Response to Comment No. 940-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 941: MAEL, VIRGINIA

6202-51st St. Ct. E.
Tacoma, WA 98467
6-26, 1995

Dear Mr Head:

Please, please, please Mr. Head don't allow the nuclear waste to come through the Port of Tacoma. Our children have to worry about earthquakes, dredge and cargo but don't give them something else to worry about. If it is to go that it doesn't have to go through military protection let it be buried over seas.

Please Mr Head consider Tacoma your city and don't send us any nuclear waste through our Port of Tacoma.

Thank you, Virginia Mael

941-1

RESPONSE TO COMMENT
COMMENTOR NO. 941: MAEL, VIRGINIA

Response to Comment No. 941-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

* This is the best available copy of this comment document.

June 1995

Mr. Charles Head;

My husband and I have four beautiful children. Our family is blessed to live in the lovely, clean Pacific Northwest. We have our choice of waterfront, coastline of the ocean or mountains to enjoy as a family. Right now all these areas are safe and free from radioactive nuclear waste. We want our environment to remain clean and free from any and all nuclear waste. We want to raise our children in a clean healthy environment - free to enjoy the "Great Outdoors!" Do not send nuclear waste through the Port of Tacoma! 943-1

Thank you,

Sincerely,

Tim and Debra Balding

Response to Comment No. 943-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 944: HARTOUGH, J.H.

To: Charles Head
Office of Spent Nuclear Fuel ~~Nuclear Fuel~~ Management June 22, 1995

If you were listening, you heard a resounding "No!" to the question of Nuclear Waste through Tacoma's Port.

In the preamble to the constitution it says "We the people..." in order ~~#~~ to ..."promote the general welfare"... establish government.

When government arrogantly disregards the will of the people, it serves no purpose. It is the case of the tail wagging the dog.

Future generations are now silent on this issue; but your right decision can protect them. We must learn how to re-process nuclear waste to make it harmless. Make that your focus.

Sincerely,
J. H. Hartough
Teacher of 23 years.

944-1

944-2

RESPONSE TO COMMENT
COMMENTOR NO. 944: HARTOUGH, J.H.

Response to Comment No. 944-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 944-2

The commentor's support for the chemical separation alternative is noted. This is Management Alternative 1, Implementation Alternative 6, which is discussed in Sections 2.2.2.6 and 4.3.6 of the EIS. It is also part of Management Alternative 3, which is discussed in Sections 2.4 and 4.5 of the EIS.

COMMENTOR NO. 945: HARTOUGH, MARY

June 21, 1995

To the Washington Beaucrats:

Dear Sirs - - -

I'm the mother of 6 children,
grandmother of 7 children and as
a Washington Born native since
1933 I am opposed to the
shipment of Nuclear Waste into
our beautiful Puget Sound.
Let the country that use
the power of nuclear fission to
dispose of the waste in their
own countryside NOT OUR Responsibility!!!
The great Northwest is one
of America final frontiers - DON'T
contaminate it due to some politicians
stupid narrowsighted old treaty.
America should have a treaty
of Health with its own sons & daughters
first!!

Mary Hartough R.N. B.S.N.

945-1

945-2

RESPONSE TO COMMENT
COMMENTOR NO. 945: HARTOUGH, MARY

Response to Comment No. 945-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 945-2

The commentor's preference for the alternative of overseas storage as described in Sections 2.3 and 4.4.1 of the EIS is noted. Foreign research reactors are not used for generation of commercial power or development of nuclear weapons. They do have research, medical, industrial, and agricultural applications (Section 1.1 of the EIS). Many of the foreign research reactor operators cannot store their spent nuclear fuel in their country due to regulatory or financial constraints (Section 1.2 of the EIS). Thus, the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

COMMENTOR NO. 946: PETERSON, SHAWN

To: Charles Head,

As a child of the United States of America, I think that the children should also have a say in this since when we grow up, well be the ones dealing with nuclear waste in our lakes, rivers, and waterways. I am ~~very~~ much aginst mooring the waste into the Puget Sound. For one reason: I have an uncle that works at the port what happens if just one of those containers brakes open? my uncle, along with hundreds of others will probly die. For another reason what if one of them breaks open in the Sound? Every living creature that lives in or around the Sound will die. Plus there will be no more diving. And what about the fishermen? They'll be pretty mad. ~~Please~~ Think about it. Is this really worth it?

Sincerely,

Shawn ~~Peterson~~ Age: 10

946-1

946-2

RESPONSE TO COMMENT
COMMENTOR NO. 946: PETERSON, SHAWN

Response to Comment No. 946-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 946-2

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radiation has ever released from a spent nuclear fuel transportation cask, nor has a spent nuclear fuel transportation cask ever been punctured, even as a result of an accident. A paragraph has been added to the EIS (Section 4.2.2.2) to make this point and to emphasize the no-impact nature of these shipments on air and water quality. In the unlikely event of a severe accident, the analysis in Section 4.2.2.3 and Appendix D, Section D.5 of the EIS determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident.

from Meghan Pfeiffer
Tacoma is Where
I live. Just because
There is little
countries and Big
City ie That nuclear
mean That doesn't
was this. To come here
You want my DaD to
unload it.

age 7
6.25.95

947-1

Response to Comment No. 947-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 948: PETERSON, COURTNEY

Charles head.

Just because we live in a bigger Country then swedenfrance, ingland, Canada etc. gives you no rite to ship it here for instence if just one of the Contaners leaks it could almost Kill everthing in its path for 25 miles there are many people that live near the sound another words you've never been here before :) I dont think the longshoremen are willing to bring it in to the contry There contry! we have enough pollution probloms all ready thank you very much, we dont need you to mak them bigger for us the point is don't ship it here any more I dont think its nessasery

Sincerly,

Courtney Peterson
age 9

948-1

948-2

948-3

RESPONSE TO COMMENT
COMMENTOR NO. 948: PETERSON, COURTNEY

Response to Comment No. 948-1

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS). Prior to 1989, it was United States policy to accept spent nuclear fuel containing uranium enriched in the United States (Section 1.1 of the EIS). Thus, the intent of the resultant proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

Response to Comment No. 948-2

If one of the spent nuclear fuel transportation casks released its radioactive contents, it would not kill everything in its path for 25 miles, as suggested by the commentor. The analysis in Section 4.2 of the EIS indicates that transporting the foreign research reactor spent nuclear fuel would cause very low impacts to persons living near a port of entry or along a transportation route.

Response to Comment No. 948-3

The possibility of longshoremen refusing to offload the foreign research reactor spent nuclear fuel was not considered in the port selection process (Appendix D, Section D.1.9 of the EIS) since that factor does not impact the capability to safely receive containers carrying foreign research reactor spent nuclear fuel. The decision as to which port or ports would be used, in the case that foreign research reactor spent nuclear fuel is accepted into the United States, will be made in the Record of Decision. In any case, the possibility described here is one of the many factors that would have to be considered in determining which ports to use.

COMMENTOR NO. 950: GRAHAM, MR. & MRS. H.

June 25, 1995

Charles Head
Program Manager
U.S. Dept. of Energy
1000 Independence Ave. SW
Wash. D.C. 20585

Dear Mr. Head,

For those of you who don't live in the Seattle/ Tacoma area, we have enough trouble already ! We have gangs, traffic, air and noise pollution, murderers, the list is endless.

Please DO NOT bring the nuclear waste here. We don't need it and we don't want it !! 950-1

KEEP IT OUTTA HERE !!!!!

Mr. & Mrs. H. Graham
3203-40th Ave. Ct. Ea.
Tacoma, Wa. 98443

RESPONSE TO COMMENT
COMMENTOR NO. 950: GRAHAM, MR. & MRS. H.

Response to Comment No. 950-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 951: BENNETT, RACHEL R.

Rachel R. Bennett
1511 South 40th Street
Tacoma WA 98408
(206) 472-4899

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. SW.
Washington, D.C. 20585

Dear Mr. Head:

I am writing in regards to the idea of highly radioactive nuclear waste being shipped through the Port of Tacoma, WA.

My family and I hope and pray that when you give your report to the director of the Office of Spent Nuclear Fuel Management, that it includes the true voice of the "City of Destiny", Tacoma, WA. Which we believe is that as a citizen of Tacoma we do not want radioactive nuclear waste being shipped here. We don't want low-level or middle-level or high-level radioactive waste in the Port Of Tacoma, Port of Seattle, Port Of Long Beach, CA or The Port of San Fransico. In fact if you can recommend the Port of Washington, D.C. for the Port of delivery I am sure you will see that our countries leaders don't want it near them or their families. 951-1

Thank you for listening and your time. We hope that you see that The City of Destiny and many more cities would like to be excluded from this plan.

Thank you,

Rachel R. Bennett

RESPONSE TO COMMENT
COMMENTOR NO. 951: BENNETT, RACHEL R.

Response to Comment No. 951-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Ports of Tacoma, Seattle, Long Beach, and San Francisco is noted. The ports of Seattle, Long Beach, and San Francisco do not meet all of the evaluation criteria used in the EIS to identify candidate ports for the potential receipt of foreign research reactor spent nuclear fuel. The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 952: JENNINGS, MR. & MRS. ROBERT V.

1) 6/26/95

In regards to shiping Nuclear Waste materials through the Port of Tacoma Positively NO.

Why ship it through our town or any other, let them take care of their own Nuclear Waste.

People worry about our atmosphere already. They want us not to burn outside, We can't even burn in our fireplaces.

They want us to Recycle every thing, we Recycle garbage, we can't use certain hairspray + deodorants these things affect the Ozone layer.

Well, what do you think this radio active Nuclear Waste is going to do to the people of Tacoma.

What about the desisions you can get from Radio active materials?

Do we the people have

952-1

952-2

952-1 (Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 952: JENNINGS, MR. & MRS. ROBERT V.

Response to Comment No. 952-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 952-2

The commentor's preference for the No Action Alternative which is described in Section 2.5 of the EIS is noted. As discussed in Section 4.6 of the EIS, implementation of the No Action Alternative would not support policies of the United States that are intended to prevent the spread of nuclear weapons. The intent of the proposed action is to support U.S. nuclear nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium fuels in civil programs worldwide (Sections 1.2 of the EIS).

Candidate ports for receipt of foreign research reactor spent nuclear fuel were chosen on the basis of selection criteria described in Appendix D of the EIS. Analyses presented in Section 4 (See especially Table 4-7) of the EIS indicate that risks associated with implementation of the proposed action to health or the environment at any of the candidate ports, including the Port of Tacoma, would be low.

COMMENTOR NO. 952:
JENNINGS, MR. & MRS. ROBERT V. (CONT'D.)

2/

to worry about our Children & Grandchildren in later years, suffering horrible deaths from breathing this Radio active material.

Remember Chernobyl, Hanford, & the Space shuttle Challenger? Even agent orange.

How many more stupid mistakes have to be made before a lesson is learned.

ask <u>us</u> the people to vote on this subject & let the voice of the people Count, then you'll see what everyone really wants.

Mr. & Mrs. Robert V. Jennings
Tacoma, Wa.

Michael a. Jennings TACOMA WA.

RESPONSE TO COMMENT
COMMENTOR NO. 952:
JENNINGS, MR. & MRS. ROBERT V. (CONT'D.)

COMMENTOR NO. 953: NELSON, DAYLE

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management
U.S. Department of Energy
1000 Independence Avenue S.W.
Washington D.C. 20585

June 25, 1995

Dear Mr. Head,

I am writing to let you know that I strongly oppose the proposal to make the Port of Tacoma a port of entry for nuclear waste from other countries. If you heard the voice of the people at the Tacoma Public Utilities meeting on June 19th, you must realize the widespread outrage over this idea. It's not just a handful of Greenpeacers and some idealistic student activists that are standing up against your department's plan. It is the entire city of Tacoma and the surrounding Puget Sound communities. We are not alarmists or panic mongers. We are average tax paying, law abiding citizens who believe we have a say in what happe ns in our state. 953-1

The Draft Environmental Impact Statement is based on outdated information, and fails to address important security and safety concerns. No amount of reassurrance as to the safety of shipping nuclear waste through our port and over our streets can over ride the fact that accidents happen. You, and the Department of Energy cannot guarantee that this proposal is risk free.

I do not want to allow a risk of this magnitude to be imposed upon myself, my children, my neighbors, or this beautiful part of our country. The Puget Sound area is a jewel. We will not permit it to be compromised.

The Department of Energy is a office of government that is supposed to SERVE THE PEOPLE. It seems as if this notion of "serving the people" has been lost in the shuffle. I urge you to listen to the voice of the people of Tacoma before you make a decision on this critical issue.

Sincerely,

Dayle Nelson

Mrs. Dayle Nelson
3220 North 9th Street
Tacoma, WA 98406
PH (206)752-7719

RESPONSE TO COMMENT
COMMENTOR NO. 953: NELSON, DAYLE

Response to Comment No. 953-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Some information on the Port of Tacoma (including the map) in the draft EIS was found to be outdated. This information and the map have been updated in Appendix D, Section D.2.1.9 of this final EIS.

The security provided for the spent nuclear fuel shipments is required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security.

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk of such actions. Security would be provided for all shipments of foreign research reactor spent nuclear fuel, as required by the Code of Federal Regulations (10 CFR Part 73). The security provisions are summarized in the new Appendix H that has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit.

DOE considers that all safety concerns have been addressed in the EIS. More specific information is needed to address the commentor's concern for safety.

COMMENTOR NO. 954: HAUGE, HELENA

Mr Charles Head,

I strongly object to the idea of shipping highly radioactive (or any degree of radioactive) nuclear waste through the Port of Tacoma. Kindly find a less pristine area to transport this waste through. Washington State has enough to contend with, with its human growth problems & Hanford. Thank-you.

Helena Hauge

954-1

RESPONSE TO COMMENT
COMMENTOR NO. 954: HAUGE, HELENA

Response to Comment No. 954-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 955: JENNINGS, SCOTT & RENEE M.

26 June, 1995

Charles Head
U.S. Dept. of Energy (EM-37)
1000 Independence Ave.
Wash. D.C. 20585

Subject: Shipping of Nuclear Waste to Tacoma Washington

Dear Sir,
I was unable to attend the meeting held Monday 6/19, but I am writing to express my deep concern and strong protest against such a plan.

My first objection is with your, and the administrations, desire to use the U.S. as a world dumping ground for nuclear waste. I do not understand why you would ever desire to accept this potentially grave burden. You stated at the meeting you desired to hear only technical reasons why waste should not be shipped, but never offered a sound technical reason why it should. It is my position that if a country cannot properly dispose of spent nuclear waste and adequately safeguard against terrorists acts, it is not worthy of producing nuclear based products in the first place. Shouldn't this safeguarding be subject to a global commission in charge of regulation in this area, keeping the nuclear waste in the country that produced it? In addition, certainly the shipping of these containers over vast distances increases the danger of not only accidents but also terrorist acts. 955-1

Secondly, I strongly submit that the Port of Tacoma should not be used for this potentially catastrophic endeavor. First of all, the data used in the initial analysis is unacceptably flawed. As stated at the meeting, the population data used is 15 years old! Few places have experienced the amount of population growth over the last 15 years as the Tacoma area and specifically the area surrounding the waterway leading to Commencement Bay. In order to arrive at the port, the route would take this nuclear waste through the Puget Sound area, a very populated and abundant in wildlife route. An accident in this area would be catastrophic to both humans and the wildlife ecosystem. In addition, the Port of Tacoma does not have adequate structure to handle such a task. No nuclear expertise exists in this area. 955-2

Last, I bring up a subject I did not her discussed at the meeting and that is, the extreme loss of land value that would result from this poor decision. Surrounding the Puget Sound waterway, and specifically Commencement Bay which houses the port, is a huge area of high value homes. These high value homes are burdened with a large amount of property taxes used to fuel the area's education system. This tax revenue would be lost as homes and land become worthless at the hand of such a hasty decision. The area's education system would be left in ruin as a result. As I stated earlier, this area has experienced huge growth over the last few years and I conservatively estimate over a million homes would be stripped of any significant value. A million homes at an average loss of $200, 000 each would result in a value loss of some $20 billion. Who will pay for this loss? Is the taxpayer willing to pick up the tab in light of the huge budget deficit challenges our country is faced with? I think not! Am I, as an individual, expected to shoulder the burden? I vehemently protest. I am not sure of what legal recourse I would have, but I would pursue a lawsuit with all my efforts. 955-3

In summary please, please reconsider this potentially devastating decision.

Concerned Citizens

Scott & Renee Jennings
4650 Lighthouse Dr. N.E.
Tacoma Wa. 98422 (206)952-7594

RESPONSE TO COMMENT
COMMENTOR NO. 955: JENNINGS, SCOTT & RENEE M.

Response to Comment No. 955-1

As discussed in Sections 1.1 and 1.2 of the EIS, the proposed action is intended to reduce the amount of weapons-grade enriched uranium available for potential diversion to the manufacture of nuclear weapons. Many of the foreign research reactor operators cannot store their spent nuclear fuel in their own country due to financial or regulatory constraints. Thus the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

Radiological health and other environmental risks were evaluated during preparation of this EIS. The analysis demonstrates that the risks associated with implementation of the proposed action to human health or the environment at candidate ports (Table 4-7 of the EIS), along transportation routes, or at interim management sites would be low (Sections 4.2.2, 4.2.3, and 4.2.4 of the EIS, respectively).

Response to Comment No. 955-2

DOE regrets any misunderstanding of the date and accuracy of the population data used for the Port of Tacoma analysis. The date of the population data used for the analysis was 1990, not 1980 as may have been indicated at the public hearing. Secondly, the population data centered on a 10-mile radius around the port, not around the city of Tacoma, which could account for a difference in the population data used for the port selection process. Appendix D, Section D.2.1.9 of the EIS presents a detailed discussion of Port of Tacoma population.

The Port of Tacoma has excellent facilities to handle containers. Appendix D, Section D.1.9.3 of the EIS presents a discussion of the "port facilities" selection criterion (Criterion 3).

As the port selection process section (Appendix D, Section D.1 of the EIS) explains in detail, Tacoma and the other nine ports all meet the criteria and hence are considered to be able to safely handle the foreign research reactor spent nuclear fuel. The experience criterion used in the port selection process (Appendix D, Section D.1.9.1 of the EIS) evaluates the port's experience in handling containerized cargo, such as would be the case for any spent nuclear fuel shipments. Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the casks used to transport it would be low, so no special handling is required.

COMMENTOR NO. 955: JENNINGS, SCOTT & RENEE M. (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 955: JENNINGS, SCOTT & RENEE M. (CONT'D.)

Response to Comment No. 955-3

The EIS evaluates the risk to the environment and the public health and safety associated with port activities in Section 4.2.2. The risk is evaluated for both incident-free operations and accident conditions. As discussed in Section 4.2.2, the risk from incident-free operations is low.

Several accident scenarios including a breach of the cask and fire sufficient to oxidize the contents were also analyzed. Results of the accident analysis at the ports are given in Section 4.2.2 of the EIS with supporting detail in Appendix D, Section D.5. No catastrophic effects were found to result from severe accidents involving foreign research reactor spent nuclear fuel.

DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. Under NEPA regulations, the socioeconomic effects evaluated for this EIS do not include those associated with psychological fear of receiving spent nuclear fuel, which would include the hypothetical loss of property values raised in the comment.

COMMENTOR NO. 956: OTIS, MR. & MRS. GLENN

6-27-95

We are appalled that you would even consider having Nuclear waste being shipped through Port of Tacoma and we are absolutely against it. Please, Please, do not let this happen. We love our Pacific Northwest and want to keep it free from such things.

Thank you for taking the time to read this.

Sincerely,

Mr. and Mrs. Glenn Otis
3921 Boise St. W.
Tacoma, Wa. 98466

956-1

RESPONSE TO COMMENT
COMMENTOR NO. 956: OTIS, MR. & MRS. GLENN

Response to Comment No. 956-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 957: SUNDE, JUDI

June 20, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management
US Department of Energy - MS EM-37
1000 Independence Avenue SW
Washington DC 20585

Dear Mr. Head:

This letter is being written to voice my concerns and objections to the proposal to move spent nuclear fuel shipments through the Port of Tacoma.

It is my understanding that the following facts regarding the Department of Energy's proposal are true:

- Outdated information regarding the impact on the Port of Tacoma resulting from fires/explosions occurring on a ship carrying spent nuclear fuel and whether the Port has the means to adequately contain/overcome such an incident was used. *957-1*
- Incorrect data regarding the depth of the major shipping lanes to and from the Port was used in determining whether it was possible to recover spent fuel casks in case of a ship breaking up and the casks sinking to the bottom of the Sound. *957-2*
- The Port area is located on a Superfund site. How can it be environmentally logical to contribute to a problem already recognized and designated for clean up? *957-1 (Cont'd.)*
- The DEIS does not address proper security measures to avoid theft of this material by "crazies."

RESPONSE TO COMMENT
COMMENTOR NO. 957: SUNDE, JUDI

Response to Comment No. 957-1

Updated information on the terminals at the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS. In regard to fire, Appendix D, Section D.5.3.1 of the EIS describes several accident scenarios that involve fire. The results of the analysis of these accidents can be found in Appendix D, Section D.5.4 of the EIS. The analysis shows that even in the event of a severe ship fire, neither the consequences nor risks are great (Appendix D, Section D.5.5 of the EIS). Although the nonradiological effects of such a catastrophic accident would obviously impact the local environment, no additional impacts are predicted due to the presence of foreign research reactor spent nuclear fuel. The input to these analyses is all current data, including the population data, which was based on the 1990 census, so the DOE considers that the results are accurate.

DOE considers that there is adequate regulatory and emergency preparedness infrastructure to ensure the safe acceptance and transport to designated management sites if the foreign research reactor spent nuclear fuel is managed in the United States. Federal funding to State, Tribal, and local governments for maintaining emergency response programs is discussed in Section 2.7.1. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advise and assistance to the State, Tribal and local agencies involved with a radiological incident. Emergency preparedness, security, and coordination of DOE with local emergency response authorities, and security are discussed in general in Sections 2.7 and 2.8 of the EIS. Details would be contained in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

The acceptance of foreign research reactor spent nuclear fuel through the Port of Tacoma would neither affect the activities being conducted in Commencement Bay as a result of being a "Superfund Site," nor would it add any additional burden to this designation. The transport of the spent nuclear fuel on the Bay would not add any hazardous material to the Bay or the environment. DOE has added a sentence to Appendix D, Section D.2.1.9 of the EIS recognizing the designation of the Commencement Bay as a Superfund Site. The notion that the spent nuclear fuel shipments, but not other more hazardous material shipments, passing through the Port of Tacoma would create a "stigma" is an unjustified fear. The analysis of impacts, as documented in Section 4 of the EIS, shows that there would be no significant adverse impacts on the port, people, or natural environment from shipments of foreign research reactor spent nuclear fuel through any of the ports of entry. Historically, there were no adverse economic or cultural impacts to the ports that received foreign research reactor spent nuclear fuel for the 30 plus years it was received.

COMMENTOR NO. 957: SUNDE, JUDI (CONT'D.)

Charles Head
June 20, 1995
Page - 2 -

The Department doesn't say what would happen to the Port and surrounding areas -- both on land and water -- in case a serious incident were to happen. The major tax base for the Port and Tacoma is located in the very area that would be adversely affected should an incident happen. There are many communities that front the Sound, impacting a large population. Is the Department going to come in and make the Port and surrounding areas "whole" again in case of an incident? I think not! 957-3

The bottom line is the **Department of Energy used outdated and incorrect information to determine whether the Port of Tacoma would be a good candidate for the shipping of spent fuel casks through Commencement Bay to the Port.** The Port of Tacoma is not a sound/logical/feasible site for the shipping of this material and should be removed from the candidate list. 957-1 (Cont'd.)

Truly yours,

Judi Sunde

Judi Sunde
17419 - 15th Avenue East
Spanaway WA 98387

cc: Port of Tacoma

RESPONSE TO COMMENT
COMMENTOR NO. 957: SUNDE, JUDI (CONT'D.)

DOE considers that foreign research reactor spent nuclear fuel could safely be received at any of the candidate commercial ports, as it has in the past, without additional security such as might be present at military bases. The security measures employed at any port would be required to meet or exceed all of the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not meet the security requirements of 10 CFR Part 73, the shipper would be responsible for providing the required additional security. DOE supports these regulations as being adequate to protect the foreign research reactor spent nuclear fuel in any commercial port.

Response to Comment No. 957-2

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1000 feet). Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

Response to Comment No. 957-3

Several accident scenarios including a breach of the cask and fire sufficient to oxidize the contents were also analyzed for all ports considered. Results of the accident analysis at the ports are given in Section 4.2.2 of the EIS with supporting detail in Appendix D, Section D.5. No catastrophic effects were found to result from severe accidents involving foreign research reactor spent nuclear fuel.

COMMENTOR NO. 958: HARRIS, DIANE

23116 46th Avenue East
Spanaway, WA 98387
June 30, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC, 20585

Re: Draft Environmental Impact Statement - March 1995
Involving Shipping Nuclear Fuel via Port of Tacoma

Dear Mr. Head:

The D.E.I.S. referenced above is terribly inaccurate and vague. Tacoma is only 30 some miles from Seattle (the city you chose not to use because of its population). What the researchers of this document failed to notice is that there is one continuous mass of humanity stretching several hundred miles north and south of the Seattle-Tacoma area, and more than a hundred miles east and west of this megatropolis. Puget Sound is a very densely populated area now, and it is growing extremely rapidly. Seattle's city center falls well within the 50 mile "danger" range of the Port of Tacoma, which would indeed put its population in harms way in the insanely frightening event of a nuclear accident while transporting nuclear waste through Tacoma. Bear in mind that the highway system in this area is the fourth worse congested in the entire United States and expected to worsen. We have been warned that it is just a matter of time until we experience a 6.0 or better earthquake in this area because we sit over several major faults. Also, there's a 14,000 foot volcano sitting about 50 miles southeast of Tacoma which geologists tell us is due to "go off" at anytime. This doesn't sound like a very safe place to be transporting nuclear waste through, does it? Or does the Department of Energy even care? We've certainly been given that impression. As a matter of fact, there are more than a half million people in Tacoma and Pierce County, Seattle, Tacoma, Everett, Olympia, and the area directly around south Puget Sound (approximately 3 1/2 millions folks) is virtually exploding with growth. I get the distinct impression that whoever compiled the census data for your document wasn't using anything current. 958-1

As a Washingtonian, I emphatically do no want any additional nuclear garbage in this state or passing through this state. Personally, I don't see the reasoning for any more in the United States, period. We cannot be the world's garbage dump any more than we have been able to be the world's peace keeper. Both ideas are ludicrous! Washington is still trying to clean up the horror that Hanford has become. What a deadly and hideous can of worms Dr. Oppenheimer opened back in 1945. Unfortunately, for the world's population, it's a can that can't be resealed. However, just because the U.S. was the first to perfect and use nuclear energy, doesn't mean that the U.S. must or should be the collection point for all of the toxic waste that is used by and spread over the world. We have military personnel who can be stationed in the current storage locations for the express purpose of insuring its 958-2

06-30-95 01:52PM FROM MBK 1701 P02

RESPONSE TO COMMENT
COMMENTOR NO. 958: HARRIS, DIANE

Response to Comment No. 958-1

The Port of Tacoma was one of ten ports that was determined to be acceptable to receive the foreign research reactor spent nuclear fuel, if the material is to be accepted into the United States. Population of the port and surrounding areas to a radius of 10 miles (16 km) is one of the considerations of the port selection criteria, and one of the reasons the Port of Seattle was not included in the final list of ports. The population criterion for port selection (Criterion 5) is discussed in more detail in Appendix D, Section D.1.9.5 of the EIS. The date of the population data used for the analysis was 1990, not 1980 as may have been indicated at the public meeting.

All population within a 50-mile radius of the Port of Tacoma was considered when analyzing the impact of a range of hypothetical port accidents. The risks were found to be low (Section 4.2.2.3 of the EIS). Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident, and thus affect the probability of such accidents; however, the number of earthquake-induced ship and road accidents is small compared to other causes.

Response to Comment No. 958-2

Management alternatives described in the EIS include management of spent nuclear fuel from foreign research reactors in the United States (Management Alternative 1, Section 2.2), overseas management (Management Alternative 2, Section 2.3), and a combination of domestic and overseas management (Management Alternative 3, Section 2.4). The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

As discussed in Section 1.1 of the EIS, spent nuclear fuel is not an attractive target for theft or sabotage. The greater risk is that, through international commerce, HEU might fall into the hands of a government with the means and intent to develop a nuclear weapons capability. Stationing military personnel at the reactor sites would have little practical effect on the potential for diversion of HEU to a weapons program.

The commentor's support for overseas reprocessing as described in (Section 2.3 of the EIS) is noted. From the viewpoint of nuclear weapons nonproliferation, overseas reprocessing does not result in a safer product (Section 2.3 of the EIS).

Charles Head
June 30, 1995
page two

need to bring it to the U.S. to "store." Instead of spending money to transport and store it here; build reprocessing plants, or assist the Scots in enlarging theirs. There surely must be a more reasonable and intelligent solution to this problem. Nuclear waste is no safer here than where it is now, providing we can supply personnel to watch over it until it can be reprocessed into a safer form. 958-3

We, the citizens of the world, have learned slowly and painfully not to believe all that we've been told by our governments about "safety" relative to using and storing radioactive materials. There are hordes of sick and dead in this state, in this country and worldwide who are the horrifying reality behind this "truth stretching" by our leaders and governmental agencies.

Undeniably, Washington State has already shouldered more than its fair share. I implore you to quit gambling with our lives. If you and the others at the Department of Energy don't think this garbage is dangerous, then I highly encourage each of you to take a cask home and bury it in your own backyard. Allow a cask or two tumble off of a train into your yard or pasture. Have your family sit in a parked car next to a truckload on a freeway during rush hour gridlock. We don't want it passing through here. Not now, not ever. Leave it where it is, and leave us alone.

Very truly yours,

Diane Harris

Diane Harris

copies to: Governor Mike Lowry
Senator Patty Murray
Senator Slade Gorton

Response to Comment No. 958-3

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Section 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 959: BARBER, HAZEL

Office of Spent Nuclear
Fuel Management -

Charles Head:

I do not like the idea of
highly radioactive waste
being shipped through the Port
of Tacoma.

Hazel Barber
Woodinville Woman
boat owner - Farmer
owner + teacher -
Resident since 1961

959-1

RESPONSE TO COMMENT
COMMENTOR NO. 959: BARBER, HAZEL

Response to Comment No. 959-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 960: HASEN, NAJEEA F.

Mr. Charles Head, 6/23/95

I am a resident of Tacoma, WA. I strongly object to having radioactive nuclear waste shipped through the Port of Tacoma. Please do not allow this dangerous situation to threaten the lives of all the people here as well as our beautiful home.

960-1

Sincerely,
Najeea F. Hasen
NAJEEA F. HASEN, LMP
319 Tacoma Ave No. #202
Tacoma, WA 98403

RESPONSE TO COMMENT
COMMENTOR NO. 960: HASEN, NAJEEA F.

Response to Comment No. 960-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 961: PETERSON, SHARON

To: Charles Head;

I am writing to express my opposition to the idea of nuclear waste being slipped through the Port of Tacoma. The idea of this happening produces a good deal of anxiety on the part of residents on the water who regard "living" near the water as an tranquil & pleasurable experience.

Please regard this as a vote from my entire family.

Sincerely,
Sharon Peterson

961-1

RESPONSE TO COMMENT
COMMENTOR NO. 961: PETERSON, SHARON

Response to Comment No. 961-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 962: RONALD, SHANNON

June 24, 1995

Charles Head
Office of Spent Nuclear Fuel Management
US Department of Energy
1000 Independence Ave SW
Washington, DC 20585

Dear Mr. Head,

I don't know if you need another letter to be convinced that Tacoma does not want radioactive nuclear waste being shipped through our port, but I wanted to be sure that you heard my voice. I do not want our port being used for shipping radioactive nuclear waste! Please listen to the people of this city. 962-1

Sincerely,

Shannon Ronald

Shannon Ronald
1243 So. Grant
Tacoma, WA 98405

RESPONSE TO COMMENT
COMMENTOR NO. 962: RONALD, SHANNON

Response to Comment No. 962-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 963: COOL, MRS. JEAN

June 24, 1995

Mr. Head -

This is to inform you that I am ~~very opposed~~ against nuclear waste being shipped through the Port of Tacoma.

I also ~~strongly resent~~ the idea that somehow Tacoma citizens are of lesser value than Seattle's should there be an accident ! What NERVE!!

I fully intend to protest this matter anywhere, anyway and how that I can.

Mrs. Jean Cool
408 S. 46th st.
Tacoma, Wash.
98408

963-1

RESPONSE TO COMMENT
COMMENTOR NO. 963: COOL, MRS. JEAN

Response to Comment No. 963-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 964: HAMMETT, EVELYN

Office of Spent Nuclear Mgmt
Charles Head

Dear Sir,

Puget Sound should not have such dangerous substances passing through. We have areas of depth too great for recovery of in case of spilled casks. 964-1

The information given about Puget Sound and Tacoma and Seattle ports is incomplete. 964-2

Sincerely,

Evelyn Hammett

Evelyn Hammett (206) 941-1682
27423-36 Pl So.
Kent, Wa 98032

RESPONSE TO COMMENT
COMMENTOR NO. 964: HAMMETT, EVELYN

Response to Comment No. 964-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through Puget Sound is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

In the unlikely event that a spent nuclear fuel transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

Response to Comment No. 964-2

Updated information on the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS.

COMMENTOR NO. 965: LEWIS, PAMELA S.

Charles Head
Ofc. of Spent Nuclear Fuel Mgmt.
U S Dept. of Energy
1000 Independence Ave. SW
Washington D.C. 20585

Charles Head;

I am seriously opposed to the plan to ship spent nuclear fuel to or even through the port of Tacoma! My prime concern is Tacoma, but I don't want this proposed substance going through any U.S. ports. 965-1

According to information printed in our local newspaper, both Scotland and Japan WANT the spent fuel for reprocessing. Let those countries take it!! Why are we involved anyway? 965-2

Sincerely,

Pamela S. Lewis

Pamela S. Lewis
2022 S. 18th
Tacoma, Wa. 98405

RESPONSE TO COMMENT
COMMENTOR NO. 965: LEWIS, PAMELA S.

Response to Comment No. 965-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 965-2

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Section 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 967: KOSCHE, CHARLENE

June 27, 1995

Charles Head
Office of Spent Nuclear Fuel Management
(EM-37)
U.S. Department of Energy
1000 Independence Avenue S.W.
Washington, D.C. 20585

Dear Mr. Head,

It is said that as human beings we have a fear of the unknown. I feel that not enough is known about nuclear waste and the long term effects of it's disposal. I therefore am afraid of having radioactive nuclear waste shipped through the Port of Tacoma, my home. Please rethink this option. 967-1

Thankyou.

Sincerely,

Charlene Kosche

Charlene Kosche
5615 - 43rd Avenue East
Tacoma, Washington 98443
206-922-5804

RESPONSE TO COMMENT
COMMENTOR NO. 967: KOSCHE, CHARLENE

Response to Comment No. 967-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 968: PYFROM, MARY

Mary Pyfrom
524 1st Ave E
Puyallup, WA
98372
6-26-95

Dear Cherbo Head,

I am strongly opposed to having nuclear waste from other countries brought to Tacoma or any part of the U.S.A. Other countries can get rid of their own waste. It is unbelievable that we'd even consider doing this.

Some people high up must have gotten a big payoff for this.

Yours Truly
Mary Pyfrom

968-1

968-2

RESPONSE TO COMMENT
COMMENTOR NO. 968: PYFROM, MARY

Response to Comment No. 968-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or any U.S. port is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 968-2

The commentor's preference for the No Action Alternative as described in Section 2.5 of the EIS is noted. As discussed in Section 4.6 of the EIS, the No Action Alternative does not support policies of the United States that are intended to prevent the spread of nuclear weapons. The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium fuels in civil programs worldwide (Sections 1.2 of the EIS). This objective is a substantive consideration in reducing the peril of nuclear weapons proliferation because a relatively small amount of HEU can be used to make a nuclear weapon. As discussed in Section 4 of the EIS, the risks associated with implementation of the proposed action to human health or the environment would be low.

COMMENTOR NO. 971: CANZLER, RON G.

June 27, 1995
Charles Head
Office of Spent Nuclear Fuel
(EM-37)
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington D.C. 20585

Dear Mr. Head:

I am writing this letter to let you know that I am against shipping Nuclear Waste through the Port of Tacoma. I think that Nuclear Waste is too hazardous to ship through a populated area like Tacoma. Citizens of the U.S.A. should not be exposed to this unseen hazard. 971-1

Mr. Head, I urge you to recommend an alternate plan that dose not require transporting hazardous waste through our town.

Thanks for your time and consideration.

Sincerely:

Ron D. Canzler
1006 E. 61st St.
Tacoma, Wa. 98404

RESPONSE TO COMMENT
COMMENTOR NO. 971: CANZLER, RON G.

Response to Comment No. 971-1

The commentor's opposition to the use of the Port of Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. Based on the port selection process described in Appendix D of the EIS, the Port of Tacoma is among the ten candidate ports listed in Section 2.2.1.6 of the EIS which could receive foreign research reactor spent nuclear fuel under Management Alternative 1 or 3. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3 of the EIS) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Section 4.2.2.2 of the EIS).

COMMENTOR NO. 972: TARANOVSKI, T.

The University of Puget Sound

Mr. Charles Head
Program Manager
Office of Spent Nuclear Fuel
Management (EM-37)
U.S. Department of Energy
1000 Independence Ave, SW
Washington, D.C. 20585

June 29, 1995

Dear Mr. Head:

I was unable to attend the recent hearing on shipment of nuclear waste via the port of Tacoma, but I would like to add my voice to those who are unalterably opposed to it. 972-1

I do not consider it sound national policy to receive and store spent nuclear waste from foreign reactors on U.S. soil. I am not impressed by the claim that national security requires this step since there are greater worries than that in regard to nuclear proliferation. I am, however, impressed by potential dangers to our community from possible spillage or nuclear accident, and, with all due respect, I am not convinced by reassurances provided by the Department of Energy. In short, the risks, to my mind, clearly outweigh potential benefits to the United States and to my community. 972-2

I hope that Tacoma will be taken off the list of ports for such shipment, and, in fact, I hope that all U.S. ports are taken of the list. This is a bad policy and I will work my with community leaders and congressional representatives to make sure that the citizens of Tacoma are not placed in danger from such acts.

Sincerely yours,

T. Taranovski
Prof. of History

P.S. The above views reflect my position as an individual, and I am not speaking as a representative of the University of Puget Sound (although I would not be surprised to find most of my colleagues sharing the above sentiments).

Department of History ▪ 1500 North Warner ▪ Tacoma, Washington 98416-0040 ▪ (206) 756-3166

RESPONSE TO COMMENT
COMMENTOR NO. 972: TARANOVSKI, T.

Response to Comment No. 972-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 972-2

The proposed action is intended to reduce international commerce in highly enriched (weapons-grade) uranium (Section 1.2 of the EIS). Because relatively small amounts of HEU could be used to manufacture a nuclear weapon, it is prudent to remove as much of this weapons-grade material as possible from international commerce (Sections 1.1 and 1.2 of the EIS). As shown in Tables 4-6 and 4-7 of the EIS, the risks associated with implementation of the proposed action to human health or the environment at the Port of Tacoma or any other candidate port would be low.

COMMENTOR NO. 974: HUNT, BRIDGET & ROSS

Dear Charles Head,

My husband and I are definately opposed to any shipping of nuclear waste into this country, and especially in the Tacoma area. I'm quite surprised to hear that this idea is even a possibility. How can people of this country even conceive of shipping in nuclear waste from other countries? It's sad to even contemplate the possible outcomes here. All I can say is use your heart in this matter, please, as well as your head. Again absolutely no nuclear waste in Tacoma Washington, or in this country.

974-1

Respectfully Yours,
Bridget & Ross
Hunt

RESPONSE TO COMMENT
COMMENTOR NO. 974: HUNT, BRIDGET & ROSS

Response to Comment No. 974-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma and into the United States is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. Likewise, analysis in Sections 4.2.3 and 4.2.4 indicates that the risks associated with ground transportation and site management are low.

The benefit to the citizens of the United States from the proposed action, including those in potential ports of entry, along transportation routes, or near potential management sites, is less risk that weapons grade uranium from civil programs could be diverted into the production of nuclear weapons that might be used against us or our allies.

DOE would like to point out that shipments of foreign research reactor spent nuclear fuel have been received at ports in the United States for over 30 years, safely and without incident.

COMMENTOR NO. 975: KENNEDY, DENISE

June 21,1995

Dear Mr. Head,
I am writing in response to the proposal of transporting high level nuclear waste through Puget Sound. I am sure that you are not really all that interested in my reasons why, just that I am a taxpayer and a business owner in Tacoma. My business is not dependent on tourist is relies on the people of the community. I really don't think that when people are planning a move to this area they will consider Tacoma if the bay glows in the dark. I am sure you are aware that this community is plagued by violence. In a time when you can't even let your kids play in a neighborhood park by themselves do you really think I an comfortable with the largest body of water in this area becoming even more polluted. *PLEASE COUNT ME OPPOSED TO THIS IDEA!!* 975-1

Sincerely,
Denise Kennedy

Denise Kennedy
2302 93rd. St. East
Tacoma, Wa. 98445

RESPONSE TO COMMENT
COMMENTOR NO. 975: KENNEDY, DENISE

Response to Comment No. 975-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 977: KELLER, BEVERLY E.

Office of Spent Nuclear Fuel Management(EM-37)
US Department of Energy
1000 Independence Ave. SW.
Washington, DC. 90585

6/23/95

To: Charles Head
cc: Mike Lowry(WA. ST. Governor)
cc: Slade Gordon(US Senator)
cc: Patty Murray(US Senator)

Dear Mr Head,

I am writing this letter because I feel that you need to hear as many voices as possible about the decision to send 'spent fuel' through the Port of Tacoma. I was at the meeting at the Public Utilities Building in Tacoma on Monday, June 19, 1995. I found out I was quite ignorant to what was being asked of the people of Tacoma and the state of Washington. But now I am clear of the issues and believe that you are about to do the citizens of the city and surrounding communities a great deal of harm. People are scared to death of this kind of poison. I know you understand that fact. I am tired of the government dictating what I have to live with. I believe I have the "God given right" to say NO to such a harmful substance going by my home. Do you have nuclear 'spent fuel' in your backyard? Probably not. So who are you to say I have to live with this kind of danger in mine. How do I protect my children and family from the kind of toxic exposure you are so willing to subject them to, in the event of an accident? Can you or anyone guarantee that there will never be an accident? You and I know that this cannot be done. With this letter, (and hopefully many like this one) WE WILL SPEAK LOUD ENOUGH FOR YOU TO HEAR! 977-1

All I am trying to do is protect my family and community from even the slightest possibility of ever becoming exposed to any type of nuclear waste.
I also think the United States does not need to take 'spent fuel' from any other countries! Why does it have to always be us? Are we the worlds watchdogs for everything? We have our own problems right here. We don't need to add to it the greatest threat of all. 977-2
I would rather pay for helping the homeless or stopping the violence in out streets, than to help some other country poison us. We are not cattle, to be led to our slaughter.
I am a mother of two small children(3 and 1). What will it take for you to realize that you or the ;government have NO RIGHT to make that decision for us.
I believe that it probably comes down to money. How much is the US. going to get paid to take the 'fuel'? I do not believe it will benefit anyone here. Just the countries that don't have to deal with it. 977-3
I have become very heavy-hearted about the way in which our country's government has of listening to it's people it has sworn to protect.
If you, Mr. Head, decide to go ahead with using the Port of Tacoma or any Puget Sound port and we have an accident, I hope you will be tried as a murderer!!!!! 977-4

Thank you and I hope to God "that you have time to listen!!"

Sincerely,
Beverly E Keller
Beverly E. Keller
21721 130th St. E.
Sumner, Wa. 98390

RESPONSE TO COMMENT
COMMENTOR NO. 977: KELLER, BEVERLY E.

Response to Comment No. 977-1

DOE shares the commentor's concern about limiting radioactive exposures to the lowest levels achievable. Sections 4.2, 4.3, and 4.5 of the EIS discuss potential impacts to workers and the general population from foreign research reactor spent nuclear fuel handling and transport. This analysis indicates that risks and impacts would be low. The analyses performed in the EIS used very conservative assumptions about radiation exposures and the actual effects would probably be much lower.

Response to Comment No. 977-2

The United States has played in the past, and continues to play a leadership role in the world community in matters of nuclear weapons nonproliferation. This leadership role ensures that our national interest is protected. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

Response to Comment No. 977-3

As discussed in Section 2.2.1 of this EIS, the Port of Tacoma is one of ten candidate ports selected for receipt of spent nuclear fuel from foreign research reactors. The selection process is described in Appendix D of this EIS. Radiological consequences and risks were evaluated for severe accidents (See Tables 4-6 and 4-7 of the EIS). No significant radiological risks were found to result from implementation of the acceptance policy at any of the candidate ports, including the Port of Tacoma (Section 4 of the EIS).

Response to Comment No. 977-4

The commentor's opposition to the use of the Port of Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. Based on the port selection process described in Appendix D of the EIS, the Port of Tacoma is among the ten candidate ports listed in Section 2.2.1.6 of the EIS which could receive foreign research reactor spent nuclear fuel under Management Alternative 1 or 3. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel casks are also low (Section 4.2.2.2).

COMMENTOR NO. 978: GRAMENZ, ROBERT

Mr. Charles Head
Office of Spent Nuclear Fuel Management, EM-37
US Department of Energy
1000 Independence Ave., SW
Washington, DC

June 28,1995

Dear Mr. Head,

I thank you for extending the period during which comments can be accepted regarding the plan to bring spent nuclear fuel into the US I had the opportunity to attend the public meeting in Tacoma on June 13. I have the following concerns:

1. Before any new policies are adopted that will result in more nuclear materials being brought into our facilities, the US must have a clearly stated non-proliferation policy, and the final disposition option for these materials must be implemented. Bringing these materials in and putting them into exdsting temporary storage sites means that further "carting around" will take place. The disposition question should be answered first. Transportation of SNF should be for the sole purpose of final storage, under international control. *978-1*
2. The US needs to take a clear position on the issue of reprocessing this fuel. Until we do so, using fears of reprocessing as a justification for importing the spent fuel into the US is questionable. *978-2*
3. DOE is still using High Enriched Uranium in its own reactors, while leaning on others to switch to LEU. We need to lead by example. *978-3*
4. We could adhere to our treaty obligations regarding FRR SNF by committing ourselves to finding the best long term and /or permanent solutions to the problem of SNF, while including other nations in the process. *978-4*

The risks of exposure to damaging radiation for Port workers and other citizens is low, but real. There is also the stigma that could be attached to a port that is handling nuclear wastes. Until the broad, long term commitments and clarifications that I enumerate above and that have been emphasized by Physicians for Social Responsibility after a review of the draft EIS, we oppose moving these materials through ports in the U. S. *978-5*

Sincerely,

Robert Gramenz, D.O
(Member of the Board, Physicians for Social Responsibility, Washington State Chapter)

RESPONSE TO COMMENT
COMMENTOR NO. 978: GRAMENZ, ROBERT

Response to Comment No. 978-1

The United States has a clearly stated policy on nuclear weapons nonproliferation which is summarized in Sections 1.1 and 1.2 of the EIS.

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS). As stated in Sections 2.1 and 4.2.7 of the EIS, if a geologic repository was not prepared to accept the foreign research reactor spent nuclear fuel or the high level radioactive waste form resulting from the chemical separation or other processing of such spent nuclear fuel, by the end of the 40 year program period, DOE would continue to manage the spent nuclear fuel, or the high level waste forms, until such a geologic repository were available.

Each foreign research reactor operator is responsible for transport of their spent nuclear fuel. The health and safety standards for the transport, however, are international in nature. As discussed in Appendix B, Section B.2.1.1 of the EIS, the international community has adopted regulations for the transport of radioactive materials and the authority for these regulations is the International Atomic Energy Agency.

Response to Comment No. 978-2

At this time, the U.S. is not chemically separating any spent nuclear fuel. The U.S. position on chemical separation of the foreign research reactor spent nuclear fuel is one of the implementation decisions that will be made based on the analysis in this EIS.

The justification for accepting the foreign research reactor spent nuclear fuel into the U.S. is to support U.S. nuclear weapons nonproliferation policy objectives. There is some fear of chemical separation only if the reprocessing is performed by a nation that intends to use the separated nuclear material in a nuclear weapon.

Response to Comment No. 978-3

The potential tritium production facility would be a part of the U.S. nuclear weapons production complex and would not be a "research reactor", such as those addressed by the Reduced Enrichment for Research and Test Reactors (RERTR) program. Thus, the use of HEU in a tritium production facility has no relationship to the proposed action. Rather, the intent of the proposed action is to support U.S. nuclear weapons nonproliferation

policy seeking to reduce, and ultimately eliminate, the use of highly enriched (weapons grade) uranium in civil programs worldwide (Section 1.2 of the EIS) in order to assist in precluding the spread of nuclear weapons to nonnuclear weapons states.

In any case, the draft EIS for tritium supply and recycling analyzed a number of different technologies for tritium production, including the Heavy Water, Modular High Temperature Gas-Cooled Reactor, Accelerator Production of tritium, and Advanced Light Water Reactor. Of these, only the Heavy Water Reactor and the Modular High Temperature Gas-Cooled Reactor would be fueled by highly enriched uranium. The preferred alternative for that final EIS is not to select a tritium supply source that is fueled by HEU.

Response to Comment No. 978-4

As discussed in Section 4.2.7, ultimate disposition of spent nuclear fuel from foreign research reactors is a priority consideration. Foreign research reactor spent nuclear fuel could be safely stored at one or more of the candidate management sites pending final disposition (Section 4.2.4 of the EIS).

Response to Comment No. 978-5

The potential impacts (including radiation exposure) to port workers are discussed in Section 4 of the EIS. Although the foreign research reactor spent nuclear fuel is radioactive material, the dose rates from the casks used to transport it would be low. Appendix D, Section D.4 of the EIS demonstrates that the radiation dose that anyone would receive handling or near a cask is less than the limit that is allowed to the public in an unrestricted area by NRC regulations (Title 10 CFR Part 20). As discussed in Section 4.2.2.5 of the EIS, to avoid radiation doses which may exceed public dose limits, DOE would establish administrative procedures and maintain records to track individual exposures. Otherwise, no special handling or loading/unloading procedures would be required for the foreign research reactor spent nuclear fuel when it is contained in approved shipping containers.

Shipment of foreign research reactor spent nuclear fuel would not contribute to any "stigma" because the analysis in the EIS indicates that there would be no significant adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2 of the EIS). Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Based on over 30 years experience shipping spent nuclear fuel, DOE considers that spent nuclear fuel transportation casks passing through the Port of Tacoma, Commencement Bay, or any other port or waterway would not affect air or water quality. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

COMMENTOR NO. 979: TROCCOLI, VINCENT P. & ANNE MARIE

June 1995

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue S.W.
Washington, D.C. 20585

Dear Mr. Head,

Simply put, we don't like the idea of highly radioactive nuclear waste being shipped through the Port of Tacoma. 979-1

Thank you for your attention.

Sincerely,

V.P. and A.M. Troccoli

Vincent P. and Anne Marie Troccoli
4420 102nd Avenue E.
Puyallup, WA 98371

RESPONSE TO COMMENT
COMMENTOR NO. 979: TROCCOLI, VINCENT P. & ANNE MARIE

Response to Comment No. 979-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 980: MAIURA, SHERRILL

June 27, 1995

Dear Mr. Head:

This letter is to advise you that I am apposed to having spent nuclear fuel be shipped through Tacoma port. Please listen to U.S. Rep. Norm Dicks on reprocessing the waste oversees. Please seek a alternative rout to for shipping this nuclear waste product through. 980-1

Sincerely,
Sherrill Maiura
Sherrill Maiura
1013 Mt. View N
Tacoma. WA 98406

RESPONSE TO COMMENT
COMMENTOR NO. 980: MAIURA, SHERRILL

Response to Comment No. 980-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. With respect to the comment from Congressman Norm Dicks on reprocessing foreign research reactor spent nuclear fuel overseas, please see the response to Comment 312.

COMMENTOR NO. 981: CUNNINGHAM, KATHRYN A.

30 June 1995

Mr. Charles Head
Office of Spend Fuel Management
EM-37 U.S. Department of Energy
1000 Independence Ave. SW
Washington, DC 20585-0001

Dear Mr. Head:

As a resident of Galveston Island and a faculty member at the University of Texas Medical Branch, I believe that it is a serious mistake to consider bringing spent nuclear fuel through our waters, particularly based upon the argument published in our newsprint: "The DOE plan would bring used nuclear fuel to the US for processing and storage to prevent the possibility of the materials being used in nuclear weapons." This is truly bizarre reasoning based upon archaic cold war ideals. Our community around the U.S. are struggling to surviv environmental destruction and we do not need foreign nuclear fuel to add to the already serious toxicity of the Texas Gulf Coast. 981-1 981-2

I believe that the entire philosophy and rationale behind this plan should be reexamined.

Cordially,

Kathryn A. Cunningham, Ph.D.
4520 Avenue R
Galveston, TX 77551

RESPONSE TO COMMENT
COMMENTOR NO. 981: CUNNINGHAM, KATHRYN A.

Response to Comment No. 981-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Galveston, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 981-2

As evidenced by the renewal of the Treaty on the Non-Proliferation of Nuclear Weapons, which was extended indefinitely under the auspices of the United Nations in May 1995, the proliferation of nuclear weaponry is a current and serious concern worldwide. During preparation of this EIS, environmental effects of the proposed action and management alternatives were evaluated in detail (Appendices A through F of the EIS). Based on the analyses in Section 4.2.2, the risks associated with implementation of the proposed action to human health and the environment at the candidate ports, including the Port of Galveston would be low.

COMMENTOR NO. 982: OATES, ROSE M.

June 28, 1995

DEAR SIR

I DONT WANT NUCLEAR WASTE PASSING THROUGH OUR AREA. ~~EVEN~~ EVEN if its SPENT WASTE IT SHOULD be KEPT OUT of THE ENTIRE U.S. 982-1

TACOMA should NOT EVEN BE A CONSIDERATION

THANK YOU for YOUR ATTENTION,

Rose M Oates #13-9
776 S. Commerce Street
Tacoma, Washington
98402

RESPONSE TO COMMENT
COMMENTOR NO. 982: OATES, ROSE M.

Response to Comment No. 982-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel to Tacoma or any part of the United States, is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, would be low. Likewise, analysis in Sections 4.2.3 and 4.2.4 of the EIS indicates that the impacts of ground transportation and storage at DOE management sites would be low.

COMMENTOR NO. 983: ROMING, DONALD C.

P.O. Box 88251
Steilacoom, WA 98388
June 27, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-34)
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington DC. 20585

Dear Mr Head,

We do not believe that the United States should be importing spent nuclear fuel from other countries. 983-1

Other countries are recycling their nuclear fuel they also accept the responsibilities of the disposition as well.

Please keep this material out of our waters in the U.S. as a whole.

Thank you.

Sincerely,
Donald & Helen Roming

*

RESPONSE TO COMMENT
COMMENTOR NO. 983: ROMING, DONALD C.

Response to Comment No. 983-1

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States is noted (Management Alternatives 1 or 3; Sections 2.2 and 2.4 of the EIS, respectively). Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

* This is the best available copy of this comment document.

COMMENTOR NO. 984: WACHLEURA, MILDRED

June 27. '95

Dear Mr. Hunt:

We are strongly opposed to the shipping of any nuclear material to the Port of Tacoma, Washington. We oppose also to transport through our state by any method to any U.S. destination. 984-1

Finally, nuclear materials are best dealt with where they are. We do not need to put populations at risk by moving them around the globe. 984-2

Find another way. 984-3

Yours truly,
Mildred Josephine Wachleura
2401 N. 26th St.
Tacoma, WA 98407

*

RESPONSE TO COMMENT
COMMENTOR NO. 984: WACHLEURA, MILDRED

Response to Comment No. 984-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 984-2

The commentor's opposition to transporting any nuclear material through the State of Washington by any method is noted. The analysis presented in Section 4.2.3, however, shows that the risks associated with this activity would be very low.

Response to Comment No. 984-3

The commentor's support for Management Alternative 2 (Section 2.3 of the EIS) or the No Action Alternative (Section 2.5 of the EIS) is noted. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). As discussed in Section 4 of the EIS, the proposed action and management alternatives would result in no significant benefits or risks to human health and the environment.

* This is the best available copy of this comment document.

COMMENTOR NO. 985: CITIZENS (TACOMA AREA)

Petition Against the Nuclear Waste Proposal:

June 26, 1995

Dear Mr. President & Congress & Mr. Head:

Isn't it burden enough being the World's police man? Now America has to also be the World's "Nuclear Waste dump"? No!!! — 985-1

Please DO NOT ship nuclear waste material through the heart of a city and heavily populated area (Tacoma). If an accident were to occur, it could jeopardize the city, port, economy, thousands of jobs, and nearby hospitals. — 985-2

Please reconsider this inappropriate location and flawed logic. Please DO NOT ruin Paradise (Washington State).

Kathlene E. Smith
17508 76 St. KPS
Longbranch, Washington 98351

Like Minded Fellow Citizens:

Inga L. Robbins
Josh Vilderbrand
Kari Martin

RESPONSE TO COMMENT
COMMENTOR NO. 985: CITIZENS (TACOMA AREA)

Response to Comment No. 985-1

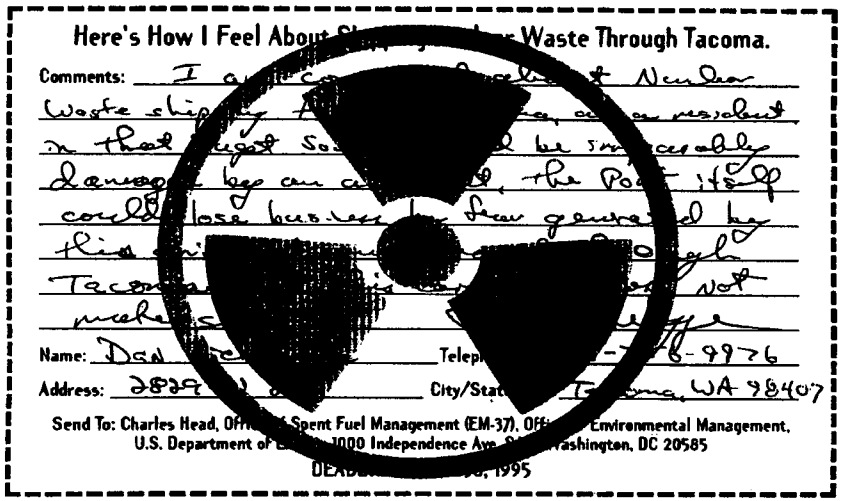
Management alternatives evaluated in the EIS for foreign spent nuclear fuel include management in the United States (Management Alternative 1, Section 2.2 of the EIS), overseas management (Management Alternative 2, Section 2.3), and a combination of domestic and overseas management (Management Alternative 3, Section 2.4). The EIS also provides an evaluation of a No Action Alternative (adopt no policy for management of foreign research reactor spent nuclear fuel). None of these alternatives would compel the United States to serve as a permanent repository for foreign research reactor spent nuclear fuel.

As discussed in Section 1.2 of the EIS, the management alternatives evaluated in this EIS are intended to support nuclear weapons nonproliferation policies of the United States.

Response to Comment No. 985-2

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 and Appendix D, Section D.5 of the EIS).

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



988-1

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by **June 30, 1995**. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Renton, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

Response to Comment No. 988-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Commentor No. 989: Kimball, Joyce

Here's How I Feel About [illegible] Nuclear Waste Through Tacoma.

Comments: We do not [illegible] nuclear waste coming through our Tacoma Port. The [illegible] are places for more [illegible] & able to take care of this waste. I do not want [illegible] to live in a [illegible], a nuclear [illegible].

989-1

Name: Joyce Kimball Telephone: (206) 564-8617

Address: 1518 [illegible] land City/State: Tacoma, WA 98465

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, DC 20585

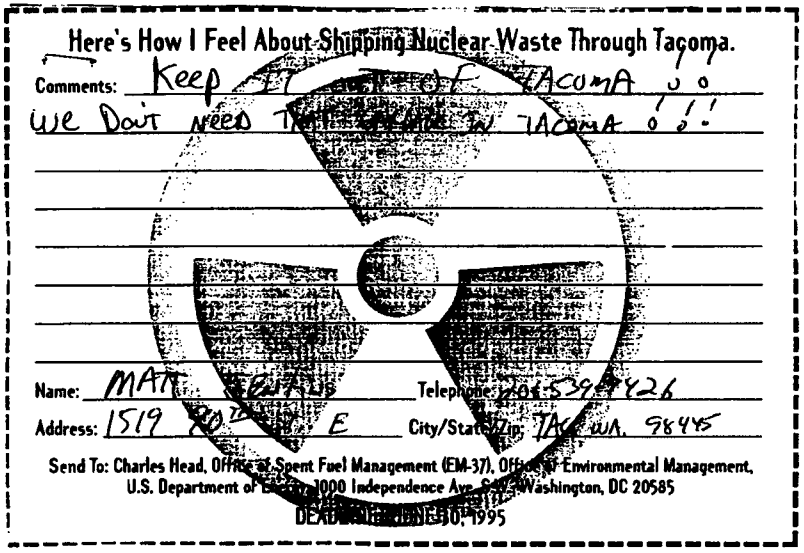
DEADLINE: [illegible] 30, 1995

Response to Comment
Commentor No. 989: Kimball, Joyce

Response to Comment No. 989-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 990: JENKINS, MATT



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: Keep it out of TACOMA !!!
We Don't NEED Nuclear Waste in TACOMA !!!

Name: MATT [illegible] Telephone: 206-539-[illegible]426

Address: 1519 [illegible] E City/State/Zip: TACOMA, WA. 98445

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, DC 20585

DEADLINE: June 30, 1995

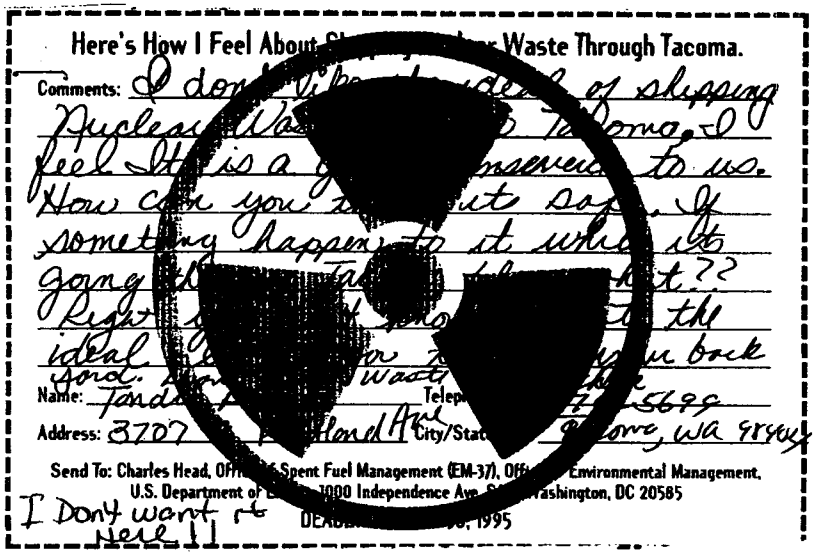
990-1

RESPONSE TO COMMENT
COMMENTOR NO. 990: JENKINS, MATT

Response to Comment No. 990-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 991: POWELL, TONDIS



Here's How I Feel About Sh[illegible] Waste Through Tacoma.

Comments: I don't like the idea of shipping Nuclear Was[illegible] To Toma. I feel It is a [illegible] to us. How can you [illegible] safe. If something happens to it while it's going [illegible] it?? Right [illegible] the ideal [illegible] back Pond. [illegible] Waste [illegible]

Name: Tondis [illegible] Telep[illegible] 5699

Address: 3707 [illegible] Holland Ave City/State [illegible] oma, Wa 98466

Send To: Charles Head, Off[illegible] Spent Fuel Management (EM-37), Off[illegible] Environmental Management, U.S. Department of [illegible] 1000 Independence Ave [illegible] Washington, DC 20585

I Dont want it DEAD[illegible] 1995 here!!

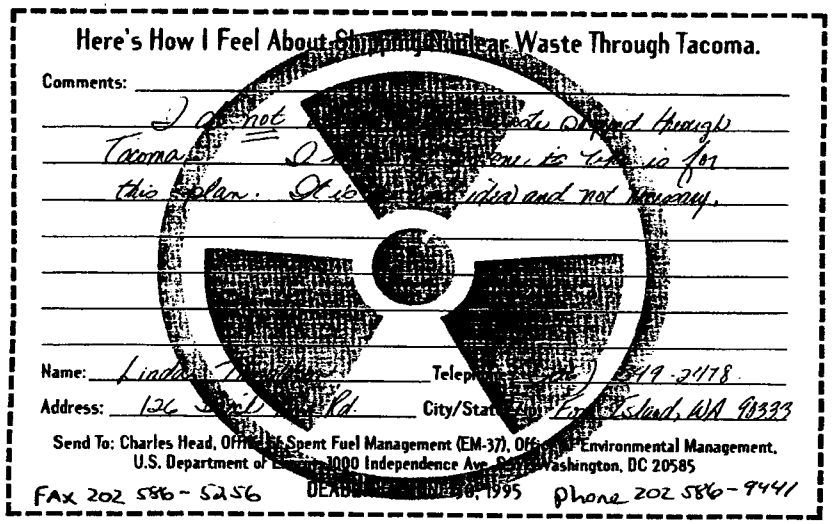
991-1

RESPONSE TO COMMENT
COMMENTOR NO. 991: POWELL, TONDIS

Response to Comment No. 991-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



992-1

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by **June 30, 1995**. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

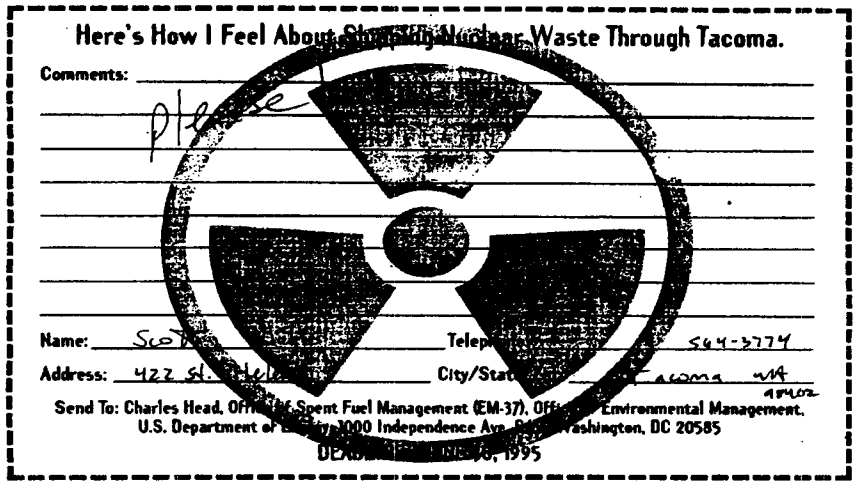
Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Renton, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau; Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

Response to Comment No. 992-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Commentor No. 993: Mills, Scott

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



993-1

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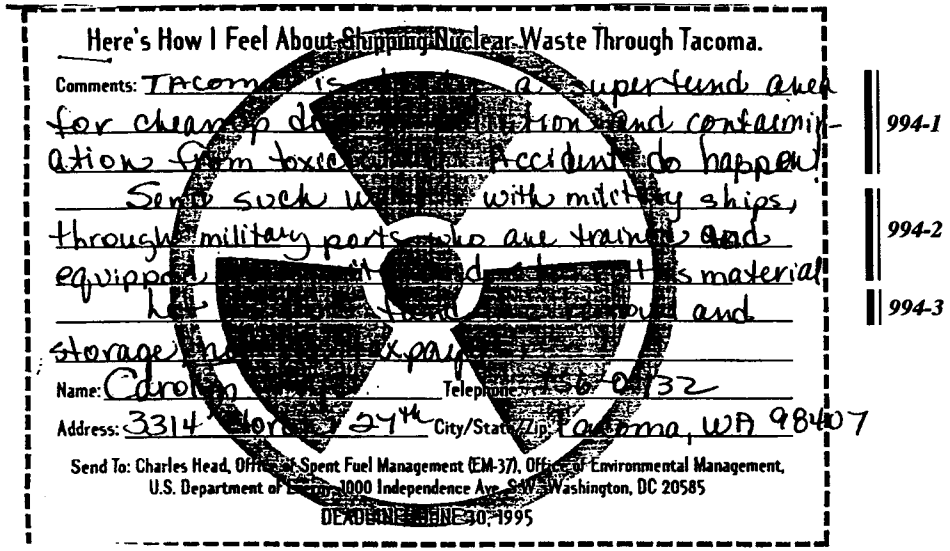
Response to Comment
Commentor No. 993: Mills, Scott

Response to Comment No. 993-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 994: FRYE, CAROLYN



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: Tacoma is a superfund area for cleanup of contamination and contamination from toxic accidents do happen. Send such waste with military ships, through military ports who are trained and equipped to handle this material and storage [illegible] expire.

Name: Carolyn [illegible] Telephone: 536-0732

Address: 3314 North 24th City/State/Zip: Tacoma, WA 98407

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: JUNE 30, 1995

994-1

994-2

994-3

RESPONSE TO COMMENT
COMMENTOR NO. 994: FRYE, CAROLYN

Response to Comment No. 994-1

DOE has added a sentence to Appendix D, Section D.2.1.9 of the EIS regarding Commencement Bay being a Superfund Site. The analysis of impacts for Management Alternatives 1 and 3 in Section 4 of the EIS indicates that there would be no significant adverse impacts on the ports, people, or natural environment from shipments of foreign research reactor spent nuclear fuel and the overall impacts to Commencement Bay would be unchanged by the various management alternatives.

Response to Comment No. 994-2

The commentor's preference for the use of military ships and military ports to transport foreign research reactor spent nuclear fuel is noted. The analyses of impacts associated with accidents and incident-free operations involving foreign research reactor spent nuclear fuel demonstrate that commercial ports and facilities represent an acceptable option for the transportation of foreign research reactor spent nuclear fuel (Section 4.2.2.3 of the EIS presents the consequences of port accidents and Section 4.2.2.2 presents impacts of incident-free operation).

Whether the shipments come as cargo on a scheduled carrier or on a chartered ship, no special precautions are expected to be required by the Coast Guard or any other authority. As such, there need be no additional requirements to use dedicated or military ships, nor any adverse consequences to the use of the commercial ships or facilities.

Response to Comment No. 994-3

As discussed in Section 2.2.1.2 and 2.2.2.3 of the EIS, several financing options have been considered, ranging from collection of fees from the research reactor operators that would pay all of the costs of the program to full subsidization of the program by DOE. A compromise between these extremes would be for developed countries to be charged a competitive fee, U.S. taxpayers would absorb the full costs of the program for developing countries and absorb the amount above a competitive fee for developed countries to accept and manage their spent nuclear fuel. The reasons the United States would pay some of the costs for other countries are: 1) some countries would be unable to afford the costs of the proposed action and would have no safe alternative means of managing their spent nuclear fuel (i.e., the developing countries); and 2) some countries would continue to use and trade weapons-grade nuclear material indefinitely unless the United States charges a competitive fee and absorbs any costs above that fee (i.e., most of the Western European countries). Costs borne by DOE for this program would ultimately be borne by the U.S. taxpayers.

COMMENTOR NO. 996: MCINTIRE, ROSE L.

847 E. 52nd
Tacoma, WA 98404
28 June 1995

Charles Head
Office of Spent Nuclear Fuel Mgmt (EM-33)
US Department of Energy
1000 Independence Ave. S.W.
Washington, DC 20585

Dear Mr. Head:

The plan to possibly use Tacoma as a port for entry for spent fuel rods is totally unacceptable. Especially, in light of the fact there are places that can use the material. We in Tacoma do not want that type of material coming through our area. 996-1

In addition, Hanford is hazardous enough without adding more to the pile. Funds for the clean up have been cut which leaves the Pacific Northwest more vulnerable to disaster than ever. 996-2

Do not bring that fuel here.

Sincerely,
Rose L. McIntire

RESPONSE TO COMMENT
COMMENTOR NO. 996: MCINTIRE, ROSE L.

Response to Comment No. 996-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 996-2

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 997: PETERSON, MARVEN & LOIS

July 1, 1995

Mr. Charles Hendy

We learned with great interest to the final hearing on the shipping of high level nuclear waste thru the Port of Tacoma, and are very much opposed to the idea. We do not need our waters and air subjected to this. Keep it out of our Commencement Bay.

Sincerely

Marvin & Lois Peterson

1918 No. Madison

Tacoma, Wa. 98406

997-1

RESPONSE TO COMMENT
COMMENTOR NO. 997: PETERSON, MARVEN & LOIS

Response to Comment No. 997-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 998: SPAULDING, KENT E.

3801 Narrows Dr.
Tacoma, WA 98407
June 26, 1995

Dept of Energy:

Sirs:

The proposal to bring foreign radioactive material through and port in the U.S. is wrong. We do not need their waste. We are not a dump! The proposal to bring it through the Port of Tacoma will be fought to the bitter end by all of us who live here. Store it at your Rocks! Not mine!

Sincerely,

Kent E Spaulding

998-1

998-2

RESPONSE TO COMMENT
COMMENTOR NO. 998: SPAULDING, KENT E.

Response to Comment No. 998-1

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States is noted (Management Alternative 1 or 3, Sections 2.2 and 2.4 of the EIS, respectively). Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

Response to Comment No. 998-2

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 999: FULLER, MARIE B.

June 28, 1995

Dear Mr. Head:

I am writing in protest against the Nuclear Waste that your Department wants to ship through the Port of Tacoma. No Way — Please do not risk our city.

As a senior citizen living in the northern part of the city I worry about too many things taking place in and around my town. I have children and grandchildren and last week twin great grandchildren. I pray you can some how assure people like a safe place in the future to grow up in.

As a bitter senior I hope you never have this kind of thing to worry about.

Marie B. Fuller
401 No. G St.
#309
Tacoma, Wa
98403

999-1

RESPONSE TO COMMENT
COMMENTOR NO. 999: FULLER, MARIE B.

Response to Comment No. 999-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1000: PRIOR, RITA

June 27. 1995

Dear Mr. Head.

My husband & I settled in tacoma in 1952 - We purchased our present home in 1959, and raised our 2 daughters, and now are very active in helping them raise our 3 grandchildren. Their families live close to us in the North end of tacoma.

Since I retired from nursing several years ago, I walk 3-4 mi. every morning along a beautiful waterfront path, that our city built & maintains. I take my grand children with me whenever possible, and my husband often accompanies me, since he retired 3 yrs. ago.

I am writing on behalf of my husband, our daughters & son-in-laws, and grand children, when I plead with you to not to ship nuclear waste into Puget Sound. 1000-1

I don't feel our country is the only one with a conscience, or 1000-2

RESPONSE TO COMMENT
COMMENTOR NO. 1000: PRIOR, RITA

Response to Comment No. 1000-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through Puget Sound and the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1000-2

As evidenced by the indefinite extension of the Treaty on the Non-Proliferation of Nuclear Weapons in May 1995, there is a worldwide concern about the potential spread of nuclear weaponry. This EIS evaluates three management alternatives for spent nuclear fuel from foreign research reactors: management in the United States (Management Alternative 1, Section 2.2), overseas management (Management Alternative 2, Section 2.3), and combined domestic and overseas management (Management Alternative 3, Section 2.4). The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of HEU in civilian programs worldwide (Section 1.2 of the EIS).

This EIS does not state that if Management Alternative 1 is not adopted, then HEU would be sold to Iran or any other nation. Sections 1.1 and 1.2 of the EIS describe nuclear weapon nonproliferation efforts and concerns of the United States.

that we should have to store the worlds radio active wastes - Weive created enough monsters of our own that we have to be responsible for. It seems like a form of black mail to say if we don't take it and store it safely, they'll sell it To Iran! If any country considers this, it should be dealt with by all of the countries in the U.N. 1000-2 (Cont'd.)

It should be stored in a most isolated part of each country that created it - I think we all feel vulnerable enough to terrorists, without having Radio active waste being shipped through our port - 1000-3

Please don't ship it through the Port of Taroma 1000-1 (Cont'd.)

Thank you -
Rita Prior

Response to Comment No. 1000-3

The commentor's preference for overseas storage in isolated areas is noted. Overseas storage of foreign research reactor spent nuclear fuel is discussed in Sections 2.3 and 4.4.1 of the EIS.

COMMENTOR NO. 1001: PRITCHETT, BARBARA

Dear Sir: 6-25-95

I DO have a problem with any more nuclear waste coming in, through or around the Port of Tacoma or any other port in the State of Washington.

[redacted]

Sincerely,

Barbara Pritchett
Registered voter
3201 So. Sawcett #15
Tacoma, Wa.
98408

1001-1

RESPONSE TO COMMENT
COMMENTOR NO. 1001: PRITCHETT, BARBARA

Response to Comment No. 1001-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1002: WATSON, MARIE

6/28/95

I can not believe that any country especially, mine would be Dumb Stupid ** enough to bring nuclear waste into enclosed waters. Please Please do not bring on another catastophe like the Alaska Oil disaster to Puget Sound

Marie Watson
Harold + Watson
3525 Lakeridge Dr. E
Sumner WA 98390

1002-1

RESPONSE TO COMMENT
COMMENTOR NO. 1002: WATSON, MARIE

Response to Comment No. 1002-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 and Appendix D, Section D.5 of the EIS).

COMMENTOR NO. 1003: HALL, CAROL M.

Mr. Charles Head

PLEASE DO NOT

allow the world wide nuclear waste to enter our waterways & the Port of Tacoma. It is very upsetting to even think of this terrible & horrible thing happening here. Why pick on us? Direct this mess to the waterways into Washington D.C., after all that is where the whole darn mess started. You make us sound like a bunch of idiots on our West coast, espically in the Pacific N.W. Its like So what do we care here in Tacoma We do care!! And you make us sound unimportant to the rest of your Washington D.C. people.

Grow up & keep this whole mess out of our area.

Thank you for listening

Carol M. Hall 9883 E. "F" ST. Tacoma, WA 98445

1003-1

RESPONSE TO COMMENT
COMMENTOR NO. 1003: HALL, CAROL M.

Response to Comment No. 1003-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. The Washington, DC area does not have the facilities required to safely manage the spent nuclear fuel.

The DOE representative's comment that their bosses in Washington "don't have time to listen" was taken in the wrong context. While it would be impractical for the Secretary of Energy to personally review and respond to all of the written and oral comments concerning this EIS, this information was reviewed by the Program Manager and his staff. The Program Manager is responsible for relaying public concerns and issues to the Secretary of Energy and her staff. As indicated by this document, all comments received from the public were noted and taken seriously. Under NEPA and DOE's environmental regulations (Section 5 of the EIS), public participation and comments are an integral component of the environmental process.

COMMENTOR NO. 1004: CONLEY, D. JEANNE

June 26, 1995

Dear Mr. Head,

I was not at the meeting you attended here in Tacoma, but I would like to add my voice to the many, many other residents of this city. I do not want nuclear waste shipped through the Port of Tacoma, WA.

1004-1

Sincerely,
D. Jeannie Conley
1021 E. Morton St.
Tacoma, WA. 98404

RESPONSE TO COMMENT
COMMENTOR NO. 1004: CONLEY, D. JEANNE

Response to Comment No. 1004-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1005: THOMAS, YVONNE ISAACSON

I am opposed to the use of the Port of Tacoma through which to ship the spent nuclear waste!

Yvonne Thomas

1005-1

RESPONSE TO COMMENT
COMMENTOR NO. 1005: THOMAS, YVONNE ISAACSON

Response to Comment No. 1005-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1006: SCOGGIN, MARY A.

Mary A. Scoggin
Retired Teller
7208 53rd St. A. East
Puyallup, Wa. 98371

June 29, 1995

Charles Head
Off. of Spent Nuclear Fuel Management (EM-9)
U.S Dept. of Energy
1000 Independence Ave. SW
Washington, D.C. 20585

NO to nuclear waste being shipped through the Port of Tacoma.

Very sincerely,
Mary A. Scoggin

1006-1

RESPONSE TO COMMENT
COMMENTOR NO. 1006: SCOGGIN, MARY A.

Response to Comment No. 1006-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1007: NORTON, GERALDINE

Dear Mr. Head:
Please, no nuclear waste through Tacoma!

Also America should not take any waste from foreign countries! They should get rid of it in their own country.

Sincerely,
Jr. Geraldine Norton
Loyal H. Norton

1007-1

1007-2

RESPONSE TO COMMENT
COMMENTOR NO. 1007: NORTON, GERALDINE

Response to Comment No. 1007-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1007-2

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

COMMENTOR NO. 1008: BARNES, MRS. LYNN

Please dont bring the
Spent Nuclear into the
State of Washington
Sincerely
Mrs Lynn Barnes

Mrs. Mrs Lynn Barnes
5901-117th Ave Ct E Sp 54
Puyallup, WA 98372-5875
206-845-1160

1008-1

RESPONSE TO COMMENT
COMMENTOR NO. 1008: BARNES, MRS. LYNN

Response to Comment No. 1008-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1009: BARNES, LYNN

Please no nuclear waste in WA

1009-1

Mr & Mrs Lynn Barnes
9801-117th Ave Ct E Sp 54
Puyallup, WA 98372-5875
206-845-1180

RESPONSE TO COMMENT
COMMENTOR NO. 1009: BARNES, LYNN

Response to Comment No. 1009-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1010: TURYA, DONALD & CHARLOTTE

no, no, no, no, no, no, no, no,
and the nuclear waste issue
for the Port of Tacoma.

The Tacoma area is doing
their part for our country,
we have Fort Lewis and
McChord Air Force nearby.

1010-1

Donald and Charlotte Turya
5003 66th Ave. West
Tacoma, Wa. 98467-2221

RESPONSE TO COMMENT
COMMENTOR NO. 1010: TURYA, DONALD & CHARLOTTE

Response to Comment No. 1010-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1011: MYRVIK, MRS. NORMAN J.

6-27-95

Dept of Energy
Gentlemen:
Just a line to inform you that my family and myself are very much opposed to your plan to ship nuclear waste through our harbor. We can't take the risk of doing this in our fine city. Ship it elsewhere where less populated.
Thank you.
Sincerely
Mrs. N. MYRVIK
4334-So-D
Tacoma, WA 98408.

1011-1

RESPONSE TO COMMENT
COMMENTOR NO. 1011: MYRVIK, MRS. NORMAN J.

Response to Comment No. 1011-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

The population in close proximity to the terminal, as well as those as far away as 50 miles, was considered when the effects of possible accidents were calculated (Appendix D, Section D.5 of the EIS). These calculations demonstrate that the risk from accidents to all individuals is low. Likewise, the incident-free radiation exposure to people nearer to the cask than those living outside the fence around the port was calculated and found to pose no significant risk (Section 4.2.3.2 of the EIS). The dose rate at 100 feet from a cask containing foreign research reactor spent nuclear fuel is essentially zero. For these reasons, the close-in population near the Port of Tacoma would not be subjected to any significant risk from the use of the terminal to receive foreign research reactor spent nuclear fuel.

COMMENTOR NO. 1013: TORGERSON, L.

June 27, '95

Dear Mr. Head-

I advertised the June 19th meeting in my church bulletin because it is too shocking that 41 countries want to use us as a nuclear dumping ground - and our government is open to it.

1. What politicians and their cronies are profiting from this? There can be no other reason than under the table payoffs & over the table profiteering. This adds to public cynicism which is widespread about political corruption. 1013-1

2. We have enough debate in our own country as to where we can dispose of our own waste. 1013-2

3. This is another example of no regard for the devastating effects nuclear waste will have on future generations. # now is their only concern. 1013-3

4. Whoever promotes this will suffer retribution time.

Sincerely,

Rev. L. Torgerson

Fox Island
U.C.C. Church.

RESPONSE TO COMMENT
COMMENTOR NO. 1013: TORGERSON, L.

Response to Comment No. 1013-1

The proposed action and management alternatives do not result from bribery or any other illegal activity. Rather, the proposed action supports the nuclear weapons nonproliferation objectives of the United States. Alternatives evaluated in this EIS include management of foreign research reactor spent nuclear fuel in the United States (Management Alternative 1, Section 2.2 of the EIS), overseas management (Management Alternative 2, Section 2.3), and combined domestic and overseas management (Management Alternative 3, Section 2.4). The No Action Alternative (adopt no policy for management of foreign research reactor spent nuclear fuel) is also evaluated (Section 2.5). As demonstrated by the analyses in Section 4 of the EIS, the risks associated with implementation of the proposed action to human health or the environment would be low.

Response to Comment No. 1013-2

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. A detailed, quantitative discussion of these impacts would have to be the subject of future NEPA documentation. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the spent nuclear fuel (Section 1.1. of the EIS).

Response to Comment No. 1013-3

Contrary to the commentor's assertion, the purpose of preparing this EIS is to evaluate and determine what significant impacts to the environment would occur if the proposed action were implemented. Sections 4.2, 4.3, and 4.5 of the EIS present discussions of the risks and impacts, which demonstrates that the risks and impacts would be low, for proposed ports of entry, along ground transportation routes, as well as for any potential management site. The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS), not to economically benefit anyone.

COMMENTOR NO. 1016: LEVINE, MAXINE

Maxine Levine

1721 Alhambra Avenue
Martinez, CA 94553
(510) 229-4320

BY FAX TO (202) 586-5256

July 7, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (RF-7)
U.S. Department of Energy
1000 Independence Avenue SW
Washington, D.C.

Dear Mr. Head:

The purpose of this letter is to express the strong opposition of my husband and myself to the proposal to store nuclear waste, even temporarily, at the Concord Naval Weapons Station. 1016-1

We are also very opposed to even trans-shipping nuclear waste through the County of Contra Costa to the Concord Naval Weapons Station. From time to time the newspapers have reported accidents involving vehicles transporting weapons. The main highway routes into Contra Costa County are among the busiest, most heavily traveled and most congested in this state, if not the nation. The Delta and the Bay water ways are heavily used by ships transporting oil and chemicals to and from the numerous refineries and chemical plants in this county. The earthquake threats also make this a dangerous concept. 1016-2 1016-3

Contra Costa County is a highly industrialized urban area and a part of the San Francisco Bay area which is one of the largest population areas in California. There are more people in this county than there are in most of the other metropolitan areas in this nation. I am appalled that the Department, which is a part of my federal government, would even consider a scheme which clearly could endanger the citizens of this area.

The concept of purposefully bring nuclear waste from other nations into the United States is horrific. It is my urgent hope that my representatives will do their utmost to change this misguided federal policy. 1016-4

Very truly yours,

Maxine Levine

cc: President Bill Clinton
Senator Barbara Boxer
Senator Diane Feinstein
Rep. George Miller
Coutra Costa County Board of Supervisors

RESPONSE TO COMMENT
COMMENTOR NO. 1016: LEVINE, MAXINE

Response to Comment No. 1016-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternatives 1 or 3) there would be no storage of this material in the Port of Concord NWS, any other port, or anyplace except for DOE management sites. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

Response to Comment No. 1016-2

The commentor's opposition to transshipping foreign research reactor spent nuclear fuel through Contra Costa County is noted. During preparation of the EIS, environmental effects which could result from implementation of Management Alternative 1 or 3 (acceptance and management in the United States) were evaluated at candidate ports and along representative transportation routes. As discussed in Sections 4.2.2 and 4.2.3 of the EIS, the risks to human health or the environment at candidate ports or along transportation routes are low. Foreign and domestic spent nuclear fuel has been transported along truck and rail routes for over four decades. During that time, no transportation cask containing spent nuclear fuel has been breached, including those involved in traffic accidents (Section 4.2.3 of the EIS).

Response to Comment No. 1016-3

The physical constraints of the passage from San Francisco Bay to Concord NWS were considered as part of the port selection process. The passage meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS). The port selection process does not, however, consider the existence of land-based facilities such as refineries because the addition of some mishap at a land-based facility would not add to the severity of the worst plausible accident, which is considered to be the collision of the ship carrying the foreign research reactor spent nuclear fuel with a petroleum tanker.

The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small

number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (port selection Criterion 2; Appendix D, Section D.1.9.2 of the EIS). Appendix D, Section D.5.3.1.3 of the EIS presents a discussion of the determination of the probability of ship accidents used in the EIS.

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the transportation cask.

Response to Comment No. 1016-4

The intent of the proposed policy is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS).

COMMENTOR NO. 1017: BOEKHOLT, CONRAD J. & BARBARA M.

1721 North Mildred Street
Tacoma, Wa 98406

June 27, 1995

Mr. Charles Head,
Program Manager
Office of Spent Nuclear Fuel Management (EM-37).
U.S. Department of Energy
1000 Independence Avenue S.W.
Washington D.C. 20585

Re Nuclear Waste

Dear Mr. Head.

This letter is being written to express our deep concern that foreign nuclear waste may be shipped through the Port of Tacoma. 1017-1

We realize the importance of the waste not ending up in the hands of any nation who might use it to make nuclear weapons, but from what we understand, there are countries who have shown a great interest in accepting it and with no threat to the Free World.

Washington is a beautiful state. We are proud of our Puget Sound, our clean waters and beaches. Shipping waste through the Puget Sound is an "accident waiting to happen". Our concern is for our grandchildren. Who can guarantee that no accident will happen during their lifetime?. 1017-2

While our concern for Tacoma and Washington State is a personal one, we also feel that as long as there are willing receivers in other parts of the world, no American Port should be used. We ask that you consider all options before you allow this to happen.

Sincerely yours,

Conrad J. Boekholt.

Barbara M. Boekholt.

RESPONSE TO COMMENT
COMMENTOR NO. 1017: BOEKHOLT, CONRAD J. & BARBARA M.

Response to Comment No. 1017-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1017-2

The commentor's preference for overseas management of foreign research reactor spent nuclear fuel is noted. Section 2.3 of the EIS provides a discussion of the advantages and disadvantages of overseas management.

Although a no-accident guarantee is not feasible, Section 4.2 of the EIS determines that the risks associated with an accident in port are low, as are the consequences of such accidents.

COMMENTOR NO. 1018: WILSON, THERESA

Dear Charles 7-1-95

It has been brought to my knowlege that toxic waste is going to be brought into my state - Washington. I thought I'd write and let you know I don't want it brought here. Our environment needs to be preserved not destroyed.

1018-1

Thank You

Theresa Wilson

RESPONSE TO COMMENT
COMMENTOR NO. 1018: WILSON, THERESA

Response to Comment No. 1018-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1020: NOVOSAD, BETH

June 30, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
US Department of Energy
1000 Independence Avenue SW
Washington DC 20585

Dear Mr. Head:

As a long-time resident of Pierce County, and soon-to-be-homeowner within Tacoma city limits, I must voice my protests to the proposal that the Department of Energy ship high-level nuclear waste through the Port of Tacoma. 1020-1

In my opinion, it makes much more sense to ship this waste to a location that has the facilities to reprocess the waste. There are facilities already in existence, close to ports, that could do this job. 1020-2

With Hanford already in Washington state, as well as mothballed nuclear power plants costing the taxpayers millions, hasn't Washington state already done our fair share and accepted enough responsibility for other nuclear projects?

Please do not saddle us with accepting high-level waste. We want our families to be able to grow and prosper without the threat of a nuclear mishap occurring in our backyard.

Thank you for listening. I sincerely hope that we will soon hear news that Tacoma has been removed from the list of sites being considered to accept this waste.

Sincerely,

Beth Novosad

Beth Novosad
PO Box 353
Tacoma WA 98401

RESPONSE TO COMMENT
COMMENTOR NO. 1020: NOVOSAD, BETH

Response to Comment No. 1020-1

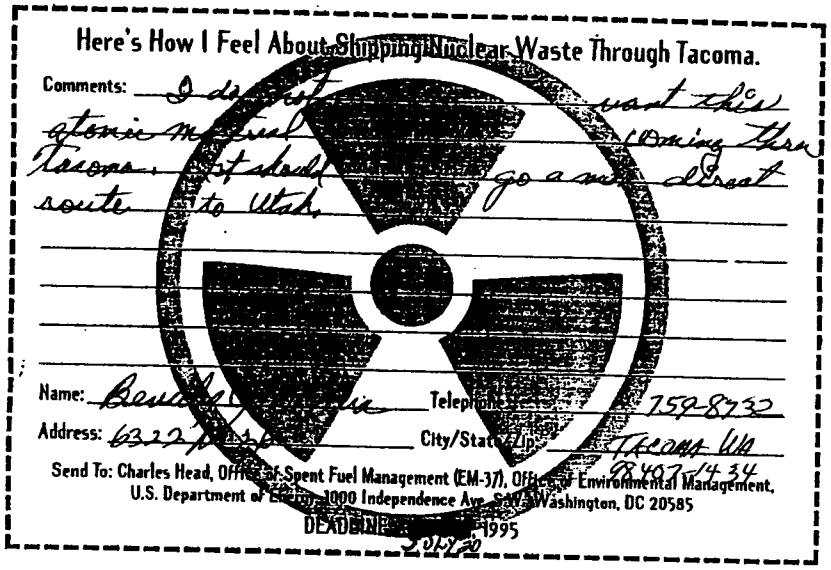
The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1020-2

The commentor's opinion that foreign research reactor spent nuclear fuel should be reprocessed at existing facilities, close to ports, is noted. Chemical separation is Implementation Alternative 6 to Management Alternative 1, and is discussed in Section 2.2.2.6 of the EIS. Facilities for chemical separation of spent nuclear fuel exist at the Savannah River Site and the Idaho National Engineering Laboratory. Port identification is based on criteria discussed in Section 2.6.3.1 of the EIS. Proximity to the management site(s) does not directly affect the identification of a port of entry.

COMMENTOR NO. 1023: WYDRA, BEVERLY J.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: I do not want this atomic material coming thru Tacoma. It should go a more direct route to Utah.

Name: [illegible] Telephone: 759-8732

Address: 6322 [illegible] City/State/Zip: Tacoma WA 98407-4434

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. S.W., Washington, DC 20585

DEADLINE: June 30, 1995 7-20-95

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by ~~June 30~~ 7-20, 1995. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Ruston, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

1023-1

RESPONSE TO COMMENT
COMMENTOR NO. 1023: WYDRA, BEVERLY J.

Response to Comment No. 1023-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1024: MEARS, BETTY

Tacoma Wa
June 28-1998

Dear Sirs -
I do not approve of your sending 1024-1
the Nuk. waste through the Pt. of
Tacoma. - Wilma Betty Mears

DAV | WILMA O MEARS
2002 SW CLP DR NE
TACOMA WA 98422

RESPONSE TO COMMENT
COMMENTOR NO. 1024: MEARS, BETTY

Response to Comment No. 1024-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

963 S. 94
Tacoma Wa.
98408

Dear Mr Head:

We are just two people concerned over the issue of the high level nuclear waste coming into our Port of Tacoma.

We would really appreciate you not allowing Tacoma to be the receiver of this. Please do not let this be buried over here.

Thank you -
Charlie Mael
Nicole Thomas

1028-1

*

Response to Comment No. 1028-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

* This is the best available copy of this comment document.

COMMENTOR NO. 1029: MAIURA, ANTHONY

June 27, 1995

Dear Mr. Head:

This letter is to advise you that I am apposed to having spent nuclear fuel be shipped through Tacoma port. Please listen to U.S. Rep. Norm Dicks on reprocessing the waste overseas. Please seek a alternative rout to for shipping this nuclear waste product through. 1029-1

Sincerely,
Anthony Maiura
Anthony Maiura
1013 Mountain View
Tacoma Wa 98406

RESPONSE TO COMMENT
COMMENTOR NO. 1029: MAIURA, ANTHONY

Response to Comment No. 1029-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. With respect to the comment from Congressman Norm Dicks on reprocessing foreign research reactor spent nuclear fuel overseas, please see the response to comment number 312.

COMMENTOR NO. 1031: BERGAMINI, MARY

2023 Huntridge Ct.
Martinez, CA 94553
July 5, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management
U.S. Department of Energy
1000 Independence Ave. SW
Washington, D.C. 20585

Dear Mr. Head:

Why have you chosen Contra Costa County to use as your storage & shipping center for nuclear waste? And just where are you planning to ship it? Perhaps you wouldn't be so eager to use our community as a toxic garbage dump if you and your people lived here.

Please reconsider your plan.

Sincerely,
Mary Bergamini

1031-1

RESPONSE TO COMMENT
COMMENTOR NO. 1031: BERGAMINI, MARY

Response to Comment No. 1031-1

The commentor's opposition to the use of Concord NWS for the shipment of foreign research reactor spent nuclear fuel is noted. Concord NWS is only a candidate for shipment, not for storage of the foreign research reactor spent nuclear fuel. The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1032: HAUGE, GUDRUN

6-23-95

Dear Mr. Head,

I would like to voice my STRONG objection to the proposal of shipping radioactive nuclear waste through the Port of Tacoma, Wa. Please, reconsider !!

1032-1

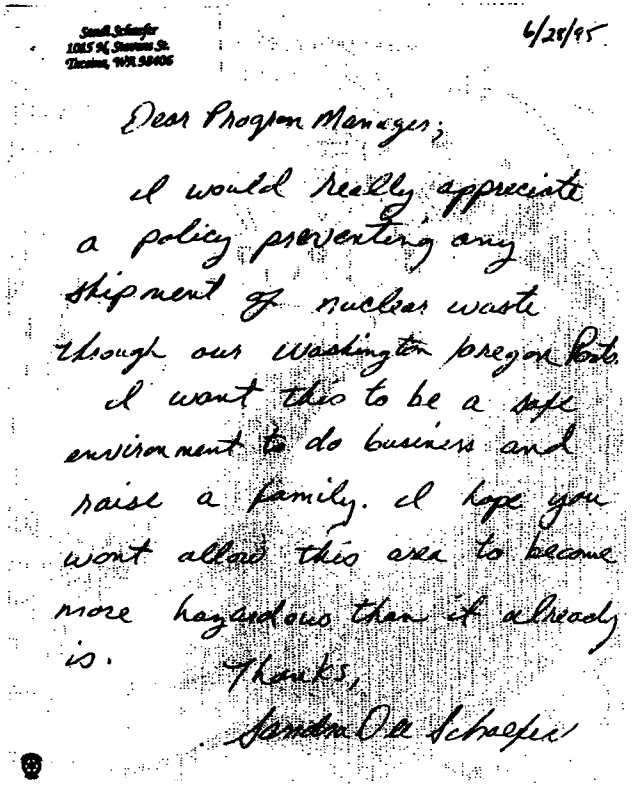
Sincerely,
Gudrun Hauge
GUDRUN HAUGE
4317 FOREST BCH. DR.
GIG HARBOR, WA. 98335

RESPONSE TO COMMENT
COMMENTOR NO. 1032: HAUGE, GUDRUN

Response to Comment No. 1032-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1033: SCHAEFER, SANDRA DEE



Sandi Schaefer
1015 N. Stevens St.
Tacoma, WA 98406

6/28/95

Dear Program Manager;

I would really appreciate a policy preventing any shipment of nuclear waste through our Washington Oregon Ports. I want this to be a safe environment to do business and raise a family. I hope you won't allow this area to become more hazardous than it already is.

Thanks,

Sandra Dee Schaefer

1033-1

RESPONSE TO COMMENT
COMMENTOR NO. 1033: SCHAEFER, SANDRA DEE

Response to Comment No. 1033-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma or the Port of Portland is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, the Port of Portland, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1035: FAIRBURN, M.K.

June 25. 95

Attn: Charles Hall

Dear Sir,

How fortunate you are to live an office so far from where nuclear fuel will be unloaded. Inside on a hill above the port & most of the time wind blows this way. You will never know the fear I my grandson, grandchildren & great grandchildren feel. Please all of you think before you put all of us in the west coast under such unnecessary threat. You have our family (grandmother). Please spare us from this waste.

Sincerely

M. Fairburn & family

1035-1

RESPONSE TO COMMENT
COMMENTOR NO. 1035: FAIRBURN, M.K.

Response to Comment No. 1035-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1036: CONNELLY, PHYLIS E. & JERRY E.

CHARLES HEAD
PROGRAM MANAGER
OFFICE OF SPENT NUCLEAR FUEL MAGMT.
U.S. DEPT. OF ENERGY
1000 INDEPENDENCE AVE. S.W.
WASHINGTON DC 20585

THIS LETTER IS SENT TO VOICE
OUR OBJECTION TO STOCK PILING
NUCLEAR WASTE IN THE U.S.
IT MIGHT COST A LITTLE MORE
TO SEND IT TO SCOTLAND,
FRANCE, OR JAPAN, BUT IT IS
A SOLUTION TO THE PROBLEN
THAT IS IN OUR BEST
INTERESTS. 1036-1

WE DO NOT WANT IT IN OUR
PORT OF TACOMA OR ANY-
WHERE IN OUR U.S. 1036-2

SINCERELY,

Phylis E. Connelly
Jerry E. Connelly

RESPONSE TO COMMENT
COMMENTOR NO. 1036: CONNELLY, PHYLIS E. & JERRY E.

Response to Comment No. 1036-1

The commentor's preference for overseas management of foreign research reactor spent nuclear fuel is noted. Section 2.3 of the EIS (Management Alternative 2) discusses the advantages and disadvantages of overseas management.

Response to Comment No. 1036-2

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1037: POSTLETHWAITE, M.J.

G.J. POSTLETHWAITE
3936 N.W. 48th St.
Oklahoma City, OK 73112

July 5, 1995

Charles Head, Program Manager
U.S. Dept. of Energy EM/37
1000 Independence Avenue
Washington, DC 20585

Dear Mr. Head;

Since the media is my only source for news about the plan to move nuclear fuel through our ports and stockpile it, I wonder if I've been misinformed about this strange idea to hoard the spent stuff in the states.

I understand that Scotland and Japan have facilities to reprocess this waste, and actually need to receive it in order to keep operating. Assuming that these countries are reliable, shouldn't we be sending it to those who are using it? 1037-1

I can find no justification for ignoring the obvious and jeopardizing our own spaces, when there is a solution so fitting to the need.

The Port of Tacoma is a lovely place, and should not be placed in such a hazardous situation when it is unnecessary. 1037-2

Please give more consideration to the Japanese and the Scotsmen who want this dangerous byproduct.

Sincerely,

G. J. Postlethwaite

RESPONSE TO COMMENT
COMMENTOR NO. 1037: POSTLETHWAITE, M.J.

Response to Comment No. 1037-1

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

Response to Comment No. 1037-2

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1038: ALLEN, CHRISTY

From the desk of . . .
Christy

Please do not
send nuclear
waste through
the Port of
Tacoma.

Sincerely,
Christy Allen

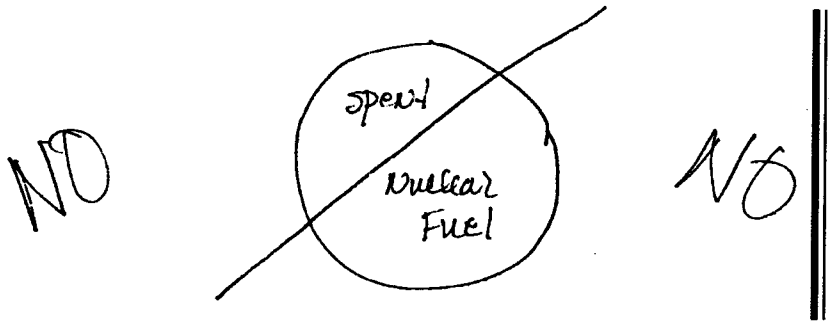
1038-1

RESPONSE TO COMMENT
COMMENTOR NO. 1038: ALLEN, CHRISTY

Response to Comment No. 1038-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1040: BUNDY, CAROL



1040-1

RESPONSE TO COMMENT
COMMENTOR NO. 1040: BUNDY, CAROL

Response to Comment No. 1040-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1041: FOREMAN, PAULA S.

July 6, 1995

Dear Mr. Head,

I am writing to oppose any shipping of nuclear waste through the Port of Tacoma. Please do whatever you can to prevent the risk of nuclear contamination to this port which is so vital to Tacoma's economy and environment. Thank you.

Sincerely,
Paula S. Foreman

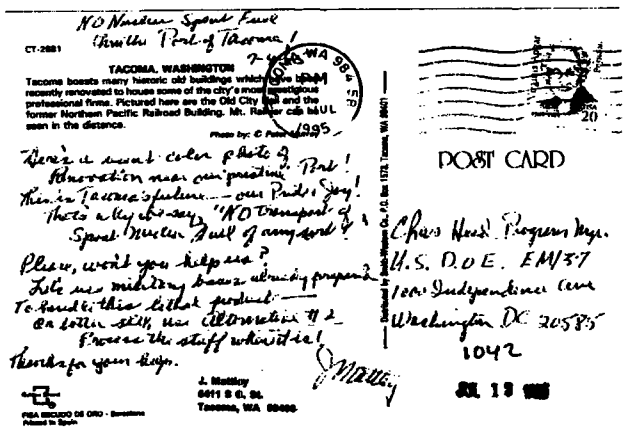
1041-1

RESPONSE TO COMMENT
COMMENTOR NO. 1041: FOREMAN, PAULA S.

Response to Comment No. 1041-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1042: MATTLEY, J.



NO Nuclear Spent Fuel
thru the Port of Tacoma!

CT-2881

TACOMA, WASHINGTON

Tacoma boasts many historic old buildings which have been recently renovated to house some of the city's most prestigious professional firms. Pictured here are the Old City Hall and the former Northern Pacific Railroad Building. Mt. Rainier can be seen in the distance.

Photo by: © Paul Dahl 1995

POST CARD

1042-1 Here's a real color photo of Renovation near our proposed Port! This is Tacoma's future — our Pride & Joy! That's why we say "NO Transport of Spent Nuclear Fuel" anywhere!

1042-2 Please, won't you help us? Life near military bases already jeopardized. To send this lethal product — on a train still, near Alternative #2 — Process the stuff where it is!

1042-3 Thankyou very much.

J. Mattley
6411 S G. St.
Tacoma, WA 98408

Chief Head Program Mgr.
U.S. DOE. EM/37
1000 Independence Ave
Washington DC 20585

1042

JUL 13

RESPONSE TO COMMENT
COMMENTOR NO. 1042: MATTLEY, J.

Response to Comment No. 1042-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1042-2

DOE considers that foreign research reactor spent nuclear fuel could safely be received at commercial ports, as it has in the past, without additional security that might be present at military bases. The security provided for the spent nuclear fuel shipments would be required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted. Sections 4.2.2.2 and 4.2.2.3 of the EIS provide the analysis on impacts of incident-free operation and consequences of port accidents, respectively.

Response to Comment No. 1042-3

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 1043: BERRY, MARIAM M.

Please add my name to the list of those opposed to shipping nuclear waste through Tacoma. Isn't there a less populated, less environmentally fragile place? I don't like to see chances taken of a disaster to this beautiful place that is my home.
Marian Berry

1043-1

RESPONSE TO COMMENT
COMMENTOR NO. 1043: BERRY, MARIAM M.

Response to Comment No. 1043-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

The population in close proximity to the terminal, as well as those as far away as 50 miles, was considered when the effects of possible accidents were calculated (Appendix D, Section D.5 of the EIS). These calculations demonstrate that the risk from accidents to all individuals is low. Likewise, the incident-free radiation exposure to people nearer to the cask than those living outside the fence around the port was calculated and found to pose no significant risk (Section 4.2.3.2 of the EIS). The dose rate at 100 feet from a cask containing foreign research reactor spent nuclear fuel is essentially zero. For these reasons, the close-in population near the Port of Tacoma would not be subjected to any significant risk from the use of the terminal to receive foreign research reactor spent nuclear fuel.

COMMENTOR NO. 1044: DOUGHTRY, WALTER L.

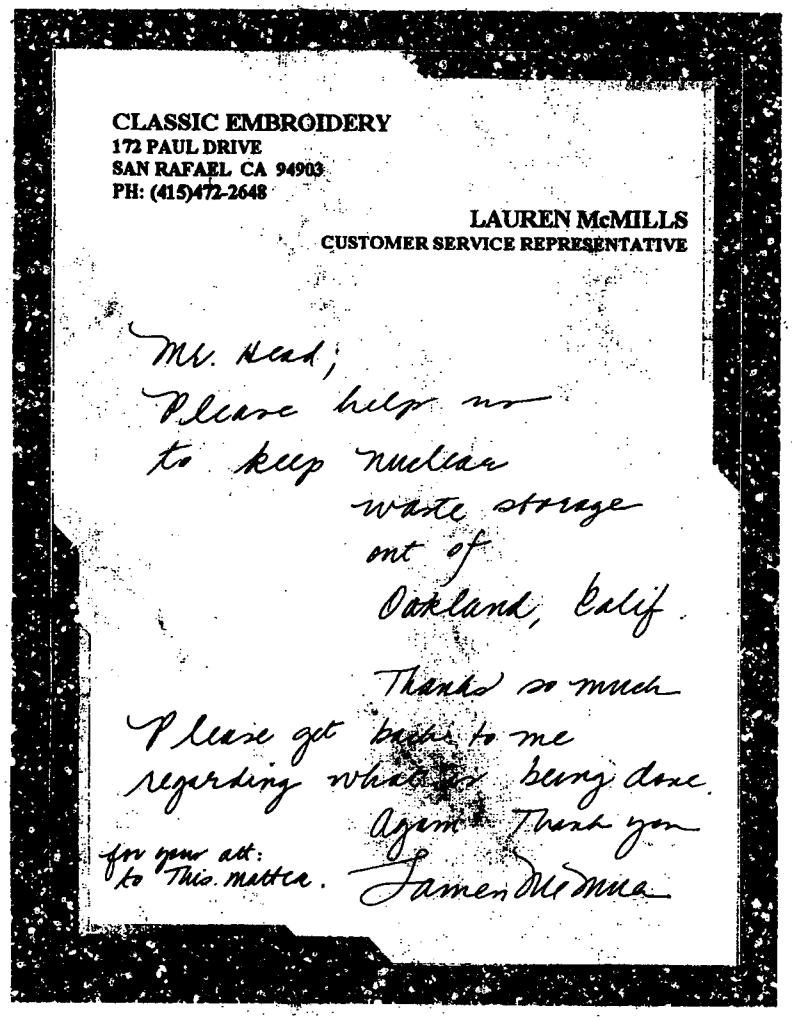
Dear Mr Head
This card is small, however my concerns for Puget Sound is LARGE. I have lived in Tacoma since 1954, from the time I got back from KOREA where I swept mines in our Navy - my son serves now in the Nuclear sub fleet with 20 plus years as a leader. WE ARE BOTH KNOWLEDGEABLE ABOUT SHIPS AND NUCLEAR POWER. AN EXAMPLE OF WHAT CAN HAPPEN IS OUR FERRIES AND THE DAMAGE CAUSED BY THEM. PLEASE DO YOUR BEST TO STOP WASTE HERE. Walt Doughtry

1044-1

RESPONSE TO COMMENT
COMMENTOR NO. 1044: DOUGHTRY, WALTER L.

Response to Comment No. 1044-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 and Appendix D, Section D.5 of the EIS).



CLASSIC EMBROIDERY
172 PAUL DRIVE
SAN RAFAEL CA 94903
PH: (415)472-2648

LAUREN McMILLS
CUSTOMER SERVICE REPRESENTATIVE

Mr. Head;
Please help us
to keep nuclear
waste storage
out of
Oakland, Calif.

Thanks so much

Please get back to me
regarding what is being done.
Again Thank you
for your att:
to This matter. James McMills

1045-1

Response to Comment No. 1045-1

The commentor's opposition to the use of Oakland for nuclear waste storage is noted. None of the candidate management sites considered for interim management of the foreign research reactor spent nuclear fuel are located in the State of California. Also, DOE is not proposing to use the Port of Oakland for receipt of foreign research reactor spent nuclear fuel. For those ports proposed to be used for such shipments, the analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the ports is low.

COMMENTOR NO. 1046: GERONTIS, GARY

JOHNNY'S SEAFOOD COMPANY, INC.
1199 DOCK STREET
TACOMA, WA 98402
(206) 627-2158 FAX: (206) 627-1322

Mr. Charles Head, Program Manager,
Office of Spent Nuclear Fuel Management (EM-37)
U. S. Department of Energy
1000 Independence Avenue, S. W.
Washington, D. C. 20585

June 30, 1995

RE: Draft Environmental Impact Statement (EIS) on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Dear Mr. Head:

The purpose of this letter is to express to you my unalterable opposition to the Department of Energy's proposal to make the Port of Tacoma, Washington a port of entry for spent foreign reactor fuel because I was unable to do so at the public hearing held on June 19, 1995. I very much wanted to add my voice to those opposed to the proposal, but was unable to gain entry to the hearing chambers. 1046-1

The proposal is not acceptable. As President of a small corporation engaged in the wholesale and retail seafood business, I am throughly familiar with and intimately dependant upon the seafood industry of Puget Sound and the coastal waters of Washington State. My company has been in business in Tacoma for 40 years and I have been a part of the Company all of my life.

Your proposal ignores the impact that an accidental discharge of radiation in the coastal waters, Straits of Juan De Fuca or Puget Sound proper would have on the seafood industry. In so many other areas involved in the handling of radioactive materials, safeguards have not been effective. The "accident" that could not happen, has always managed to happen. I need only cite Chernobyl, Hanford and Three Mile Island to prove my point. I strongly recommend that you not select Tacoma as a port of entry for this program. 1046-2

Sincerely,

Gary Gerontis

GARY GERONTIS, President,
Johnny's Seafood Company, Inc.

RESPONSE TO COMMENT
COMMENTOR NO. 1046: GERONTIS, GARY

Response to Comment No. 1046-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1046-2

DOE considers that there would be no significant adverse impacts on the natural resources or on the air and water quality at any of the ports that might be used to receive the foreign research reactor spent nuclear fuel, if accepted into the United States. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive material has ever been released from a spent nuclear fuel transportation cask, nor has a spent nuclear fuel transportation cask ever been punctured, even as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

In the unlikely event of a severe accident, the analysis performed for the EIS indicates that some radioactive material could be released from the cask and distributed into the environment. However, the analysis in Sections 4.2.2.3 and Appendix D, Section D.5, determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident. Close in to the accident, near the transportation cask would likely require some cleanup, but the overall impact on the water and air quality in the port would be low. Sections 4.2.2.3 and Appendix D, Section D.5 of the EIS detail the accident analysis and results.

COMMENTOR NO. 1047: FOGG, B.F.

Box 98505
Tacoma, WA 98498
June 22, 1995

Dear Mr. Head,

I enclose a present for you, to be shared with others as you wish.

Would you please ask the Federal powers-that-be to build their own port that would cater exclusively to the export of nuclear waste. The coast of Alaska's mainland comes to mind as a possible site. 1047-1

Thank you.

Sincerely,
Bo F. Fogg
(BO F. FOGG, M.A., M.A.)

RESPONSE TO COMMENT
COMMENTOR NO. 1047: FOGG, B.F.

Response to Comment No. 1047-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. The commentor's preference for construction of a government port that would cater exclusively to the export of nuclear waste is also noted. The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. DOE has no intention of building a new port to receive or export spent nuclear fuel.

COMMENTOR NO. 1048: STANFORD, MATTHEW JR.

Charles Head
Office of Spent Fuel Management
EM-37 U.S. Department of Energy
1000 Independence Ave. SW.
Washington, D.C. 20585-0001

Dear Mister Head,

Given the nature of the economy of Galveston, Texas I am completely against using the Isle Port as a pass through point for spent weapons grade nuclear waste.

I am sure you would consider it redundant for me to address the many issues for and against this proposal as you are well aware of them. The point here is to express my sentiments against the project at this time.

If some of the final destination disposal problems could be solved along with the criteria for maintaining safety requirements, especially with the closed and relatively fragile eco-system surrounding the port, then future dialogue on the proposed plan may be warranted. But, since community objection will probably be the main judgement point, I cast my vote in the negative.

1048-1

Sincerely,

Matthew Stanford Jr.

Matthew Stanford JR.
2912 Galvez Ave. (P)
Galveston, Texas 77550

RESPONSE TO COMMENT
COMMENTOR NO. 1048: STANFORD, MATTHEW JR.

Response to Comment No. 1048-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Galveston, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1049: BERGMAN, DARYL, RON & MAYA

July 5, 1995

Mr. Charlie Head
EM37
U.S. Dept. of Energy
1000 Independence Ave. So. West
Washington D.C. 20585

Dear Mr. Head:

I am writing to express my deep concern regarding the proposal to use Concord, CA as a transfer point for spent nuclear fuel rods. Obviously, there are many reasons why this plan is not acceptable, the proximity to our water supply, liquifaction concerns in the event of an earthquake, the population density in the Bay Area, proximity to oil refineries etc.. I would like to bring your attention to one other problem with this plan. It has come to my attention that after transfer this toxic material will be moved on our highways. I have enclosed a recent article in the Contra Costa Times that identifies the East Bay as having the worst gridlock in the Bay Area - which is the second most populated area in California. Just recently we had two incidents in which large trucks exploded on our freeways. Locating a transfer station in Concord, and using our roads to haul deadly materials makes no sense at all. We request that this plan be eliminated. 1049-1

It's appalling to think that the United States government is even considering to cheapen the value of the lives in this community. So much for our rights to life, liberty and the pursuit of happiness. This entire program should be rethought. California has already suffered dearly from massive base closures - and now we are being singled out to be the location for a nuclear transfer site. Please read the enclosed article and strike Concord from your list of possibile locations. 1049-2

Sincerely,
Daryl, Ron and Maya Bergman
510-687-7019

enc:
cc - Mr. Charlie Head
DOE
1000 Independence Ave.
Washington, D.C.

RESPONSE TO COMMENT
COMMENTOR NO. 1049: BERGMAN, DARYL, RON & MAYA

Response to Comment No. 1049-1

The commentor's opposition to the use of Concord NWS for the receipt of foreign research reactor spent nuclear fuel is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk of bringing foreign research reactor spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low. The EIS demonstrates that there would be no significant adverse impacts to any of the ports, bays, or waterways that the material might pass through or near. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. Based on over 30 years experience shipping spent nuclear fuel, DOE considers that spent nuclear fuel transportation casks passing through the Concord NWS would not release their contents, and would thereby not affect the quality of the water. As stated in Section 2.6.2 of the EIS, to date no spent nuclear fuel transportation cask has ever released any of its contents (radioactive material), even in actual highway accidents. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

The port selection process that determined that Concord NWS was an acceptable port considered the population of the port and surrounding areas (Appendix D, Section D.1.9.5 of the EIS). Additionally, all population within a 50-mile radius of the Concord NWS was considered when analyzing the potential impact of a range of hypothetical port accidents. The risks were found to be low (Appendix D, Section D.5 of the EIS).

The passage from San Francisco Bay to Concord meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2). The port selection criteria do not consider the existence of land-based facilities such as refineries because they have no direct impact on the risk associated with the shipment of foreign research reactor spent nuclear fuel. While local hazards, such as earthquakes, may slightly increase the probability of an accident, they would not increase the consequences of the accident, which were found to be very minor.

Response to Comment No. 1049-2

The commentor's opposition to truck transport from the Concord NWS is noted. The estimates of radiological health effects presented in Section 4.2.3 of the EIS are based on conservative assumptions using representative truck transportation routes from candidate ports to interim management sites, including consideration of traffic volumes and surrounding populations. Supporting detail for the calculations is given in Appendix E of the EIS. Radiological and nonradiological health effects of the alternatives were found to be low.

COMMENTOR NO. 1052: BUTKEY, TOM & GENNY

July 2, 1995

Office of Spent Nuclear Fuel Management
EM-37
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington DC 20585

To: Charles Head, Program Manager

We totally reject the idea of nuclear waste of any sort being transported through or stored in the Puget Sound area -- Tacoma in particular.

There are too many possibilities for disaster. This kind of thing should definitely not be done in an area that is heavily populated with military bases, as our area is. It leaves military bases wide open to terrorist threats. It leaves us, the powerless inhabitants, as something that would just be considered an "unfortunate" bi-product should an accident occur. 1052-1

Push it through somewhere else. Park it somewhere else. Seattle had the right to say no and so does Tacoma.

Sincerely,

Tom and Genny Butkey
754 Polk Street South
Tacoma, WA 98444-5678

RESPONSE TO COMMENT
COMMENTOR NO. 1052: BUTKEY, TOM & GENNY

Response to Comment No. 1052-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternatives 1 or 3), there would be no storage of this material in the Port of Tacoma, or any other port. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk of such actions. Security would be provided for all shipments of foreign research reactor spent nuclear fuel, as required by the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. The security provisions are summarized in the new Appendix H that has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit.

Response to Comment No. 1053: Hodgson, Stephen A.

Stephen A. Hodgson
1803 - 27th Street
Galveston, TX 77550

July 6, 1995

Charles Head
Office of Spent Fuel Management
EM-3
U.S. Department of Energy
Washington, D.C. 20585-0001

SUBJ: Nuclear Waste Transport Facility
in Galveston, Texas

Dear Mr. Head:

I support the plan to permit the transport of radioactive waste through the Port of Galveston. *1053-1*

Legitimate opposition to the plan, I believe, should relate to safety issues such as to some accident theory which has perhaps been overlooked or omitted in the Environmental Impact Statement presented by the U.S. Department of Energy, (DOE).

The "Not in my backyard" type of opposition is emotional, not based on fact and should be discounted as such.

The "Not in my backyard crowd,"if taken seriously, would collectively shut down (or stop from happening) every power plant, chemical plant, land fill, prison, weapons facility, sewage treatment plant, etc., in the USA. The crowd would slowly but surely strangle the whole country. Hundreds of people in Galveston signed a petition to stop the permits and construction of the new WALMART store. But it finally got built. I would wager hard currency that many of the petition signers are now shopping at WALMART. The parking lot has cars at all hours and is very crowded at some hours.

The 40 people who braved the downpouring rain to appear at the hearing, according to the newspaper, were unanimous in their opposition to the DOE plans. But are those people representative of Galveston? I didn't show up because I hadn't yet read the Environmental Impact Statement and didn't believe myself informed enough to make a contribution.

What about the 70,000 people that didn't appear. Could we say that they were not overly concerned about the plans? Were they giving a tacit vote of approval by not appearing? Perhaps some were. Perhaps 40 or more persons were giving silent approval. Perhaps some who did not appear would have been opposed to the plan.

Response to Comment Commentor No. 1053: Hodgson, Stephen A.

Response to Comment No. 1053-1

The commentor's support for bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted.

The port selection process only indicates ports that are acceptable for the receipt and handling of foreign research reactor spent nuclear fuel. The decision as to which port or ports might be used if foreign research reactor spent nuclear fuel were accepted into the United States will be addressed in the Record of Decision, to be issued no sooner than 30 days after issuance of this final EIS.

Response to Comment No. 1053: Hodgson, Stephen A. (Cont'd.)

The sun is a giant reactor which is bombarding the earth with enormous quantities of radiation, ranging from large amounts of infrared, visible, and ultraviolet radiation to smaller amounts of X-rays and gamma rays. Sunbathers expose themselves to far more radiation than the public will ever see from the occasional ships, trucks and rail cars that would transport the waste. A percent of these sunbathers will develop skin cancer and many will be sunburned right then and there. But do we talk about closing down the beach? Do we notify our tourists and prospective tourists about the hazards of solar radiation? Hardly. But should we or could we? How could we possibly reach tourists who would be coming from every city in the country? *1053-2*

The paper quoted someone as saying, "If they (the tourists) found out we had nuclear waste here -- forget it." Now wait just a minute please. Do we advertise to our tourists that we transport and burn other forms of hazardous waste? Do we tell them not to wear blue or red tee shirts or risk getting shot? Do we tell them we're importing viruses for research? Hardly. Do we tell them about the pool table in Joe's bar. That stands for TROUBLE with a capital T, right here in Galveston City.

Even those who may choose to work in the docks handling the nuclear containers will wear film badges and dosimeters which measure the amount of radiation exposure. When a specified limit of dosage is reached (which is within conservative standards), the individual is not permitted any more exposure for that month. The work areas in which radiation exposure is possible would be secured and the public cannot enter except by authorization from safety officers, and with the use of film badges. They will also have a good reason to be there.

I did not see a single quote in the newspaper addressed at a specific safety issue. Were there any such? How many persons have reviewed the EIS, even perfunctorily?

Well then, how will this issue be decided? How should it be decided? By forty people who braved the rainstorm but evidently did not target specific safety issues? By vote of the Wharves Board? By the DOE or the Texas Health Department?

I believe that the hearing was not statistically significant enough to be representative of Galveston. I propose another route to decision making: An outreach program in the form of pro and con discussions by informed persons with various interested groups. Opinion surveys would then be conducted of these groups. Such groups would include the service clubs, the Fraternal clubs, the Chamber of Commerce, church and neighborhood groups, brown bag meetings at various work places and any other interested groups.

Another method would be a public hearing, similar to the last one conducted by the Wharves Board, but this time admitting only those who certify to having reviewed the Environmental Impact Statement or are otherwise knowledgeable about nuclear waste and nuclear waste handling.

Response to Comment Commentor No. 1053: Hodgson, Stephen A. (Cont'd.)

Response to Comment No. 1053-2

The commentor's observations regarding the danger of excessive exposure to the sun is noted. Sunbathers do expose themselves to increased risk of skin cancer, but this subject is outside the scope of this EIS.

The point of this would be to inform people and get informed input. And especially to minimize the impact of the "Not in my backyard" crowd.

If I may facilitate this by making contact with various groups and determining if there is interest in such meetings, would you please advise.

I present myself as a private citizen, but with some level of expertise in nuclear waste handling by employment experience at the Idaho National Engineering Lab and at the Nevada Test Site. I was a Project Mechanical Engineer for a waste handling and storage facility as a part of the Nuclear Fuel Reprocessing facility. Enclosed is a published article regarding the project, coauthored by myself.

Very truly yours,

Stephen A. Hodgson
Professional Engineer and
Galveston Citizen, Homeowner
and taxpayer.

c., Robert Lucey
The Daily News

Dr. Elbert Whorton, member
Wharves Board

John Unbehagen, Chairman
Wharves Board

PS: Please phone me at (409) 772-3639 or contact me by FAX at (409) 772-5192

Response to Comment No. 1054: Karilanovic, Dorothy L.

July 5, 1995

Mrs. Dorothy L. (McDonald) Karilanovic
4906 Crockett
Galveston Island, Tx 77551

Charles Head
Office of Spent Fuel Management
EM-37 U.S. Dept. of Energy
1000 Independence Ave., S.W.
Washington, D.C. 20585-0001

Dear Sir:

I am writing in reference to a proposal pending to transfer spent nuclear fuel through the port of Galveston, Texas. At a meeting held recently in Galveston, approximately 40 individuals attended a promotional program for the project, many voicing their opinions in opposition to the proposal.

For a number of years, the small city of Galveston (pop. approximately 61,000) located on an island only 3 miles wide has been struggling arduously to upgrade its tax base, to attract new business to the port and improve economic conditions for its citizens and small businesses. Thousands of dollars have been invested in improving the wharf sites for tourists located adjacent to Galveston's historical district - a main tourist attraction of the city - where many restaurants and shops are now located with the hope and intent of attracting thousands of visitors all year long. In spite of the money spent on the city by a few visionary wealthy philanthropists to try and build up a viable economy of tourism, middle income and lower income families are continuing to leave the island because of the paucity of well-paying jobs. In this regard, the city, therefore, does not need a deterrent to further discourage business interests from becoming established on the island, such as the Dept. of Energy's proposal to make Galveston a depot and transfer site for used nuclear waste.

1054-1

(Continued)

Response to Comment Commentor No. 1054: Karilanovic, Dorothy L.

Response to Comment No. 1054-1

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Galveston would have no adverse economic impacts on business or tourism within the port or the surrounding communities.

Letter to Charles Head, Dept. of Energy (Cont'd) 2

The cities and towns of this country should not have to help the Government and big industry sweep the results of risky poor policy planning under the rug. Why wasn't a way developed years ago when nuclear technology was originally developed to dispose of the potentially lethal waste products? 1054-2

Ten thousand years of deadly viability! Ten thousand years of fear and shame!

God, help us.

Sincerely,

Dorothy L. Karilanovic

(Mrs.) Dorothy L. Karilanovic

cc: John Unbehagen, Board Chairman, Galveston Wharves
Elbert Whorton, Board Member, Galveston Wharves

Response to Comment No. 1054-2

Environmental management, including safe waste disposal, is one of DOE's primary missions. The impacts of ultimate disposition of spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1 of the EIS).

RESPONSE TO COMMENT NO. 1055: DAWSON, JEAN F.

7616 131st St. Ct. E.
Puyallup, Wa. 98373
July 4, 1995

Mr. Charles Head
Office of Spent Nuclear Fuel Management
(EM-37)
U.S. DEpartment of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

Dear Sir:

Accepting spent nuclear fuel shipped to the United States through the Port of Tacoma would be a serious error in my opinion.

Aside from the possible hazard to human health in this densely populated area, there is the additional risk of leakage in case of a severe earthquake. This could be a problem in any west coast port, but especially so in Tacoma.

An earthquake of greater than 7 magnitude may not occur for 50 or 100 years, but we are due for one according to seismologists.

The Port is built on an old mud flow from Mt. Ranier. This soil type could be expected to liquify in a strong quake, causing severe damage to any structure--building, dock crane, or railroad--that stands on it. The Pierce County Department of Emergency Management believes the Port will become a toxic nightmare in the event of a severe quake.Radiation leaking from nuclear fuel could make the area uninhabitable for a long time.

I am enclosing a brochure with some pertinent facts marked.

1055-1

Yours truly,

Jean F. Dawson

Jean F. Dawson

RESPONSE TO COMMENT
COMMENTOR NO. 1055: DAWSON, JEAN F.

Response to Comment No. 1055-1

The commentor's opposition to the use of the Port of Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. The analysis in the EIS indicates that the risks associated with an accident are low (Sections 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Section 4.2.2.2).

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Spent nuclear fuel transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). To date, after more than 30 years of spent nuclear fuel shipments, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident. Therefore, a seismic event, even if it caused structures at the Port of Tacoma to fail, is not expected to compromise the spent nuclear fuel transportation cask. Further, the analyses of impacts associated with accidents involving foreign research reactor spent nuclear fuel presented in Section 4.2.2.3 demonstrate that the use of any of the selected ports would not pose any significant risk to the port personnel or the population near the ports.

RESPONSE TO COMMENT NO. 1056: PATRICK, JOHN & BARBARA

July 2, 1995

Office of Spent Nuclear Fuel Management
EM-37
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington DC 20585

To: Charles Head, Program Manager

We totally reject the idea of nuclear waste of any sort being transported through or stored in the Puget Sound area -- Tacoma in particular.

There are too many possibilities for disaster. This kind of thing should definitely not be done in an area that is heavily populated with military bases, as our area is. It leaves military bases wide open to terrorist threats. It leaves us, the powerless inhabitants, as something that would just be considered an "unfortunate" bi-product should an accident occur.

1056-1

Push it through somewhere else. Park it somewhere else. Seattle had the right to say no and so does Tacoma.

Sincerely,

John and Barbara Patrick
753 Polk Street South
Tacoma, WA 98444-5678

RESPONSE TO COMMENT COMMENTOR NO. 1056: PATRICK, JOHN & BARBARA

Response to Comment No. 1056-1

The commentor's opposition to the use of the Port of Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. However, the analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3 and 4.5) and that the risk associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Section 4.2.2.2 and 4.5), and pose no significant risks to port personnel, the local population, or the environment.

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternatives 1 or 3), there would be no storage of this material in the Port of Tacoma, or any other port. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk of such actions. Security would be provided for all shipments of foreign research reactor spent nuclear fuel, as required by the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. The security provisions are provided in the new Appendix H that has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that would be prepared for each foreign research reactor spent nuclear fuel shipment to specify details of the transportation process, including security provisions in port and during transit.

Response to Comment No. 1058: Citizens (Tacoma Area)

Charles Head
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Ave. S.W.
Washington, D.C. 20585

Dear Mr. Head:

These signatures are from residents of Tacoma, WA (or nearby areas) who wish to say:

"NO!"

to nuclear waste being shipped through the Port of Tacoma!!!!!!!!

1058-1

NAME	ADDRESS
Linda Ramsey	2913 So. 19 St. Tacoma, WA 98405
Melissa McGuiness	5414 So. Mason Tacoma Wa 98409
J.D. Harstad	2909 So. 19th Tacoma Wa 98405
Beasie Harstad	2909 So 19th Tacoma Wa 98405
[illegible]	2913 S. 19th Tacoma Wa 98405
Edna Combs	3601 So. K St Tacoma, Wn. 9840
Charles M Combs	3319 So K St Tacoma, Wa 98408
Edward M Combs	3601 So K St Tacoma Wa 98408
Annette L Combs	3319 So K St Tacoma, Wash. 98408
Billie J. Lasly	2917 So 19th Tacoma Wa 98405

Response to Comment
Commentor No. 1058: Citizens (Tacoma Area)

Response to Comment No. 1058-1

The commentors' opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

NO NUCLEAR WASTE IN TACOMA

1059-1

We strongly oppose the shipment of high-level nuclear waste through the Port of Tacoma and urge the U.S. Department of Energy to remove Tacoma as a possible entry site.

Sign With Signature.

Name	Address	City	Zip
Gerald Eyaman	405 6th Ave #200	Tacoma	98402
Jennifer Hanlon	405 6th Ave #[illegible]	Tacoma	98402
[illegible]	Walker Apts #508	Tacoma	98402
[illegible]	"	Tac #609	"
Barbara Smith	"	" #[illegible]	"
Gertrude	"	" #305	"
[illegible]	405 6th Ave #510	Tacoma	"
[illegible]	405 6th Ave #[illegible]	"	"
Frances [illegible]	405 6th Ave	#406	
[illegible]	405 6th Ave	Tacoma WA	98402
Ethel [illegible]	405 6th Ave #307	Tacoma	98402
[illegible]	405 6th Ave #[illegible]	Tacoma Wa	[illegible]
[illegible]	405 6th Ave #711	Tacoma	Wa [illegible] 9840
[illegible]	405 6th Ave #603	Tacoma,	WA 98402
[illegible]	3018 So. Windom	Tac	98409
[illegible]	1002 E. 46th St.	Tacoma	98404

THE WALKER APARTMENTS
405 6TH AVE. (OFC)
TACOMA, WA 98402-2206

Response to Comment No. 1059-1

The commentors' opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

RESPONSE TO COMMENT NO. 1059: THE WALKER APARTMENTS (CONT'D.)

NO NUCLEAR WASTE IN TACOMA

We strongly oppose the shipment of high-level nuclear waste through the Port of Tacoma and urge the U.S. Department of Energy to remove Tacoma as a possible entry site.

Name	Address	City	Zip
Julia M. Ares	405 6th Ave #[illegible]	Tacoma	[illegible]
Kimberly Kay Cromaver	" " #810	Tacoma,	WA 98402
Linda Geddy	4651 0th Ave #306	TACOMA	98402
[illegible]	" " 608	Tacoma	98[illegible]

THE WALKER APARTMENTS
405 6TH AVE. (OFC)
TACOMA, WA 98402-2306

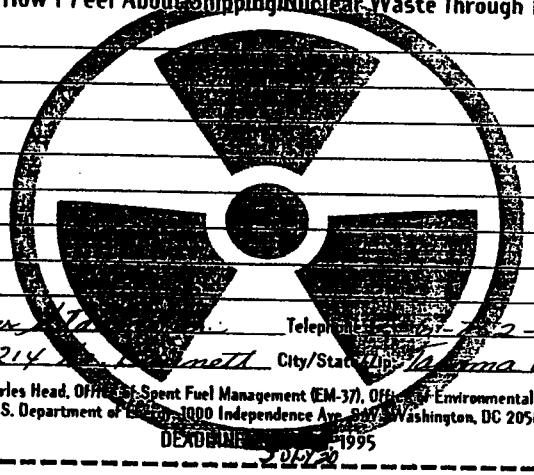
RESPONSE TO COMMENT
COMMENTOR NO. 1059: THE WALKER APARTMENTS (CONT'D.)

COMMENTOR NO. 1060: STALMAKER, ROGER

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: _____



Name: Roger [illegible] Telephone: [illegible] 272-4030

Address: 4214 [illegible] Bennett City/State/Zip: Tacoma Wa. 98407

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. SW, Washington, DC 20585

DEADLINE: June 30, 1995

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Ruston, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau, Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

1060-1

RESPONSE TO COMMENT
COMMENTOR NO. 1060: STALMAKER, ROGER

Response to Comment No. 1060-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1061: STALMAKER, MILDRED L.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.

Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: Something [illegible] to defuse our dear [illegible] waste so its no danger. Please do not bring it here. 1061-1 1061-2

Name: Mildred [illegible] Telephone: 206-752-4030

Address: 4214 [illegible] City/State/Zip: Tacoma Wa. 98407

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave. SW, Washington, DC 20585

DEADLINE: June 30, 1995

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Renton, Federal Way; Tacoma-Pierce County Visitor & Convention Bureau, Tacoma-Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

RESPONSE TO COMMENT
COMMENTOR NO. 1061: STALMAKER, MILDRED L.

Response to Comment No. 1061-1

DOE is involved in various technology development programs to address and resolve nuclear waste management and disposal concerns. These programs cover a wide range of new and demonstrated technologies to advance beyond current waste management operations. The advances in high level nuclear waste separation, concentration and immobilization, and low level mixed waste characterization and disposal technologies would lead to an acceptable technique for stabilization and final disposition of spent nuclear fuel wastes.

Response to Comment No. 1061-2

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1062: NICKELL, JEAN

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Joan Nickell **Phone:** 935-0120

Title and Organization: Member Mt Diablo Unitarian Universalist Church

Address: 648 Center St.

City: Walnut Creek **State** CA **Zip** 94596

*** COMMENTS ***

I write this as an individual, not on behalf of my church. I am deeply concerned about the environment. I am very deeply concerned about the continued production of nuclear waste, considering the current and undoubtedly permanent impossibility in Storing it. Shipping the rods through our county and state is very scary. An accident would be devastating to the population and the environment. Your environmental impact report is not clear or complete enough. Our objections are not satisfied that you plan to use in any particular. Save the rods where they are! 1062-1 1062-2 1062-3

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 1062: NICKELL, JEAN

Response to Comment No. 1062-1

Spent nuclear fuel can be stored safety for long periods of time, as discussed in Appendix F, Section F.1 and Section 2.6.5.1 of the EIS.

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS).

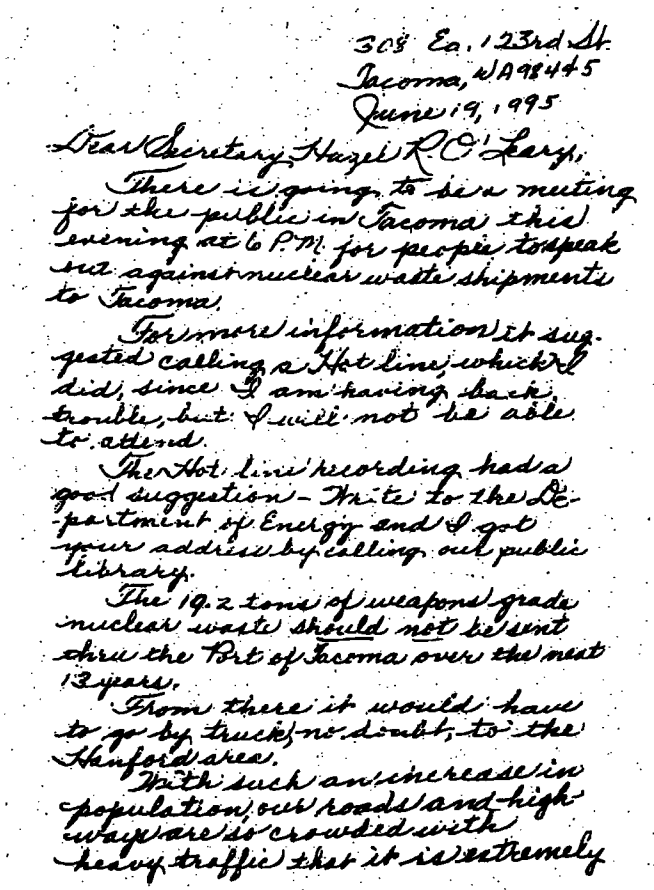
Response to Comment No. 1062-2

The commentor's opposition to the use of the Concord NWS for receipt of foreign research reactor spent nuclear fuel is noted. However, the analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Section 4.2.2.2), and pose no significant risk to port personnel, the local population, or the environment.

Response to Comment No. 1062-3

The commentor's preference to keep the spent nuclear fuel rods where they are currently located is noted. This is Management Alternative 2 and is discussed in Sections 2.3 and 4.4 of the EIS. This preference, however, would not fulfill the U.S. nuclear weapons nonproliferation objective and would force many research reactors to shut down. This would limit their usefulness and contribution to research and medical advances. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

COMMENTOR NO. 1067: KITTLESON, ALBERTA



308 Ea. 123rd St.
Tacoma, WA 98445
June 19, 1995

Dear Secretary Hazel R. O'Leary,

There is going to be a meeting for the public in Tacoma this evening at 6 P.M. for people to speak out against nuclear waste shipments to Tacoma.

For more information it suggested calling a Hot line, which I did, since I am having back trouble, but I will not be able to attend.

The Hot line recording had a good suggestion - Write to the Department of Energy and I got your address by calling our public library.

The 19.2 tons of weapons grade nuclear waste should not be sent thru the Port of Tacoma over the next 13 years.

From there it would have to go by truck, no doubt, to the Hanford area.

With such an increase in population our roads and highways are so crowded with heavy traffic that it is extremely

1067-1

1067-2

RESPONSE TO COMMENT
COMMENTOR NO. 1067: KITTLESON, ALBERTA

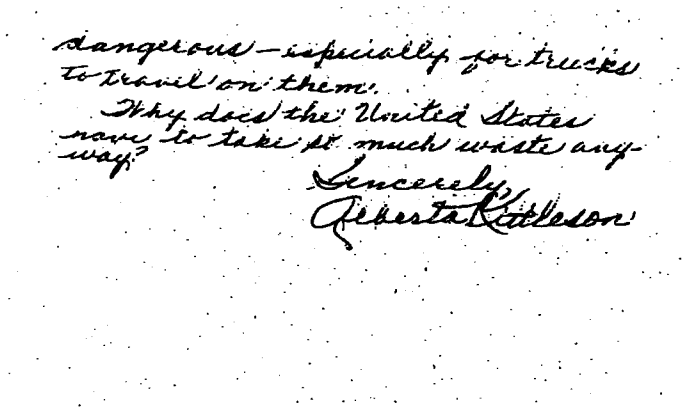
Response to Comment No. 1067-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1067-2

The ground transport route options and identification process are discussed in Section 2.6.4 of the EIS. Over a hundred representative ground transport route options were analyzed in Appendix E, including routes to all of the potential foreign research reactor spent nuclear fuel management sites. The results are presented in Section 4.2.3 of the EIS. In all cases the risks were found to be low.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.



dangerous – especially for trucks to travel on them.

Why does the United States have to take so much waste anyway?

Sincerely,
Roberta Kittleson

1067-2 (Cont'd.)

1067-3

Response to Comment No. 1067-3

Prior to 1989, it was a policy of the United States to accept foreign research reactor spent nuclear fuel for disposition in the United States (Section 1.1 of the EIS). Many foreign research reactor operators have no immediate means of disposing of their spent nuclear fuel (Section 1.2 of the EIS). Thus, the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

COMMENTOR NO. 1069: CITIZENS (TACOMA AREA)

June 26, 1995

The Honorable Hazel O'Leary
The Secretary of Energy
Washington, DC 20585

*

Dear Ms. Secretary,

As residents of Tacoma, Washington, we declare strong objections to the proposal to receive nuclear waste at the Port of Tacoma from overseas, for transport to storage elsewhere. **1069-1**

We have the obvious safety concerns over receiving and transferring these materials to rail and carrying them through the fourth busiest corridor in the United States. **1069-2**

In addition, we feel (1) this waste program is not good environmental policy, economic policy, or energy policy, (2) the United States has failed to develop procedures for safe permanent disposal of nuclear waste, and (3) instead of utilizing our hi-tech industry to resolve nuclear waste disposal problems, we are adding nuclear waste from other countries to our existing storage and disposal problems and creating a permanent blight on the region's natural and economic landscape. This is no legacy to leave the next generation. **1069-3**

Mr. and Mrs. Richard A. Thompson, 1864 Hillside Dr. NE, Tacoma, WA 98422
Mr. and Mrs. Herman Lau, 1861 Hillside DR. NE, Tacoma, WA 98422
Mr. and Mrs. Gary Fanelig, 1861 Hillside Dr NE Tacoma, WA 98422
Mr. and Mrs. [illegible] Dawson [illegible] Dr NE Tacoma WA 98422
[illegible] 1865 Hillside Dr NE Tacoma WA 98422
[illegible] Tacoma [illegible] 98422
[illegible] & Mrs. [illegible] 1860 Parkview Dr. N.E. Tacoma 98422
Mr. & Mrs. Thomas K. Kuminach 4714 Browns Pt. Blvd. N.E. Tacoma, WA. 98422
Gail Blankenship 1863 Hillside Drive NE Tacoma WA 98422
Kathy R Wilson 1859 Parkview NE Tacoma WA 98422
Jenny [illegible] 1866 Parkview Drive NE Tacoma WA 98422
David and Marcia [illegible] 2117 Hillside Dr NE Tacoma WA 98422
John and Dianne Hansen 2101 Hillside Dr. NE. Tacoma WA 98422

RESPONSE TO COMMENT
COMMENTOR NO. 1069: CITIZENS (TACOMA AREA)

Response to Comment No. 1069-1

The commentors' opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1069-2

The commentor's concerns about safety are noted. The risks of receiving, transferring, and transporting the foreign research reactor spent nuclear fuel are discussed in Sections 4.2.2 and 4.2.3 of the EIS. In all cases, the risks were found to be low.

Response to Comment No. 1069-3

The commentor's opinion that the proposed action represents poor environmental policy, economic policy, and energy policy is noted.

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1 of the EIS).

DOE is using high technology to resolve nuclear waste disposal problems. Vitrification is the preferred technology for high-level waste and geologic disposal is the preferred disposal technique. Many other countries, especially developing countries, do not have these technological capabilities.

DOE agrees that the next generation should not have to clean up the existing nuclear waste inventories. That is one of the reasons that DOE issued the draft Waste Management Programmatic EIS in August, 1995, as discussed in Section 1.5 of the EIS.

* This is the best available copy of this comment document.

COMMENTOR NO. 1070: MCCLINTIC, JAMES M.

The Honorable Hazel O'Leary, Secretary,
U. S. Department of Energy
1000 Independance Avenue S.W., Rm. 7A257
Washington, D. C. 20585

June 26, 1995

Dear Secretary O'Leary:

This letter is to advise you that I am adamantly opposed to a proposal made by your staff to use the Port of Tacoma, Washington as a port of entry for spent radioactive nuclear fuel materials from foreign reactors. 1070-1

Members of your staff have prepared a draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. This proposal envisions using the Port of Tacoma as a transshipment point for radioactive nuclear waste materials. These materials would be offloaded from seagoing cargo vessels and loaded aboard other forms of transportation and thence shipped on to storage sites here in the U. S..

Your staffer, Mr. Charles Head, who attended a public hearing on June 19th, here in Tacoma, is quoted in a local newspaper article. His words give me grave cause for concern. During the meeting, overwelming disapproval of the proposal was voiced by people from all over Western Washington. Your staffer told the Tacoma News Tribune reporter that "They don't have time to listen." I believe that he meant that you and your department don't have time to listen to the concerns of the citizens most likely to be affected by this proposal. Perhaps Mr. Head has forgotten that he and the entire department serve by the grace of the Congress and the President, and thereby, the citizens of the country. I strongly recommend that you counsel Mr. Head on his responsibilities, lest he begin to personify the National Rifle Association's recent reference to "jackbooted government thugs." I truly hope that Mr. Head was misquoted or misunderstood by the reporter. 1070-2

I also have grave concerns for the safety of the citizens of Washington and the fishery which is such a large part of the local economy should the unthinkable happen, a nuclear accident. I urge you in the strongest possible terms to ask your staff to select an alternative to Tacoma, Washington as the port of entry if this program must be adopted. Your staff has not done its homework properly. There are serious concerns not addressed by your proposed EIS. These include, but are not limited to the following: The long term effects of unrecoverable containers in Puget Sound; the security of containers during transshipment; the 1070-3

RESPONSE TO COMMENT
COMMENTOR NO. 1070: MCCLINTIC, JAMES M.

Response to Comment No. 1070-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1070-2

The DOE representative's comment that their bosses in Washington "don't have time to listen" was taken in the wrong context. While it would be impractical for the Secretary of Energy to personally review and respond to all of the written and oral comments concerning this EIS, this information was reviewed by the Program Manager and his staff. The Program Manager is responsible for relaying public concerns and issues to the Secretary of Energy and her staff. As indicated by this document, all comments received from the public were noted and taken seriously. Under NEPA and DOE's environmental regulations (Section 5 of the EIS), public participation and comments are an integral component of the environmental process.

Overall, DOE's public interaction related to this draft EIS has exceeded requirements set forth in NEPA and the environmental regulations of DOE. Seventeen public hearings were held in the locations determined to be most likely to be directly affected by the EIS alternatives. In addition, the period of acceptance for written comments was extended from June 20 to July 20, 1995. DOE considers that these actions have provided sufficient opportunity for the public to comment on the draft EIS.

Response to Comment No. 1070-3

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1000 feet). Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

The security provided for the spent nuclear fuel shipments would be required to meet or exceed all of the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. To better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel, Appendix H has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all

COMMENTOR NO. 1070: MCCLINTIC, JAMES M. (CONT'D.)

effects of a nuclear accident at the port. Please do not dismiss my concerns and those of my fellow citizens. We have been told too many times that the horrible "accident" can't happen, but Chernobyl, Hanford and Thee Mile Island tell us otherwise. There are other sites for the port of entry which do not pose the security or accident risks that exist in Tacoma. Please do not risk making the beautiful Puget Sound Region a nuclear wasteland.

Sincerely,

JAMES M. McCLINTIC
6017 65th St. Ct. W.
Tacoma, WA 98467-3944

RESPONSE TO COMMENT
COMMENTOR NO. 1070: MCCLINTIC, JAMES M. (CONT'D.)

of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site(s).

The EIS includes analyses that were performed to evaluate the impact of various accidents. The consequences of port accidents, including category six accidents (the worst plausible accident), are discussed in Appendix D, Section D.5.4.2.2. In all cases the risks were found to be low.

COMMENTOR NO. 1071: CASEY, DIANA L.

Charles Head
Office of Spent Nuclear Fuel Mamagement
(EM - 37)
U.S. Department of Energy
1000 Independence Avenue S.W.
Washington, D>C> 20585

Dear Sir:

It was with great dismay that I heard about the Federal Government's consideration of Tacoma, Wa., as a possible port of entry for the transportation of nuclear waste. This is an inhabited area and for the past several years Tacoma has made a very serious effort to clean up and contain its toxic pollutants. The city has gotten better and better in its compliance with federal law and the Environmental Protection Agency. Is this now to be its reward? Our families live here, and if man's ignorance in his careless usage of nuclear facilities is ever enlightened, perhaps our great grandchildren will be able to also. Have we learned nothing from the disasters of Three Mile Island and Chernobyl? 1071-1

Tacoma, since it is the best deepwater port on the West Coast, should not even be considered for this nuclear transportation. If an accident were to foul the waters here , the entire Puget Sound fishing industry would die, and all of the large cities in the area would be in very serious danger of irreversible poisoning. Seattle, our San Francisco of the North, our capitol city,Olypmia, and many other metropolitan areas would be in jeopardy for the health and safety of its citizenry for years to come.

The Environmental Protection Act has protected the spotted owl to the detriment of the forestry industry, but the humans in this area cannot even be assured pure water, air, or soil for their offspring. I know...I know,,,EVERY precaution will be taken to preclude an accident, but nothing is fail safe. So, you ask, where should we go instead of Hanford, Washington, for storage of spent fuel?
My suggestion would be to go back to the virtually uninhabited places that the Federal Government has used in the past to detonate nuclear warheads, like those areas in New Mexico that had the cancer rates tripled for only a few locals and their families and had the surrounding areas poisoned with a radioactive half-life of only a few thousand years. Is it not enough to poison just a part of the planet and make it unliveable? Do we really have to threaten the entire blessed globe? 1071-2

RESPONSE TO COMMENT
COMMENTOR NO. 1071: CASEY, DIANA L.

Response to Comment No. 1071-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

DOE considers that there would be no significant adverse impacts on the natural resources and on the air and water quality at any of the ports that might be used to receive the material under the proposed policy of managing foreign research reactor spent nuclear fuel. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive material has ever been released from a spent nuclear fuel transportation cask, nor has a spent nuclear fuel transportation cask ever been punctured, even as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

Response to Comment No. 1071-2

Candidate management sites are described in Section 3.3 of the EIS. These sites were selected for management of spent nuclear fuel from foreign research reactors because they have appropriate handling facilities and personnel as well as established security measures. The management sites are remote from populated areas. As discussed in Section 4 of the EIS, foreign research reactor spent nuclear fuel can be safely stored at one or more of these sites. Selection of new remote sites would not be cost effective.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 1071: CASEY, DIANA L. (CONT'D.)

The Puget Sound region boasts the last natural (undeveloped) estuary in the United States; this is the Nisqually Basin area, and to put this in harm's way along with this most beautiful of living areas is unconscionable. There is enough desert the world over for the storage of nuclear waste; there is absolutely no reason at all to use a wonderfully liveable area, one of the last outside Alaska in the U.S. that still has some old growth forest and wilderness area. The idea that the Feds can foist this upon us without our even voting upon it sounds a tad like a Tea Tax to me. Is it any wonder the militia is arming itself? How about shipping the waste up the Potomac River and storing it in a nice lead- lined building on Pennsylvania Avenue instead? Or, just maybe we need to look at alternatives to nuclear energy since we seem to have created a Frankenstein that noone, not even the physicists, seem to know how to control. Will it come far too late, that knowledge that dividing the smallest thing known to man may unleash a plague of sickness and death the likes of which the world has never seen? Cannot our leaders see beyond the ends of their noses at the likely result of using so much nuclear fuel? Will we eventually have to launch the waste into space ? We in Tacoma cherish our unpolluted natural areas, our lives and our living space, and we will fight to keep it unfouled.

Sincerely,

Diana L. Casey

Diana L. Casey

RESPONSE TO COMMENT
COMMENTOR NO. 1071: CASEY, DIANA L. (CONT'D.)

Nuclear warheads are not detonated in the State of New Mexico. The first atomic bomb was detonated in July 1945 southeast of Socorro, New Mexico in a portion of what is now the Trinity Site within White Sands Missile Range, New Mexico. Since that time, no nuclear detonations have been conducted in New Mexico. The Trinity Site is now a tourist attraction. Tourism and hunting on White Sands Missile Range are controlled to minimize interference with range operations and the abundant desert wildlife now residing in the area. Cancer rates in that area are not known to significantly exceed the national average.

COMMENTOR NO. 1072: JENSEN, ROBERT J. & BEVERLY A.

Tacoma Wa
June 27, 1995

Dear Sir
Just a few lines to let you know how terrible the majority of us Puget Sounders feel about our country even considering accepting other countries nuclear garbage — We cannot emphasize strongly enough how disasterous one small accident would be — Not only are we ill-equipped to handle such volumes of foreign nuclear waste products, but we can't even take care of our own properly. (ie: Hanford and Yucca.)
An alternative would be to keep the nuclear waste overseas, where it would be reprocessed in Scotland, Japan or France. All three of these countries have indicated they want it —
Please don't make our

1072-1

1072-2

RESPONSE TO COMMENT
COMMENTOR NO. 1072: JENSEN, ROBERT J. & BEVERLY A.

Response to Comment No. 1072-1

The commentor's opposition to acceptance of foreign research reactor spent nuclear fuel in the United States is noted. Other alternatives under consideration are described in Sections 2.3 and 2.5 of the EIS.

Response to Comment No. 1072-2

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 1072:
JENSEN, ROBERT J. & BEVERLY A. (CONT'D.)

country, especially our beautiful Puget Sound Area, a nuclear garbage dump for foreign countries.

Thank you very much for your consideration.

Sincerely,
Robert J. Jensen
Beverly A. Jensen

RESPONSE TO COMMENT
COMMENTOR NO. 1072:
JENSEN, ROBERT J. & BEVERLY A. (CONT'D.)

COMMENTOR NO. 1073: AMDAHL, DREW

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Drew Amdahl Phone: 206 346-9475

Title and Organization:

Address: 5301 Portview Pl. NE

City: Tacoma State WA Zip 98422

*** COMMENTS ***

I am opposed to the routing of nuclear waste thru the Port of Tacoma for a number of reasons including: possibility of shipboard fires for which temperature the nuclear containers are not designed to withstand; ill-trained/ equipped city, county, state emergency workers for nuclear accidents; getting stuck in traffic in my regular trips through the Port of Tacoma next to a truck containing nuclear waste; and being downwind in a residential area a couple of miles from the Port of Tacoma. I am very concerned about the possibility of terrorist hijacking or attack on the nuclear shipments. The shipping route thru the Straits of Juan de Fuca & Puget Sound provide ample cover for small terrorist boats or even on-shore missles & weapons to be used against the ship carrying the nuclear waste. There is a lot of coast line in the many miles of inland waterways in the Port of Tacoma shipping route conducive to this activity. This should be a criteria in the selection process of a port! The shipping route also goes through some heavily populated areas. The Port of Tacoma itself is not designed to be secure against terrorist activities. In my opinion military harbor facilities should be given much greater weight than commercial ports due to security issues as well as experience in handling nuclear wastes & emergencies.

1073-1

1073-2

To Mail in Comments, Address Correspondence to:
Mr. Charles R. Hold
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 1073: AMDAHL, DREW

Response to Comment No. 1073-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, the analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Section 4.2.2.2), and pose no significant risk to port personnel, the local population, or the environment.

Appendix D, Section D.5.3.1 of the EIS describes several accident scenarios that involve fire. The results of the analysis of these accidents can be found in Appendix D, Section D.5.4. The analysis indicates that even in the event of a severe ship fire, neither the consequences nor risks are great (Appendix D, Section D.5.5). Although the nonradiological effects of such a catastrophic accident would obviously impact the local environment, no additional impacts are predicted due to the presence of foreign research reactor spent nuclear fuel.

DOE considers that there is adequate regulatory and emergency preparedness infrastructure to ensure the safe acceptance and transport to designated management sites if the foreign research reactor spent nuclear fuel is managed in the United States. Federal funding to State, Tribal, and local governments for maintaining emergency response programs is discussed in Section 2.7.1 of the EIS. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advise and assistance to the State, Tribal and local agencies involved with a radiological incident. Emergency preparedness, security, and coordination of DOE with local emergency response authorities, and security are discussed in general in Sections 2.7 and 2.8 of the EIS. Details would be contained in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

The radiation dose that anyone would receive handling, working or traveling near a cask is below the limit that is allowed to the public in an unrestricted area by NRC regulations (Title 10 CFR Part 20). As such, no special precaution would be required from anyone in the area of a cask carrying foreign research reactor spent nuclear fuel.

Neither acts of terrorism nor theft of materials by a determined group of individuals can be completely precluded. However, proper security measures can greatly reduce the risk of such actions. The security provided for the spent nuclear fuel shipments is required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional

COMMENTOR NO. 1073: AMDAHL, DREW (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 1073: AMDAHL, DREW (CONT'D.)

Section 3.2 of the EIS presents the population within 10 miles (16 km) of each port, and the accident impact analysis takes into account population within 50 miles (80 km) of the port. Port selection Criterion 5 (Appendix D, Section D.1.9.5 of the EIS) considers population in the port and along the route to the management site.

Response to Comment No. 1073-2

The EIS evaluates the use of both military and commercial ports in Section 4.2.2 and Appendix D. The information presented demonstrates that the risks associated with using any of the ports identified by the port selection process is low.

COMMENTOR NO. 1074: JOHNSON, MARJORIE

July 9, 1995

Charles Head
Office of Spent Nuclear Fuel Management
US Department of Energy
1000 Independence Avenue SW
Washington D.C. 20585

Dear Mr. Head:

I hope that by now, from everything I have read and heard, you have removed Tacoma Washington from all consideration concerning shipments of high-level nuclear waste through our port. 1074-1

I don't believe that any port in this country should have to dea with it.

If our country has that much money to spend on this kind of project, then use that money to send equipment and professional to the country where it is now stored for appropriate containmen 1074-2

The U.S. does not have to take on all the worlds problems.

Sincerely,

M Johnson

Marjorie Johnson
8801 27th Street West 16B
Tacoma, WA 98466

RESPONSE TO COMMENT
COMMENTOR NO. 1074: JOHNSON, MARJORIE

Response to Comment No. 1074-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma, or any U.S. port, is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1074-2

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

COMMENTOR NO. 1077: BUNNELL, DIANNE

July 7, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585

Dear Mr. Head:

I read with great satisfaction that the June public hearings on the issue of bringing spent foreign research fuel elements through the Port of Tacoma resulted in a strong show of support by Washingtonians *AGAINST* such a possibility. — *1077-1*

I know Ports are the issue, but I wish you could explain to me, Mr. Head, how American depositories are better suited than any that could be constructed by American know-how, with personnel trained by American methods (or perhaps administered by Americans) *in the country that creates the waste???* — *1077-2*

Our personal experience is this: my husband's first wife died at age 39 from a cancer that normally is easily treatable. We have no proof that the unusually aggressive, fast growing cancer was affected by the fact that Susan grew up near Hanford nuclear facility; but, if there's nothing to worry about at Hanford, why the massive clean up efforts underway today? Nuclear storage is *not* the end of the story. — *1077-3*

During the time my husband was a boy growing up in Tacoma in the 50's, there was total disregard to environmentally sound practices — now, Tacoma has made monumental leaps in terms of clean up, fine cultural offerings and civic pride. Finally, Tacoma's getting to be beautiful! This plan would certainly affect this great city. What business seeks out a city in which massive amounts nuclear business is conducted? Other issues include transportation routes, handling facilities and the configurations of the on-dock rail yard were incorrectly drawn up on out-of-date maps; the depth of water in the Tacoma area would present a disasterous problem, if an accident were to ever happen; the population in this area has skyrocketed, and will continue to grow -- has a full disaster contingency been addressed in terms of redressing the citizenry and funding needed to rebuild? These issues and others addressed at the hearing make it clear that the Port of Tacoma is not an optimum location for this program.. — *1077-1 (Cont'd.)*

Is this program of nuclear dumping grounds really in the best interest of the next generation? Or is it simply expedient? As Steven Seagal said at a rally against building a nuclear storage dump on reservation land: "I see death. How's one word? Death," he said. "I could add a couple of others: sickness, suffering." As far as I'm concerned, we've already experienced the results of nuclear waste. — *1077-4*

Sincerely,

Dianne Bunnell

Dianne Bunnell

14507 Berry Valley Rd.
Yelm, WA 98597

RESPONSE TO COMMENT
COMMENTOR NO. 1077: BUNNELL, DIANNE

Response to Comment No. 1077-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, such adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Tacoma would have no adverse economic impacts on business or tourism within the port or the surrounding communities.

In regard to the EIS being based on outdated and inaccurate information, updated information on the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS. All of the errors identified by the commentor, have been corrected in the final EIS, and the conclusion that the risks associated with accepting foreign research reactor spent nuclear fuel into the United States through Tacoma, or any of the other candidate ports, are low and would result in low impacts is still valid. The population data used in the analyses, which was verified as being correct, were based on the 1990 census.

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1000 feet). Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters. The impacts of a foreign research reactor spent nuclear fuel transportation cask sinking in coastal and deep waters are estimated in the EIS (Appendix C, Section C.5). The results of this analysis shows that both the consequences and the risk of these accidents are low (Appendix C, Sections C.5.4 and C.5.5).

The population in close proximity to the terminal, as well as those as far away as 50 miles, was considered when the effects of possible accidents were calculated (Appendix D, Section D.5 of the EIS). These calculations demonstrate that the risk from accidents to all individuals is low. Likewise, the incident-free radiation exposure to people nearer to the cask than those living outside the fence around the port was calculated and found to

pose no significant risk (Section 4.2.3.2 of the EIS). The dose rate at 100 feet from a cask containing foreign research reactor spent nuclear fuel is essentially zero. For these reasons, the close-in population near the Port of Tacoma would not be subjected to any significant risk from the use of the terminal to receive foreign research reactor spent nuclear fuel.

Response to Comment No. 1077-2

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

Response to Comment No. 1077-3

DOE agrees that radiological contamination presents a risk to the health and safety of workers and nearby public. DOE is committed to the Tri-party agreement for the cleanup of contaminated areas at the Hanford Site; however, the cleanup at the Hanford Site is beyond the scope of this EIS. Section 4.2.4 and Appendix F, Section F.4.3 of the EIS discuss the impacts of foreign research reactor spent nuclear fuel storage at the Hanford Site.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 1077-4

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly-enriched (weapons-grade) uranium in civil programs worldwide.

COMMENTOR NO. 1078: FORM LETTER F

Charles Head
Program Manager
Office of Spent Nuclear Fuel Management
Us Department of Energy
1000 Independence Avenue S.W.,
Washington D.C. 20585

July 9,1995

RE: Spent Nuclear Fuel Through
Port of Tacoma

Dear Mr. Head:

I wish to be counted among the multitudes of people AGAINST shipping spent nuclear fuel through the Port of Tacoma, Tacoma, Washington. *1078-1*

Since there is a need and request for nuclear fuel in Japan and Scotland it should be sent there. *1078-2*

Stock-piling this fuel in the United States and shipping through the Port of Tacoma or any other ports should NOT even be considered.

I am against it.

Sincerely,

Mabel Peska
[illegible]
[illegible]

RESPONSE TO COMMENT
COMMENTOR NO. 1078: FORM LETTER F

Response to Comment No. 1078-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1078-2

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

Commentor No. 1078: Form Letter F (Cont'd.)

Individuals submitting this form letter:

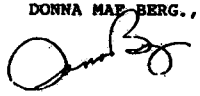
Gibbs, Thomas	Reenan, Larry
Milkulski, Yvonne	Reenan, Andy
Peseka, Mabile	Reenan, Valorie
Rankin, Dioginea	Reenan, Virginia A.

Response to Comment
Commentor No. 1078: Form Letter F (Cont'd.)

COMMENTOR NO. 1084: BERG, DONNA MAE

Dear Mr HEAD,
We the people of TACOMA are asking you to say no to
SPENT NUCLEAR FUEL. Our city as well as yours live in fear 24 hours a da
Every city and town holds within their midst a chill.
HUNGER/.. HOMELESSNESS/..GANGS/.. GUNS/.. RAPE/ AND MURDERS.
Not to mention TAXES THAT ARE OUT OF CONTROL.
Your voice can and should be a positive for our countrys future.
NO WAY...NO WANT...NO HOW...NO WASTE....

ONE VOICE.
DONNA MAE BERG.,,



1084-1

RESPONSE TO COMMENT
COMMENTOR NO. 1084: BERG, DONNA MAE

Response to Comment No. 1084-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1085: SCHERER, ELLEN

June 23, 1995

Mr. Charles Head
Department of Energy
1000 Independance Avenue
Washington, D.C. 20585

Dear Mr. Head;

After recently watching the hearings on the Nuclear Waste issue in Washington State, I have become very alarmed. I am the mother of 3 small children. We are in the process of buying a home in the Federal Way area which is a short distance from the Port of Tacoma.

And the federal government wants to bring nuclear waste from Japan to the area for storage. Why? I'm sure you are aware that this is a highly populated area. The nuclear industry has a far from good safety record. Any sort of accident or mishap would start a chain reaction of catastrophic events. Nuclear is an unstoppable force and it would be unwise to expose innocent people to a potential volative situation. 1085-1

Please don't let this happen. Other options should be taken.

Thank you for listening.

Please respond when a decision has been reached.

Ellen Scherer
1900 S.W. Campus Dr.
Bldg. 42 - Apt. 101
Federal Way, Washington 98023

206-661-1842

RESPONSE TO COMMENT
COMMENTOR NO. 1085: SCHERER, ELLEN

Response to Comment No. 1085-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternatives 1 or 3), there would be no storage of this material in the Port of Tacoma, or any other port. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

COMMENTOR NO. 1086: CHUTE, MARGARET C.

Dear Mr. Charles Head,

I am writing to protest shipping nuclear waste through the U.S. via port in Tacoma. 1086-1

Why make a "nuclear garbage dump" of the United States. A probable accident would ruin this area. 1086-2

Also we have no commercial reprocessing facilities in the United States, France and Japan. These countries have the waste with to do with and would use the nuclear waste. 1086-3

Sincerely,
Margaret C. Chute
2501 So 35th St #10
Tacoma, Wa. 98409

RESPONSE TO COMMENT
COMMENTOR NO. 1086: CHUTE, MARGARET C.

Response to Comment No. 1086-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma, is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1086-2

Prior to 1989, it was a policy of the United States to accept foreign research reactor spent nuclear fuel for disposition in the United States (Section 1.1 of the EIS). Many foreign research reactor operators have no immediate means of disposing of their spent nuclear fuel (Section 1.2 of the EIS). The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). As discussed in Section 4 of the EIS, each of the management alternatives could be implemented without significant effects on human health or the environment.

Response to Comment No. 1086-3

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS. As discussed in Section 2.6.5.2, the United States has chemical separation facilities at two of the potential management sites.

In the near future, the chemical separation facilities at the Savannah River Site might resume operations for the foreign research reactor spent nuclear fuel or for another purpose. These options are discussed in Section 2.2.2.6 of the EIS.

DOE announced a Record of Decision on May 30, 1995 for the Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory (INEL) Environmental Restoration and Waste Management Programs EIS. Chemical separation at the Idaho National Engineering Laboratory was not included in this Record of Decision, so additional site-specific NEPA documentation would be required to restart the chemical separation facilities at this site.

COMMENTOR NO. 1091: CHAPEL, MARGARET C.

July 4, '95

Dear Mr. Head,

Please don't put your toxic garbage in Concord Naval Weapons Station, or anywhere in the San Francisco Bay area.

1091-1

Thankyou,
Margaret C. Chapel

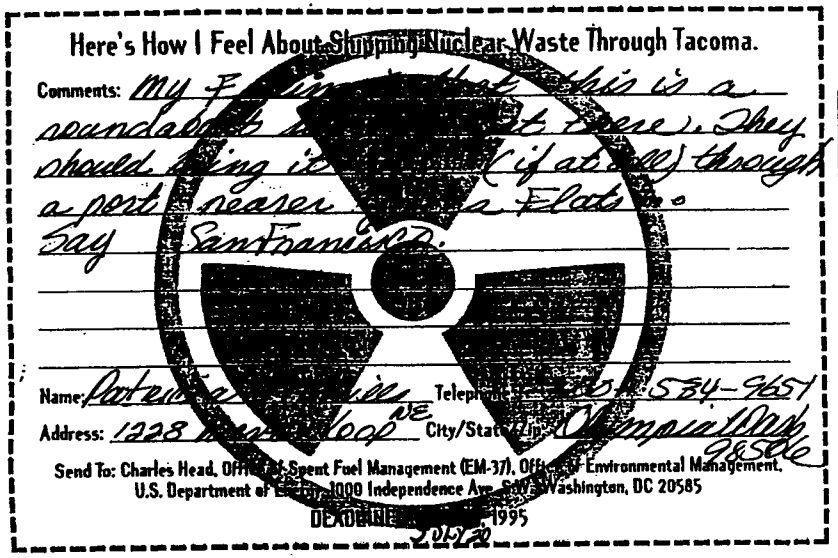
RESPONSE TO COMMENT
COMMENTOR NO. 1091: CHAPEL, MARGARET C.

Response to Comment No. 1091-1

The commentor's opposition to the use of Concord NWS for the shipment of foreign research reactor spent nuclear fuel is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Commentor No. 1092: Mills, Patricia J.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: My F[illegible] that this is a scandal to ship it here. They should bring it [illegible] (if at all) through a port nearer [illegible] Flats. Say SanFrancisco.

Name: Patricia J. Mills Telephone: (206) 584-9651

Address: 1228 [illegible] Loop SE City/State/Zip: Olympia WA 98506

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., SW, Washington, DC 20585

DEADLINE: June 30, 1995

The strongest weapon against nuclear waste is right at your fingertips. Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste. For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Renton, Federal Way; Tacoma-Pierce County Visitor & Convention Bureau, Tacoma-Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

1092-1

Response to Comment Commentor No. 1092: Mills, Patricia J.

Response to Comment No. 1092-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

June 1995

Dear Secretary of Energy Hazel O'Leary,
I live in Contra Costa county where the Concord Naval
Weapons Station and port are. I am opposed to the plan
to bring spent fuel and high level nuclear waste
through the Bay Area, with its large population. We
are also politically aware here, and environmentally 1093-1
sensitive. We have earthquakes and flooding, and
plenty of traffic accidents. It seems foolish to transport
this very hazardous material so far when there are
closer alternatives.
Furthermore, I think that the countries that use nu-
clear power should get used to disposing of its waste
nearby, or give it up. We cannot keep taking all the waste 1093-2
and the U.S. should not be distributing this stuff in the
first place. We should not be making or using it ourselves
until we know how to safely dispose of it. We are far
from that point! Nuclear power is not necessary, and
nuclear weapons are an abomination. Not only the wastes
but the weapons can fall into the wrong hands at any
time, and be abused. The U.S. has abused them and so
have the other nations that have them. Nuclear power 1093-3
plants and weapons have already done a great deal of
harm. We should not be encouraging and making it
easier for the rest of the world to go nuclear, but
shutting down the present production and use of radio-
active materials. We don't know what to do with the
contamination we have already. Each new step is 1093-4
fraught with danger and controversy, as you know.
If only President Clinton had the guts to tell the world!
Trying to play it safe, he probably won't be re-elected,
but if he found his own backbone or could borrow one,
he might be. Which reminds me of a joke I'll enclose
from the book from the Fellowship of Reconciliation - "How
To Keep Laughing Even Though You've Considered All the
Facts" by Richard Beato.

Response to Comment No. 1093-1

The commentor's opposition to the use of Concord NWS to receive foreign research reactor spent nuclear fuel is noted. The port selection criteria discussed in Appendix D, Section D.1.9 of the EIS identify those ports that can safely handle foreign research reactor spent nuclear fuel. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Concord NWS, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The EIS indicates that the risks associated with an accident are low (Section 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Section 4.2.2.2).

All population within a 50-mile radius of the Concord NWS was considered when analyzing the impact of both incident-free transport and the range of hypothetical port accidents. The risks were found to be low. (Appendix D, Section D.5 provides details on accident analysis).

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the transportation cask.

Response to Comment No. 1093-2

The commentor's opposition to acceptance of foreign research reactor spent nuclear fuel is noted. Other alternatives under consideration are discussed in Sections 2.3 and 2.5 of the EIS.

The United States encourages the use of LEU fuel in research reactors because it cannot be used to manufacture nuclear weapons. As discussed in Sections 2.2.1.9 and 2.6.5, foreign research reactor spent nuclear fuel could be safely stored at any of the five candidate management sites until final disposition. Final disposition is a high priority consideration and is discussed qualitatively in Section 4.2.7 of the EIS.

As shown in Tables 2-1 and 2-2 of the EIS, Iraq is not a candidate for participation in the proposed action. Thus, spent nuclear fuel from Iraq would not be managed under the proposed policy.

COMMENTOR NO. 1093: REIMER, NANCY (CONT'D.)

2/ most of the spent fuel from other countries that the U.S. would be bringing back could be disposed of just as safely, or more so, in those countries, such as Canada and Europe. As for the unstable parts of the world, what are we giving them nuclear material for? We see what has happened in Iraq, and to Iraq, which the U.S. flooded with weapons in the 1980's! The greatest abuses have been committed there, including by Bush in the Gulf War, which he could have easily prevented by sending clear signals to Saddam Hussein that he wanted that war, although in the end it didn't help him, and the terrible consequences continue. Saddam Hussein said well, however, that now is allied with the Russians for humanitarian reasons! From bad to worse with power, politics and nuclear energy.

Back at home, too much of the radioactive materials are also starting or ending up on Indian land. So is other hazardous waste. The health of Native Americans has suffered. Nuclear weapons have been exploded on Shoshone land in the 1950's. The people of Big Mountain have been driven off their land and are still fighting relocation because Peabody Coal, Santa Fe Pacific and others, including some tribal leaders, want to exploit the area. Our local utility (Pacific Gas and Electric) is trying to send nuclear wastes to the Apache Mescalero Reservation and to Ward Valley, west of Needles, Calif. and 18 miles from the Colorado River. No wonder

1093-5

1093-2 (Cont'd.)

1093-6

RESPONSE TO COMMENT
COMMENTOR NO. 1093: REIMER, NANCY (CONT'D.)

Response to Comment No. 1093-3

Foreign research reactors are not used for generation of commercial power or the development of nuclear weapons. Section 1.1 of the EIS describes the research, medical, agricultural, and industrial applications of research reactors. Because it is unrealistic to expect foreign nations to forego the benefits of nuclear technology, the United States supports the use of LEU fuel in civilian applications and discourages actions which might lead to the spread of nuclear weaponry (See Sections 1.1 and 1.2 of the EIS). In addition, the U.S. accrues significant benefits from the operation of foreign research reactors - including Moly-99 and other medical isotopes.

Response to Comment No. 1093-4

See response to comment number 1093-2 above.

Response to Comment No. 1093-5

The commentor's preference for the overseas management alternative is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

Response to Comment No. 1093-6

If Management Alternative 1 is adopted, no foreign research reactor spent nuclear fuel would be managed on Indian lands. Sections 2.6.5 and 3.3 of the EIS describe candidate management sites for spent nuclear fuel from foreign research reactors. Section 3 and Appendix A provide characterizations of the racial and ethnic composition of populations residing in potentially affected areas.

3/

people are nervous! The Oklahoma City disaster made us all more aware of the problem of home-grown terrorism, too. The downsizing and moving away of companies is causing unemployment and the attendant economic and psychological problems, which can lead to such crazy acts. The government should lead the way in finding sensible solutions. The obvious one in the case of nuclear power is to phase it out, but the present policy seems to be to perpetuate it, and kind of hook the central purpose, which is military, with so-called benign uses: nuclear energy, radioisotopes in medicine, agriculture, industry, etc., only if the overall price is not higher than the benefits, but it is.

Please do not visit this menace on the S.F. Bay area any more than it already is. We are struck with the Livermore lab, the Concord Naval Weapons Station, and other nuclear hazards already. One building at Lawrence Livermore National Laboratory stores 8.80 pounds of plutonium according to a May 14, 1995 newspaper article about earthquake preparation.

I appreciate your coverage in helping more of the truth about our nuclear past emerge. As long as it is hidden, there is little chance of preventing future disasters. We have a world to save, and informed people know that it is in great danger. A half a century ago, a few years after my birth, the U.S. bombed Japan. That was a terrible mistake. Now I have Japanese in-laws -and a nephew who did not survive racism and others.

Sincerely, Nancy Reimer

1093-2 (Cont'd.)

1093-7

Response to Comment No. 1093-7

The commentor's opposition to bringing foreign research reactor spent nuclear fuel into the San Francisco Bay Area and, more specifically, into Concord NWS is noted. As indicated by the analysis in Section 4 of the EIS, the risk associated with implementation of the proposed action to human health and the environment would be low. Environmental effects of normal operations and accidents were included in the environmental action.

Response to Comment No. 1093-7

The commentor's opposition to bringing foreign research reactor spent nuclear fuel into the San Francisco Bay Area and, more specifically, into the Concord NWS is noted. As discussed in Section 4 of the EIS, the risks associated with implementation of the proposed action to human health or the environment would be low. Environmental effects of normal operations and accidents were included in the environmental evaluation.

COMMENTOR NO. 1093: REIMER, NANCY (CONT'D.)

P. S. Since writing this I was very sorry to read that the U.S. government is planning to resume nuclear testing. This places the whole world in jeopardy as it undermines the difficult and necessary process of stopping the arms race, and undoes the progress already made through much hard work and sacrifice. Please do what you can to stop it. We appreciate the efforts you are making, but they are not enough. Too much is at stake here.

This is a love letter, if you really mean what comes with it - love for the world, and for you and your efforts to save it, We really must put our shoulder to the wheel now, and keep at, and be honest, too.

RESPONSE TO COMMENT
COMMENTOR NO. 1093: REIMER, NANCY (CONT'D.)

COMMENTOR NO. 1095: BENSON, ARDEN R.

720 N.W. Front Ave., D-12
Portland, OR 97209
July 12, 1995

U.S. Department of Energy
Office of Environmental Management (EM-37)
Attention: Mr. Charles Head
1000 Independence Ave. S.W.
Washington, DC, 20585-0001

Dear Mr. Head:

Twenty tons of weapons-grade U-235 waste to be transported from foreign countries to be stored at Hanford? Right next to the Columbia River? Hanford, with its perennial problems of leaking containers, and its incredible and unaccountable losses of plutonium? I guess the Columbia River and the cities along its banks are expendable. 1095-1

With decisions like that coming from our own government, who needs enemies?

Sincerely,

Arden R. Benson
(503) 295-4076

RESPONSE TO COMMENT
COMMENTOR NO. 1095: BENSON, ARDEN R.

Response to Comment No. 1095-1

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 1096: BENSON, TERESA

June 26, 1995

Mr. Charles Head, Program Manager
Office of Spent Nuclear Field Management
US Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

Dear Mr. Head;

I, oppose bringing nuclear waste from foreign countries to be brought into the United States. **1096-1**

Sincerely;

[illegible] Benson
[illegible] McCann Rd
[illegible], GA [illegible]

RESPONSE TO COMMENT
COMMENTOR NO. 1096: BENSON, TERESA

Response to Comment No. 1096-1

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States is noted (Management Alternatives 1 or 3, Sections 2.2 and 2.4 of the EIS, respectively). Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

COMMENTOR NO. 1097: SCHROEDER, PAUL C.

July 12, 1995

Paul C. Schroeder
4725 41st St. N.E.
Tacoma, WA 98422

Charles Head
Program Manager
Spent Nuclear Fuel Management

Dear Mr. Head:

I urge you not to ship nuclear waste through the Port of Tacoma.

I can see no economic benefit, yet it is likely that there exists liabilities in one form or another. Specifically increased taxes and devalued property. 1097-1

Being a close neighbor to the Port, I stand to lose significantly should you decide to ship this waste through the Port of Tacoma.

Sincerely,

Paul C. Schroeder

Paul C. Schroeder

RESPONSE TO COMMENT
COMMENTOR NO. 1097: SCHROEDER, PAUL C.

Response to Comment No. 1097-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 and Appendix D, Section D.5 of the EIS).

Although not a direct economic benefit, the management alternatives described in the EIS would reduce the threat of nuclear proliferation, which has both national and global value.

COMMENTOR NO. 1102: ROCHE, ANITA F.

4848 Venner Rd
Martinez CA 94553
July 5, 1995

Dear Mr. Head,

The DOE plan to ship nuclear waste through the Concord Naval Weapons Station should be "dumped." To put the shipments through a densely populated area such as the San Francisco Bay could be another Chernobyl.

I don't like pushing the plan onto another area either; but, isn't there somewhere less populated that could be used?

Please reconsider.

Sincerely,
Anita Roche

1102-1

RESPONSE TO COMMENT
COMMENTOR NO. 1102: ROCHE, ANITA F.

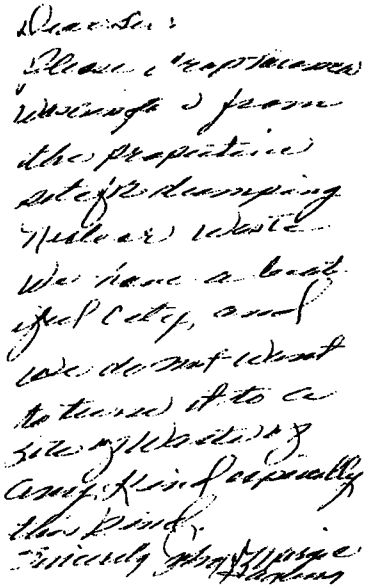
Response to Comment No. 1102-1

The commentor's opposition to the use of Concord NWS for the shipment of foreign research reactor spent nuclear fuel is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

The port selection process that determined that Concord NWS was an acceptable port considered the population of the port and surrounding areas (Appendix D, Section D.1.9.5 of the EIS). Additionally, all population within a 50-mile radius of the Concord NWS was considered when analyzing the potential impact of a range of hypothetical port accidents. The risks were found to be low (Section D.5).

The passage from San Francisco Bay to Concord meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for the port selection (Appendix D, Section D.1.9.2).

COMMENTOR NO. 1104: HAGBERG, JOHN



1104-1

RESPONSE TO COMMENT
COMMENTOR NO. 1104: HAGBERG, JOHN

Response to Comment No. 1104-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1105: TRETTIN, LILLIAN D.

712 Wakendaw Blvd.
Mount Pleasant, SC 29464

May 9 1995

Mr Charles Head
Office of Environmental Management (EM-37)
U.S Department of Energy
1000 Independence Ave S.W
Washington D.C. 20585

Dear Sir

I want to state emphatically for the record that I oppose the shipment of nuclear fuel rods through Wando Welch Terminal a property that borders the town of Mount Pleasant SC. The terminal is located near some of the town s most rapidly expanding suburbs and busiest thoroughfares. The proposed action is clearly inappropriate for a community expanding at Mount Pleasant's current high rate of growth. I am writing, not in response to a paid public notice in one of the local newspapers (which I--like a lot of other people in Mount Pleasant--missed), but in response to the headline of a more prominent news article that appeared the day after the meeting: "Few turn out to protest nuclear fuel rod shipments." As the article notes, attendance at the meeting on May 8 was low compared to attendance at a meeting held a year earlier, at which time residents voiced strong disapproval. It is unfortunate that the May 8 meeting received so little attention, since a well-managed scoping process is one of the keys to a successful (and acceptable) EIS.

1105-1

Please add my name and address to your mailing list. I would like to receive the draft EIS and any other public material related to this process (the DOE implementation plan, if there is one), and I would like to be notified of any other public meetings. Before I moved to Mount Pleasant last year, I worked at Oak Ridge National Laboratory in Oak Ridge TN, where I prepared social and cultural impact sections of large-scale environmental impact statements for the Dept of Energy. I thus have first hand experience with the opportunities and the drawbacks that characterize the scoping process. This first scoping meeting failed because it was inadequately advertised and attended; it could not have possibly addressed the concerns and arguments that residents in this region share. I hope many of them will call the mayor's office, as I did, or read the editorials that are sure to appear, and send you a flood of letters.

Sincerely,

Lillian D. Tretlin

Lillian D. Tretlin, Ph.D.

cc: Mayor Cheryll Woods-Flowers
Town of Mount Plesant

RESPONSE TO COMMENT
COMMENTOR NO. 1105: TRETTIN, LILLIAN D.

Response to Comment No. 1105-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Wando Welch Terminal is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Charleston, Wando Terminal, or to any of the ports analyzed in the EIS, is low.

The commentor states that the population of Mount Pleasant and surrounding communities is large and growing rapidly, hence it is not an appropriate port to use to bring in the foreign research reactor spent nuclear fuel. However, Section 4.2.2 of the EIS, which evaluates the impacts on ports of Management Alternative 1 to the proposed policy, and which takes into account population, indicates that the risk associated with this activity at any of the assessed ports, including those ports in the Charleston/Mount Pleasant area, is low.

COMMENTOR NO. 1062: NICKELL, JEAN

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Jean Nickell **Phone:** 935-0120

Title and Organization: Member Mt Diablo Unitarian Universalist Church

Address: 1618 Center St.

City: Walnut Creek **State** CA **Zip** 94596

*** COMMENTS ***

I write this as an individual, not on behalf of my church. I am deeply concerned about the environment. I am also deeply concerned about the continued production of nuclear waste, considering the current and undoubtedly permanent impossibility of storing it. Shipping the rods through our county and state is too scary. An accident would be devastating to the population and the environment. Your environmental impact report is not clear or complete enough. Our citizens are not satisfied that you plan is wise in any particular. Leave the rods where they are! 1062-1 1062-2 1062-3

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 1062: NICKELL, JEAN

Response to Comment No. 1062-1

Spent nuclear fuel can be stored safety for long periods of time, as discussed in Appendix F, Section F.1 and Section 2.6.5.1 of the EIS.

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS).

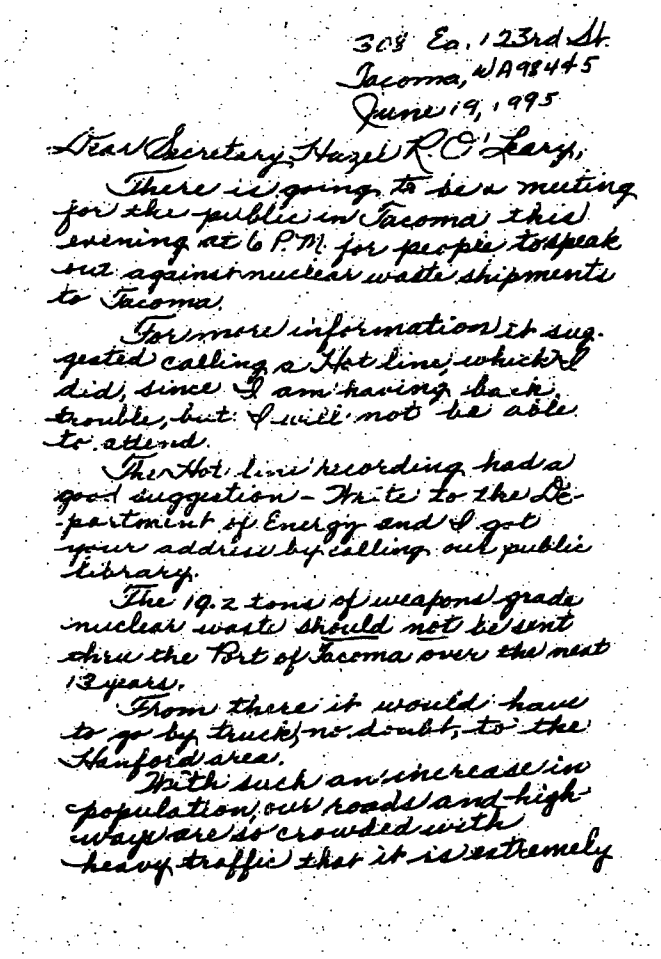
Response to Comment No. 1062-2

The commentor's opposition to the use of the Concord NWS for receipt of foreign research reactor spent nuclear fuel is noted. However, the analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Section 4.2.2.2), and pose no significant risk to port personnel, the local population, or the environment.

Response to Comment No. 1062-3

The commentor's preference to keep the spent nuclear fuel rods where they are currently located is noted. This is Management Alternative 2 and is discussed in Sections 2.3 and 4.4 of the EIS. This preference, however, would not fulfill the U.S. nuclear weapons nonproliferation objective and would force many research reactors to shut down. This would limit their usefulness and contribution to research and medical advances. The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

COMMENTOR NO. 1067: KITTLESON, ALBERTA



308 Ea. 123rd St.
Tacoma, WA 98445
June 19, 1995

Dear Secretary Hazel R. O'Leary,

There is going to be a meeting for the public in Tacoma this evening at 6 P.M. for people to speak out against nuclear waste shipments to Tacoma.

For more information it suggested calling a Hot line, which I did, since I am having back trouble, but I will not be able to attend.

The Hot line recording had a good suggestion - Write to the Department of Energy and I got your address by calling our public library.

1067-1 The 19.2 tons of weapons grade nuclear waste should not be sent thru the Port of Tacoma over the next 13 years.

From there it would have to go by truck, no doubt, to the Hanford area.

1067-2 With such an increase in population our roads and highways are so crowded with heavy traffic that it is extremely

RESPONSE TO COMMENT
COMMENTOR NO. 1067: KITTLESON, ALBERTA

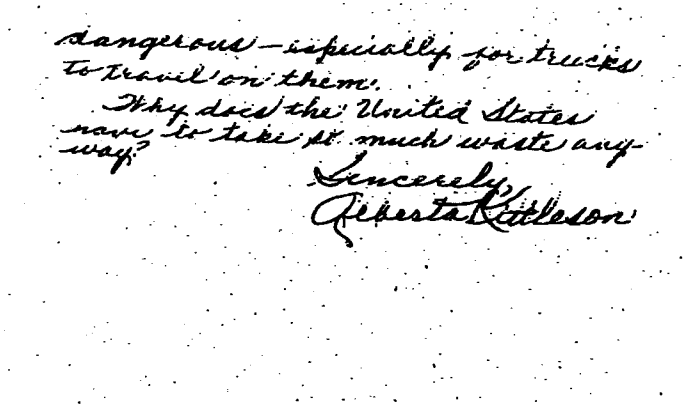
Response to Comment No. 1067-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1067-2

The ground transport route options and identification process are discussed in Section 2.6.4 of the EIS. Over a hundred representative ground transport route options were analyzed in Appendix E, including routes to all of the potential foreign research reactor spent nuclear fuel management sites. The results are presented in Section 4.2.3 of the EIS. In all cases the risks were found to be low.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.



dangerous – especially for trucks to travel on them.
Why does the United States have to take so much waste anyway?
Sincerely,
Roberta Kittleson

1067-2 (Cont'd.)

1067-3

Response to Comment No. 1067-3

Prior to 1989, it was a policy of the United States to accept foreign research reactor spent nuclear fuel for disposition in the United States (Section 1.1 of the EIS). Many foreign research reactor operators have no immediate means of disposing of their spent nuclear fuel (Section 1.2 of the EIS). Thus, the intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS).

COMMENTOR NO. 1069: CITIZENS (TACOMA AREA)

June 26, 1995

The Honorable Hazel O'Leary
The Secretary of Energy
Washington, DC 20585

Dear Ms. Secretary, *

As residents of Tacoma, Washington, we declare strong objections to the proposal to receive nuclear waste at the Port of Tacoma from overseas, for transport to storage elsewhere. **1069-1**

We have the obvious safety concerns over receiving and transferring these materials to rail and carrying them through the fourth busiest corridor in the United States. **1069-2**

In addition, we feel (1) this waste program is not good environmental policy, economic policy, or energy policy, (2) the United States has failed to develop procedures for safe permanent disposal of nuclear waste, and (3) instead of utilizing our hi-tech industry to resolve nuclear waste disposal problems, we are adding nuclear waste from other countries to our existing storage and disposal problems and creating a permanent blight on the region's natural and economic landscape. This is no legacy to leave the next generation. **1069-3**

Mr. and Mrs. Richard A. Thompson, 1864 Hillside Dr. NE, Tacoma, WA 98422
Mr. and Mrs. Harmon Lau, 1861 Hillside DR. NE, Tacoma, WA 98422
Mr. and Mrs. Gary Family, 1861 Hillside Dr NE Tacoma, WA 98422
Mr. and Mrs. Greg Dawson [illegible] Tacoma WA 98422
[illegible] 1855 Hillside Dr NE Tacoma WA 98422
[illegible] Tacoma WA 98422
Mr. & Mrs. [illegible] 1866 Parkview Dr. N.E. Tacoma 98422
Mr. & Mrs. Thomas K. Vermeusch 4714 Browns Pt. Blvd. N.E. Tacoma, WA. 98422
Gail Blankenship 1863 Hillside Drive NE Tacoma WA 98422
Kathy R Wilson 1859 Parkview NE Tacoma WA 98422
Jenny [illegible] 1866 Parkview Drive NE Tacoma WA 98422
David and Marcia [illegible] 2117 Hillside Dr. NE Tacoma WA 98422
John and Diane Hansen 2101 Hillside Dr. NE Tacoma WA 98422

RESPONSE TO COMMENT
COMMENTOR NO. 1069: CITIZENS (TACOMA AREA)

Response to Comment No. 1069-1

The commentors' opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1069-2

The commentor's concerns about safety are noted. The risks of receiving, transferring, and transporting the foreign research reactor spent nuclear fuel are discussed in Sections 4.2.2 and 4.2.3 of the EIS. In all cases, the risks were found to be low.

Response to Comment No. 1069-3

The commentor's opinion that the proposed action represents poor environmental policy, economic policy, and energy policy is noted.

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1 of the EIS).

DOE is using high technology to resolve nuclear waste disposal problems. Vitrification is the preferred technology for high-level waste and geologic disposal is the preferred disposal technique. Many other countries, especially developing countries, do not have these technological capabilities.

DOE agrees that the next generation should not have to clean up the existing nuclear waste inventories. That is one of the reasons that DOE issued the draft Waste Management Programmatic EIS in August, 1995, as discussed in Section 1.5 of the EIS.

* This is the best available copy of this comment document.

COMMENTOR NO. 1070: MCCLINTIC, JAMES M.

The Honorable Hazel O'Leary, Secretary,
U. S. Department of Energy
1000 Independance Avenue S.W., Rm. 7A257
Washington, D. C. 20585

June 26, 1995

Dear Secretary O'Leary:

This letter is to advise you that I am adamantly opposed to a proposal made by your staff to use the Port of Tacoma, Washington as a port of entry for spent radioactive nuclear fuel materials from foreign reactors. 1070-1

Members of your staff have prepared a draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. This proposal envisions using the Port of Tacoma as a transshipment point for radioactive nuclear waste materials. These materials would be offloaded from seagoing cargo vessels and loaded aboard other forms of transportation and thence shipped on to storage sites here in the U. S..

Your staffer, Mr. Charles Head, who attended a public hearing on June 19th, here in Tacoma, is quoted in a local newspaper article. His words give me grave cause for concern. During the meeting, overwelming disapproval of the proposal was voiced by people from all over Western Washington. Your staffer told the Tacoma News Tribune reporter that "They don't have time to listen." I believe that he meant that you and your department don't have time to listen to the concerns of the citizens most likely to be affected by this proposal. Perhaps Mr. Head has forgotten that he and the entire department serve by the grace of the Congress and the President, and thereby, the citizens of the country. I strongly recommend that you counsel Mr. Head on his responsibilities, lest he begin to personify the National Rifle Association's recent reference to "jackbooted government thugs." I truly hope that Mr. Head was misquoted or misunderstood by the reporter. 1070-2

I also have grave concerns for the safety of the citizens of Washington and the fishery which is such a large part of the local economy should the unthinkable happen, a nuclear accident. I urge you in the strongest possible terms to ask your staff to select an alternative to Tacoma, Washington as the port of entry if this program must be adopted. Your staff has not done its homework properly. There are serious concerns not addressed by your proposed EIS. These include, but are not limited to the following: The long term effects of unrecoverable containers in Puget Sound; the security of containers during transshipment; the 1070-3

RESPONSE TO COMMENT
COMMENTOR NO. 1070: MCCLINTIC, JAMES M.

Response to Comment No. 1070-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1070-2

The DOE representative's comment that their bosses in Washington "don't have time to listen" was taken in the wrong context. While it would be impractical for the Secretary of Energy to personally review and respond to all of the written and oral comments concerning this EIS, this information was reviewed by the Program Manager and his staff. The Program Manager is responsible for relaying public concerns and issues to the Secretary of Energy and her staff. As indicated by this document, all comments received from the public were noted and taken seriously. Under NEPA and DOE's environmental regulations (Section 5 of the EIS), public participation and comments are an integral component of the environmental process.

Overall, DOE's public interaction related to this draft EIS has exceeded requirements set forth in NEPA and the environmental regulations of DOE. Seventeen public hearings were held in the locations determined to be most likely to be directly affected by the EIS alternatives. In addition, the period of acceptance for written comments was extended from June 20 to July 20, 1995. DOE considers that these actions have provided sufficient opportunity for the public to comment on the draft EIS.

Response to Comment No. 1070-3

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1000 feet). Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters.

The security provided for the spent nuclear fuel shipments would be required to meet or exceed all of the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. To better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel, Appendix H has been added to the final EIS in response to public comments. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all

COMMENTOR NO. 1070: MCCLINTIC, JAMES M. (CONT'D.)

effects of a nuclear accident at the port. Please do not dismiss my concerns and those of my fellow citizens. We have been told too many times that the horrible "accident" can't happen, but Chernobyl, Hanford and Thee Mile Island tell us otherwise. There are other sites for the port of entry which do not pose the security or accident risks that exist in Tacoma. Please do not risk making the beautiful Puget Sound Region a nuclear wasteland.

Sincerely,

JAMES M. McCLINTIC
8017 65th St. Ct. W.
Tacoma, WA 98467-3944

RESPONSE TO COMMENT
COMMENTOR NO. 1070: MCCLINTIC, JAMES M. (CONT'D.)

of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site(s).

The EIS includes analyses that were performed to evaluate the impact of various accidents. The consequences of port accidents, including category six accidents (the worst plausible accident), are discussed in Appendix D, Section D.5.4.2.2. In all cases the risks were found to be low.

COMMENTOR NO. 1071: CASEY, DIANA L.

Charles Head
Office of Spent Nuclear Fuel Mamagement
(EM - 37)
U.S. Department of Energy
1000 Independence Avenue S.W.
Washington, D>C> 20585

Dear Sir:

It was with great dismay that I heard about the Federal Government's consideration of Tacoma, Wa., as a possible port of entry for the transportation of nuclear waste. This is an inhabited area and for the past several years Tacoma has made a very serious effort to clean up and contain its toxic pollutants. The city has gotten better and better in its compliance with federal law and the Environmental Protection Agency. Is this now to be its reward? Our families live here, and if man's ignorance in his careless usage of nuclear facilities is ever enlightened, perhaps our great grandchildren will be able to also. Have we learned nothing from the disasters of Three Mile Island and Chernobyl? 1071-1

Tacoma, since it is the best deepwater port on the West Coast, should not even be considered for this nuclear transportation. If an accident were to foul the waters here , the entire Puget Sound fishing industry would die, and all of the large cities in the area would be in very serious danger of irreversible poisoning. Seattle, our San Francisco of the North, our capitol city,Olypmia, and many other metropolitan areas would be in jeopardy for the health and safety of its citizenry for years to come.

The Environmental Protection Act has protected the spotted owl to the detriment of the forestry industry, but the humans in this area cannot even be assured pure water, air, or soil for their offspring. I know...I know,,,EVERY precaution will be taken to preclude an accident, but nothing is fail safe. So, you ask, where should we go instead of Hanford, Washington, for storage of spent fuel? 1071-2
My suggestion would be to go back to the virtually uninhabited places that the Federal Government has used in the past to detonate nuclear warheads, like those areas in New Mexico that had the cancer rates tripled for only a few locals and their families and had the surrounding areas poisoned with a radioactive half-life of only a few thousand years. Is it not enough to poison just a part of the planet and make it unliveable? Do we really have to threaten the entire blessed globe?

RESPONSE TO COMMENT
COMMENTOR NO. 1071: CASEY, DIANA L.

Response to Comment No. 1071-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

DOE considers that there would be no significant adverse impacts on the natural resources and on the air and water quality at any of the ports that might be used to receive the material under the proposed policy of managing foreign research reactor spent nuclear fuel. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive material has ever been released from a spent nuclear fuel transportation cask, nor has a spent nuclear fuel transportation cask ever been punctured, even as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on air and water quality.

Response to Comment No. 1071-2

Candidate management sites are described in Section 3.3 of the EIS. These sites were selected for management of spent nuclear fuel from foreign research reactors because they have appropriate handling facilities and personnel as well as established security measures. The management sites are remote from populated areas. As discussed in Section 4 of the EIS, foreign research reactor spent nuclear fuel can be safely stored at one or more of these sites. Selection of new remote sites would not be cost effective.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 1072:
JENSEN, ROBERT J. & BEVERLY A. (CONT'D.)

country, especially our beautiful Puget Sound Area, a nuclear garbage dump for foreign countries.

Thank you very much for your consideration —

Sincerely,
Robert J. Jensen
Beverly A. Jensen

RESPONSE TO COMMENT
COMMENTOR NO. 1072:
JENSEN, ROBERT J. & BEVERLY A. (CONT'D.)

COMMENTOR NO. 1073: AMDAHL, DREW

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Drew Amdahl Phone: 206 346-9475

Title and Organization:

Address: 5301 Portview Pl. NE

City: Tacoma State: WA Zip: 98422

*** COMMENTS ***

I am opposed to the routing of nuclear waste thru the Port of Tacoma for a number of reasons including: possibility of shipboard fires for which temperature the nuclear containers are not designed to withstand; ill-trained/ equipped city, county, state emergency workers for nuclear accidents; getting stuck in traffic in my regular trips through the Port of Tacoma next to a truck containing nuclear waste; and being downwind in a residential area a couple of miles from the Port of Tacoma. I am very concerned about the possibility of terrorist hijacking or attack on the nuclear shipments. The shipping route thru the Straits of Juan de Fuca & Puget Sound provide ample cover for small terrorist boats or even on-shore missles & weapons to be used against the ship carrying the nuclear waste. There is a lot of coast line in the many miles of inland waterways in the Port of Tacoma shipping route conducive to this activity. This should be a criteria in the selection process of a port! The shipping route also goes through some heavily populated areas. The Port of Tacoma itself is not designed to be secure against terrorist activities. In my opinion military harbor facilities should be given much greater weight than commercial ports due to security issues as well as experience in handling nuclear wastes & emergencies.

1073-1

1073-2

To Mail in Comments, Address Correspondence to:
Mr. Charles E. Findley
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 1073: AMDAHL, DREW

Response to Comment No. 1073-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, the analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Section 4.2.2.2), and pose no significant risk to port personnel, the local population, or the environment.

Appendix D, Section D.5.3.1 of the EIS describes several accident scenarios that involve fire. The results of the analysis of these accidents can be found in Appendix D, Section D.5.4. The analysis indicates that even in the event of a severe ship fire, neither the consequences nor risks are great (Appendix D, Section D.5.5). Although the nonradiological effects of such a catastrophic accident would obviously impact the local environment, no additional impacts are predicted due to the presence of foreign research reactor spent nuclear fuel.

DOE considers that there is adequate regulatory and emergency preparedness infrastructure to ensure the safe acceptance and transport to designated management sites if the foreign research reactor spent nuclear fuel is managed in the United States. Federal funding to State, Tribal, and local governments for maintaining emergency response programs is discussed in Section 2.7.1 of the EIS. There are three national emergency response plans under which DOE provides radiological monitoring and assessment assistance. Under these plans, DOE provides technical advise and assistance to the State, Tribal and local agencies involved with a radiological incident. Emergency preparedness, security, and coordination of DOE with local emergency response authorities, and security are discussed in general in Sections 2.7 and 2.8 of the EIS. Details would be contained in the Transportation Plan, that would be prepared prior to any individual spent nuclear fuel shipment and coordinated with State and local officials. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

The radiation dose that anyone would receive handling, working or traveling near a cask is below the limit that is allowed to the public in an unrestricted area by NRC regulations (Title 10 CFR Part 20). As such, no special precaution would be required from anyone in the area of a cask carrying foreign research reactor spent nuclear fuel.

Neither acts of terrorism nor theft of materials by a determined group of individuals can be completely precluded. However, proper security measures can greatly reduce the risk of such actions. The security provided for the spent nuclear fuel shipments is required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional

COMMENTOR NO. 1073: AMDAHL, DREW (CONT'D.)

RESPONSE TO COMMENT
COMMENTOR NO. 1073: AMDAHL, DREW (CONT'D.)

Section 3.2 of the EIS presents the population within 10 miles (16 km) of each port, and the accident impact analysis takes into account population within 50 miles (80 km) of the port. Port selection Criterion 5 (Appendix D, Section D.1.9.5 of the EIS) considers population in the port and along the route to the management site.

Response to Comment No. 1073-2

The EIS evaluates the use of both military and commercial ports in Section 4.2.2 and Appendix D. The information presented demonstrates that the risks associated with using any of the ports identified by the port selection process is low.

COMMENTOR NO. 1074: JOHNSON, MARJORIE

July 9, 1995

Charles Head
Office of Spent Nuclear Fuel Management
US Department of Energy
1000 Independence Avenue SW
Washington D.C. 20585

Dear Mr. Head:

I hope that by now, from everything I have read and heard, you have removed Tacoma Washington from all consideration concerning shipments of high-level nuclear waste through our port. 1074-1

I don't believe that any port in this country should have to dea with it.

If our country has that much money to spend on this kind of project, then use that money to send equipment and professional to the country where it is now stored for appropriate containmen 1074-2

The U.S. does not have to take on all the worlds problems.

Sincerely,

M Johnson

Marjorie Johnson
8801 27th Street West 16B
Tacoma, WA 98466

RESPONSE TO COMMENT
COMMENTOR NO. 1074: JOHNSON, MARJORIE

Response to Comment No. 1074-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma, or any U.S. port, is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1074-2

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

COMMENTOR NO. 1077: BUNNELL, DIANNE

July 7, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585

Dear Mr. Head:

I read with great satisfaction that the June public hearings on the issue of bringing spent foreign research fuel elements through the Port of Tacoma resulted in a strong show of support by Washingtonians *AGAINST* such a possibility. 1077-1

I know Ports are the issue, but I wish you could explain to me, Mr. Head, how American depositories are better suited than any that could be constructed by American know-how, with personnel trained by American methods (or perhaps administered by Americans) *in the country that creates the waste???* 1077-2

Our personal experience is this: my husband's first wife died at age 39 from a cancer that normally is easily treatable. We have no proof that the unusually aggressive, fast growing cancer was affected by the fact that Susan grew up near Hanford nuclear facility; but, if there's nothing to worry about at Hanford, why the massive clean up efforts underway today? Nuclear storage is *not* the end of the story. 1077-3

During the time my husband was a boy growing up in Tacoma in the 50's, there was total disregard to environmentally sound practices — now, Tacoma has made monumental leaps in terms of clean up, fine cultural offerings and civic pride. Finally, Tacoma's getting to be beautiful! This plan would certainly affect this great city. What business seeks out a city in which massive amounts nuclear business is conducted? Other issues include transportation routes, handling facilities and the configurations of the on-dock rail yard were incorrectly drawn up on out-of-date maps; the depth of water in the Tacoma area would present a disasterous problem, if an accident were to ever happen; the population in this area has skyrocketed, and will continue to grow — has a full disaster contingency been addressed in terms of redressing the citizenry and funding needed to rebuild? These issues and others addressed at the hearing make it clear that the Port of Tacoma is not an optimum location for this program. 1077-1 (Cont'd.)

Is this program of nuclear dumping grounds really in the best interest of the next generation? Or is it simply expedient? As Steven Seagal said at a rally against building a nuclear storage dump on reservation land: "I see death. How's one word? Death," he said. "I could add a couple of others: sickness, suffering." As far as I'm concerned, we've already experienced the results of nuclear waste. 1077-4

Sincerely,

Dianne Bunnell

Dianne Bunnell

14507 Berry Valley Rd.
Yelm, WA 98597

RESPONSE TO COMMENT
COMMENTOR NO. 1077: BUNNELL, DIANNE

Response to Comment No. 1077-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, such adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Tacoma would have no adverse economic impacts on business or tourism within the port or the surrounding communities.

In regard to the EIS being based on outdated and inaccurate information, updated information on the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS. All of the errors identified by the commentor, have been corrected in the final EIS, and the conclusion that the risks associated with accepting foreign research reactor spent nuclear fuel into the United States through Tacoma, or any of the other candidate ports, are low and would result in low impacts is still valid. The population data used in the analyses, which was verified as being correct, were based on the 1990 census.

In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel were to sink in any U.S. coastal waters, it would be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1000 feet). Appendix C, Section C.5.5 of the EIS presents information on the probability of a cask sinking in coastal and deep ocean waters. The impacts of a foreign research reactor spent nuclear fuel transportation cask sinking in coastal and deep waters are estimated in the EIS (Appendix C, Section C.5). The results of this analysis shows that both the consequences and the risk of these accidents are low (Appendix C, Sections C.5.4 and C.5.5).

The population in close proximity to the terminal, as well as those as far away as 50 miles, was considered when the effects of possible accidents were calculated (Appendix D, Section D.5 of the EIS). These calculations demonstrate that the risk from accidents to all individuals is low. Likewise, the incident-free radiation exposure to people nearer to the cask than those living outside the fence around the port was calculated and found to

pose no significant risk (Section 4.2.3.2 of the EIS). The dose rate at 100 feet from a cask containing foreign research reactor spent nuclear fuel is essentially zero. For these reasons, the close-in population near the Port of Tacoma would not be subjected to any significant risk from the use of the terminal to receive foreign research reactor spent nuclear fuel.

Response to Comment No. 1077-2

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

Response to Comment No. 1077-3

DOE agrees that radiological contamination presents a risk to the health and safety of workers and nearby public. DOE is committed to the Tri-party agreement for the cleanup of contaminated areas at the Hanford Site; however, the cleanup at the Hanford Site is beyond the scope of this EIS. Section 4.2.4 and Appendix F, Section F.4.3 of the EIS discuss the impacts of foreign research reactor spent nuclear fuel storage at the Hanford Site.

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 1077-4

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly-enriched (weapons-grade) uranium in civil programs worldwide.

COMMENTOR NO. 1078: FORM LETTER F

Charles Head
Program Manager
Office of Spent Nuclear Fuel Management
Us Department of Energy
1000 Independence Avenue S.W.,
Washington D.C. 20585

July 9,1995

RE: Spent Nuclear Fuel Through
Port of Tacoma

Dear Mr. Head:

I wish to be counted among the multitudes of people AGAINST shipping spent nuclear fuel through the Port of Tacoma, Tacoma, Washington. *1078-1*

Since there is a need and request for nuclear fuel in Japan and Scotland it should be sent there. *1078-2*

Stock-piling this fuel in the United States and shipping through the Port of Tacoma or any other ports should NOT even be considered.

I am against it.

Sincerely,

Mabel Nesbit

RESPONSE TO COMMENT
COMMENTOR NO. 1078: FORM LETTER F

Response to Comment No. 1078-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1078-2

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 1078: FORM LETTER F (CONT'D.)

Individuals submitting this form letter:

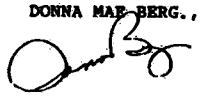
Gibbs, Thomas	Reenan, Larry
Milkulski, Yvonne	Reenan, Andy
Peseka, Mabile	Reenan, Valorie
Rankin, Dioginea	Reenan, Virginia A.

RESPONSE TO COMMENT
COMMENTOR NO. 1078: FORM LETTER F (CONT'D.)

COMMENTOR NO. 1084: BERG, DONNA MAE

~~Dear~~ Mr HEAD,
We the people of TACOMA are asking you to say no to
SPENT NUCLEAR FUEL. Our city as well as yours live in fear 24 hours a da
Every city and town holds within their midst a chill.
HUNGER/.. HOMELESSNESS/..GANGS/.. GUNS/.. RAPE/ AND MURDERS.
Not to mention TAXES THAT ARE OUT OF CONTROL.
Your voice can and should be a positive for our countrys future.
NO WAY...NO WANT...NO HOW...NO WASTE....

ONE VOICE.
DONNA MAE BERG.,,



1084-1

RESPONSE TO COMMENT
COMMENTOR NO. 1084: BERG, DONNA MAE

Response to Comment No. 1084-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1085: SCHERER, ELLEN

June 23, 1995

Mr. Charles Head
Department of Energy
1000 Independence Avenue
Washington, D.C. 20585

Dear Mr. Head;

After recently watching the hearings on the Nuclear Waste issue in Washington State, I have become very alarmed. I am the mother of 3 small children. We are in the process of buying a home in the Federal Way area which is a short distance from the Port of Tacoma.

And the federal government wants to bring nuclear waste from Japan to the area for storage. Why? I'm sure you are aware that this is a highly populated area. The nuclear industry has a far from good safety record. Any sort of accident or mishap would start a chain reaction of catastrophic events. Nuclear is an unstoppable force and it would be unwise to expose innocent people to a potential volative situation. 1085-1

Please don't let this happen. Other options should be taken.

Thank you for listening.

Please respond when a decision has been reached.

Ellen Scherer
1900 S.W. Campus Dr.
Bldg. 42 - Apt. 101
Federal Way, Washington 98023

206-661-1842

RESPONSE TO COMMENT
COMMENTOR NO. 1085: SCHERER, ELLEN

Response to Comment No. 1085-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternatives 1 or 3), there would be no storage of this material in the Port of Tacoma, or any other port. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

COMMENTOR NO. 1086: CHUTE, MARGARET C.

Dear Mr. Charles Head,
I am writing to protest shipping nuclear waste through the U.S. via port in Tacoma. 1086-1

Why make a "nuclear garbage dump" of the United States. A probable accident would ruin this area. 1086-2

Also we have no commercial reprocessing facilities in the U.S. Scotland, France and Japan. These countries have the wherewithal to do with and would use the nuclear waste. 1086-3

Sincerely,
Margaret C. Chute
2501 So 35th St #10
Tacoma, Wa. 98405

RESPONSE TO COMMENT
COMMENTOR NO. 1086: CHUTE, MARGARET C.

Response to Comment No. 1086-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma, is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1086-2

Prior to 1989, it was a policy of the United States to accept foreign research reactor spent nuclear fuel for disposition in the United States (Section 1.1 of the EIS). Many foreign research reactor operators have no immediate means of disposing of their spent nuclear fuel (Section 1.2 of the EIS). The intent of the proposed policy is to remove as much U.S.-origin HEU as possible from civil programs worldwide and give foreign research reactor operators time to convert their reactors to the use of LEU fuels and to make arrangements for disposition of their LEU spent nuclear fuel (Section 1.2 of the EIS). As discussed in Section 4 of the EIS, each of the management alternatives could be implemented without significant effects on human health or the environment.

Response to Comment No. 1086-3

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS. As discussed in Section 2.6.5.2, the United States has chemical separation facilities at two of the potential management sites.

In the near future, the chemical separation facilities at the Savannah River Site might resume operations for the foreign research reactor spent nuclear fuel or for another purpose. These options are discussed in Section 2.2.2.6 of the EIS.

DOE announced a Record of Decision on May 30, 1995 for the Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory (INEL) Environmental Restoration and Waste Management Programs EIS. Chemical separation at the Idaho National Engineering Laboratory was not included in this Record of Decision, so additional site-specific NEPA documentation would be required to restart the chemical separation facilities at this site.

COMMENTOR NO. 1091: CHAPEL, MARGARET C.

April 4, '95

Dear Mr. Head,

Please limit* put your topic garbage in Concord Naval Weapons Station, or anywhere in the San Francisco Bay area. 1091-1

Thankyou,
Margaret C. Chapel

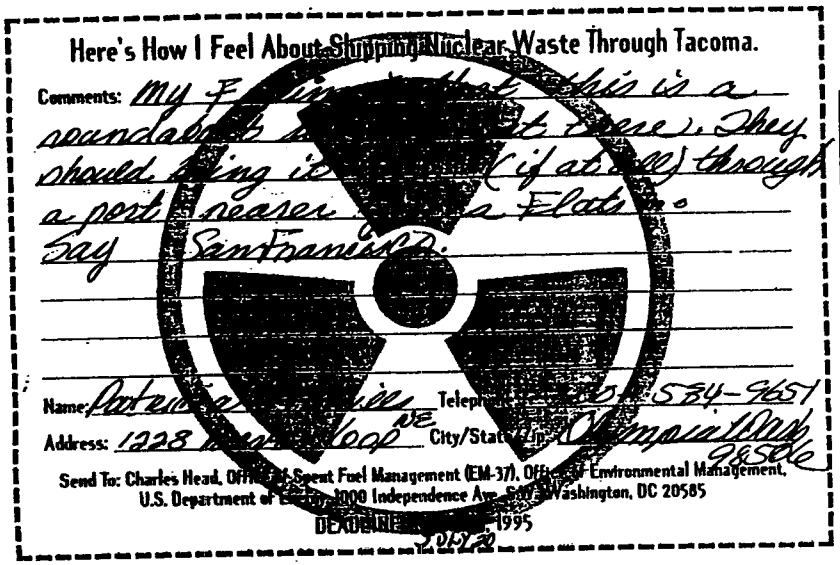
RESPONSE TO COMMENT
COMMENTOR NO. 1091: CHAPEL, MARGARET C.

Response to Comment No. 1091-1

The commentor's opposition to the use of Concord NWS for the shipment of foreign research reactor spent nuclear fuel is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1092: MILLS, PATRICIA J.

AMAZINGLY, YOU CAN STOP NUCLEAR WASTE FROM COMING HERE WITH JUST ONE HAND.



Here's How I Feel About Shipping Nuclear Waste Through Tacoma.

Comments: My F[illegible] that this is a scandal[illegible] to here. They should bring it [illegible] (if at all) through a port nearer [illegible] Flats. Say Santa Barbara.

Name: Patricia [illegible] Telephone: 206-534-9651

Address: 1228 [illegible] Loop NE City/State/Zip: Olympia WA 98506

Send To: Charles Head, Office of Spent Fuel Management (EM-37), Office of Environmental Management, U.S. Department of Energy, 1000 Independence Ave., S.W., Washington, DC 20585

DEADLINE: June 30, 1995

The strongest weapon against nuclear waste is right at your fingertips.
Here's your chance to let the Department of Energy know how you feel about their possible plan to ship 19.2 tons of weapons-grade nuclear waste through the Port of Tacoma over the next 13 years. So, pick up a pen, fill out this form and send it to the address above by June 30, 1995. And let them know that Tacoma is not a place for nuclear waste.
For more information call the Port of Tacoma Hot Line at 597-7575.

Co-sponsored by Port of Tacoma; Port of Seattle; Longshore Local #23; Puyallup Tribe; Citizens for a Healthy Bay; Cities of Tacoma, Fife, Milton, Renton, Federal Way; Tacoma–Pierce County Visitor & Convention Bureau; Tacoma–Pierce County Chamber of Commerce; Pierce County Central Labor Council and Pierce County.

1092-1

RESPONSE TO COMMENT
COMMENTOR NO. 1092: MILLS, PATRICIA J.

Response to Comment No. 1092-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

June 1995

Dear Secretary of Energy Hazel O'Leary,

I live in Contra Costa county where the Concord Naval Weapons Station and port are. I am opposed to the plan to bring spent fuel and high level nuclear waste through the Bay Area, with its large population. We are also politically aware here, and environmentally sensitive. We have earthquakes and flooding, and plenty of traffic accidents. We are not fooled to transport this very hazardous material so far when there are closer alternatives. 1093-1

Furthermore, I think that the countries that use nuclear power should get used to disposing of its waste nearby, or give it up. We cannot keep taking all the waste and the U.S. should not be distributing this stuff in the first place. We should not be making it or using it ourselves until we know how to safely dispose of it. We are far from that point! Nuclear power is not necessary, and nuclear weapons are an abomination. Not only the waste but the weapons can fall into the wrong hands at any time, and be abused. The U.S. has abused them and the have the other nations that have them. Nuclear power plants and weapons have already done a great deal of harm. We should not be encouraging and making it easier for the rest of the world to go nuclear, but shutting down the present production and use of radioactive materials. We don't know what to do with the contamination we have already. Each nuclear step is fraught with danger and controversy, as you know. If only President Clinton had the guts to do what he ordered! Trying to play it safe, he probably won't be re-elected, but if he found his own backbone for real he could become one he might be. Which reminds me of a joke I received in connection with the book from the Fellowship of Reconciliation - How To Keep Laughing Even Though You're Scared to Death by Richard Beard. 1093-2

1093-3

1093-4

RESPONSE TO COMMENT
COMMENTOR NO. 1093: REIMER, NANCY

Response to Comment No. 1093-1

The commentor's opposition to the use of Concord NWS to receive foreign research reactor spent nuclear fuel is noted. The port selection criteria discussed in Appendix D, Section D.1.9 of the EIS identify those ports that can safely handle foreign research reactor spent nuclear fuel. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Concord NWS, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The EIS indicates that the risks associated with an accident are low (Section 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Section 4.2.2.2).

All population within a 50-mile radius of the Concord NWS was considered when analyzing the impact of both incident-free transport and the range of hypothetical port accidents. The risks were found to be low. (Appendix D, Section D.5 provides details on accident analysis).

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the transportation cask.

Response to Comment No. 1093-2

The commentor's opposition to acceptance of foreign research reactor spent nuclear fuel is noted. Other alternatives under consideration are discussed in Sections 2.3 and 2.5 of the EIS.

The United States encourages the use of LEU fuel in research reactors because it cannot be used to manufacture nuclear weapons. As discussed in Sections 2.2.1.9 and 2.6.5, foreign research reactor spent nuclear fuel could be safely stored at any of the five candidate management sites until final disposition. Final disposition is a high priority consideration and is discussed qualitatively in Section 4.2.7 of the EIS.

As shown in Tables 2-1 and 2-2 of the EIS, Iraq is not a candidate for participation in the proposed action. Thus, spent nuclear fuel from Iraq would not be managed under the proposed policy.

COMMENTOR NO. 1093: REIMER, NANCY (CONT'D.)

2/ Most of the spent fuel from other countries that the U.S. would be bringing back could be disposed of just as safely, or more so, in those countries, such as Canada and Europe. As for the unstable parts of the world, what are we giving them nuclear materials for? We see what has happened in Iraq, and to Iraq, which the U.S. flooded with weapons in the 1980's. The greatest abuses have been committed there, including by Bush in the Gulf War, which he could have easily prevented by sending clear signals to Saddam Hussein. One feels that he wanted that war, although in the end it didn't help him, and the terrible consequences continue. Saddam Hussein eats well, however, and now is allied with the Russians for Star Wars technology! From bad to worse with power politics and nuclear energy.

Back at home, too much of the radioactive materials are starting or ending up on Indian land. So is other hazardous waste. The health of Native Americans has suffered. Nuclear weapons have been exploded on Shoshone land in the 1990's. The people of Big Mountain have been driven off their land and are still fighting relocation because Peabody Coal, Arizona Pacific and others, including some tribal leaders, want to exploit the area. Our local utility (Pacific Gas and Electric) is hoping to send nuclear wastes to the Apache Nation reservation and to Ward Valley, west of Needles, Calif. and 15 miles from the Colorado River. No wonder

1093-5

1093-2 (Cont'd.)

1093-6

RESPONSE TO COMMENT
COMMENTOR NO. 1093: REIMER, NANCY (CONT'D.)

Response to Comment No. 1093-3

Foreign research reactors are not used for generation of commercial power or the development of nuclear weapons. Section 1.1 of the EIS describes the research, medical, agricultural, and industrial applications of research reactors. Because it is unrealistic to expect foreign nations to forego the benefits of nuclear technology, the United States supports the use of LEU fuel in civilian applications and discourages actions which might lead to the spread of nuclear weaponry (See Sections 1.1 and 1.2 of the EIS). In addition, the U.S. accrues significant benefits from the operation of foreign research reactors - including Moly-99 and other medical isotopes.

Response to Comment No. 1093-4

See response to comment number 1093-2 above.

Response to Comment No. 1093-5

The commentor's preference for the overseas management alternative is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS.

Response to Comment No. 1093-6

If Management Alternative 1 is adopted, no foreign research reactor spent nuclear fuel would be managed on Indian lands. Sections 2.6.5 and 3.3 of the EIS describe candidate management sites for spent nuclear fuel from foreign research reactors. Section 3 and Appendix A provide characterizations of the racial and ethnic composition of populations residing in potentially affected areas.

3/

people are nervous! The Oklahoma City disaster made us all more aware of the problem of home-grown terrorism, too. The downsizing and moving away of companies is causing unemployment and the attendant economic and psychological problems, which can lead to such crazy acts. The government should lead the way in finding sensible solutions. The obvious one in the case of nuclear power is to phase it out, but the present policy seems to be to perpetuate it, and kind of mask the central purpose, which is military, with so-called benign uses: nuclear energy makes sense in medicine, agriculture, industry, etc., only if the overall price is not higher than the benefits, but it is.

1093-2 (Cont'd.)

Please do not visit this menace on the S.F. Bay area any more than it already is. It is armed with the Livermore lab, the Concord Naval Weapons Station, and other nuclear hazards already. One building at Lawrence Livermore National Laboratory stores 8.80 pounds of plutonium according to a May 14, 1995 newspaper article about earth quake preparation.

1093-7

I appreciate your coverage in helping raise awareness about our nuclear past & menace. As long as it is hidden, there is little chance of preventing future disasters. We have a world to save, and informed people know that it is in great danger. A half a century ago, a few years after my birth, the U.S. bombed Japan. That was a terrible mistake. Now I have Japanese in-laws - and a nephew who did not survive racism and chemicals.

Sincerely, Nancy Reimer

Response to Comment No. 1093-7

The commentor's opposition to bringing foreign research reactor spent nuclear fuel into the San Francisco Bay Area and, more specifically, into Concord NWS is noted. As indicated by the analysis in Section 4 of the EIS, the risk associated with implementation of the proposed action to human health and the environment would be low. Environmental effects of normal operations and accidents were included in the environmental action.

Response to Comment No. 1093-7

The commentor's opposition to bringing foreign research reactor spent nuclear fuel into the San Francisco Bay Area and, more specifically, into the Concord NWS is noted. As discussed in Section 4 of the EIS, the risks associated with implementation of the proposed action to human health or the environment would be low. Environmental effects of normal operations and accidents were included in the environmental evaluation.

COMMENTOR NO. 1093: REIMER, NANCY (CONT'D.)

P. S. Since writing this I was very sorry to read that the U.S. government is planning to resume nuclear testing. This places the whole world in jeopardy as it undermines the difficult and necessary process of stopping the arms race, and undoes the progress already made through much hard work and sacrifice. Please do what you can to stop it. We appreciate the efforts you are making, but they are not enough. Too much is at stake here.

This is a love letter, if you really read what comes with it - love for the world, and for you and your efforts to save it. We really must put our shoulders to the wheel now, and keep on, and be honest, too.

RESPONSE TO COMMENT
COMMENTOR NO. 1093: REIMER, NANCY (CONT'D.)

COMMENTOR NO. 1095: BENSON, ARDEN R.

720 N.W. Front Ave., D-12
Portland, OR 97209
July 12, 1995

U.S. Department of Energy
Office of Environmental Management (EM-37)
Attention: Mr. Charles Head
1000 Independence Ave. S.W.
Washington, DC, 20585-0001

Dear Mr. Head:

Twenty tons of weapons-grade U-235 waste to be transported from foreign countries to be stored at Hanford? Right next to the Columbia River? Hanford, with its perennial problems of leaking containers, and its incredible and unaccountable losses of plutonium? I guess the Columbia River and the cities along its banks are expendable. 1095-1

With decisions like that coming from our own government, who needs enemies?

Sincerely,

Arden R. Benson
(503) 295-4076

RESPONSE TO COMMENT
COMMENTOR NO. 1095: BENSON, ARDEN R.

Response to Comment No. 1095-1

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

COMMENTOR NO. 1096: BENSON, TERESA

June 26, 1995

Mr. Charles Head, Program Manager
Office of Spent Nuclear Field Management
US Department of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

Dear Mr. Head;

I, oppose bringing nuclear waste from foreign countries to be brought into the United States. 1096-1

Sincerely;

Teresa Benson
[illegible]
Valdosta, Ga. [illegible]

RESPONSE TO COMMENT
COMMENTOR NO. 1096: BENSON, TERESA

Response to Comment No. 1096-1

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States is noted (Management Alternatives 1 or 3, Sections 2.2 and 2.4 of the EIS, respectively). Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

COMMENTOR NO. 1097: SCHROEDER, PAUL C.

July 12, 1995

Paul C. Schroeder
4725 41st St. N.E.
Tacoma, WA 98422

Charles Head
Program Manager
Spent Nuclear Fuel Management

Dear Mr. Head:

I urge you not to ship nuclear waste through the Port of Tacoma.

I can see no economic benefit, yet it is likely that there exists liabilities in one form or another. Specifically increased taxes and devalued property. 1097-1

Being a close neighbor to the Port, I stand to lose significantly should you decide to ship this waste through the Port of Tacoma.

Sincerely,

Paul C. Schroeder

Paul C. Schroeder

RESPONSE TO COMMENT
COMMENTOR NO. 1097: SCHROEDER, PAUL C.

Response to Comment No. 1097-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. The analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 and Appendix D, Section D.5 of the EIS).

Although not a direct economic benefit, the management alternatives described in the EIS would reduce the threat of nuclear proliferation, which has both national and global value.

COMMENTOR NO. 1102: ROCHE, ANITA F.

4848 Kenner Rd
Martinez CA 94553
July 5, 1995

Dear Mr. Head,

The DOE plan to ship nuclear waste through the Concord Naval Weapons Station should be "dumped." To put the shipments through a densely populated area such as the San Francisco Bay could be another Chernobyl.

I don't like pushing the plan onto another area either; but, isn't there somewhere less populated that could be used?

Please reconsider.

Sincerely,
Anita Roche

1102-1

RESPONSE TO COMMENT
COMMENTOR NO. 1102: ROCHE, ANITA F.

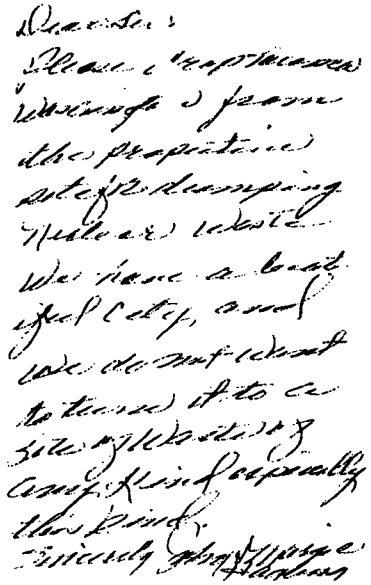
Response to Comment No. 1102-1

The commentor's opposition to the use of Concord NWS for the shipment of foreign research reactor spent nuclear fuel is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

The port selection process that determined that Concord NWS was an acceptable port considered the population of the port and surrounding areas (Appendix D, Section D.1.9.5 of the EIS). Additionally, all population within a 50-mile radius of the Concord NWS was considered when analyzing the potential impact of a range of hypothetical port accidents. The risks were found to be low (Section D.5).

The passage from San Francisco Bay to Concord meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for the port selection (Appendix D, Section D.1.9.2).

COMMENTOR NO. 1104: HAGBERG, JOHN



1104-1

RESPONSE TO COMMENT
COMMENTOR NO. 1104: HAGBERG, JOHN

Response to Comment No. 1104-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1105: TRETTIN, LILLIAN D.

712 Wakendaw Blvd.
Mount Pleasant, SC 29464

May 9 1995

Mr Charles Head
Office of Environmental Management (EM-37)
U.S Department of Energy
1000 Independence Ave S.W
Washington D.C. 20585

Dear Sir

I want to state emphatically for the record that I oppose the shipment of nuclear fuel rods through Wando Welch Terminal a property that borders the town of Mount Pleasant SC. The terminal is located near some of the town s most rapidly expanding suburbs and busiest thoroughfares. The proposed action is clearly inappropriate for a community expanding at Mount Pleasant's current high rate of growth. I am writing, not in response to a paid public notice in one of the local newspapers (which I--like a lot of other people in Mount Pleasant--missed), but in response to the headline of a more prominent news article that appeared the day after the meeting: "Few turn out to protest nuclear fuel rod shipments." As the article notes, attendance at the meeting on May 8 was low compared to attendance at a meeting held a year earlier, at which time residents voiced strong disapproval. It is unfortunate that the May 8 meeting received so little attention, since a well-managed scoping process is one of the keys to a successful (and acceptable) EIS.

1105-1

Please add my name and address to your mailing list. I would like to receive the draft EIS and any other public material related to this process (the DOE implementation plan, if there is one), and I would like to be notified of any other public meetings. Before I moved to Mount Pleasant last year, I worked at Oak Ridge National Laboratory in Oak Ridge TN, where I prepared social and cultural impact sections of large-scale environmental impact statements for the Dept of Energy. I thus have first hand experience with the opportunities and the drawbacks that characterize the scoping process. This first scoping meeting failed because it was inadequately advertised and attended; it could not have possibly addressed the concerns and arguments that residents in this region share. I hope many of them will call the mayor's office, as I did, or read the editorials that are sure to appear, and send you a flood of letters.

Sincerely,

Lillian D. Trettin

Lillian D. Trettin, Ph.D.

cc: Mayor Cheryll Woods-Flowers
Town of Mount Pleasant

RESPONSE TO COMMENT
COMMENTOR NO. 1105: TRETTIN, LILLIAN D.

Response to Comment No. 1105-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Wando Welch Terminal is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Port of Charleston, Wando Terminal, or to any of the ports analyzed in the EIS, is low.

The commentor states that the population of Mount Pleasant and surrounding communities is large and growing rapidly, hence it is not an appropriate port to use to bring in the foreign research reactor spent nuclear fuel. However, Section 4.2.2 of the EIS, which evaluates the impacts on ports of Management Alternative 1 to the proposed policy, and which takes into account population, indicates that the risk associated with this activity at any of the assessed ports, including those ports in the Charleston/Mount Pleasant area, is low.

COMMENTOR NO. 1147: PASLEY, BILL

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: _____

Name: Bill Pasley

Address: 1813 29th St

Galveston TX

1147-1

RESPONSE TO COMMENT
COMMENTOR NO. 1147: PASLEY, BILL

Response to Comment No. 1147-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1148: CASTANO, ARTHUR

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: _____

Name: ARTHUR CASTANO

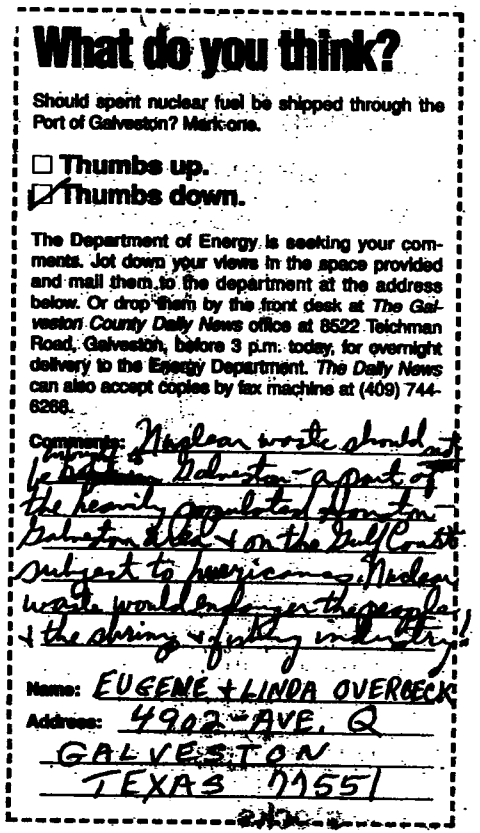
Address: 2725 59TH

1148-1

RESPONSE TO COMMENT
COMMENTOR NO. 1148: CASTANO, ARTHUR

Response to Comment No. 1148-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: Nuclear waste should not be shipped through Galveston - a part of the heavily populated Houston-Galveston area + on the Gulf Coast subject to hurricanes. Nuclear waste would endanger the people + the shrimping + fishing industry!

Name: EUGENE + LINDA OVERBECK

Address: 4902 AVE. Q
GALVESTON
TEXAS 77551

1149-1

Response to Comment No. 1149-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk to humans, wildlife, and the environment associated with bringing spent nuclear fuel to the Port of Galveston, or to any other port evaluated, is low.

Although hurricanes or fogs could lead to a minor delay for an individual foreign research reactor spent nuclear fuel shipment, such events would not significantly affect the transport of the spent nuclear fuel, because ships carrying the fuel could be rerouted, or wait for passage of a hurricane. Appendix D, Section D.2.1.2 of the EIS discusses the environmental conditions in the area of the Port of Galveston, including potential for hurricanes.

COMMENTOR NO. 1150: CRAFT, W.E. & GLADYS RAE

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: We have seen no convincing studies as to the impact of an accident on the environment or the people in areas affected.

Name: W.E. + Gladys Rae CRAFT
Address: 5602 - Rosewood Dr.
Galv. TX 77551
PH. 409-744-4435

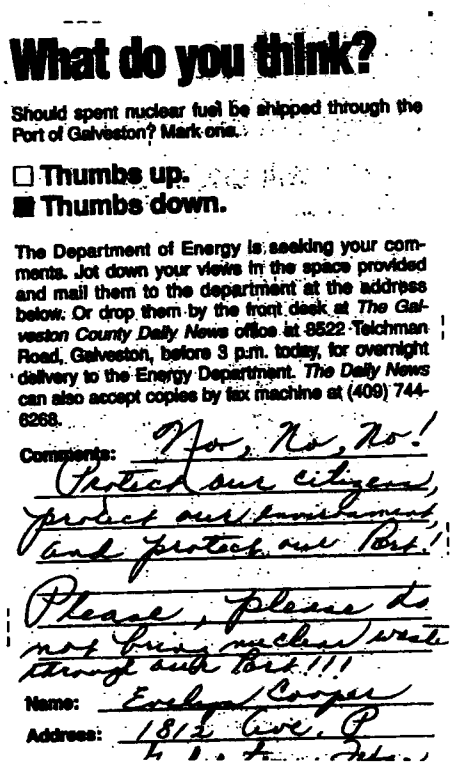
1150-1

RESPONSE TO COMMENT
COMMENTOR NO. 1150: CRAFT, W.E. & GLADYS RAE

Response to Comment No. 1150-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. Section 4.2.2.3 of the EIS demonstrates that the risks associated with an accident in port are very low, and that there would be little adverse impact upon the environment.

COMMENTOR NO. 1151: COOPER, EVELYN



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
■ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: No, No, No! Protect our citizens, protect our environment, and protect our Port! Please, please do not bring nuclear waste through our Port!!!

Name: Evelyn Cooper

Address: 1812 Cove, P. [illegible]

1151-1

RESPONSE TO COMMENT
COMMENTOR NO. 1151: COOPER, EVELYN

Response to Comment No. 1151-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1152: MAGEE, C.O.

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: Nuclear waste is extremely dangerous. One little mistake & the radiation could cause deadly effects. DOE plans continue for nuclear materials to "decompose." DOE could make Galveston a waste-land.

Name: Rev. Dr. C.O. Magee

Address: 9611 Ave R½

City

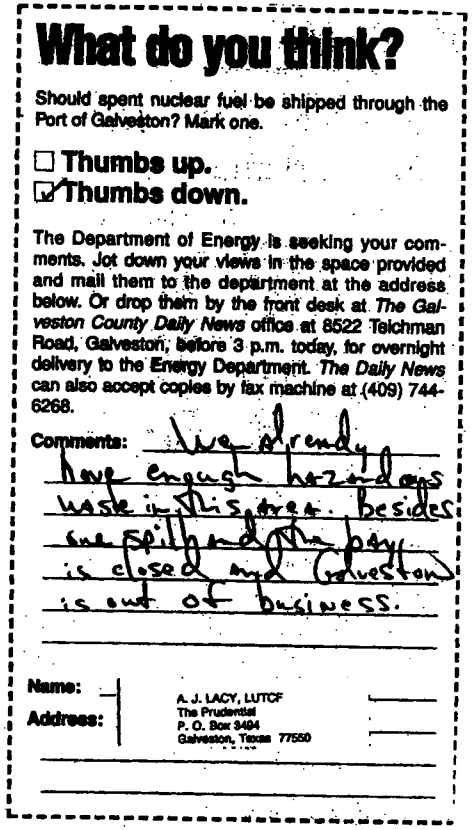
1152-1

RESPONSE TO COMMENT
COMMENTOR NO. 1152: MAGEE, C.O.

Response to Comment No. 1152-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. Section 4.2.2.3 of the EIS demonstrates that the risks associated with an accident in port are very low, and that there would be little adverse impact upon the environment.

COMMENTOR NO. 1153: LACY, A.J.



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: We already have enough hazardous waste in this area. besides one spill and the bay is closed and Galveston is out of business.

Name: A. J. LACY, LUTCF
Address: The Prudential
P. O. Box 3494
Galveston, Texas 77550

1153-1

RESPONSE TO COMMENT
COMMENTOR NO. 1153: LACY, A.J.

Response to Comment No. 1153-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. Section 4.2.2.3 of the EIS demonstrates that the risks associated with an accident in port are very low, and there would be little adverse impact upon the environment.

COMMENTOR NO. 1154: CRAFT, JAMES A.

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: _____

Name: James A. Craft
Address: 2725 Palm Cir W
Galveston Texas
409-744 5119

1154-1

RESPONSE TO COMMENT
COMMENTOR NO. 1154: CRAFT, JAMES A.

Response to Comment No. 1154-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1155: SILLER, ALBERTA

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

[ ] Thumbs up.
[X] Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: I AM definitely AGAINST having SPENT Nuclear fuel shipped Through The GALVESTON port. IT could have devASTATING effects should A hurricane hit While These containers ARE IN PORT OR if there Should be A leakage.

Name: ALBERTA SILLER

Address: 1727- BROADWAY GALVESTON TX 77550-4910

1155-1

RESPONSE TO COMMENT
COMMENTOR NO. 1155: SILLER, ALBERTA

Response to Comment No. 1155-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Galveston, or to any other port evaluated, is low.

Although hurricanes or fogs could lead to a minor delay for an individual foreign research reactor spent nuclear fuel shipment, such events would not significantly affect the transport of the spent nuclear fuel, because ships carrying the fuel could be rerouted, or wait for passage of a hurricane. Appendix D, Section D.2.1.2 of the EIS discusses the environmental conditions in the area of the Port of Galveston, including potential for hurricanes.

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of spent nuclear fuel shipments, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident. Based on this experience, DOE does not expect that transportation casks passing through the Port of Galveston would leak or affect the quality of the air or water.

COMMENTOR NO. 1156: BUSHING, ROBYN

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☐ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: NO NUCLEAR WASTE THRU THE PORT OF GALVESTON

Name: ROBYN BUSHING

Address: 2622 GEROL CT
GALVESTON, TX 77551

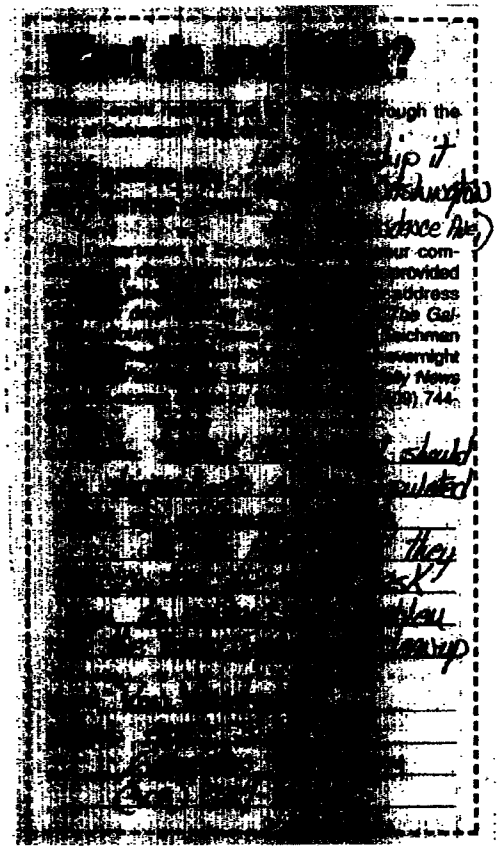
1156-1

RESPONSE TO COMMENT
COMMENTOR NO. 1156: BUSHING, ROBYN

Response to Comment No. 1156-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1157: VANDEGRIFT, RON



1157-1

1157-2

1157-3

RESPONSE TO COMMENT
COMMENTOR NO. 1157: VANDEGRIFT, RON

Response to Comment No. 1157-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

The Washington, D.C. area does not have the facilities or experience required to manage the spent nuclear fuel.

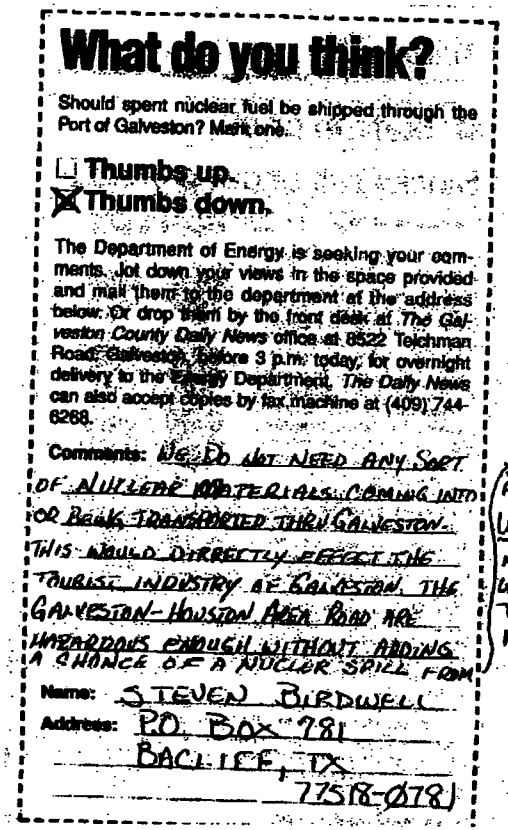
Response to Comment No. 1157-2

The port selection process that determined that Galveston was an acceptable port considered the population of the port and surrounding areas (see Appendix D, Section D.1.9.5 of the EIS). Additionally, all population within a 50-mile radius of the Port of Galveston was considered when analyzing the potential impact of a range of hypothetical port accidents. The risks were found to be low (Appendix D, Section D.5 of the EIS).

Response to Comment No. 1157-3

The commentor's request for an explanation of the cleanup at the Brio Superfund Site is outside the scope of this EIS.

COMMENTOR NO. 1158: BIRDWELL, STEVEN



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: WE DO NOT NEED ANY SORT OF NUCLEAR MATERIALS COMING INTO OR BEING TRANSPORTED THRU GALVESTON. THIS WOULD DIRECTLY EFFECT THE TOURIST INDUSTRY AT GALVESTON, THE GALVESTON-HOUSTON AREA AND ARE HAZARDOUS ENOUGH WITHOUT ADDING A CHANCE OF A NUCLEAR SPILL FROM A TRAFFIC ACCEDENT. WE DO NOT NEED NUCLEAR WASTE COMING THROUGH THIS AREA.

Name: STEVEN BIRDWELL

Address: P.O. BOX 781
BACLIFF, TX
77518-0781

1158-1

1158-2

1158-3

RESPONSE TO COMMENT
COMMENTOR NO. 1158: BIRDWELL, STEVEN

Response to Comment No. 1158-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

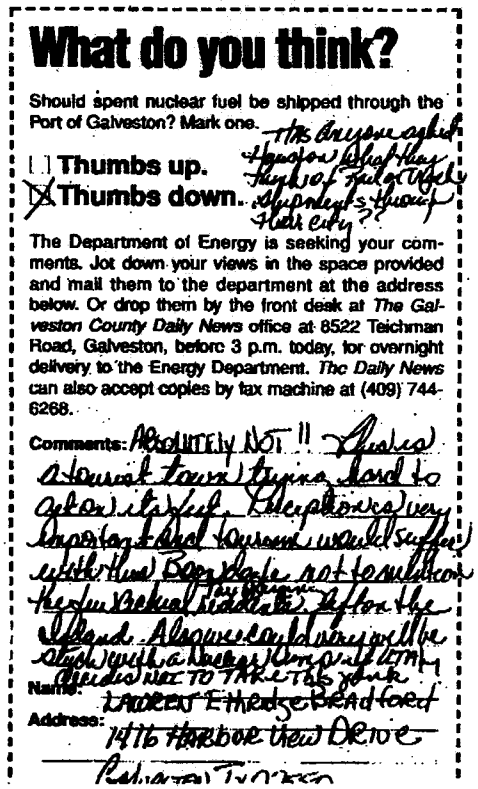
Response to Comment No. 1158-2

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse economic and cultural impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Under NEPA regulations, the socioeconomic effects evaluated for this EIS do not include those associated with psychological fear of receiving spent nuclear fuel. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Galveston would have no detrimental effect on tourist industry at the port.

Response to Comment No. 1158-3

Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, after more than 30 years of nuclear fuel shipments, no radioactive material has ever been released from a spent nuclear fuel transportation cask as a result of an accident.

COMMENTOR NO. 1159: BRADFORD, LAUREN ETHRIDGE



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

[ ] Thumbs up.

[X] Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments:

Name: LAUREN Ethridge Bradford

Address: 1416 Harbor View Drive

1159-1

1159-2

1159-3

RESPONSE TO COMMENT
COMMENTOR NO. 1159: BRADFORD, LAUREN ETHRIDGE

Response to Comment No. 1159-1

A copy of the draft EIS was sent to the Honorable Bob Lanier, Mayor of the City of Houston.

Response to Comment No. 1159-2

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE agrees that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be higher than the actual risk, or the risk from other even more hazardous activities. However, such adverse impacts have not been observed during the 30 plus years in which foreign research reactor spent nuclear fuel was accepted into the United States in the past. Under NEPA regulations, the socioeconomic effects evaluated for this EIS do not include those associated with the psychological fears of receiving spent nuclear fuel. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Galveston would have no detrimental effect on tourism or the future business development of the port.

Response to Comment No. 1159-3

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternatives 1 or 3), there would be no storage of this material in the Port of Galveston, or any other port. Under normal circumstances, it would remain at the port for a few hours. In the event of a major disruption of ground transportation systems, due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination.

Commentor No. 1160: Hedgepath, Dave & Jeanne

1160-1

*

Response to Comment
Commentor No. 1160: Hedgepath, Dave & Jeanne

Response to Comment No. 1160-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

* This is the best available copy of this comment document.

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: GALVESTON IS AN ISLAND. SHOULD A NUCLEAR ACCIDENT OCCUR-NO MATTER HOW REMOTE THE POSSIBILITY- EVACUATION OF THE POPULATION WOULD BE EXTREMELY DIFFICULT, IF NOT IMPOSSIBLE.

Name: GEM BORDAGES
Address: 610 FERRY ROAD #11
GALVESTON ISLAND, TX 77550
(409) 763-1178

1161-1

1161-2

Response to Comment No. 1161-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Galveston, or to any other port evaluated, is low.

Response to Comment No. 1161-2

Several accident scenarios including a breach of the cask and fire sufficient to oxidize the contents were analyzed during preparation of the EIS. Results of the accident analysis at the ports are given in Section 4.2.2 of the EIS with supporting detail in Appendix D, Section D.5. No catastrophic effects were found to result from severe accidents involving foreign research reactor spent nuclear fuel. In addition, no catastrophic events were identified that would require the evacuation of the island of Galveston. Emergency response and management for the ports identified in the EIS are discussed in Section 2.7.

COMMENTOR NO. 1162: GOODWIN, SONYA

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: _____

Name: Sonya Goodwin

Address: 1110 Noble Rd
Texas City, TX 77591

1162-1

RESPONSE TO COMMENT
COMMENTOR NO. 1162: GOODWIN, SONYA

Response to Comment No. 1162-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1163: PIERCE, S.

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: _____

Name: S. Pierce

Address: 6912-O
Galveston, TX 77551

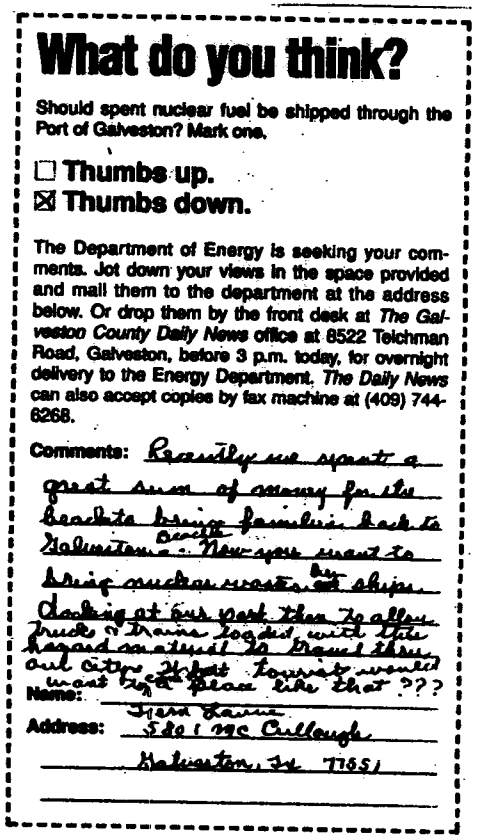
1163-1

RESPONSE TO COMMENT
COMMENTOR NO. 1163: PIERCE, S.

Response to Comment No. 1163-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1164: LARUE, FIERN



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: Recently we spent a great sum of money for the beaches to bring families back to Galveston. Now you want to bring nuclear waste by ship docking at our port then to allow trucks & trains loaded with that hazard material to travel thru our cities. What tourist would want to go to a place like that ???

Name: Fiern Larue

Address: 5801 McCullough
Galveston, Tx 77551

1164-1

RESPONSE TO COMMENT
COMMENTOR NO. 1164: LARUE, FIERN

Response to Comment No. 1164-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Galveston would have no significant adverse impacts on tourism within the port or the surrounding communities.

COMMENTOR NO. 1165: BARRETT, CHARLENE

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: No the potential for serious health problems pollution of the waterways, killing of the sea life; which would eliminate many residents livelihoods out weighs any economic benefits in my opinion. Can't a location in a non populated area/region be found?

Name: Charlene Barrett

Address: 4020 - Ave N
Galveston, Texas 77550

1165-1

1165-2

1165-3

1165-4

RESPONSE TO COMMENT
COMMENTOR NO. 1165: BARRETT, CHARLENE

Response to Comment No. 1165-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

Response to Comment No. 1165-2

Sections 4.2.2 and 4.2.3 of the EIS present a discussion of the health risks and impacts on the Galveston port area from receipt of the foreign research reactor spent nuclear fuel. The analyses in Section 4 of the EIS demonstrate that such risks and impacts would be low, both for port areas as well as for the proposed management sites.

Response to Comment No. 1165-3

On the issue of air and water quality as it pertains to the proposed action for managing foreign research reactor spent nuclear fuel, DOE considers that there would be no significant adverse impacts to any of the ports that might be used to accept the material. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, no radioactive contents have ever been released from a spent nuclear fuel transportation cask, nor has a spent nuclear fuel transportation cask ever been punctured, even as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point and to emphasize the no-impact nature of these shipments on environmental quality, including marine resources.

Response to Comment No. 1165-4

The use of a remote port might slightly reduce the already low consequences of an accident, however there are other considerations that also must be made when making port selection. Appendix D, Section D.1.9 of the EIS presents a complete discussion of the port selection process.

COMMENTOR NO. 1166: ALFINIECE, DONA

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: Hazardous
Create a health risk
to the citizens of Galveston
only for the benefit
of Economic greed.

Name: Dona Alfiniece
Address: 1321 25th st.

1166-1

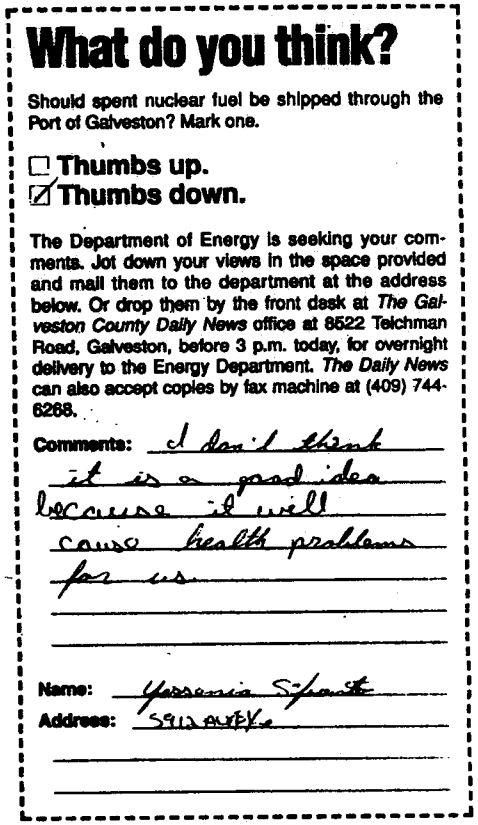
RESPONSE TO COMMENT
COMMENTOR NO. 1166: ALFINIECE, DONA

Response to Comment No. 1166-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risks associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated in the EIS, are low.

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and ultimately eliminate, the use of highly-enriched (weapons-grade) uranium in civil programs worldwide. There are very few, if any, economic benefits that would result from the proposed action.

COMMENTOR NO. 1167: SEFIENTE, YESSENIA



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: I don't think it is a good idea because it will cause health problems for us

Name: Yessenia Sifuente

Address: 5913 AVE K

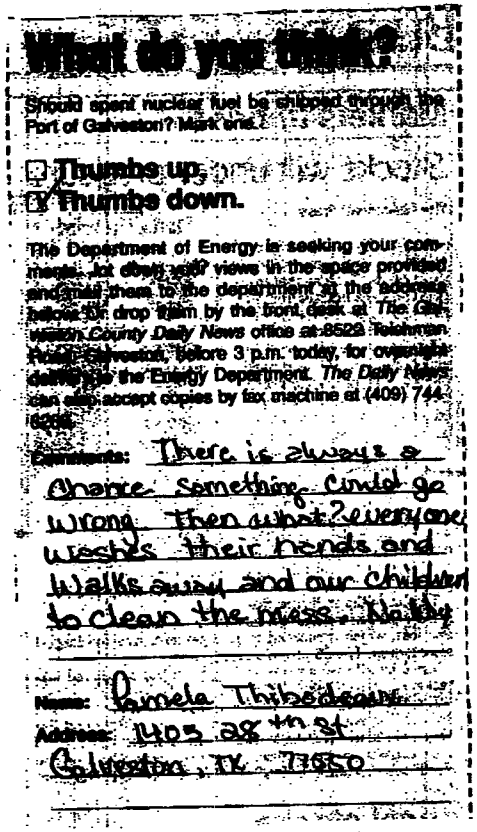
1167-1

RESPONSE TO COMMENT
COMMENTOR NO. 1167: SEFIENTE, YESSENIA

Response to Comment No. 1167-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1168: THIBODEAUX, PAMELA



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for oversight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6209.

Comments: There is always a chance something could go wrong. Then what? Everyone washes their hands and walks away and our children to clean the mess. No Way

Name: Pamela Thibodeaux

Address: 1405 28th St
Galveston, TX 77550

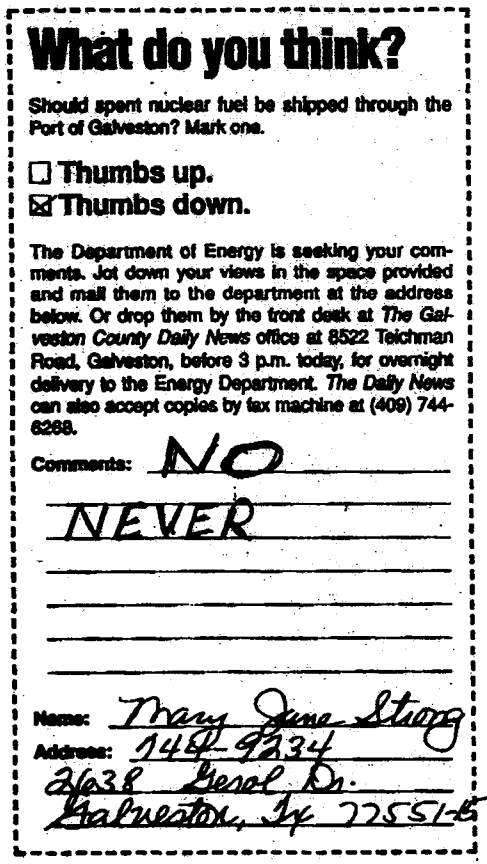
1168-1

RESPONSE TO COMMENT
COMMENTOR NO. 1168: THIBODEAUX, PAMELA

Response to Comment No. 1168-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. Section 4.2.2.3 of the EIS demonstrates that the risks associated with an accident in port are very low, and that there would be little adverse impact upon the environment.

COMMENTOR NO. 1169: STRONG, MARY JANE



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: NO
NEVER

Name: Mary Jane Strong
Address: 14P 9234
2638 Seral Dr.
Galveston, Tx 77551-5530

1169-1

RESPONSE TO COMMENT
COMMENTOR NO. 1169: STRONG, MARY JANE

Response to Comment No. 1169-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1170: HESTER, GAIL

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: There's enough trash in the water now, we don't need any more.

Name: Gail Hester
Address: 1011 Commodore
Galveston, TX 77554

1170-1

RESPONSE TO COMMENT
COMMENTOR NO. 1170: HESTER, GAIL

Response to Comment No. 1170-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1171: HUSKEY, VASHA H.

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: NO, NO, NO! The risk is too great.

Name: Vasha H. Huskey

Address: 2300 Market #600 Galveston, Tx 77550

1171-1

RESPONSE TO COMMENT
COMMENTOR NO. 1171: HUSKEY, VASHA H.

Response to Comment No. 1171-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1172: BURKE, SANDI

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☐ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: Why? I don't understand what [redacted] purpose would be served. Our waters have enough debris and trash + oil spill.
No - Don't do it.

Name: Sande Burke

Address: 3311 Avenue Q #27
Galveston Tx 77551

1172-1

RESPONSE TO COMMENT
COMMENTOR NO. 1172: BURKE, SANDI

Response to Comment No. 1172-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Galveston, or to any other port evaluated, is low, and that there would be minimal impacts to the natural environment of Galveston.

The intent of the proposed action is to support U.S. nuclear weapons nonproliferation policy seeking to reduce, and eventually eliminate, the use of highly-enriched (weapons-grade) uranium in civil programs worldwide (Section 1.2 of the EIS).

COMMENTOR NO. 1173: SULLIVANT, K.

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: I don't want my child's eyes to glow in the dark.

Name: K. Sullivant

Address: 9373 Jamaica Beach Galveston, TX 77554

1173-1

RESPONSE TO COMMENT
COMMENTOR NO. 1173: SULLIVANT, K.

Response to Comment No. 1173-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1174: GULLOTTE, J.M.

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: I don't feel that the U.S. should be disposing or storing spent fuel for any foreign countrys as for our own spent fuel, We should be concerned about safer transportation & storage facilities

Name: J.M. Gullotte

Address: 5212 Oak
Galveston, Tx. 77551

1174-1

1174-2

1174-3

RESPONSE TO COMMENT
COMMENTOR NO. 1174: GULLOTTE, J.M.

Response to Comment No. 1174-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

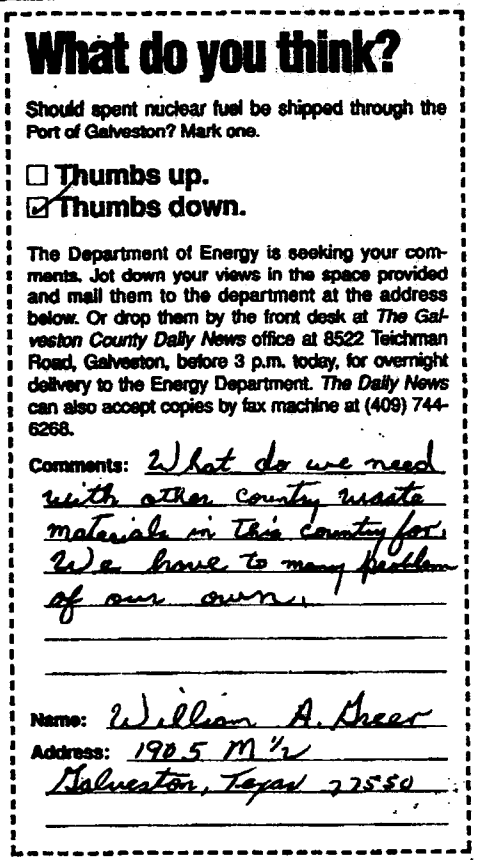
Response to Comment No. 1174-2

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States is noted (Management Alternative 1 or 3, Sections 2.2 and 2.4 of the EIS, respectively). Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

Response to Comment No. 1174-3

Foreign research reactor spent nuclear fuel has been safely transported in the United States for over 40 years (Section 4.2.3 of the EIS). None of the shipments, including shipments involved in accidents, has ever resulted in a release of the radioactive contents of a spent nuclear fuel transportation cask (Section 4.2.3 of the EIS).

COMMENTOR NO. 1175: GREER, WILLIAM A.



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: What do we need with other country waste materials in this country for. We have to many problem of our own.

Name: Willian A. Greer

Address: 1905 M 1/2
Galveston, Texas 77550

1175-1

1175-2

RESPONSE TO COMMENT
COMMENTOR NO. 1175: GREER, WILLIAM A.

Response to Comment No. 1175-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

Response to Comment No. 1175-2

Management of foreign research reactor spent nuclear fuel in the United States is only one of the alternatives evaluated in this EIS (Sections 2.2 through 2.4). The intent of all three management alternatives is to support the nuclear weapons nonproliferation objectives of the United States by seeking reduction, and eventual elimination, of highly enriched (weapons-grade) uranium in civilian commerce. Under Management Alternative 1 (management in the United States), foreign research reactor spent nuclear fuel would be accepted for a limited period of time during which foreign research reactor operators could make arrangements for disposition of their spent nuclear fuel.

COMMENTOR NO. 1176: CAMPBELL, JOHN

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: Radioactive fuel is scary & dangerous

Name: John Campbell

Address: 1210 Harborview Gal. Tx

1176-1

RESPONSE TO COMMENT
COMMENTOR NO. 1176: CAMPBELL, JOHN

Response to Comment No. 1176-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

Commentor No. 1177: Wylie, Betty L.

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: No I don't want Nuclear fuel shipped through our port. Not now or Anytime in the future

Name: Betty L. Wylie

Address: 2418 Ave M
Galveston Tx 77550

1177-1

Response to Comment
Commentor No. 1177: Wylie, Betty L.

Response to Comment No. 1177-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1178: ROARK, DON

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: _____

Name: Don Roark

Address: 510 Valley
Dickinson Tx 77539

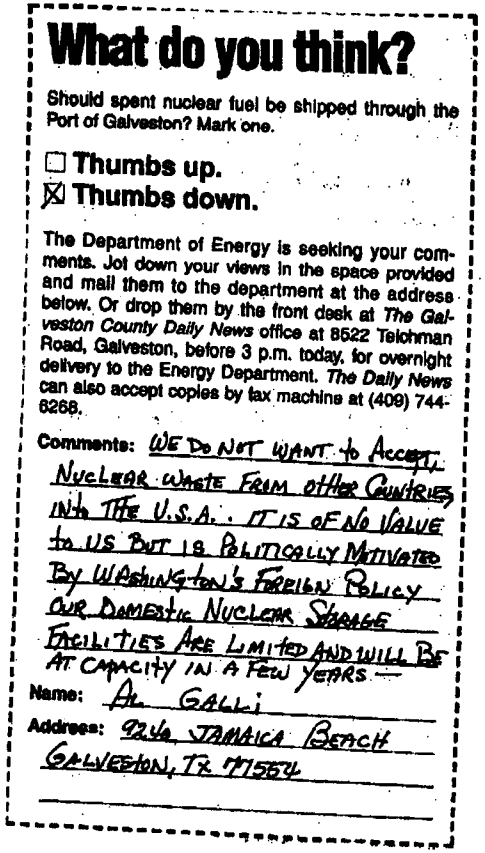
1178-1

RESPONSE TO COMMENT
COMMENTOR NO. 1178: ROARK, DON

Response to Comment No. 1178-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1179: GALLI, AL



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: WE DO NOT WANT to ACCEPT NUCLEAR WASTE FROM other COUNTRIES IN the U.S.A. IT IS OF NO VALUE to US BUT IS POLITICALLY MOTIVATED BY WASHINGTON'S FOREIGN POLICY OUR DOMESTIC NUCLEAR STORAGE FACILITIES ARE LIMITED AND WILL BE AT CAPACITY IN A FEW YEARS —

Name: AL GALLI

Address: 924 JAMAICA BEACH GALVESTON, TX 77554

1179-1

1179-2

RESPONSE TO COMMENT
COMMENTOR NO. 1179: GALLI, AL

Response to Comment No. 1179-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

Response to Comment No. 1179-2

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States is noted (Management Alternative 1 or 3, Sections 2.2 and 2.4 of the EIS, respectively). Sections 2.3, 2.4 and 4.4 of the EIS describe other alternatives under consideration. The purpose and need for the proposed action is described in Section 1.2 of the EIS.

COMMENTOR NO. 1180: LITTON, L.

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: There is too much traffic in the port and channels and a mishap would be disastrous for the bay & gulf and all the industries they support.

1180-1

1180-2

Name: L. Litton

Address: 4221 Bellico
BACLIFF, TX 77518

RESPONSE TO COMMENT
COMMENTOR NO. 1180: LITTON, L.

Response to Comment No. 1180-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

Response to Comment No. 1180-2

The volume or size of the local marine traffic (present or future) was not considered in the calculation of risk associated with the shipment of foreign research reactor spent nuclear fuel. In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow, and even when heavy, is normally a small number of ships per hour. Historically, increasing the volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay (port selection Criterion 2; Appendix D, Section D.1.9.2 of the EIS). Appendix D, Section D.5.3.1.3 of the EIS presents a discussion of the determination of the probability of ship accidents used in the EIS. Section 4.2.2.3 of the EIS demonstrates that the risks associated with an accident in a port are low, and there would be little adverse impact upon the environment.

COMMENTOR NO. 1181: GOEGER, DOUG

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☒ **Thumbs up.**
☐ **Thumbs down.**

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: With the safety precautions that will be in place, I am sure that the route traveled by the spent nuclear fuel will be much safer than portions of Seawall Blvd, or many other Galveston streets, after midnight.

Name: Doug Goeger

Address: 6900 Williams Dr
Galveston, TX 77551

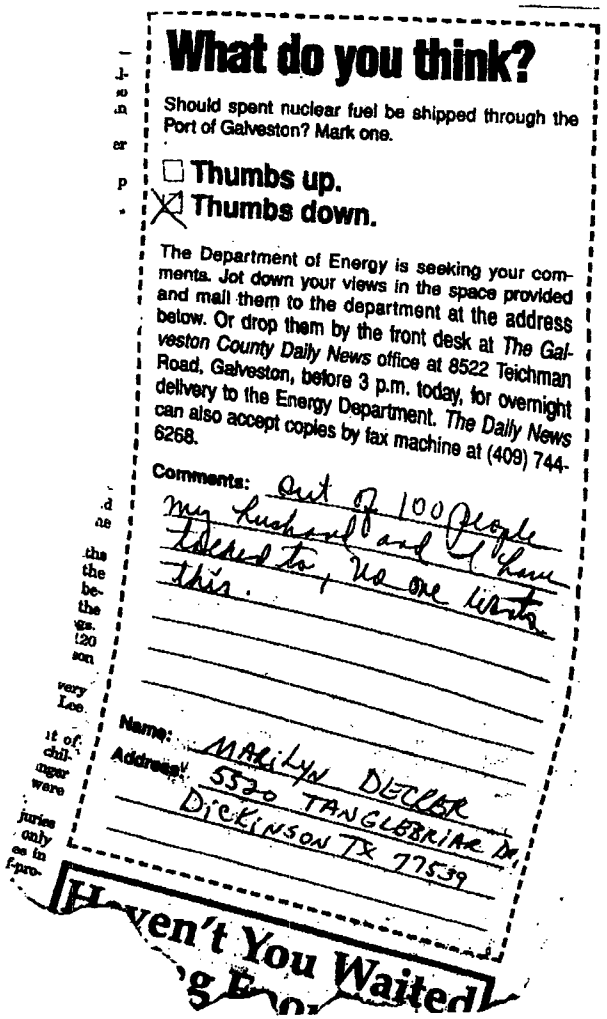
1181-1

RESPONSE TO COMMENT
COMMENTOR NO. 1181: GOEGER, DOUG

Response to Comment No. 1181-1

The commentor's favorable statement on the use of the Port of Galveston as a port of entry for foreign research reactor spent nuclear fuel is noted. The Port of Galveston is one of ten candidate ports of entry which are determined to be acceptable in the case that foreign research reactor spent nuclear fuel is accepted into the United States. If any foreign research reactor spent nuclear fuel were to be accepted into the United States, the selection of the actual port(s) of entry to be used would be made in the Record of Decision, subsequent to completion of this final EIS.

COMMENTOR NO. 1182: DECRER, MARILYN



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: Out of 100 people my husband and I have talked to, no one wants this.

Name: MARILYN DECRER

Address: 5520 TANGLEBRIAR DR. DICKINSON TX 77539

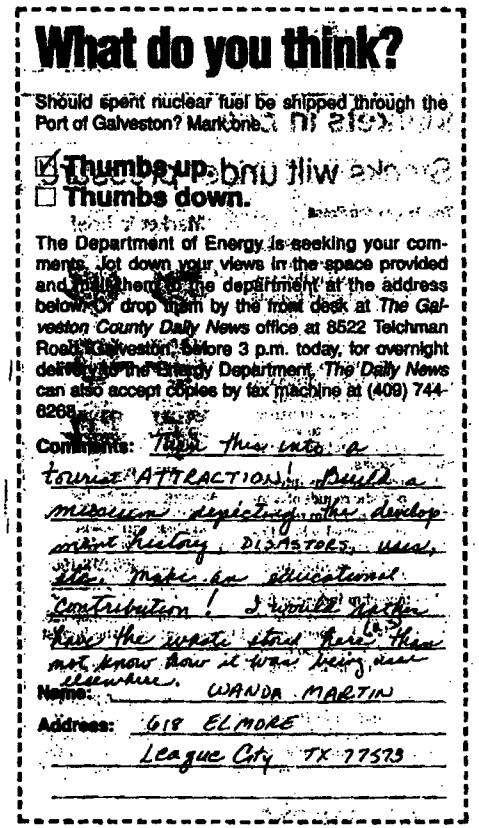
Haven't You Waited

1182-1

RESPONSE TO COMMENT
COMMENTOR NO. 1182: DECRER, MARILYN

Response to Comment No. 1182-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☑ Thumbs up.
☐ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below, or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6209.

Comments: Turn this into a tourist ATTRACTION! Build a museum depicting the develop ment history, DISASTERS, uses, etc. Make an educational contribution! I wish Yucca Mtn. have the waste stored there. Then not know how it was being done elsewhere.

Name: WANDA MARTIN

Address: 618 ELMORE
League City TX 77573

1183-1

1183-2

Response to Comment No. 1183-1

The commentor's favorable statement on the use of the Port of Galveston as a port of entry for foreign research reactor spent nuclear fuel is noted. The Port of Galveston is one of ten candidate ports of entry which are determined to be acceptable in the case that foreign research reactor spent nuclear fuel is accepted into the United States. If any foreign research reactor spent nuclear fuel were to be accepted into the United States, the selection of the actual port(s) of entry to be used would be made in the Record of Decision, subsequent to completion of this final EIS.

Response to Comment No. 1183-2

The commentor's support for accepting and managing foreign research reactor spent nuclear fuel in the United States, is noted. Acceptance of foreign research reactor spent nuclear fuel in the United States is considered under Management Alternatives 1 or 3, described in Sections 2.2 and 2.4 of the EIS, respectively.

COMMENTOR NO. 1184: LAPAUGH, RALPH A.

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☑ Thumbs up.
☐ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: THIS PORT/CITY NEEDS ANY TYPE OF CARGO IT CAN GET. IF THIS CARGO CAN PROVIDE EVEN A FEW DECENT JOBS INSTEAD OF THE WORTHLESS "Mc JOBS" PRESENTLY AVAILABLE, IT WILL BE WORTH ANY RISK INVOLVED. I HOPE THE CITY DOESN'T THROW AWAY ANOTHER CHANCE FOR ITS BLUE COLLER WORKERS!

Name: RALPH A. LAPAUGH

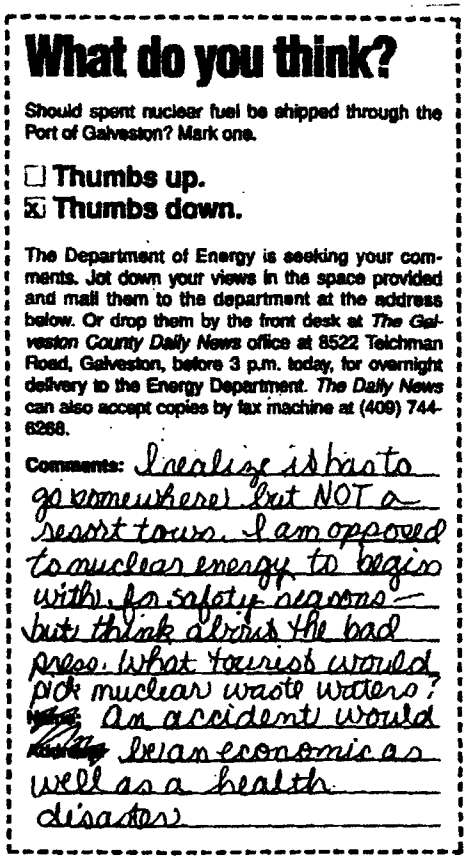
Address: P.O. BOX 2418
GALVESTON, TX. 77553
409-762-9633 / 762-7880

1184-1

RESPONSE TO COMMENT
COMMENTOR NO. 1184: LAPAUGH, RALPH A.

Response to Comment No. 1184-1

The commentor's favorable statement on the use of the Port of Galveston as a port of entry for foreign research reactor spent nuclear fuel is noted. The Port of Galveston is one of ten candidate ports of entry which are determined to be acceptable in the case that foreign research reactor spent nuclear fuel is accepted into the United States. If any foreign research reactor spent nuclear fuel were to be accepted into the United States, the selection of the actual port(s) of entry to be used would be made in the Record of Decision, subsequent to completion of this final EIS.



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6288.

Comments: I realize it has to go somewhere but NOT a resort town. I am opposed to nuclear energy to begin with. For safety reasons — but think about the bad press. What tourist would pick nuclear waste waters? An accident would mean economic as well as a health disaster

1185-1

1185-2

1185-3

Response to Comment No. 1185-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

Response to Comment No. 1185-2

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Based on this past experience, DOE considers that of shipping foreign research reactor spent nuclear fuel through the Port of Galveston would have no detrimental effect on tourism at the port.

Response to Comment No. 1185-3

Sections 4.2.2 and 4.2.3 of the EIS present a discussion of the health risks and impacts on the Galveston port area from receipt of the foreign research reactor spent nuclear fuel. The analyses in Section 4 of the EIS demonstrate that such risks and impacts would be low, both for port areas as well as for the proposed management sites.

COMMENTOR NO. 1186: LEVIN, WILLIAM C.

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-8288.

Comments: Shipping spent nuclear fuel (spent or otherwise) through Galveston is foolhardy & irresponsible. Let's not expose more than 4 million people to the risk & ridiculous fear associated with it.

Name: Dr. Wm. C. Levin

Address: 1301 Harbor View Dr. Galveston TX 77550

1186-1

1186-2

RESPONSE TO COMMENT
COMMENTOR NO. 1186: LEVIN, WILLIAM C.

Response to Comment No. 1186-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

Response to Comment No. 1186-2

Sections 4.2.2 and 4.2.3 of the EIS present a discussion of the health risks and impacts on the Galveston port area from receipt of the foreign research reactor spent nuclear fuel. The analyses in Section 4 of the EIS demonstrate that such risks and impacts would be low, both for port areas as well as for the proposed management sites.

COMMENTOR NO. 1187: LEVIN, EDNA S.

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: This Project would be extremely dangerous to the City of Galveston - and to its citizens -

Name: Edna S. Levin

Address: 1301 Harbor View
Galveston, TX 77550

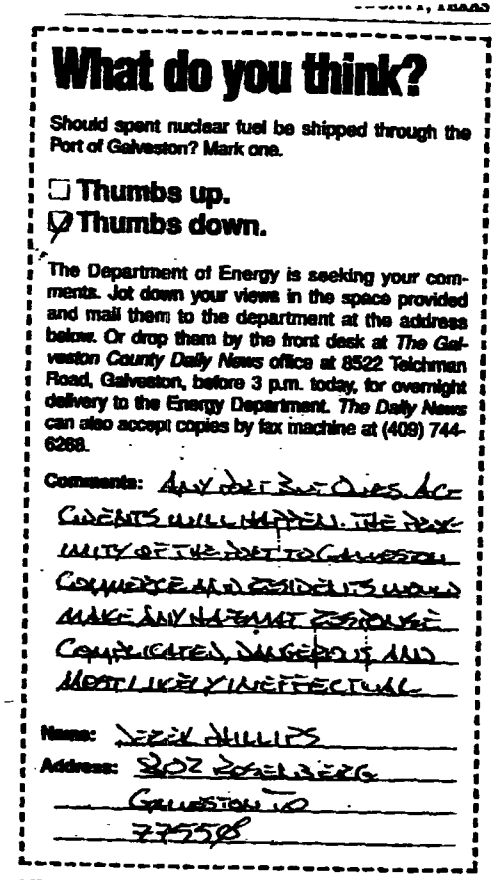
1187-1

RESPONSE TO COMMENT
COMMENTOR NO. 1187: LEVIN, EDNA S.

Response to Comment No. 1187-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1188: PHILLIPS, DEREK



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: ANY ACCIDENT BUT DOES OCCURS WILL HAPPEN. THE PROXIMITY OF THE PORT TO GALVESTON COMMERCE AND RESIDENTS WOULD MAKE ANY HAZMAT RESPONSE COMPLICATED, DANGEROUS AND MOST LIKELY INEFFECTUAL

Name: DEREK PHILLIPS

Address: 307 20th ½ AVE

GALVESTON TX

77550

1188-1

RESPONSE TO COMMENT
COMMENTOR NO. 1188: PHILLIPS, DEREK

Response to Comment No. 1188-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Galveston, or to any other port evaluated, is low. Section 2.7.4 of the EIS provides a discussion of emergency response capabilities.

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: I would not feel that my children & myself would be safe in the event of an accident or hurricane. I do not believe I would remain in Galveston if this was passed. I am a BOI + lived here all my life.

Name: Tammy Schlotter

Address: 4711 Ave P½
Galveston, Texas 77551

1189-1

Response to Comment No. 1189-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Galveston, or to any other port evaluated, is low.

Although hurricanes or fogs could lead to a minor delay for an individual foreign research reactor spent nuclear fuel shipment, such events would not significantly affect the transport of the spent nuclear fuel, because ships carrying the fuel could be rerouted, or wait for passage of a hurricane. Appendix D, Section D.2.1.2 of the EIS discusses the environmental conditions in the area of the Port of Galveston, including potential for hurricanes.

COMMENTOR NO. 1190: BROWN, CARLETON W.

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ **Thumbs up.**
☒ **Thumbs down.**

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: This area is already too unsafe environmentally.

Name: Carleton W. Brown

Address: 901 Ball Street (Avenue H)
Galveston, Texas 77550

1190-1

RESPONSE TO COMMENT
COMMENTOR NO. 1190: BROWN, CARLETON W.

Response to Comment No. 1190-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

GALVESTON COUNTY, TEXAS

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: We don't want or need this. We have said so time every hearing, so far and surely even the DOE can't have misunderstood Galveston's total opposition. No good and only harm can come from this.

Name: FREDRICK J. BRADFORD

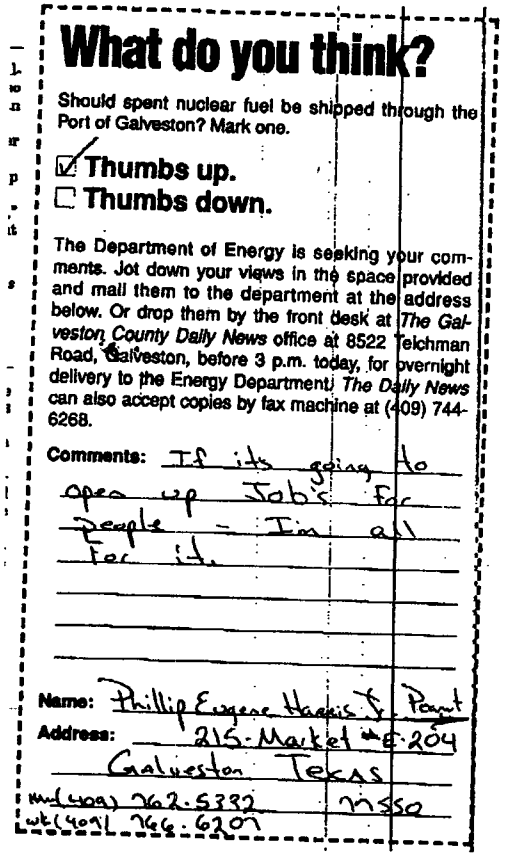
Address: 1416 HARBOR VIEW DR
GALVESTON, TX
77550

1191-1

Response to Comment No. 1191-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1192: HARRIS, PHILLIP EUGENE JR.



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☑ Thumbs up.
☐ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: If its going to open up Jobs for people - Im all for it.

Name: Phillip Eugene Harris Jr. Paint

Address: 215 Market #204
Galveston Texas
hm(409) 762-5332 77550
wk(409) 766-6207

1192-1

1192-2

RESPONSE TO COMMENT
COMMENTOR NO. 1192: HARRIS, PHILLIP EUGENE JR.

Response to Comment No. 1192-1

The commentor's favorable statement on the use of the Port of Galveston as a port of entry for foreign research reactor spent nuclear fuel is noted. The Port of Galveston is one of ten candidate ports of entry which are determined to be acceptable in the case that foreign research reactor spent nuclear fuel is accepted into the United States. If any foreign research reactor spent nuclear fuel were to be accepted into the United States, the selection of the actual port(s) of entry to be used would be made in the Record of Decision, subsequent to completion of this final EIS.

Response to Comment No. 1192-2

The number of shipments of foreign research reactor spent nuclear fuel that would be transported through the Port of Galveston, if foreign research reactor spent nuclear fuel is accepted into the United States, would probably not be sufficient in number to have an effect on job creation at the port of Galveston.

COMMENTOR NO. 1193: NEAL, JACK

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: LET THIS COUNTRY SHOULD NOT BECOME THE NUCLEAR WASTE DUMP FOR THE WORLD. AND THE AMOUNT OF HANDLING REQUIRED TO TRANSFER THE WASTE FUEL IS INVITING DISASTER. AND THE PORT OF GALVESTON IS ILL EQUIPPED TO HANDLE NUCLEAR WASTE. PLEASE DONT DO THIS.

Name: JACK NEAL

Address: P.O. BOX 205
DICKINSON, (GALVESTON COUNTY)
TX 77539

1193-1

1193-2

1193-1 (Cont'd.)

RESPONSE TO COMMENT
COMMENTOR NO. 1193: NEAL, JACK

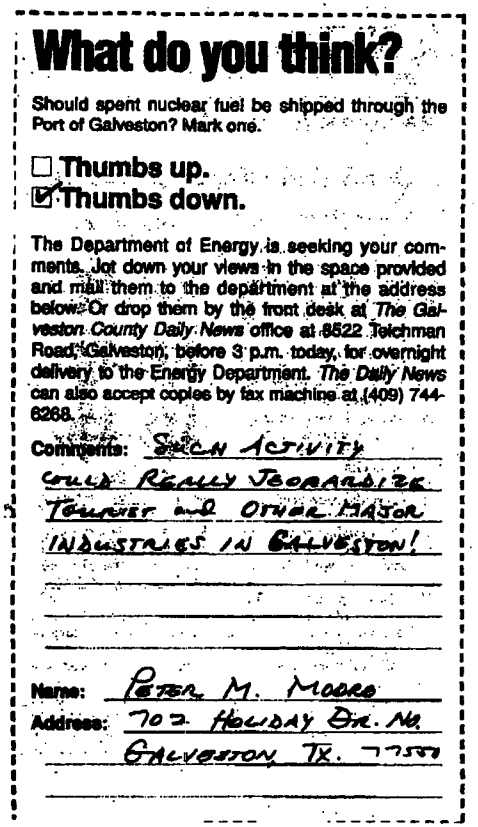
Response to Comment No. 1193-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. DOE considers that the port selection criteria successfully identify ports that can safely handle foreign research reactor spent nuclear fuel. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Galveston, would not pose any significant risk to either the port personnel or the population near the port. Spent nuclear fuel from foreign research reactors is shipped in standard containers, and does not require special handling techniques (Section 2.6.3.2.2 of the EIS).

Response to Comment No. 1193-2

The commentor's opposition to management of spent nuclear fuel from foreign research reactors in the United States is noted (Management Alternatives 1 or 3, Sections 2.2 and 2.4 of the EIS, respectively). Sections 2.3 and 2.5 of the EIS describes other alternatives under consideration.

COMMENTOR NO. 1194: MOORE, PETER M.



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: SPENT ACTIVITY COULD REALLY JEOPARDIZE TOURIST AND OTHER MAJOR INDUSTRIES IN GALVESTON!

Name: PETER M. MOORE

Address: 702 HOLIDAY DR. NO. GALVESTON, TX. 77550

1194-1

1194-2

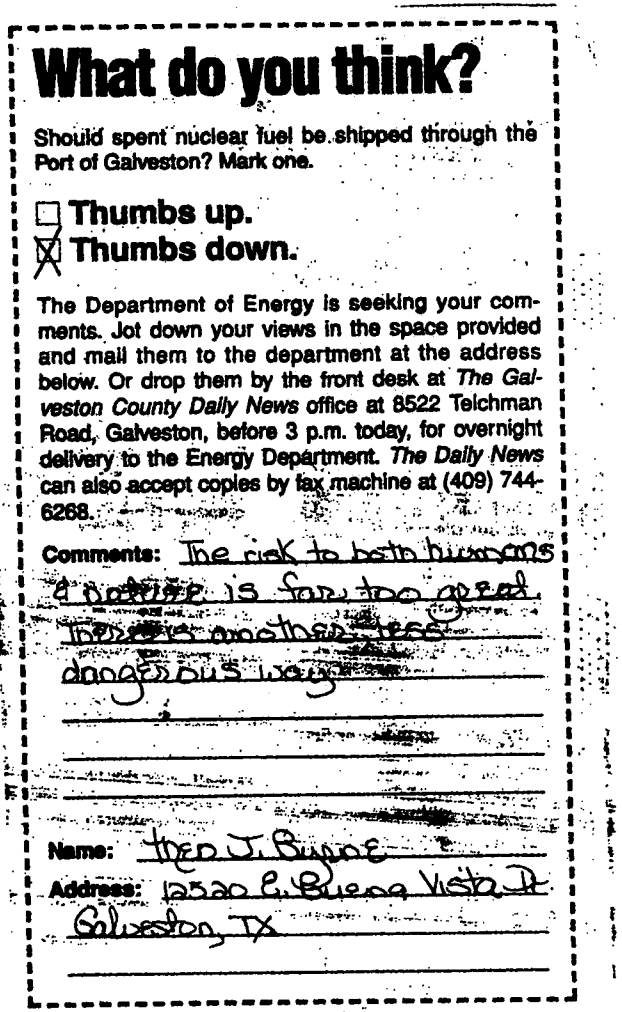
RESPONSE TO COMMENT
COMMENTOR NO. 1194: MOORE, PETER M.

Response to Comment No. 1194-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

Response to Comment No. 1194-2

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Galveston would have no detrimental effect on tourism or other major industries at Galveston.



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: The risk to both humans & nature is far too great. There is another less dangerous way.

Name: Theo J. Byrne

Address: 12520 E. Buena Vista Dr.
Galveston, TX

1195-1

Response to Comment No. 1195-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1196: NORRIS, KIM

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: Please do not put the Galveston Bay system spawning area for many marine vertebrates further at risk. Jobs, commerce, health & safety for thousands are at stake. We did not ask that this fuel be produced, we have not used it ourselves, ask do not wish to risk our families because others were irresponsibly legislating!

Name: Kim Norris

Address: 3102 Cove View Blvd. D201
Galveston, TX 77554

1196-1

1196-2

RESPONSE TO COMMENT
COMMENTOR NO. 1196: NORRIS, KIM

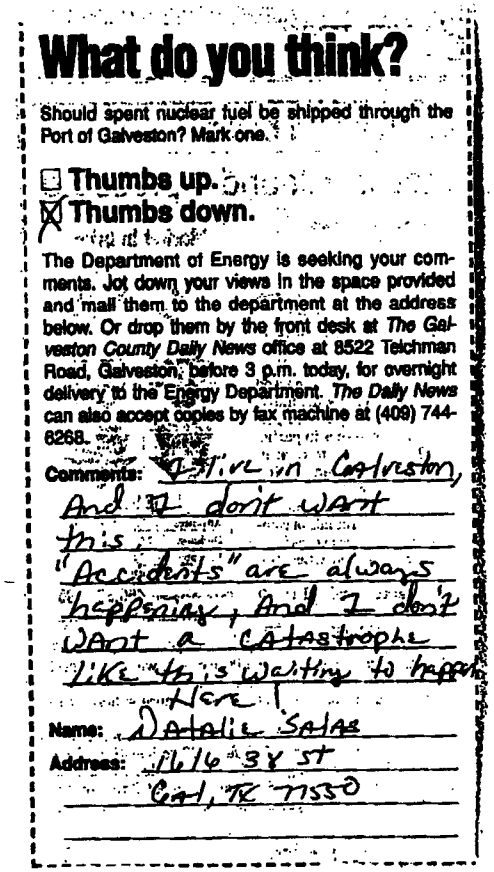
Response to Comment No. 1196-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

Response to Comment No. 1196-2

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk to humans, wildlife, and the environment associated with the shipment of foreign research reactor spent nuclear fuel through any of the ports identified is low.

DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Galveston would have no detrimental effect on jobs or commerce in Galveston.



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: I live in Galveston, And I don't want this, "Accidents" are always happening, And I don't want a catastrophe like this waiting to happen Here!

Name: Natalie Salas

Address: 1616 38 St
Gal, TX 77550

1197-1

Response to Comment No. 1197-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. Section 4.2.2.3 of the EIS demonstrates that the risks associated with an accident in port are very low, and that there would be little adverse impact upon the environment.

COMMENTOR NO. 1198: MUELLER, ROSEMARY

GALVESTON COUNTY, TEXAS

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: "NIMBY"

Name: ROSEMARY MUELLER
Address: 4925 FT CROCKETT BLVD
GALVESTON, TX 77551

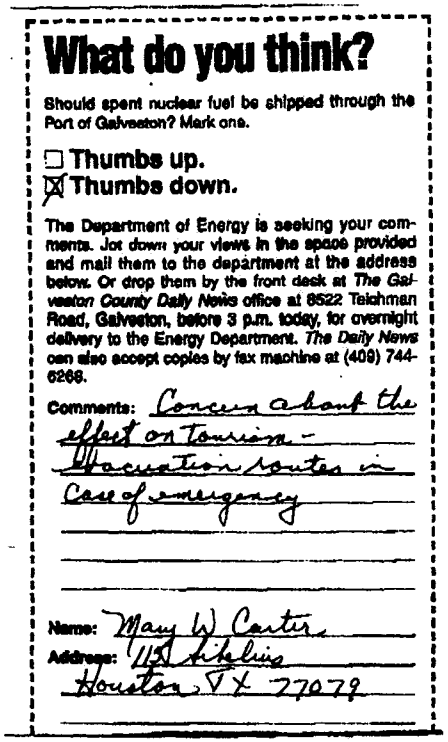
1198-1

RESPONSE TO COMMENT
COMMENTOR NO. 1198: MUELLER, ROSEMARY

Response to Comment No. 1198-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1199: CARTER, MARY W.



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: Concern about the effect on tourism - Evacuation routes in case of emergency

Name: Mary W Carter

Address: 115 Lichelius Houston, TX 77079

1199-1

1199-2

1199-3

RESPONSE TO COMMENT
COMMENTOR NO. 1199: CARTER, MARY W.

Response to Comment No. 1199-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

Response to Comment No. 1199-2

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor fuel was accepted into the United States in the past. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Galveston would have no detrimental effect on tourism at the port.

Response to Comment No. 1199-3

Several accident scenarios including a breach of the cask and fire sufficient to oxidize the contents were analyzed during preparation of the EIS. Results of the accident analysis at the ports are given in Section 4.2.2 of the EIS with supporting detail in Appendix D, Section D.5 . No catastrophic effects were found to result from severe accidents involving foreign research reactor spent nuclear fuel. In addition, no catastrophic events were identified that would require the evacuation of the island of Galveston. Emergency response and management for the ports identified in the EIS are discussed in Section 2.7.

COMMENTOR NO. 1200: HOLMES, TERRY R.

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: We simply do not need to expose all our children to any more potential problems. Don't our children have enough to deal with already.

Name: TERRY R. Holmes

Address: 511 N. 5th
Galveston Texas 77551

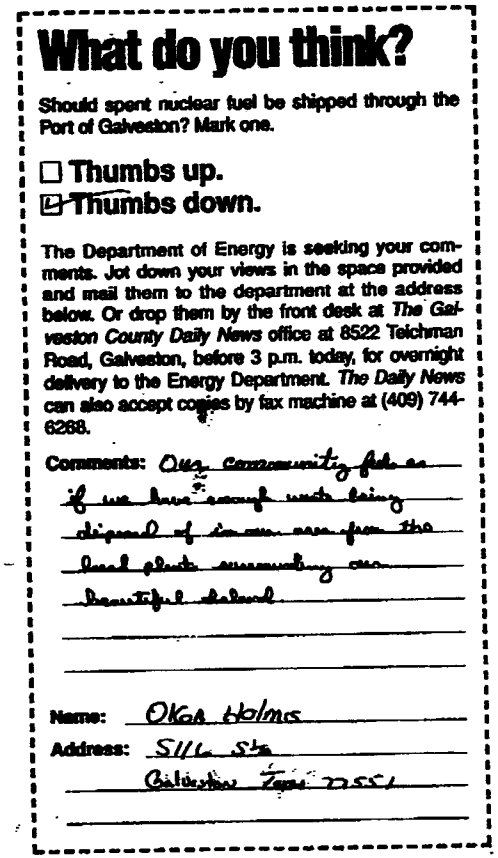
1200-1

RESPONSE TO COMMENT
COMMENTOR NO. 1200: HOLMES, TERRY R.

Response to Comment No. 1200-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, anaylsis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1201: HOLMES, OLGA



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6288.

Comments: Our community fish as if we have enough with being aligned of in one area from the local plants surrounding our beautiful island

Name: Olga Holmes

Address: 5111 Sta
Galveston Texas 77551

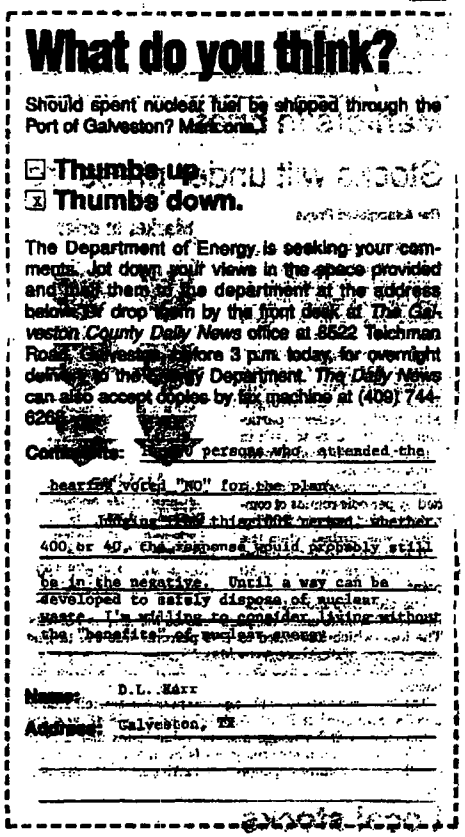
1201-1

RESPONSE TO COMMENT
COMMENTOR NO. 1201: HOLMES, OLGA

Response to Comment No. 1201-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1202: KARR, D.L.



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Make one.

☐ Thumbs up.

☒ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below, or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the agency Department. *The Daily News* can also accept copies by fax machine at (409) 744-6266.

Comments: [illegible] persons who attended the hearing voted "NO" for the plant. [illegible] indicate whether 400, or 40. The answer would probably still be in the negative. Until a way can be developed to safely dispose of nuclear waste. I'm willing to consider living without the benefits of nuclear energy.

Name: D.L. Karr

Address: Galveston, TX

1202-1

1202-2

RESPONSE TO COMMENT
COMMENTOR NO. 1202: KARR, D.L.

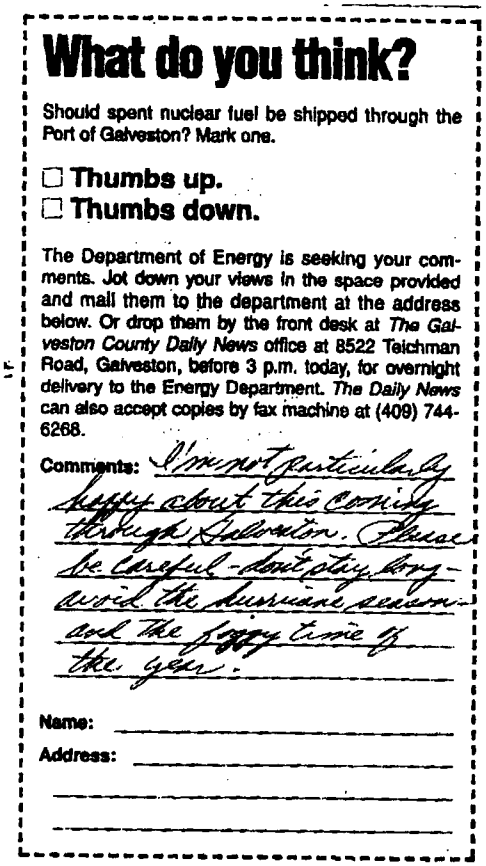
Response to Comment No. 1202-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

Response to Comment No. 1202-2

The commentor's position that applications of nuclear technology should stop until a safe means of disposal is found is noted. As discussed in Section 4.2.4 of the EIS, spent nuclear fuel from foreign research reactors could be safely stored at one or more of the interim management sites pending final disposition.

COMMENTOR NO. 1203: ANONYMOUS



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☐ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: I'm not particularly happy about this coming through Galveston. Please be careful - don't stay long - avoid the hurricane season - and the foggy time of the year.

Name: _____

Address: _____

1203-1

RESPONSE TO COMMENT
COMMENTOR NO. 1203: ANONYMOUS

Response to Comment No. 1203-1

Any ship that would be used to transport foreign research reactor spent nuclear fuel will be equipped with long range communication equipment and remain in contact with weather advisory services. Therefore, the ship would be aware of the existence of a hurricane or other dangerous storm with sufficient advance notice in order to avoid being in the Port of Galveston specifically, or any port or other restricted waterway when such a storm hit. Since docking the ship and unloading of the foreign research reactor spent nuclear fuel would be accomplished quickly, typically well within a day, the foreign research reactor spent nuclear fuel would not be caught in restricted spaces due to an extended port stay. Even if the ship were to experience a collision or sink as the result of a severe storm or other cause, the analysis in the EIS indicates that the risk to people nearby is low. Appendix D, Section D.5 presents details on the calculation of consequences and risk associated with accidents in port and their approaches. Appendix D, Section D.2.1.2 of the EIS discusses the environmental conditions in the area of the Port of Galveston, including fog and potential for hurricanes.

COMMENTOR NO. 1204: LISTER, DICK

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☒ Thumbs up.
☐ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6288.

Comments: Very much in favor. Spent nuclear fuel can be safely transported. This additional activity for the Port is a plus for Galveston and should be welcomed by us all.

Name: Dick Lister

Address: 2416 Ave N
Galv. 77550

1204-1

RESPONSE TO COMMENT
COMMENTOR NO. 1204: LISTER, DICK

Response to Comment No. 1204-1

The commentor's favorable statement on the use of the Port of Galveston as a port of entry for foreign research reactor spent nuclear fuel is noted. The Port of Galveston is one of ten candidate ports of entry which are determined to be acceptable in the case that foreign research reactor spent nuclear fuel is accepted into the United States. If any spent nuclear fuel were to be accepted into the United States, the selection of the actual port(s) of entry to be used would be made in the Record of Decision, subsequent to completion of this final EIS.

COMMENTOR NO. 1205: CANTINI, ARMIN

SENT BY: 7-18-95 ; 1:58PM ; AMERICAN INDEMNITY→ :# 1/

Wednesday, July 19, 1995 01:53

- From:

Name: Armin Cantini
Company: American Indemnity
Phone: (409) 766-4822
Fax: (409) 766-5531

- To:

Name: U.S. Department Of Energy
Company: C/o The Galveston County Daily News
Phone: (409) 744-3611
Fax: (409) 744-6268

otal number of pages, including cover: 1

- Message:

To the U. S. Department of Energy:

I would like to express my adamant opposition to the transport of spent nuclear fuels through the Port of Galveston. The potential perils and downside to this plan are many, while I can see absolutely no advantages to the Port of Galveston or to the citizens of our community. 1205-1

Galveston is a community rich in history and architecture. Coupled with our beaches and recreational activities such as fishing, surfing, and boating, Galveston is a destination for some 6 million visitors annually. I feel this plan imperils our burgeoning visitor industry just at a time when we are beginning to make a resurgence as a visitor destination. 1205-2

Because Galveston is an island, these fuels would have to be further transported along heavily congested local roads before crossing a bridge to the mainland which is our only link to a north/south interstate highway. 1205-3

I would respectfully urge you to consider the alternative plan for disposal of these spent nuclear fuels which is to keep them in the country of origin. According to published reports, there is a tremendous economic advantage to this alternative. 1205-4

The proposed plan for sending these fuels through the Port of Galveston has been strongly opposed by many in our community. It has been officially opposed by The Galveston City Council, The Galveston County Commissioners Court and several civic organizations. The Port of Galveston is in the process of filing a written response which will request your consideration of the alternative plan. Again, I urge you to abandon any efforts to ship these spent nuclear wastes through our home town.

Armin Cantini

RESPONSE TO COMMENT
COMMENTOR NO. 1205: CANTINI, ARMIN

Response to Comment No. 1205-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

Response to Comment No. 1205-2

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Galveston would have no detrimental effect on tourism or future business development at the port.

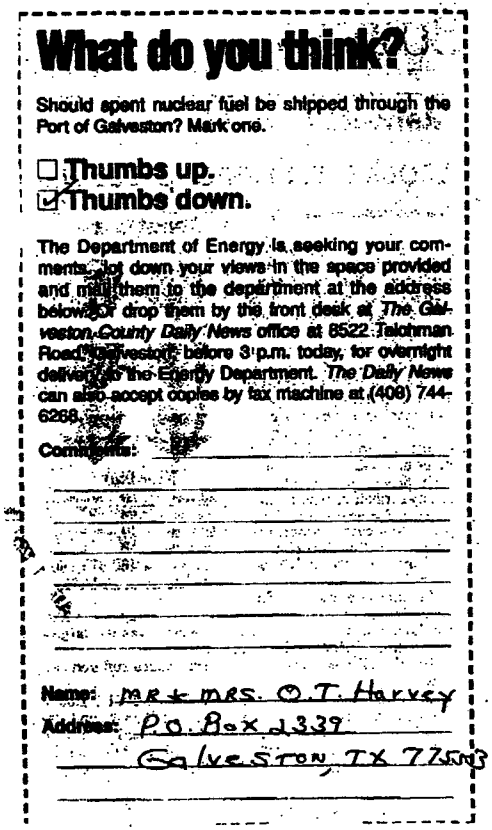
Response to Comment No. 1205-3

The risks of ground transport are discussed in Section 4.2.3 and Appendix E of the EIS. In all cases, the risks are shown to be low.

Response to Comment No. 1205-4

The commentor's preference for the option of each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5 of the EIS, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

COMMENTOR NO. 1206: HARVEY, MR. & MRS. O.T.



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
☑ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments:

Name: MR & MRS. O.T. Harvey

Address: P.O. Box 1339

Galveston, TX 77553

1206-1

RESPONSE TO COMMENT
COMMENTOR NO. 1206: HARVEY, MR. & MRS. O.T.

Response to Comment No. 1206-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel through the Port of Galveston, or any other port evaluated, is low.

COMMENTOR NO. 1215: PECK, ROBERT & DIANE

July 20, 1995

Robert & Diane Peck
3121 Avenue P
Galveston, Texas 77550

Attn: Mr. Charles Head

We are opposed to the transportation of foreign spent nuclear fuel via the Port of Galve
ton. Galveston is an
island with only one Interstate highway connected to the mainland by a bridge. The tran
ortation of this nuclear
waste must also go through a major city , Houston. 1215-1

Galveston, Texas as an entry port would be a bad choice by our government. This move
uld hurt the tourist
industry and wipe out what is left of the port business. 1215-2

Galveston, Texas is a bad choice!

Thank you.

RESPONSE TO COMMENT
COMMENTOR NO. 1215: PECK, ROBERT & DIANE

Response to Comment No. 1215-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Galveston, or to any of the ports analyzed in the EIS, is low.

In port selection, one of the criteria (Criterion 5, Appendix D, Section D.1.9.5 of the EIS) considers population in port and along the route to the management site. Galveston is considered a low-population density port and the population along the route (including Houston) to the management sites is among the lowest of the candidate ports (Appendix D, Section D.1.9.5 of the EIS). DOE acknowledges that there is only one major road to the mainland, however, this is not a reason to eliminate Galveston from consideration, considering the low risk of the proposed action (Section 4.2.2.3 of the EIS).

Response to Comment No. 1215-2

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Galveston would have no detrimental effect on tourism or future business development at the port.

COMMENTOR NO. 1219: LINVILLE, SUSAN J. & OTHEL L.

July 20, 1995

Charles Head
Office of Spent Fuel Management (EM-37)
Office of Environmental Management
US Department of Energy
1000 Independence Ave. SW
Washington, DC 20585

Dear Mr. Head,

We oppose the importation of spent nuclear fuel into the United States — but especially the Pacific Northwest, Hanford + Idaho. Using commercial freighters and public facilities is risking public safety — no matter how many precautions are taken. No one can promise or guarantee that a disaster will never happen and we citizens who were at the mercy of our government from Hanford's 30+ years radiation leaking problems deserve to have peace of mind. We've paid our nuclear dues.

1219-1
1219-2
1219-3
1219-4
1219-2 (Cont'd.)

Sincerely,
Susan J & Othel L. Linville
PO Box 90, Indianola WA 98342

phone
360-297-3954

RESPONSE TO COMMENT
COMMENTOR NO. 1219: LINVILLE, SUSAN J. & OTHEL L.

Response to Comment No. 1219-1

The commentor's opposition to acceptance of foreign research reactor spent nuclear fuel in the United States is noted. Sections 2.3, 2.5, and 4.4 of the EIS describe other alternatives under consideration.

Response to Comment No. 1219-2

As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford Site.

Response to Comment No. 1219-3

According to the Record of Decision for the Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement, discussed above, some foreign research reactor spent nuclear fuel could be managed at the Idaho National Engineering Laboratory. Based on the environmental impact analysis, presented in Section 4.2.4 and Appendix F, Section F.4 of this EIS, the Idaho National Engineering Laboratory would be an acceptable site for foreign research reactor spent nuclear fuel management.

Response to Comment No. 1219-4

Based on the analyses of impacts associated with accidents and incident-free operations involving foreign research reactor spent nuclear fuel, DOE considers that commercial ports, facilities and freighters represent acceptable options for the receipt and transportation of foreign research reactor spent nuclear fuel (Section 4.2.2.3 of the EIS on consequences of port accidents and Section 4.2.2.2 for impacts of incident-free operation).

COMMENTOR NO. 1222: SHAWL, SALLIE E.

Sallie E. Shawl
15507 McCandless Rd KPN
Lakebay, WA 98349
(206) 383-3056 (days)

Memorandum

TO: Charles Head, Program Manager
Office of Spent Nuclear Fuel Mgmt, DOE

FROM: Sallie Shawl
Concerned Citizen

DATE: July 20, 1995

SUBJECT: Nuclear Waste Shipments through Tacoma

I am another person against the shipment of nuclear waste through Tacoma. 1222-1

As a matter of fact, I'm against the waste being shipped anywhere, not because I don't want it in my backyard but because I believe that if people have to deal with the waste, they'll be less likely to want to create the waste in the first place. My hope is that someday in the not-too-distant future we, as a species, will stop the madness of doing anything which creates such waste.

Yes, we have much waste to deal with now. And I hope to God that we can figure out a long-term way to store it. But in the meanwhile, it should be stored where it is, alleviating the dangers involved in transporting it. In terms of the security issues, it would be alot cheaper for us to store it there and have our personnel there to guard it there. Has that ever been considered? 1222-2 1222-3

That's all.

For a nuclear-free world,

Sallie E. Shawl

RESPONSE TO COMMENT
COMMENTOR NO. 1222: SHAWL, SALLIE E.

Response to Comment No. 1222-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

The commentor's preference for the overseas management alternative is also noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

Response to Comment No. 1222-2

The impacts of ultimate disposition of the foreign research reactor spent nuclear fuel are discussed qualitatively in Section 4.2.7 of the EIS. DOE is currently evaluating the feasibility of construction of a disposal site at Yucca Mountain, NV. In the meantime, support for U.S. nuclear weapons nonproliferation policy requires DOE and the Department of State to consider other means of dealing with the foreign research reactor spent nuclear fuel (Section 1.1. of the EIS).

Response to Comment No. 1222-3

The commentor's preference for the alternative of overseas storage is noted. This is Management Alternative 2, Subalternative 1a, which is discussed in Sections 2.3 and 4.4.1 of the EIS. The cost of secure long term storage in multiple nations overseas would be greater than the cost of secure storage in existing U.S. facilities.

COMMENTOR NO. 1224: FORM LETTER H

July 14, 1995

Charles Head, Program Manager
Office of Spent Nuclear Fuel Management (EM-37)
U.S. Department of Energy
1000 Independence Avenue SW
Washington DC 20585

Dear Sir:

Why don't you use your "HEAD", Charles????

If you think for one minute I'm going to jeopardize my life - not to mention the lives of the many unborn in the area - and sit by to let this atrocity to mankind take place.

Tacoma is a beautiful town - geographically and spiritually. The risk of nuclear waste is one with which I cannot live. I consider it an insult to my intelligence to even propose such an outlandish act!

Believe you me, I have contacted many friends and associates who will share similar thoughts with you.

WAKE UP CHARLES!!

Bill Klem

1224-1

RESPONSE TO COMMENT
COMMENTOR NO. 1224: FORM LETTER H

Response to Comment No. 1224-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Commentor No. 1224: Form Letter H (Cont'd.)

Individuals submitting this form letter:

Brown, Lu Lu
Chavey
Cilother, Jaeque L.
Fissell, Ron
Hausema, D.
Holmes, Sharon
Jones, Betty
Klem, Bill
Riely, Terry
Rodreguez, A.
Scott, Sally
Steckle, Connie S.
Waits, Sherrie

Response to Comment
Commentor No. 1224: Form Letter H (Cont'd.)

COMMENTOR NO. 1233: CONWAY, DEBRA A.

Debra A. Conway
1610 Bievu
Galveston, TX 77551
(409)744-4277

July 19, 1995

Charles Head
Office of Spent Fuel Management, EM-37
U. S. Department of Energy
1000 Independence Ave, SW
Washington, DC 20585-0001

Dear Mr. Head,

I am writing to you concerning the idea of shipping spent nuclear fuel through Galveston. I am a life long resident of Galveston and I for one do not want spent nuclear fuel to be passed though where I live. I have read an article on this idea and I have found that the state for it's destination, is fighting this in court and that it will not be except any fuel to be stored. This in turn means that it will be stored on the island until they settle in court. What person would want to come to this island with the knowledge that there is nuclear waste here? This island has been made into a tourist town. The tourist and the beaches are our livelihood. My concerns are as follows:

What will happen if there is a spill (you have seen what happens when we spill oil)?

What will happen if there is a hurricane while the fuel is being stored on the island? You cannot tell me that you will have a safe storage facilities. No one can control or predict what mother nature will do.

I hope that many other locals wil get involed and inform you that this is not what this island wants or need.

1233-1

Sincerly,

Debra A. Conway

RESPONSE TO COMMENT
COMMENTOR NO. 1233: CONWAY, DEBRA A.

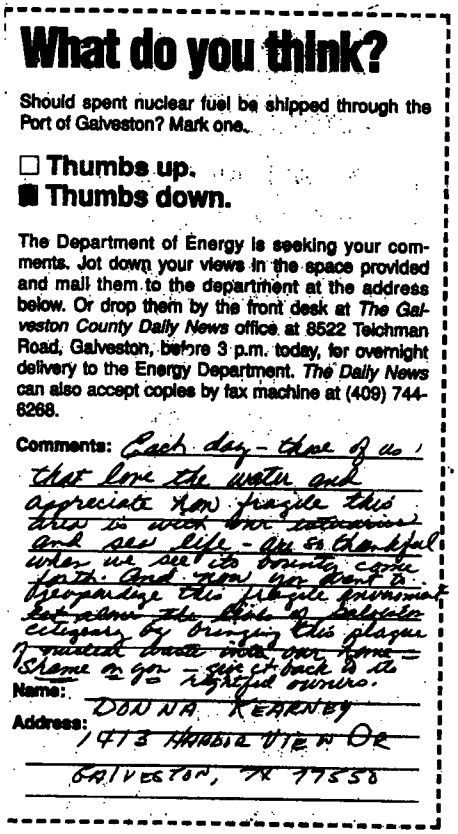
Response to Comment No. 1233-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Galveston would have no detrimental effect on tourism or future business development at the port.

If the foreign research reactor spent nuclear fuel is accepted into the United States, there would be no storage of this material in the Port of Galveston, or any other port. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

Foreign research reactor spent nuclear fuel in a transportation cask cannot "spill" because it is solid metallic fuel and is shipped dry. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. To date, with over 30 years of experience, no radioactive contents have ever been released from a spent nuclear fuel transportation cask as a result of an accident. A paragraph has been added to Section 4.2.2.2 of the EIS to make this point.

Although hurricanes or fogs could lead to a minor delay for an individual foreign research reactor spent nuclear fuel shipment, such events would not significantly affect the transport of the spent nuclear fuel, because ships carrying the fuel could be rerouted, or wait for passage of a hurricane. Appendix D, Section D.2.1.2 of the EIS discusses the environmental conditions in the area of the Port of Galveston, including potential for hurricanes.



What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☐ Thumbs up.
■ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today, for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: Each day - those of us that love the water and appreciate how fragile this [illegible] and see life - are so thankful when we see its bounty come forth. And now we want to jeopardize this fragile ecosystem [illegible] citizens by bringing this plague [illegible] Shame on you - give it back to its rightful owners.

Name: DONNA KEARNEY

Address: 1473 HARBOR VIEW DR
GALVESTON, TX 77550

1239-1

1239-2

Response to Comment No. 1239-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Galveston, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1239-2

The commentor's preference for each country managing its own spent nuclear fuel is noted. This could be either Management Alternative 2 or the No Action Alternative, which are described in Sections 2.3 and 2.5 of the EIS, respectively. The policy considerations and environmental impacts of these two alternatives are discussed in Sections 4.4 and 4.6 of the EIS.

COMMENTOR NO. 1240: BARNETT, GINGER

What do you think?

Should spent nuclear fuel be shipped through the Port of Galveston? Mark one.

☒ Thumbs up.
☐ Thumbs down.

The Department of Energy is seeking your comments. Jot down your views in the space provided and mail them to the department at the address below. Or drop them by the front desk at *The Galveston County Daily News* office at 8522 Teichman Road, Galveston, before 3 p.m. today for overnight delivery to the Energy Department. *The Daily News* can also accept copies by fax machine at (409) 744-6268.

Comments: Nuclear waste must be disposed of when used & must be transported to some place. I would rather see Galveston receive the revenue generated by this shipment than anywhere else.

Name: Ginger Barnett

Address: 2705-61st Box 38
Galveston, Tx 77551

1240-1

RESPONSE TO COMMENT
COMMENTOR NO. 1240: BARNETT, GINGER

Response to Comment No. 1240-1

The commentor's favorable statement on the use of the Port of Galveston as the port of entry for foreign research reactor spent nuclear fuel is noted. The Port of Galveston is one of ten candidate ports of entry which are determined to be acceptable in the case that foreign research reactor spent nuclear fuel is accepted into the United States. If any foreign research reactor spent nuclear fuel were to be accepted into the United States, the selection of the actual port(s) of entry to be used would be made in the Record of Decision, subsequent to completion of this final EIS.

COMMENTOR NO. 1246: BROWN, MR. MICHAEL C., SR.

July 19, 1995

CHARLES HEAD
OFFICE OF SPENT FUEL MANAGEMENT
EM 37
U S DEPARTMENT OF ENERGY
1000 INDEPENDENCE AVE SW
WASHINGTON, DC 20585- 0001

Dear Mr. Head:

I disagree with the use of Galveston Bay being used to transport radioactive waste. I do not care if you go around the island, along side, or in the middle. Thousands of people will get injured, if an accidental occurs. This island is not set up for radioactive accidents. This is not a way of life for people living in Galveston. 1246-1

Once the word gets out, you will not be able to sell any houses in Galveston, or get anybody to come to Galveston Island. NO RADIOACTIVE WASTE !!!!!!! 1246-2

mr. Michael C. Brown Sr.

Mr. Michael C. Brown, Sr.
P. O. Box 2532
Galveston, Texas 77553

RESPONSE TO COMMENT
COMMENTOR NO. 1246: BROWN, MR. MICHAEL C., SR.

Response to Comment No. 1246-1

The commentor's opposition to the use of the Port of Galveston for receipt of foreign research reactor spent nuclear fuel is noted. Based on the port selection process described in Appendix D of the EIS, the Port of Galveston is among the ten candidate ports listed in Section 2.2.1.6 of the EIS which could receive foreign research reactor spent nuclear fuel under Management Alternative 1 or 3. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Galveston, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Section 4.2.2.2).

Response to Comment No. 1246-2

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Galveston would have no detrimental effect on tourism, property values, or future business development at the port.

COMMENTOR NO. 1247: LEE, A.

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Abijo Lee Phone: 676-9372

Title and Organization:

Address: 2608 Trefalgar ct

City: Clyde State Ca Zip 94520

*** COMMENTS ***

The Oil Refinery pollutes our area enough in that people get sick all the time. Please ~~no~~ no more potentially hazardous chemicals or materials in our neighborhood. You must consider average people living in this area before you decide. 1247-1

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

RESPONSE TO COMMENT
COMMENTOR NO. 1247: LEE, A.

Response to Comment No. 1247-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1248: MATSON FAMILY

7/20/95

Dear Mr Head

Re: Spent Nuclear Fuel

My family has lived in Tacoma our entire life. We protest any nuclear products passing through Tacoma Washington, or any other Puget Sound Port. We promise to use every legal remedy available to protect ourselves from this threat. We feel we are being victimized by our own government. 1248-1

Mary Matson
Kirsten Matson
James Matson
Linda Matson
Diane Matson
4206 No 11th
Tacoma WA 98406

RESPONSE TO COMMENT
COMMENTOR NO. 1248: MATSON FAMILY

Response to Comment No. 1248-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma, or to any other Puget Sound port, is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1250: KIMBALL, LINDA

LINDA KIMBALL
13106 Hermitage
Houston, Texas 77079
July 20, 1995

Charles Head
Office of Spent Fuel Mgt.
EW-34 U.S. Dept of Energy
1000 Independence Ave SW
Washington D.C. 20585-0001

Dear Mr. Head:

I write this letter as a concerned citizen of the Gulf Coast area. I do not want to see nuclear waste travel through the Port of Galveston. I own property in both Galveston and Houston. My family has enjoyed the quality of recreation the area affords for many years and we hope to continue to do so.

Hopefully, you realize Galveston is an island. One of the major sources of income for island residents is tourism. There are many weekend visitors as well as property owners from Houston with second homes that frequent the islands beaches, historic sites and fishing facilities.

1250-1

1250-2

RESPONSE TO COMMENT
COMMENTOR NO. 1250: KIMBALL, LINDA

Response to Comment No. 1250-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Galveston, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1250-2

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipment of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Galveston would have no detrimental effect on tourism or future business development at the port.

COMMENTOR NO. 1250: KIMBALL, LINDA (CONT'D.)

To travel from Houston, Bay from Galveston one must go across the Galveston Causeway. This the one access on and off the island should a severe disaster occur if the island needed to be evacuated. I experienced an evacuation years ago because of a hurricane warning. The causeway was "bottle necked" for hours.

I say no to nuclear waste travelling via the Port of Galveston!

Sincerely
Linda Kimball

1250-3

RESPONSE TO COMMENT
COMMENTOR NO. 1250: KIMBALL, LINDA (CONT'D.)

Response to Comment No. 1250-3

As discussed in Sections 4.2.2.3 and 4.5 of the EIS, very low consequences for, or risks to, the population of Galveston would be expected from a severe accident involving spent nuclear fuel from foreign research reactors. Spent nuclear fuel is neither flammable or explosive. No evacuation of the city would be required due to an accident involving foreign research reactor spent nuclear fuel.

COMMENTOR NO. 1252: BROWN, MRS. GRISELDA

July 19, 1995

CHARLES HEAD
OFFICE OF SPENT FUEL MANAGEMENT
EM 37
U S DEPARTMENT OF ENERGY
1000 INDEPENDENCE AVE SW
WASHINGTON, DC 20585- 0001

Dear Mr. Head:

I disagree with the use of Galveston Bay being used to transport radioactive waste. I do not care if you go around the island, along side, or in the middle. Thousands of people will get injured, if an accidental occurs. This island is not set up for radioactive accidents. This is not a way of life for people living in Galveston. 1252-1

Once the word gets out, you will not be able to sell any houses in Galveston, or get anybody to come to Galveston Island. NO RADIOACTIVE WASTE !!!!!! 1252-2

Mrs. Griselda Brown

Mrs. Griselda Brown
P. O. Box 2532
Galveston, Texas 77553

RESPONSE TO COMMENT
COMMENTOR NO. 1252: BROWN, MRS. GRISELDA

Response to Comment No. 1252-1

The commentor's opposition to the use of the Port of Galveston for receipt of foreign research reactor spent nuclear fuel is noted. Based on the port selection process described in Appendix D of the EIS, the Port of Galveston is among the ten candidate ports listed in Section 2.2.1.6 of the EIS which could receive foreign research reactor spent nuclear fuel under Management Alternative 1 or 3. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Galveston, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Section 4.2.2.2).

Response to Comment No. 1252-2

Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor fuel was accepted into the United States in the past. Based on past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Galveston would have no detrimental effect on tourism or future business development at the port.

COMMENTOR NO. 1254: DANIEL, CORNELIUS W., IV

3735 South Fawcett Street
Tacoma, WA 98408
July 18, 1995

Charles Head, Program Manager
Office of Spent Nuclear fuel Management
(EM-37) U.S. Department of Energy
1000 Independence Ave. S.W.
Washington DC 20585

Mr. Head:

I am writing in regards to the issue of shipping spent nuclear waste through the Port of Tacoma. I strongly believe that this should not be done. In the City of Tacoma alone there are over 176,000 people (as per the 1990 census). In Pierce County, excluding Tacoma there are 214,795 households. All these people would be affected if there were to be an accident with the waste that your agency plans on bringing through our port, as well as those residents in South King County. 1254-1

The Port of Tacoma is with a few miles at most of Interstate 5, which is the main highway from Seattle to Portland. Any mishap could shut down I-5 causing disruption of transportation of goods and services throughout the Puget Sound. This area is also prone to occasional earthquakes, which increases the risk of mishap.

I read that Japan and Scotland have facilities that could use this material. I believe if there are other counties that are reliable, they should be given this waste. These two counties would be such places. Insisting that this waste be kept within the United States is an unwise policy in this day. 1254-2

If this spent nuclear waste is shipped through the Port of Tacoma, I will be forced to considered moving from Tacoma and I know of others that feel the same way. This would be

RESPONSE TO COMMENT
COMMENTOR NO. 1254: DANIEL, CORNELIUS W., IV

Response to Comment No. 1254-1

The commentor's opposition to the use of the Port of Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. Based on the port selection process described in Appendix D of the EIS, the Port of Tacoma is among the ten candidate ports listed in Section 2.2.1.6 of the EIS which could receive foreign research reactor spent nuclear fuel under Management Alternatives 1 and 3. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Sections 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel casks are also low (Section 4.2.2.2).

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is very small. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at the Port of Tacoma to fail, is not expected to compromise the spent nuclear fuel transportation cask. Further, the analyses of impacts associated with accidents involving foreign research reactor spent nuclear fuel presented in Section 4.2.2.3 of the EIS demonstrate that the use of any of the selected ports would not pose any significant risk to the port personnel or the population near the ports.

Response to Comment No. 1254-2

The commentor's preference for overseas reprocessing is noted. This is Management Alternative 2, Subalternative 1b, which is discussed in Sections 2.3 and 4.4.2 of the EIS.

COMMENTOR NO. 1254: DANIEL, CORNELIUS W., IV (CONT'D.)

sad to see because Tacoma is beginning a revival. Additional, I have heard absolutely no word that there is any benefit to having this waste shipped through the Port of Tacoma, or for that matter any other city that is being forced upon. I feel that not having any real say or compensation in this matter is the greatest injustice of all.

Sincerely,

Cornelius W. Daniel IV "Cort"
(206) 475-4799

RESPONSE TO COMMENT
COMMENTOR NO. 1254: DANIEL, CORNELIUS W., IV (CONT'D.)

COMMENTOR NO. 1257: HERMAN, E.M.

1608 SE 52 Ave.
Portland, OR 97215
Saturday, July 15, 1995

Mr. Head:

Don't be sending foreign nuclear waste through Portland. If the DOE has gotta have it so badly, float it up the Potomac and deal with it there. Let Washington handle the friendly "Atoms for Peace". 1257-1

Sincerely,

E M Herman

RESPONSE TO COMMENT
COMMENTOR NO. 1257: HERMAN, E.M.

Response to Comment No. 1257-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Portland is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Portland, or to any of the ports analyzed in the EIS, is low. The Washington, DC area does not have the appropriate facilities or experience required to safely receive the foreign research reactor spent nuclear fuel.

COMMENTOR NO. 1258: HUMMEL, MRS.

To whom It may concern,

Please do not consider allowing spent Nuclear fuel to be shipped through the Port of Galveston.

Galveston is a beautiful city with a rich historical past.
We all must try and prevail in our efforts to save our environment.
This is an unfavorable plan.

We need to have great concern of the potential, unavoidable dangers, that spent nuclear fuel can and probably will cause to our city. 1258-1

We need to take care of our residents and visitors of Galveston. Do we need to be reminded that the Port of Galveston is directly across the Street of the University and the Hospital.
Even one nuclear mishap could fatally expose hundreds of [redacted] already ill UTMB patients, not to mention the staff 1258-2

RESPONSE TO COMMENT
COMMENTOR NO. 1258: HUMMEL, MRS.

Response to Comment No. 1258-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Galveston is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Galveston, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1258-2

Sections 4.2 and 4.5 of the EIS discuss the risks and consequences of accidents involving the foreign research reactor spent nuclear fuel. The analyses demonstrate that the risks and consequences of transporting the foreign research reactor spent nuclear fuel are low.

and medical Students. People we are talking deadly Nuclear waste!

Each year Galveston opens its shores to thousands of welcome visitors every day. The beautiful Historical Strand area is also a neighbor with the port of Galveston.

This is a wake up call. Lets work together before its to late and Stop a serious nuclear mishap from occurring.

Stop and realize the economical disaster, even one Nuclear fuel mishap Could Cause to Galvestonians.

For our health, enviornment, Peace of Mind And last but not least Stop this for our Future ENCONOMY.

Just SAY No to Spent Nuclear Fuel Coming though our GALveston Ports.

1258-2 (Cont'd.)

1258-2 (Cont'd.)

1258-3

Response to Comment No. 1258-3

Several accident scenarios, including severe accidents were analyzed during preparation of the EIS. Results of the accident analysis at the ports are given in Section 4.2.2 of the EIS with supporting detail in Appendix D, Section D.5. No catastrophic effects were found to result from severe accidents involving foreign research reactor spent nuclear fuel. Based on the evaluation of impacts presented in Section 4 of the EIS, the risk associated with the shipments of foreign research reactor spent nuclear fuel through any of the ports identified is not greater than the risk associated with the handling of other hazardous cargos. DOE acknowledges that, in many instances, the perception by the public of the risks associated with spent nuclear fuel may be greater than the actual risk, or the risk from other even more hazardous activities. However, adverse impacts have not been observed during the 30 plus years foreign research reactor spent nuclear fuel was accepted into the United States in the past. Based on this past experience, DOE considers that shipping foreign research reactor spent nuclear fuel through the Port of Galveston would have no detrimental effect on future economy of the port.

COMMENTOR NO. 1259: ROBERTS, ELIZABETH

July 18, 1995

Office of Spent Nuclear
Fuel Management (EM-37
U.S. Dept. of Energy
1000 Independence Ave S.W.
Washington DC 20585
Dear Mr Head:
Please do not ship Nuclear
Waste through the port of Tacoma,
Washington because of:
1. Fort Lewis + McChord A.F.B
Military Installations
2. Earth Quake Country (area)
3. Downtown Hospitals
4. Downtown Tacoma Dome
5. Down Town Railroad Dept
6. mt Rainer (ACTIVE)
7. POPULATION OF THE CITIES
8. ETC.

Sincerely,
Elizabeth Roberts
717-4TH ST S.W.
PUYALLUP WA
98371

1259-1

RESPONSE TO COMMENT
COMMENTOR NO. 1259: ROBERTS, ELIZABETH

Response to Comment No. 1259-1

The commentor's opposition to the use of the Port of Tacoma for receipt of foreign research reactor spent nuclear fuel is noted. Based on the port selection process described in Appendix D of the EIS, the Port of Tacoma is among the ten candidate ports listed in Section 2.2.1.6 of the EIS which could receive foreign research reactor spent nuclear fuel under Management Alternative 1 or 3. The analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port. The analysis in the EIS indicates that the risks associated with an accident are low (Section 4.2.2.3) and that the risks associated with incident-free handling of the foreign research reactor spent nuclear fuel are also low (Section 4.2.2.2).

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at the Port of Tacoma to fail, is not expected to compromise the spent nuclear fuel transportation cask.

All of the population within a 50-mile radius of the Port of Tacoma was considered when analyzing the impact of a range of hypothetical port accidents. The risks were found to be low (Section 4.2.2.3 of the EIS). The evaluation of accident probabilities, both marine and land, were based on national accident rates, which include locale-specific conditions only as they impact the national statistics. As local hazards, such as earthquakes, volcanos, and mud slides, could be accident initiators, they may slightly increase the probability of an accident. However, they would not increase the consequences of the accident, which were found to be minor for marine (Appendix C, Section C.5.4 of the EIS), port (Appendix D, Section D.5.4.2.2), and land transportation accidents (Appendix E, Section E.7.4).

COMMENTOR NO. 1260: MCLEOD, DEAN L.

17 July 1995

Public Comments on the Draft FFR SNF EIS
Attention: Charles R. Head
Office of Spent Fuel Management (EM-37)
United States Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585-0001

Dear Sir:

I write this as a resident of Bay Point, recently moved to Concord, California. I come from a conservative background and have never carried a placard or participated in an organized protest in my life. I'm 51 years old and a grandfather. Today also happens to be the anniversary of the greatest homefront disaster of World War II, when the docks at Concord Naval Weapons Station exploded.

The following is written, acknowledging the responsibility that you are faced with, and the need to focus on the larger, more general issues.

It is clear to me, that until a couple of months ago, Concord, California was just the name of a place to you; one to which you had given little or no thought. Further, based on the subject EIS, I conclude that you have never even heard of Bay Point, California. I hope that my questions and comments will help to change that. 1260-1

The geographic, demographic and industrial particularities of this place cry out against the plan to increase the already intense risks that exist here.

Here are my comments and questions on the Draft EIS:
My review of the "Summary" revealed several general areas that need consideration. There is very little hard data in the "Summary", but it raises numerous questions in my mind. I quote from the EIS, then respond:

1. p. 4: "On October 21, 1993, DOE published a Notice of Intent to prepare an EIS on a proposed action for the acceptance of foreign research reactor spent nuclear fuel containing uranium enriched in the United States (58 FR 54336)." "DOE received public comments, through writing and testimony at nine public hearings held at candidate port and site locations, through January 1994." "DOE received over 2,000 comments from about 500 individuals on a variety of issues..." 1260-2

Since legal notice, comment period and public hearings were based on the assumption that the port of entry would be Oakland, the last minute change to Concord Naval Weapons Station has effectively deprived the affected

RESPONSE TO COMMENT
COMMENTOR NO. 1260: MCLEOD, DEAN L.

Response to Comment No. 1260-1

The commentor's opposition to the use of Concord NWS for receipt of foreign research reactor spent nuclear fuel is noted.

Concord was one of 161 ports (153 commercial and eight military ports) considered. These ports were evaluated against selection criteria, resulting in 10 ports that met all of the criteria. See EIS Appendix D, Sections D.1.8 and D.1.9 for a detailed discussion of the process and results. The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1260-2

The fact that a scoping meeting was not held in the Concord vicinity is due to the fact that one of the purposes of the scoping meeting, in accordance with NEPA and DOE's applicable regulations, is to identify the scope of the EIS through public input. Therefore, based on information and comments provided by participants at the scoping meeting, and based on other considerations, DOE acted within its rights to expand the scope of the EIS to include additional ports as possible candidates for receipt of foreign research reactor spent nuclear fuel. Once such additional port is Concord NWS. The public and other interested parties (government officials, industry, etc.) were afforded opportunity to comment on the draft EIS, both at the public hearing and in writing after the public hearing. The 90 day public comment period ended on July 20, 1995. In addition, DOE considers the analyses conducted in Section 3.2.1.6 and Appendix D, Section D.2.1.6 are adequate regarding Concord NWS.

COMMENTOR NO. 1260: MCLEOD, DEAN L. (CONT'D.)

communities of their rights as citizens. No one in Contra Costa was aware of the decision to utilize Concord until April, 1995. This is outrageous. Are you prepared for the legal consequences of this?

More importantly, whatever studies were undertaken as to suitability of the various ports, Concord had to have been given short shrift, since it was not even considered until the past few months. Why was inadequate study made of CNWS?

2. p. 13: "Screening criteria [for choosing potential ports of entry] were based on input from the public (during the EIS scoping process), a U.S. Merchant Marine Academy panel of maritime safety experts and factors identified in Section 3151of the National Defense Authorization Act of FY 1994.

Why was the affected public for Concord excluded from input until the last moment?.

Of the three recommendations of the Maritime Acadamy panel "necessary for safe shipment", Concord fails two. One of these is "short distance from the open ocean". Page D-11 of Selection and Evaluation of Potential Ports of Entry says:

> Ports that can only be reached by transporting spent nuclear fuel through long, narrow, winding, or crowded ship channels present additional risks that can be avoided by using ports that are easier to reach.
>
> Less desirable are potential ports...which present [a narrow strait such as Carquinez] crowded by oil tankers in the channel and numerous petroleum and petrochemical plants along the channel that could impact on ship safety in the event of a plant or pipeline accident.

The second "necessary" criteria is "adequate port cargo facilities" (D-3). The U.S. Merchant Marine Academy Workshop recommended "onsite purpose-built cranes with trained operators". Concord has neither. Construction of crane facilities would not lead to "trained operators". Why has the DOE ignored these factors?

Under "important but not necessary" recommendations, Concord fails for numerous reasons:

1.There are "significant environmental considerations for the port D-15)" The landward portion of the station is home to several endangered species. The port areas straddle a sensitive and delicate wetlands area. Why has this been ignored?

1260-2 (Cont'd.)

1260-3

1260-4

RESPONSE TO COMMENT
COMMENTOR NO. 1260: MCLEOD, DEAN L. (CONT'D.)

Response to Comment No. 1260-3

Concord NWS was one of 161 ports (153 commercial and eight military ports) considered. These ports were evaluated against selection criteria, resulting in 10 ports that met all of the criteria. See Appendix D, Sections D.1.8 and D.1.9 of the EIS for a detailed discussion of the process and results.

DOE's public interaction related to this draft EIS exceed the requirements set forth in NEPA and DOE's environmental regulations. Seventeen public hearings were held in locations determined most likely to be directly affected by the EIS alternatives. In addition, the period of acceptance for written comments was extended from June 20 to July 20, 1995. DOE considers that these actions have provided sufficient opportunity for the public to comment on the draft EIS.

If any foreign research reactor spent nuclear fuel is to be accepted into the United States, the selection of the actual port(s) of entry to be used would be made in the Record of Decision, subsequent to completion of this final EIS.

The physical constraints of the passage from San Francisco Bay to Concord NWS were considered as part of the port selection process. The passage was found to meet the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2 of the EIS).

As shown by the port selection process described in Appendix D, Section D.1 of the EIS, Concord NWS and the other nine ports all meet the port selection criteria and hence are considered to be able to safely handle the foreign research reactor spent nuclear fuel. Criterion 3 regarding appropriate port facilities (Appendix D, Section D.1.9.1) was established to evaluate each port for "adequate port cargo facilities" as recommended by the U.S. Merchant Marine Academy. Under Criterion 3, each port was to have at least one adequate crane for offloading containerized spent nuclear fuel onto ground transport. Currently, the Concord NWS has a floating crane that routinely handles containers. Also, the NWS is scheduled to add two container cranes to increase the container handling capacity of the facility.

Response to Comment No. 1260-4

As a part of the port selection process, the EIS examines desirable port attributes as one of the criteria used in selecting ports acceptable for the receipt and handling of foreign research reactor spent nuclear fuel. The port selection process is described in detail in Appendix D, Section D.1.9 of the EIS with desirable port attributes discussed in Section D.1.9.6. Included among the desirable port attributes, DOE examined the environmental concerns near the ports and the environmental concerns from severe natural phenomena, such as earthquakes.

COMMENTOR NO. 1260: MCLEOD, DEAN L. (CONT'D.)

2. There is a substantial presence of "conflicting uses: explosives, petroleum..." Concord is the main west coast transhipment center for weapons and explosives. Bringing in waste nuclear material to the same facility, even if to a separate area, contradicts the panel's recommendation. The station is surrounded by petroleum and chemical plants. Why has this been ignored?

Likelihood of severe natural phenomena impacting port activities (such as high winds ...earthquakes". The port at CNWS was built adjacent to the town of Bay Point, which was renamed Port Chicago in 1931 because, like the more famous place, there are constant high winds. The port straddles the Concord Earthqake Fault, and is built on swamp land subject to instant liquifaction in a severe earthquake. Why has this been ignored?

Why would the DOE ignore the requirements of the National Defence Authorization Act and the recommendations of the U.S. Merchant Marine Academy panel?

I believe it is significant that the safety statistics quoted in the study separate the risks of marine transportation, port handling and rail/truck transportation, ignoring the fact that Contra Costa, particularly Bay Point, would be subject to all three hazards, thus tripling the risks. Why have not the impacted communities been advised of these risks?

1260-4 (Cont'd.)

4. p. 21: "In more than three decades of shipping spent nuclear fuel into and within the United States, no accident has ever occurred in which a "Type B" cask was punctured or spent nuclear fuel contents released, even in actual highway accidents.

Try this logic: In the 27 years that Southwest Airlines has flown there has been no crash, accident or death. Therefore, is there no such risk? Statistically, taking only Southwest Airlines, the risk of accident is one in billions, considering all the passenger miles the airline has flown. But what is the reality? Every few months airlines crash somewhere in the world. What are the statistics for airline safety over-all? Although quite safe, entirely different than that for Southwest Airlines alone. What is pertinent to this issue are the odds of road accidents, shipping accidents and train accidents in general. More fundamental, though, is the consequence of an accident. In an auto or train accident, one or two persons might get killed. When an airline crashes, a couple of hundred people can die. If there is a serious accident, where the spent nuclear fuel rods burn, many thousands of persons could ultimately die from radiation sickness or cancer. Why does the EIS downplay the real dangers?

1260-5

5. p. 26: "An emergency management and response infrastructure exists to support the implementation of those Management Alternatives that have an effect in the United States. This encompasses ports of entry, ground

1260-6

RESPONSE TO COMMENT
COMMENTOR NO. 1260: MCLEOD, DEAN L. (CONT'D.)

Although ports are not generally environmentally sensitive areas within the context of NEPA, the EIS identifies the presence of wetlands and Tule Elk near the Concord NWS as an environmental concern. If foreign research reactor spent nuclear fuel is accepted by the United States, environmental concerns may be considered in the decision as to which port to use for each shipment of foreign research reactor spent nuclear fuel. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk to humans as well as wildlife associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

DOE understands that Concord NWS's primary mission is to support the military through handling munitions and that no handling of the foreign research reactor spent nuclear fuel could occur concurrently with handling explosives. Administrative controls would be in place to preclude the handling of high explosives while the foreign research reactor spent nuclear fuel was on Concord NWS or in a ship near Concord NWS. While there would be high explosives in Concord NWS's bunkers while the foreign research reactor spent nuclear fuel was being handled, as long as the high explosives were not handled, there would be little danger of explosion. The port selection criteria do not consider the existence of other land-based facilities, such as refineries or inventories of hazardous materials, because they have no direct impact on the risk associated with the shipment of foreign research reactor spent nuclear fuel.

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. While local hazards, such as earthquakes, could slightly increase the probability of an accident, they would not increase the consequences of the accident, which were found to be very minor for both marine and land transportation accidents. Appendix D, Section D.5.3.1.3 of the EIS discusses the port accident probabilities developed from marine accident data. Hence the overall low risk is essentially unchanged in seismic areas.

In preparing the EIS, DOE has considered accepting the foreign research reactor spent nuclear fuel at any of 10 ports selected on the basis of specific criteria described in Section 2.6.3.1 of the EIS. As stated in the EIS, the criteria were based on several sources, including the recommendations made at a U.S. Merchant Marine Academy workshop, public input received during the scoping process, and the factors identified in Section 3151 of Public Law 103-160 (the National Defense Authorization Act for the fiscal year 1994). For each port selected, the impacts from activities related to the shipments of foreign research reactor spent nuclear fuel were evaluated in Section 4.2.2. The evaluation includes impacts from incident-free activities, credible accidents (including shipboard fires), emergency management and response, cumulative impacts, mitigation measures, and environmental justice concerns. The risk to the environment and the health and safety of workers and public resulting from the proposed action for all candidate ports was determined to be low.

COMMENTOR NO. 1260: MCLEOD, DEAN L. (CONT'D.)

transportation routes, and management sites." "In the United States, state and local governments are required to have emergency management and response programs." "Thses programs must be capable of managing all hazards, ranging from natural disasters to hazardous materials incidents on a day-to-day basis."

This totally begs the question.

The emergency management and response infrastructure in Contra Costa and Solano Counties would be powerless to "manage" in the face of a nuclear materials leak on the river, at Concord Naval Weapons Station or on highway 4. Contra Costa County failed to adequately manage a simple chemical spill at the General Chemical Plant in Richmond two years ago. Why does the EIS provide no indication of how Contra Costa County would cope? 1260-6 (Cont'd.)

6. p. 36: "The most severe ground transport accidents would be truck or train crashes, followed by a large fire."

Highway 4, the main route between Concord and the storage sites is one of the most dangerous highways in Northern California. Were it to be used east of Concord or west of Martinez the odds of a truck accident rise astronomically. The road beds of the railroads leading to and from Concord Naval Weapons Station are under-maintained and their general safety is questionable. 1260-7

Review of Appendix A: Environmental Justice Analysis

8. p. A-1: "Executive Order 12898 *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, directs Federal agencies to identify and address...disproportionately high and adverse human health or environmental effects of their programs, policies and activities on minority and low income populations."

The fundamental assumptions of the analysis in Appendix A are faulty. A circle with a ten mile radius (the assumption chosen) could be drawn around any metropolitan area and produce the finding that no environmental injustice exists. By including the racial and economic demographics of the mored distant affluent and well educated areas in the statistics, the real impact on those most at risk is obscured. The study admits that the closer a community is to the accident, the greater the risk. The greatest risk is at the port of entry. A circle drawn 3 miles around the loading docks of Concord Naval Weapons station would primarily include the communities of Clyde and Bay Point. An examination of the racial and demographic make-up of these communities will persuade the objective observer that using Concord Naval Weapons Station violates Executive Order 12898. 1260-8

9. p. A-1: "In the case of spent nuclear fuel from foreign research reactors, no fatalities are expected due to radiological exposure or traffic accidents." 1260-9

RESPONSE TO COMMENT
COMMENTOR NO. 1260: MCLEOD, DEAN L. (CONT'D.)

No significant health, safety, or environmental risks were found to exist at any of the candidate commercial or military ports selected (Sections 4.2.2 and 4.5 of the EIS) which would warrant a cumulative impact analysis in the final EIS addressing the effect of receiving spent nuclear fuel on existing commercial and military environments at the various ports, including the Concord NWS. Spent nuclear fuel from foreign research reactors is shipped in standard containers, and does not require special handling techniques (Section 2.6.3.2.2 of the EIS) or additional security beyond that required by NRC regulation (which can readily be provided in any of the commercial or military ports). No special precautions are required by the U.S. Coast Guard (Section 2.6.3.2.2 of the EIS).

Response to Comment No. 1260-5

While it is a fact, that there have not been any accidents in the United States in which a "Type B" spent nuclear fuel transportation cask was punctured, the EIS evaluated the consequences of accidents involving a cask where the cask is considered failed with a certain probability. The accidents ranged from no cask failure to that of cask failure combined with a high intensity fire. The approach and the results of the transportation analysis are documented in Appendix E and summarized in Section 4 of the EIS. For the analysis of accidents at sea and at ports, Appendices C and D of the EIS provide the approach and the calculational results. The results are not downplayed.

Response to Comment No. 1260-6

DOE considers that if foreign research reactor spent nuclear fuel is managed in the United States, there is adequate regulatory and emergency preparedness infrastructure to ensure its safe acceptance and transportation to the designated management site. Emergency preparedness, security, and coordination of DOE with local emergency response authorities that would be involved with the acceptance and transportation of foreign research reactor spent nuclear fuel will be discussed in detail in the Transportation Plan, to be prepared prior to the implementation of the policy. The general provisions of the Transportation Plan are included in Appendix H, which was added to the final EIS in response to public comments.

As discussed in Section 2.7.3.2 of the EIS, DOE provides funding to States and Tribes through the Office of Environmental Management and the Office of Civilian Radioactive Waste Management to assist with transportation related issues. This funding has been used in the past to enhance a jurisdiction's emergency management and response capabilities. Besides funding, much of DOE's assistance is provided in the form of technical assistance, for which DOE bears the cost. Assistance may be provided through DOE's Radiological Assistance Program and under the National Contingency Plan, as well as through training, DOE sponsored meetings, informal discussions, and informational materials.

COMMENTOR NO. 1260: MCLEOD, DEAN L. (CONT'D.)

This totally begs the question. The statistical analysis used to dismiss potential risks is completely bogus. The analysts who scratched out the piffle in this study should be forced to give their names to the public for ridicule, and be reported to any professional organizations to which they belong.

1260-9 (Cont'd.)

10. p. A-2: "Potential radiological impacts to people residing near the port are associated with low probability (less than one in a million) accidents that are so severe that the spent nuclear fuel casks rupture and a fire would burn long enough around the cask that some of the radiological material would be released." "Most of this vaporized spent nuclear fuel would be expected to be deposited in the first few miles downwind of the fire but small amounts could be carried out for several tens of miles."!!

Yes, death for several tens of miles. This is the crux of the issue. There can be almost no imaginable scenario in which anyone would willingly submit to any level of risk. The residents of Bay Point have born excessive risks for 53 years. Concord is 6-7 miles south and west of the docks. Bay Point is 1 1/2 miles southeast and directly downwind. Fifty-one years ago today over 300 persons were killed and the town of Bay Point/Port Chicago was devastated WITH WORLD WAR II VINTAGE BOMBS.

1260-10

11. p. A-3: "The port at Concord Naval Weapons Station is the exception [among proposed ports in that it has] larger percentages of minority populations *in the surrounding county.*"

The assertion here is that within a 10 mile radius of the base (the presumed danger zone) the percentage of minority and poor people is lower than the surrounding counties. This conclusion is so fallacious and deceptive that it boggles the mind. Within the 10 mile radius (see map on A10) are included Pittsburg, Bay Point, Concord, Pleasant Hill, Martinez, Benicia, Vallejo and Crockett. If you average in Benicia, Concord, Pleasant Hill and Martinez, the impact on poor and minorities is less than average. Why has the DOE ignored the fact that the greatest risk is in Bay Point, with its large minority and poor population.

1260-8 (Cont'd.)

Review of Appendix C:
Marine Transport and Associated Environmental Impacts:

The major flaw in the analysis is that no consideration was given to the special risks associated with ship transport 35 miles up river from the Golden Gate. The Carquinez Straits are particularly narrow, with treacherous currents. Furthermore, populations all along the route are put at risk. This cannot be compared to open sea shipping, nor highway or rail transportation. Why has the DOE failed to study this special risk?

1260-11

RESPONSE TO COMMENT
COMMENTOR NO. 1260: MCLEOD, DEAN L. (CONT'D.)

Response to Comment No. 1260-7

DOE has not yet selected ground transportation or transport modes for the foreign research reactor spent nuclear fuel. If Concord NWS is selected, then DOE would choose the best route to I-680 in accordance with Department of Transportation regulations (49 CFR Part 397.101 (a)(2)). That route could use Route 4, Route 24, and/or Waterfront Road. These are the local Concord streets that the trucks would probably use. The State of California routing agency can designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103.

The commentor's view that the railroad roadbeds leading to and from Concord NWS are under-maintained and their general safety is questionable is noted. Section 4.2.3 of the EIS, however, demonstrates that the risks of transporting the foreign research reactor spent nuclear fuel by rail would be low.

Response to Comment No. 1260-8

As discussed in Appendix D, Section D.1.9.5 of the EIS, a circle with a 10-mile (16-km) radius centered at each candidate port was selected for the analysis because it is the area most likely affected in the event of an accident involving spent nuclear fuel from foreign research reactors. Table A-1 of Appendix A, shows an enumeration of minority populations residing within ten miles of candidate ports and in counties having boundaries within ten miles of the candidate ports. For eight of the twelve terminals listed in Table A-1, the percentage of minority population residing within ten miles of the candidate port exceeded the percentage of minority population residing in surrounding counties. The opposite was found for four of the twelve terminals, including Concord NWS. Due to the different racial and ethnic compositions and geographical dispersions of populations residing near candidate ports (Table A-2 of Appendix A), it is not feasible to identify a typical demographic condition. The analysis in the EIS provides an equal treatment for all the candidate ports consistent with the physical nature of radiological risks in the event of an accident. As discussed in Section 4 of the EIS, implementation of the proposed action would result in no significant benefits or risks to workers or the general population, including minority and low-income populations.

Response to Comment No. 1260-9

DOE disagrees with the commentor's assertion that the statistical analysis is bogus. The statistical nature of radiological health effects is explained in Section 4.1.3 of the EIS. Other analytical procedures are discussed throughout Section 4 and Appendices B, C, D, E, and F. Since the commentor does not offer any specific criticisms of the analysis, DOE is unable to respond in specific terms. Nevertheless, the commentor's disagreement with the results is noted. The names of the analysts are listed in Section 6 of the EIS.

COMMENTOR NO. 1260: MCLEOD, DEAN L. (CONT'D.)

Review of Appendix D: Selection and Evaluation of Potential Ports of Entry

The section for Concord Naval Weapons Station (D-60 through D-63) was put together very hastily, so much so that place names are not even spelled correctly (San Suisun Bay, Clydes, Brizzly Bay). More significant, though is the complete failure to mention the community of Bay Point, with its population of 20,000 adjacent to the weapons station fence. How can the DOE ignore out of existence a community of 20,000 people?

1260-11 (Cont'd.)

13. p. D-62: The likelihood of severe natural phenomena, such as high winds and earthquakes is reflected in the structural requirements...in the Uniform Building Code." "For the Port of Concord NWS, the code provides a basic wind speed of about 70 miles per hour. The port is located on the edge of a very high seismic zone with an acceleration of 0.45 g."

Yes, any reasonable person can see that this is no place for hazardous materials of the nature proposed. On this basis alone, the Concord Naval Weapons Station should be dropped from consideration. Were an accident to occur, the prevailing winds would spread the radioactive material very far, very fast. Furthermore, the docks are on the edge of the Concord Fault Zone. Dramatically significant, though is the fact that the whole dock area is filled wetlands subject to immediate liquifaction in the case of an earthquake. The USGS regularly warns us that it is not a question of whether we will have a severe earthquake, but simply a question of when. Further, the study makes no mention of the 25 inch natural gas main that runs parallel to the railroad tracks through the weapons station and through the community of Bay Point. Nor does it mention the gasoline and jet fuel pipes that abound along the tracks near the docks. This is a major disaster waiting to happen. Why does the EIS ignore these explosive safety factors?

1260-12

Mr. Head, please give careful consideration to your place in history. Surely you don't want to risk being in the position of the Navy Port Director, 12th Naval District, who recommended in 1941 that Port Chicago was an ideal location for weapons storage, particularly because of "its complete isolation from habitation and industrial activity". Two years later, on July 17, 1944,the adjacent town of Port Chicago was extensively damaged and hundreds were killed. The risks to your place in history and to Contra Costa are exponentially greater this July 17, 1995.

Sincerely yours,

Dean L. McLeod
1830 Polk Street
Concord, California 94521

RESPONSE TO COMMENT
COMMENTOR NO. 1260: MCLEOD, DEAN L. (CONT'D.)

Response to Comment No. 1260-10

The commentor's quote from Appendix A is accurate, but DOE disagrees with the commentor's conclusion about impacts from an accident, "death for several tens of miles." Exposure to small amounts of radioactive material increases the risk of cancer whether the radioactive material comes from natural sources or man-made sources, but this exposure does not cause death to everyone who is exposed. The amount of risk depends on the amount of exposure (Sections 4.1.3 and 4.1.4 of the EIS).

Response to Comment No. 1260-11

The port selection process that determined that Concord NWS was an acceptable port considered the population of the port and surrounding areas. Appendix D, Section D.1.9.5 of the EIS provides an explanation of the "population" criterion. In regard to the amount of marine traffic and the number of refineries and bridges along the route to Concord NWS, the passage from San Francisco Bay to Concord NWS was evaluated and found to meet the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection (Appendix D, Section D.1.9.2). The population and favorable transit from open ocean are not the only considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel, if it is accepted into the United States. Other items of importance include population along the route to the management site, port experience with handling containers, and port facilities. Appendix D, Section D.1.9 of the EIS presents details of the port selection process.

The corrections identified by the commentor have been incorporated into the EIS.

None of the port descriptions, either in Section 3.2 or Appendix D, Section D.2 of the EIS, list or discuss all of the communities in the area of the port. There was no attempt to ignore Bay Point out of existence. When the population of the area was calculated for the port selection evaluation and for accident analyses, Bay Point was included.

Response to Comment No. 1260-12

Appendix D, Section D.5.3.1 of the EIS describes several accident scenarios that involve fire. When the impacts of accidents were calculated (Appendix D, Section D.5.3.3), a 50-mile radius around the port, as well as the local meteorology and prevailing winds, were taken into account. The results of the analysis of these accidents can be found in Appendix D, Section D.5.4. The analysis shows that even in the event of a severe ship fire, neither the consequences nor risks are great (Appendix D, Section D.5.5). Although such a catastrophic accident would obviously impact the local environment, no significant impacts are predicted due to the presence of foreign research reactor spent nuclear fuel. In fact, the analysis of impacts associated with an accident involving foreign research

reactor spent nuclear fuel also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS). The analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing foreign research reactor spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low, even for the most-affected individuals.

The effects of a severe explosion on a foreign research reactor spent nuclear fuel transportation cask was not evaluated because the radiological impacts of the fire discussed above would be worse, or "bound" the results of an explosion. The energy content of a severe fire greatly exceeds that of a severe explosion. With a severe fire not only is the cask violated, as it might be by a large explosion, but the heat of the fire would lift what is released from the cask, spreading the radioactive material farther, affecting more people. The impacts of an explosion followed by a severe fire are equivalent to the category 6 accident which results in a violated cask being engulfed by a severe fire (Appendix D, Section D.5.3.1.1 of the EIS), which is discussed above.

Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident, and thus affect the probability of such accidents; however, the number of earthquake-induced ship and road accidents is small compared to other causes.

DOE would like to point out that the foreign research reactor spent nuclear fuel is neither volatile nor unstable. The fuel that the proposed policy deals with is a metal which contains enriched uranium matrixed in, all clad with either aluminum or stainless steel. This type of fuel is very stable. See Section 2.6.1 of the EIS for a detailed description of the foreign research reactor spent nuclear fuel.

COMMENTOR NO. 1261: SALTER, GAYLE CORD

Written Comments on the Draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

If you would like to give us written comments, please feel free to use this page and drop it off at the registration table when you leave. Alternatively, you may mail your comments to the Department of Energy at the address listed below. Also, please provide us with your name, address, and telephone number for any follow-up information or any questions concerning the intent of your comments. This will also allow us to properly indicate the source of the comments in the comment response document. Thank you.

Name: Gaeffe Salter Phone: 510-672-0599
Title and Organization: — a concerned citizen
Address: 302 Mt. Sierra Place
City: Clayton State CA Zip 94517

*** COMMENTS ***

I am writing on behalf of all my family. We oppose the plan for nuclear waste coming to our nearby Naval Weapons Station in Concord. 1261-1

It is our choice that foreign waste be kept abroad, hopefully under international management. We feel the U.S. has more than enough to handle with the storage of our own nuclear waste.

The Concord area is part of the East Bay Area, a densely populated part of northern California. We are setting on an active quake fault-line. I'm sure by now many area citizens & the contacted you with the terse, negative opinions regarding this matter. 1261-2

Sincerely,
Gayle Cord Salter

To Mail in Comments, Address Correspondence to:

Mr. Charles R. Head
Office of Spent Fuel Management, EM-37
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0001

P.S. I'd love to have part of the monies spent to produce all your read-out materials!!

RESPONSE TO COMMENT
COMMENTOR NO. 1261: SALTER, GAYLE CORD

Response to Comment No. 1261-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1261-2

The commentor's preference for overseas management is noted. This is Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

All of the population within a 50-mile radius of the Concord NWS were considered when analyzing the impact of both incident-free transport and the range of hypothetical port accidents. The risks were found to be low. (Appendix D, Section D.5 of the EIS provides details of the accident analysis). Earthquakes were not analyzed separately in the EIS because seismic activity would not result in greater damage to a transportation cask than that caused by a ship collision and subsequent fire. Rather, the consequences from the worst plausible accidents involving foreign research reactor spent nuclear fuel transportation casks were evaluated, regardless of what initiated them. An earthquake could be the initiator of either a ship or road accident, and thus affect the probability of such accidents; however, the number of earthquake-induced ship and road accidents is small compared to other causes. Therefore, the probability of accidents, and hence overall low risk (consequences multiplied by probability) is essentially unchanged in seismic areas.

COMMENTOR NO. 1262: CONCERNED CITIZENS

We, the undersigned, object to the Department of Energy's plan for the transportation of nuclear waste, such as spent nuclear fuel rods, through the waterways, and on the railways, highways and roads of the San Francisco Bay Area. We also object to the unloading and storage, no matter how temporary, of nuclear waste in the Bay Area, including the Concord Naval Weapons Station in Concord, CA., as is currently proposed.

1262-1
1262-2

Name	Address	Date
Gayle Salter	302 Mt. Sierra Place Clayton	05/31/95
Philip W. Salter	302 Mt. Sierra Pl. Clayton	5/31/95
Jennifer Schmidt	1220 Farm Bureau Rd Concord	6-20-95
Don Carol	4672 LARWIN RD CONCORD CA	6-20-95
[illegible]	2100 PACHECO ST #311, CONCORD, CA 94520	6-23-95
[illegible]	5262 Olive dr., Concord, CA, 94521-32	
[illegible]	[illegible]	
Lisa Ungaldi	305 Mountaire Parkway Clayton, CA.	7/12/95
Emmitt Cord	7800 Quian Pl. Loomis, CA.	7/12/95

Please return to Concerned Citizens 4672 North Larwin Ave., Concord, CA. 94521

RESPONSE TO COMMENT
COMMENTOR NO. 1262: CONCERNED CITIZENS

Response to Comment No. 1262-1

The commentors' opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS and on the waterways, railroads, highways, and roads in the San Francisco Bay Area is noted. Sections 4.2.2 and 4.2.3 of the EIS, however, demonstrate that the risk associated with bringing spent nuclear fuel to the Concord NWS and through the Bay Area, or to any of the ports or routes analyzed in the EIS, is low.

Response to Comment No. 1262-2

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternative 1 or 3) there would be no storage of this material in the Concord NWS, any other port, or anyplace except for DOE management sites. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

COMMENTOR NO. 1263: HOLLANDER, TARA

~~Charles Head~~
Program Manager

\Office of S pent Nuclear Fuel Management (EM-37)
U.S. Dept. of Energy
1000 Independence Ave., S.W.
Washington, D.C. 20585

Dear Mr. Head;

I wish to strongly state my objections to the plan that would make Tacoma the port that would receive nuclear waste currently being shipped from overseas. My understanding is that arrangements could be made to keep the waste in Scotland, Japan, or France. All of these other options have not yet been thoroughly explored. I would also strenuously object to shipping the waste through Tacoma, as there are better ports to do so in Portland and California. 1263-1 1263-2 1263-1 (Cont'd.)

Thank you for your consideration.

Sincerely,

Tara Hollander

Tara Hollander
2613 N. Shirley St.
Tacoma, WA 98407

RESPONSE TO COMMENT
COMMENTOR NO. 1263: HOLLANDER, TARA

Response to Comment No. 1263-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1263-2

The commentor's preference for shipping the material to Scotland, Japan, or France is noted. This is covered under Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

COMMENTOR NO. 1266: PEDERSEN, DOUGLAS

July 20, 1995

Department of Energy
Forrestal Building, Room GB-205
1000 Independence Avenue Southwest
Washington, DC 20585

Attention: Charles Head, Project Manager

Subject: Shipment of High Level Nuclear Waste through the Port of Tacoma

Dear Mr. Head:

I was unable to attend the public hearings held recently by the Department of Energy (DOE) in Tacoma, Washington. The newspaper reports indicated that the DOE is seeking "technical reasons" for disqualifying the Port of Tacoma from receiving radioactive spent fuel rods from foreign reactors.

The first technical reason involves a train wreck that never should have happened. On November 11, 1993, two fully loaded freight trains collided head-on at high speed, shredding eight locomotives and launching freight cars hundreds of feet through the air (see attached). Had one of your "unbreakable" nuclear shipping casks been involved, I shudder to think of how the local volunteer fire department would deal with the pieces, especially since the wreckage smoldered for over 14 hours. 1266-1

The second objection comes from DOE Secretary Hazel O'Leary -- your boss. She says that in eight years, we will run out of storage space for domestically-produced, high-level radioactive waste (see attached). Why then are we bringing in materials from overseas when there is no place to put it? 1266-2

Thanks for your time.

Douglas Pedersen
409 SE 23rd
Auburn, WA 98002

cc: Senator Slade Gorton
Senator Patty Murray
Congressman Norm Dicks
Congressman Randy Tate
Governor Mike Lowry

Attachments

RESPONSE TO COMMENT
COMMENTOR NO. 1266: PEDERSEN, DOUGLAS

Response to Comment No. 1266-1

Accidents do occur. That is why the spent nuclear fuel transportation casks are designed, constructed and tested by simulation to withstand a series of impact and fire tests (Appendix B, Section B.2 of the EIS). Representative transportation casks have been crash tested to confirm compliance with regulatory standards. Two actual crash tests involving locomotive and tractor trailer carrying a spent nuclear fuel transportation cask have been performed. Both tests showed no failure of the casks, but the locomotive was destroyed. These tests demonstrated that the spent nuclear fuel transportation casks built to the federal standard would protect and retain their contents in all credible accidents. With regards to fire duration, real life tests have been conducted to determine the accuracy of the techniques used to demonstrate compliance with this regulatory requirement. Further, examinations of real life fires on land and at seas, and fire tests have demonstrated that high intensity fires are unlikely to be sustained for lengthy periods, and even then not in a single location.

Nevertheless, in spite of the improbability of such fires, the EIS contains the results of an analysis of such a fire (Section 4.2.1.3). The results of the analyses are given in Appendix D of the EIS.

Response to Comment No. 1266-2

Storage technologies which could be used for safe storage of spent nuclear fuel from foreign research reactors are discussed in Section 2.6.5 of the EIS. Candidate management sites for foreign research reactor spent nuclear fuel are described in Section 3.3 of the EIS. As discussed in Section 2.6.5.3 of the EIS, management of foreign research reactor spent nuclear fuel could be accomplished with modifications to existing facilities and construction of new interim storage facilities. Activities of the domestic commercial nuclear power industry are unrelated to the management alternatives evaluated in this EIS.

COMMENTOR NO. 1270: KARAIM, DENNIS A.

Mr. Charles R. Head
Office of Spent Fuel Management (EM-37)
United States Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585-0001

Re: Public Comments on the Draft FRR SNF EIS

Dear Sir,

I am a five-year resident of Bay Point, a town bordering the Concord Naval Weapons Station. More accurately, my property is directly adjacent to the Weapons Station. Therefore, I was very interested to hear of the Department of Energy's proposed plans for the Weapons Station.

I attended the Public Hearing held by the Department of Energy in Concord, California on May 22, 1995. A proposal for using the Concord Naval Weapons Station as a spent nuclear fuel transfer station was discussed.

I presented information about the Concord fault which runs through the proposed site. The Concord fault is only one of many faults in the San Francisco Bay Area. Not only will the spent nuclear fuel be transferred from ship to land on this fault, but than by ground over many other Bay Area faults to one of the proposed temporary storage facilities.

Having an active fault line under a proposed transfer station, as well as many other faults in the area which would affect ground transportation, will greatly increase the possibility of an accident and increase fatality risks.

The information I presented came from the Association of Bay Area Governments. The following is the agency's name, address, phone and fax number:

Association of Bay Area Governments (ABAG)
P.O. Box 2050
Oakland, CA 94604-2050
Phone: 510-464-7900
Fax: 510-464-7970

A document was written about the San Francisco Bay Area fault locations, their activity, and impact. The document's name is "San Francisco Bay Area On Shaky Ground" and the authors are Jean B. Perkins and Jack Boatwright. The source for the fault locations and activity was the California Division of Mines and Geology. Please contact Jean for further information regarding this document.

This week I also contacted the U.S. Geological Survey in Menlo Park, CA. An earthquake with a magnitude of 1.9 was measured on the Concord Fault on July 10, 1995, at 6:52 a.m.

I am confident that the three resources I have mentioned could, upon request, provide more information related to the location, activity, and impact of all the San Francisco Bay Area fault lines.

Finally, I am oppose to the Concord Naval Weapons Station being used for the transfer or storage of spent nuclear fuel or any other nuclear material.

Sincerely,

D. A. Karaim

Dennis A. Karaim
23 Wharf Drive
Bay Point, CA 94565
Phone: 510-458-9315

1270-1

1270-2

RESPONSE TO COMMENT
COMMENTOR NO. 1270: KARAIM, DENNIS A.

Response to Comment No. 1270-1

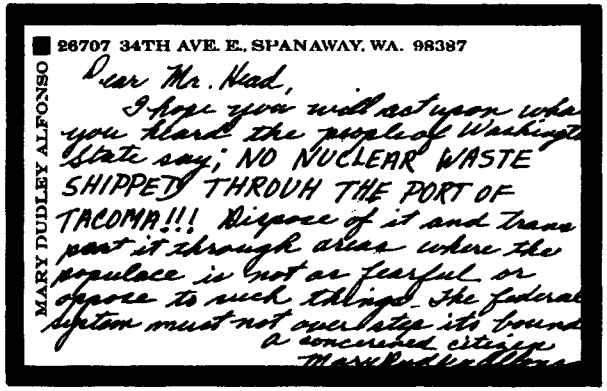
The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Concord NWS is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the ports analyzed in the EIS, is low.

The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event is low. Transportation casks are designed and built to withstand significant punishment without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the transportation cask. Further, the analyses of impacts associated with accidents involving foreign research reactor spent nuclear fuel presented in Section 4.2.2.3 of the EIS demonstrates that the use of any of the selected ports would not pose any significant risk to the port personnel or the population near the ports.

Response to Comment No. 1270-2

If the foreign research reactor spent nuclear fuel is accepted into the United States (Management Alternative 1 or 3), there would be no storage of this material in the Concord NWS, any other port, or anyplace except for DOE management sites. Under normal circumstances, it would remain at a port for only a few hours. In the event of a major disruption of ground transportation systems due to adverse weather, seismic activity, or other situation, DOE's goal is to minimize holding times at the ports and to provide safe transport of the spent nuclear fuel to its destination as quickly as possible.

COMMENTOR NO. 1277: ALFONSO, MARY DUDLEY



MARY DUDLEY ALFONSO
26707 34TH AVE. E., SPANAWAY, WA. 98387

Dear Mr. Head,
I hope you will act upon what you hear the people of Washington State say; NO NUCLEAR WASTE SHIPPED THROUH THE PORT OF TACOMA!!! Dispose of it and transport it through areas where the populace is not as fearful or opposed to such things. The federal system must not overstep its bounds.
a concerned citizen
Mary Dudley Alfonso

1277-1

RESPONSE TO COMMENT
COMMENTOR NO. 1277: ALFONSO, MARY DUDLEY

Response to Comment No. 1277-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

COMMENTOR NO. 1278: VIKON, SHIRLEY J.

July 29, 1995

Charles Head, Office of Spent
Nuclear Fuel Management
(EM-37) U.S. Dept of Energy
1000 Independence Ave. S.W.
Washington D.C., 20585

Dear Mr. Head:
I live in the city of Tacoma
WA. I strongly disapprove of
sending spent nuclear fuel
through our port. I understand
there are two places - neither
in the U.S.A. who would like
to receive it - ~~Scotland~~ + Israel.
Please do not route the waste
fuel through our port.

Thank you,
Shirley J. Vikon
1524 S. 58th St.
Tacoma WA 98408

1278-1

1278-2

RESPONSE TO COMMENT
COMMENTOR NO. 1278: VIKON, SHIRLEY J.

Response to Comment No. 1278-1

The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. However, analysis in Sections 4.2.2 and 4.5 of the EIS indicates that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low.

Response to Comment No. 1278-2

The commentor's preference for shipping the foreign research reactor spent nuclear fuel to Scotland and/or Israel is noted. Shipment to Israel would not be possible, but shipment to Scotland is covered under Management Alternative 2, which is discussed in Sections 2.3 and 4.4 of the EIS.

NEPA TEAM

DOE/EIS-0218F
February 1996

Volume 3

FINAL ENVIRONMENTAL IMPACT STATEMENT

on a

Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel

Public Comments and Department of Energy Responses
Part 4 – Public Hearings

United States Department of Energy
Assistant Secretary for Environmental Management
Washington, DC 20585

Volume 3 is organized into three sections:

- Section 1 - Overview
- Section 2 - Written Comments and Responses
- Section 3 - Public Hearings

The Overview sets the tone for the document by summarizing the public comment process, by explaining how the receipt of written comments and the public hearing process were handled, and by summarizing the major issues raised by commentors and DOE's responses to these issues.

Section 2 of Volume 3, "Written Comments and Responses" contains all of the written comments received by DOE on the draft EIS. Upon receipt, these documents were assigned a sequential log number to be used in tracking during the comment response process. For presentation in Volume 3, these documents maintained their original log number, but were separated into the following seven distinct "affiliation" categories:

Section 2.1 - Federal Government
Section 2.2 - State Government
Section 2.3 - Local Government
Section 2.4 - Native American Groups
Section 2.5 - Non-Government Organizations
Section 2.6 - Foreign Entities
Section 2.7 - Individuals

Since these documents retained their original log number, the reader should note that while the documents in each respective section are in ascending order, their numbering therein is not sequential.

In order for a reader to find a specific document, a full "List of Commentors" has been included in each book (or part) of Volume 3, immediately following the "Table of Contents." This "List of Commentors" has been compiled alphabetically using either the commentors last name, the name of the submitting organization, or the name of a Federal, State, Tribal, or local government branch. City and State government bodies are listed under "City of" or "State of." Members of Congress are listed by the Senator's or Representative's name, with the government branch following.

To locate a document(s):

1. Find the "List of Commentors" and the name of the individual submitting the comment (or the name of the organization or agency if the comments were submitted on their behalf), and note the page number assigned to the first page of the comment document (i.e., a document from a Native American Group would be number 2.4-1, etc.).

2. Find the Volume 3 book (or part) that contains the section and page number for which you are looking and turn to the appropriate page to find a scanned copy of the document along with the responses to each of the comments delineated therein.

the written comments, the comments received during each of the 17 public hearings. Oral comments provided at these hearings have been summarized, rather than individually identified by each respective speaker. As such, there is not a list of speakers or identification of the commentors at the public hearings. A list of all registered attendees is provided immediately following the summary of each of the public hearings.

Public Comments and Department of Energy Responses

Section 1 Overview

Section 2 Written Comments and Responses

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Section 2.2 State Government 2.2-1
Section 2.3 Local Government 2.3-1
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Section 2.6 Foreign Entities 2.6-1
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Section 3 Public Hearings

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Section 3.2 Concord Public Hearing 3.2-1
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Section 3.15 Tacoma Public Hearing 3.15-1
Section 3.16 Washington, D.C. Public Hearing 3.16-1
Section 3.17 Wilmington Public Hearing 3.17-1

Attachment 1

Transcript of Public Hearing Held in Tacoma, Washington on June 19, 1995 on the Draft Environmental Impact Statement on the Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel A.1

Attachment 2

Port and Transportation Accident Analyses of Additional Military Ports A.2

SECTION 3.0 PUBLIC HEARINGS

The public hearing at Charleston, South Carolina, a candidate port of entry, was held in the Mt. Pleasant Complex, on May 8, 1995. Twenty-eight people attended the hearing. The hearing was interactive in nature and the following is a summary of the comments and issues that were raised. The following is a summary of the comments and issues that were raised. Information in brackets [ ] was not provided during the hearing.

ISSUES RAISED	DOE RESPONSES
A comment was made that, as is evident by the small turnout at the hearing, not many people have heard about it and the hearing was not well-advertised.	The draft EIS was mailed to more than 1500 people and an official DOE announcement of the hearing location and purpose was advertised in local newspapers. [Public service announcements were also provided to local radio stations and to cable-access television. The hearing was announced in the Federal Register concerning the EIS. In addition, 1-800 numbers were provided for pre-registration and for requesting copies of the draft EIS.]
A question was asked as to why DOE stopped accepting foreign research reactor spent nuclear fuel in 1988.	When the program of accepting foreign research reactor spent fuel expired (in 1988 for Highly Enriched Uranium (HEU) fuels and 1992 for Low Enriched Uranium (LEU) fuels), an environmental review was required prior to renewal of the policy.
Clarification was requested on the time periods covered by the EIS (e.g., 40 years, 10-15 years).	The [proposed] policy has a 10-year duration and a potential 13-year period to complete the actual shipments. The evaluation of impacts [in the EIS] cover a 40-year [interim storage] period.
A comment was made that DOE keeps referring to the port as "Charleston," but the Wando Terminal is actually in Mount Pleasant.	[Even though the Wando Terminal is in the town of Mt. Pleasant, it is considered to be part of the Greater Charleston Area and is operated as part of the "Port of Charleston."]
A comment was made that DOE has not yet perfected vitrification of high-level waste resulting from chemical separation. Commentor questioned how vitrification can be considered for the spent nuclear fuel sent to the Savannah River Site?	Chemical separation and vitrification of the high level waste are evaluated as alternatives in the draft EIS. The Defense Waste Processing Facility at Savannah River Site, which would be used for vitrifying the high-level wastes, is scheduled to start operations this year.
A question was asked as to why barge transport was not analyzed. Commentor requested that barge transport be considered for the Savannah River Site transportation because it provides for a shorter route.	Barge transportation was considered in the draft EIS but was dismissed due to added risk of additional intermodal transport activity. [In response to public comments, barge transportation was reconsidered in the final EIS and is discussed in Sections 4.2.3.6 and Appendices A and E of the EIS.]
A question was asked as to what medical group or doctor reviewed or conducted the analyses on health effects. The draft EIS Appendices do not indicate medical involvement.	REACTS (the nation's premier radiation health facilities/personnel) reviewed risk codes and analyses.
A question was asked about the effect of public comment and whether the size of the group affects the weight given the comment.	The public's input is considered in preparing the final EIS and addressing identified errors. The size of the group does not affect consideration of comments.

ISSUES RAISED	DOE RESPONSES
A question was asked as to where the vitrified waste would be stored.	Current plans are for disposal of the vitrified waste in a deep geologic repository. DOE is currently studying a potential repository site at Yucca Mountain in Nevada. [Interim storage of vitrified waste from the chemical separation of the foreign research reactor spent nuclear fuel could be at the Savannah River Site (see Sections 2.2.2.6 and 4.3.6 of the EIS.]
Comments were made strongly opposing shipments of spent nuclear fuel through Mount Pleasant. Reasons provided included the following: Mt. Pleasant does not meet criteria for receiving shipments; no railroad; poor evacuation routes; insufficient emergency response capabilities; truck shipments would pass close to schools; wind and fog conditions; and rapid growth in community, subdivisions, and businesses.	[The commentor's opposition to the use of Charleston/Mt. Pleasant is noted. As to Charleston/Mt. Pleasant not meeting the criteria for receiving shipments of foreign research reactor spent nuclear fuel, the port does meet the criteria, as discussed in Appendix D, Section D.1.9. of the EIS.] [Although Wando Terminal does not have a railroad connection, this does not remove it from consideration, as discussed in Appendix D, Section D.1.9.4.] [Section 4.2.2.3 of the EIS shows that risks resulting from a severe accident in the Charleston area would be so low that evacuation routes were not a consideration in the port selection process.] [Charleston weather, with the exception of hurricanes, is not considered extreme. Appendix D, Section D.1.9.6 of the EIS discusses severe natural phenomena.] [The population along the route from Wando to various management sites was considered in the port selection process (Appendix D, Section D.1.9.5). Although this analysis considered residential population, it does not consider day-time population concentrations such as schools. Nevertheless, the overall risk calculated is accurate, in part because overall some schools might bring children closer to the route used while others would move them further away. The risk associated with all ground transportation was found to be low.] [In regard to emergency response capabilities, DOE will ensure that those capabilities are sufficient for the ports selected for use, if foreign research reactor spent nuclear fuel is accepted by the United States.]
Two letters were read and submitted for the record by the Mayor from (1) State Port Authority and (2) Town of Mt. Pleasant.	[These are addressed in the written comments in Chapter 2 of this Volume 3.]

ISSUES RAISED	DOE RESPONSES
Recommendations were made that DOE use military ports instead of commercial ports because shipments are of national interest and the military ports have experience in handling similar cargo. Commentors specifically suggested that DOE should consider the facilities in North Charleston, in place of those at the Wando Terminal.	The EIS analyses show a safe record of shipping through commercial ports and these risks are not at a level that would preclude commercial ports. [Of the 161 ports considered by the draft EIS, eight were military ports. As the result of public comment, an additional nine military ports, five on the West Coast and four on the East Coast, were considered after the draft EIS was released. No significant reduction in risk was found by using any of the additional military ports. However, the Naval Weapons station in the Charleston, South Carolina area was found to be an excellent facility because of its low population, hazardous cargo handling experience, nuclear experience, and proximity to Interstate highways and rail lines.]
A question was asked if the selection of storage sites and ports of entry are related.	The draft EIS proposes use of any of the 10 candidate ports identified in the draft EIS. Specific ports for a given shipment will depend on shipping arrangements existing at the time. [The distance from all ports to the management site is considered in Appendix D, Section D.2 as part of the port selection process. The storage site selection was not based on proximity to ports.]
A question was asked if "No Action" is a reasonable alternative given the United States commitment to nonproliferation.	DOE and the Department of State have indicated that they do not consider No Action to be a responsible alternative, but the NEPA process requires that this alternative be addressed in an EIS. [Section 4.6 of the EIS]
A comment was made that the analysis in Appendix D is not clear as to why the Wando Terminal was chosen over the North Charleston Terminal.	[This is discussed in Appendix D, Section D.2.1.1. Wando Terminal was selected over North Charleston because of superior services and greater distance from populated areas.]
A question was asked if United States flag vessels and sailors will be used. Commentor suggested that they should be used to keep business in the United States and not disrupt port growth.	DOE has not required the use of United States vessels. Analyses in the draft EIS assume commercial vessels will be used, because experience indicates that container vessels and crew are highly qualified.
Explanation was requested as to why DOE has not provided funds to Mount Pleasant for training and response equipment.	No decision has been made on whether foreign research reactor spent nuclear fuel would come into the United States. When a decision is made, DOE will work with the States to develop a transportation plan addressing these needs.

ISSUES RAISED	DOE RESPONSES
A request was made to clarify the relationship of the DOE Programmatic Spent Nuclear Fuel and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Program EIS to this proposed Nuclear Weapons Nonproliferation Policy concerning Foreign Research Reactor Spent Nuclear Fuel EIS.	The EIS includes the five [management] sites under consideration for spent fuel management in the draft DOE Programmatic Spent Nuclear Fuel and Idaho National Engineering Laboratory (SNF & INEL) EIS [Section 1.5 of the EIS]. Decisions made under the Programmatic SNF & INEL EIS will determine the management sites for foreign research reactor spent nuclear fuel. The preferred alternative in the Programmatic SNF & INEL EIS is to store aluminum-clad spent nuclear fuel at the Savannah River Site and non-aluminum-clad spent fuel (TRIGA) at the Idaho National Engineering Laboratory. [Since the public hearing, the Programmatic EIS Record of Decision (ROD) was issued on May 30, 1995. It establishes that the Savannah River Site would receive aluminum-clad fuel and the Idaho National Engineering Laboratory would receive non-aluminum clad fuel, in the event that foreign research reactor spent nuclear fuel is accepted by the United States.]
A question was asked as to why DOE uses "approximately" in giving projected shipments, elements, volumes, etc.	It is difficult to provide precise figures for shipments and volumes projected over a ten year period into the future.
A question was asked as to the exact number of foreign research reactor spent nuclear fuel elements that could be shipped to the United States.	The current [total] estimates are up to 22,700 fuel elements or 19.2 metric tons of heavy metal (MTHM).
A question was asked as to which countries have the capability to convert reactors to LEU fuels but refuse to do so.	Three countries out of 41 have not converted to LEU, although they are physically able to do so. Countries include the Netherlands and France. [No countries have formally refused to convert their research reactors to LEU. There are three reactors in two countries (France and Belgium) that cannot be converted to use the LEU fuel available today. In addition, the operators of low-power research reactors (less than 100kw) that do not need fresh fuel for the remainder of the service life [lifetime core], do not intend to convert to LEU fuel.]
An estimate was requested of the number of weapons that could be developed if 10 percent of the HEU under the proposed policy was diverted for nuclear weapons.	It is estimated that about 18 [meant 8] nuclear weapons could be produced from 10 percent of the metric tonnage of HEU spent nuclear fuel in the proposed action. [Eighteen nuclear weapons could be made from 10 percent of the unirradiated research reactor nuclear fuel, eight from spent nuclear fuel.]
A comment was made that DOE should evaluate the impacts of shipments into Wando Terminal on the 1978 Court Order that established environmental protection conditions for developing the Wando Terminal. Commentor stated that spent nuclear fuel shipments would violate the Court Order.	[The Department of Energy was not a party to the Federal Court Order which the commentor referenced. However, a review of the court order, signed in March, 1979, indicates that none of the provisions would be violated by shipping foreign research reactor spent nuclear fuel into the Wando Terminal.]

ISSUES RAISED	DOE RESPONSES
A question was asked as to what DOE will do permanently with the spent nuclear fuel given that facilities at the Savannah River Site are temporary and staff is decreasing.	DOE does not intend to store spent nuclear fuel permanently at the Savannah River Site. Storage is intended for an interim period pending ultimate disposal in a geologic repository. The Savannah River Site is fully capable of storing over that time period [in existing or future facilities].
A question was asked as to how personnel downsizing at the Savannah River Site will affect the ability to safely store aluminum-clad spent nuclear fuel.	Personnel reductions are not planned for spent nuclear fuel management. The Receiving Basin for Offsite Fuels (RBOF) can safely store aluminum-clad fuel. In addition to RBOF, the EIS discusses the use of one or more of the reactor disassembly basins for storing additional spent nuclear fuel elements. [The L-Reactor Disassembly Basin is considered for this purpose.]
A question was asked about the status of financial assistance DOE promised to the State of South Carolina for emergency response.	Financial assistance was part of an agreement between the State and DOE for the transport of the "urgent relief" shipment to the Savannah River Site from Sunny Point, North Carolina. Payment was stopped when the Governor of South Carolina filed suit against DOE. [Federal funding to state and local governments for maintaining emergency response programs has been provided historically by DOE, as discussed in Section 2.7.1. There are three national emergency response plans under which DOE provides radiological monitoring and assessments assistance. Under these plans, DOE provides technical advice and assistance to the State, Tribal, and local agencies involved with a radiological incident. Emergency response authorities are discussed in Section 2.7 and Appendix H of the EIS.]
Concern was expressed about the deteriorating nature of aluminum-clad fuel in pool storage and about possible deterioration in the fuel in the Receiving Basin for Offsite Fuels.	Spent [nuclear] fuel stored in the older reactor disassembly basins has degraded, because the basins were not designed for long-term storage. RBOF, which is a newer facility, has been designed for longer life and the integrity of the fuel has been maintained.
A comment was made that when DOE spent nuclear fuel deteriorated and created additional high-level waste, DOE did not do another environmental review. Commentor stated that deteriorating waste presents a "clear and present danger" and should be subject to environmental review.	[The subject of the EIS is foreign research reactor spent nuclear fuel, all of which is currently not in DOE's possession.] [All foreign research reactor spent nuclear fuel accepted under the proposed policy would either be sound fuel or failed fuel in sealed cans. Any spent nuclear fuel that arrives in failed condition will be canned prior to storage. If the fuel were to be stored wet, the condition of the spent nuclear fuel will be monitored to detect any failing fuel. In this way, no high level waste will be generated.]

ISSUES RAISED	DOE RESPONSES
Questions were asked as to why the United States should accept spent nuclear fuel from developed countries or NATO countries when they are not the threat to proliferation.	DOE wants to remove HEU from worldwide commerce. Developed countries need to set the example for less developed countries. Developed countries sell research reactors and they set the standard for the fuel cycle.
A question was asked as to why foreign research reactor spent nuclear fuel is not stored abroad until a geologic repository is available; spent nuclear fuel would then be transported only once.	DOE is concerned about continued use of HEU if the United States does not take action now. [One of the options presented in the EIS is for the United States to assist other nations to store the spent nuclear fuel overseas (Management Alternative 2, subalternative 1a, Section 4.4.1 of the EIS).]
A question was asked as to how difficult it is, and what time-frame is needed, for research reactors to convert from HEU to LEU.	The necessary tasks, such as new designs, design verification, and establishment of control systems are difficult and can take several years.
A question was asked about the impacts to public health if a cask is damaged and dropped into the river. Activities such as eating fish and swimming in the river were cited as examples of concerns.	Casks are designed against a set of criteria to withstand severe accidents. Casks are subjected to a drop test in which the cask is dropped onto an unyielding surface; they are submerged in water; they are subjected to high temperatures; and they are dropped onto a steel post. [In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel is sunk in any U.S. coastal waters, it will be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). See Appendix C, Section C.5.5 of the EIS for information on the probability of a cask sinking in coastal and deep ocean waters. Swimming or other uses of the water would not be impacted.]
A concern was expressed about the impact that a terrorist attack involving explosives would have in dispersing radioactive material.	The casks are robust and designed to withstand severe accidents. An explosion could damage everything near the cask but the contents of the cask probably would remain intact. In addition, spent nuclear fuel is a metal which is not readily dispersible. [Appendix D, Section D.5.9 discusses the consequences of a terrorist attack on a cask.]
A question was asked as to how certain DOE is that the cladding will be intact for all of the spent nuclear fuel.	It is possible that not all spent nuclear fuel has been stored the way DOE would have preferred. However, before spent nuclear fuel leaves a foreign country, it will be examined by a United States inspector [a DOE representative]. If there is a breach in the fuel, it must be canned in a sealed container, which then is placed into the cask.
A question was asked as to who owns the fuel and what is its documentation.	The foreign research reactor operators own the fuel until it is received into United States territory. All fuel that is accepted is accompanied by information as to its history, characteristics, etc. [The actual location of taking title to the foreign research reactor spent nuclear fuel is discussed in Section 2.2.1.4.]

ISSUES RAISED	DOE RESPONSES
A question was asked as to whether the amount of plutonium in foreign research reactor spent nuclear fuel poses a nuclear proliferation or health risk.	Foreign research reactor spent nuclear fuel contains little plutonium, and there is not enough to present a proliferation risk. It is the highly enriched uranium that is the major proliferation risk.
Explanation was requested as to why the spent nuclear fuel was not sent to a country who wants it (e.g., France).	Overseas reprocessing by the French or the British is considered as an alternative [Management Alternative 2] in the EIS [Section 2.3].
A comment was made that spent nuclear fuel has been safely transported in the past.	[Foreign research reactor spent nuclear fuel has been transported safely over long distances without incident for over thirty years.]

List of Attendees at Charleston, SC Public Hearing

Baron, S.

Bateman, W.

Bowser, Rita

Browder, Jewel

Daly, G.H.

Harris, John G.

Harris, Susan

Hindman, T.B.

Hope, Mrs. T.B.

Hope, Reverend T.B.

Hughes, Jim

Jennings, Stephanie

Kearns, Mrs. Dorothy B.

Lundy, Howard

McDaniel, Marvin M.

McDonough, Mike

McLeod, Barrie

McManus, T.M.

Pate, Kerry

Ravenscroft, Norman

Rivers, David

Thomas, Henry G.

Tjersland, Gary T.

Waters, Chris

Wells, Christopher

Williams, Blake R.

Woods-Flowers, Mayor Cheryl

The public hearing for the Concord Naval Weapons Station, a candidate port of entry, was held at the Centre Concord, Concord, California on May 22, 1995. There were 177 registrants for the hearing, and approximately 240 people attended. The hearing attendees requested a format in which they presented public statements with little or no dialogue between attendees and DOE. Consequently, DOE responded to some comments in writing after the hearing. Those responses are presented in brackets [ ]. The following is a summary of the comments and issues that were raised.

ISSUES RAISED	DOE RESPONSES
A request was made to extend the comment period to 90 days. A question was asked as to who had authority to extend the public comment period. A comment was made that if citizens do not have enough time to provide comments, an injunction will be pursued.	The Secretary of Energy has authority to extend the public comment period. [Comment period was extended from June 20 to July 20, 1995, for a total of 90 days.]
A request was made for additional public hearings/information hearings. A comment was made that Oakland had an opportunity to speak in November 1993; yet Concord/Contra Costa residents did not have opportunity to attend hearings or provide comments during the scoping process.	The request for a second hearing is noted. In addition to attending public hearings, hearing attendees and the public are encouraged to provide written comments which can be addressed in detail. [Public hearings were held near the candidate ports of entry and the potential management sites. DOE considers that these actions have provided ample opportunity for the public to comment on the draft EIS.]
An announcement was made that the Concord City Council will consider this issue on June 6. The Martinez City Supervisor announced a public hearing to address issue on June 5.	[These announcements are noted.]
A comment was made that advertising for the public hearing was inadequate, did not provide enough advance notice, and that local communities were not notified by DOE of the hearing.	[An announcement of the hearing time, date, location and purpose was included in a Federal Register Notice. Notices of the hearings were disseminated through the news media, including radio, television, and newspapers. DOE requested that the hearing notice be placed within the first 10 pages of the newspaper and that the notice be published both one week and one day before the hearing. This schedule was modified to fit some local newspaper publication schedules. In addition, an 1-800 number was provided for hearing pre-registration and for requesting responses to questions about the hearing.]
A question was asked as to why Tacoma, only 250 miles from the Idaho National Engineering Laboratory site, is not selected as the port. Other ports are closer to the DOE sites than Concord.	[Tacoma is one of ten candidate ports selected by the process described in Appendix D, Section D.1.9, of the EIS. The distance from the port to the management site is only one of the considerations in selecting ports of entry for the foreign research reactor spent nuclear fuel. Other considerations such as port population, route population, port experience with handling containers, and access to the ocean will be considered in making the final selection of a port(s) of entry.]

ISSUES RAISED	DOE RESPONSES
A question was asked that if the potential for accidents is minimal, why are port population levels of concern.	The 1994 National Defense Authorization Act [which was written specifically to regulate the receipt and storage of foreign research reactor spent nuclear fuel at the Savannah River Site] states [that where economically feasible and to the maximum extent practicable], the government should use low population ports in receiving foreign research reactor spent nuclear fuel. DOE elected to apply this criterion in identifying ports of entry for all five potential [management] sites, to the extent practicable. [See Appendix D, Section D.1.9 of the EIS for the port selection criteria.]
A question was asked as to how many shipments could come into Concord.	There would be [a maximum of approximately] 180 casks shipped over 13 years, and these shipments could be divided among the three proposed ports on the West Coast.
A question was asked as to whether military ports are required for the spent [nuclear] fuel shipments.	Military ports are not required. Their handling activities are largely the same as commercial ports. However, during the public scoping process for the EIS, public comments requested that military ports be included in the analysis.
Commentors questioned why DOE would off-load at a military port. Objections to the military port included: - the ease with which military ports provide cover-up of DOE activities; - lack of security and ease of entry at the Concord NWS; - a 1942 explosion at the Concord NWS and the court-martial of 250 sailors who refused to unload nuclear cargo; - question as to whether there is missing nuclear material at Concord NWS and whether DOE can confirm or deny that there are nuclear weapons at the Concord NWS; and - desire to close the military base.	[Concord NWS was selected as one of 10 candidate ports of entry that could safely and effectively receive spent nuclear fuel from foreign research reactors. Candidate ports meet selection criteria described in Appendix D, Section D.1.9 of the EIS. Eight of the 10 ports are commercial ports. Concord NWS's security is equal to or better than that at commercial ports, but security at candidate ports is acceptable. DOE will neither confirm nor deny the presence of nuclear weapons at Concord NWS. The presence or absence of nuclear weapons at Concord NWS is not relevant to the evaluation of environmental effects conducted during the preparation of the EIS. If Concord NWS were not available, alternate ports would be used from those selected in the Record of Decision.]
Concern was expressed about the Concord NWS's capacity to off-load spent nuclear fuel shipments.	Spent nuclear fuel shipments will be in International Standards Organization (ISO) containers and Concord NWS has the experience and facilities necessary to handle these containers. [Concord NWS experience dealing with hazardous materials is further detailed in Appendix D, Section D.2.1.6 of the EIS.]

ISSUES RAISED	DOE RESPONSES
A comment was made about a Channel 2, KTVU, November 1993 study that recalled munitions incidents at the Concord NWS. These included: inadequate worker training, dropping of containers into Sacramento River, derailments, collisions, crane accidents, and inappropriately packed weapons.	[As a result of the television report the commentor cites, the Contra Costa County Board of Supervisors initiated an investigation of the allegations. Their report on the subject, "Safety at the Concord Naval Weapons Station" dated November 2, 1993, concluded in part, "There were no incidents involving explosions or radiation exposure....Many of the reported incidents were not accidents caused by Weapons Station employees but, rather, were discoveries by employees that materials being received had been damaged during loading or transit. In some cases the shipments had not been properly blocked, braced or banded."] [Concord NWS has not dropped ordnance into the water. If ordnance were dropped into the water, Concord NWS policy is to recover it without exception. Periodic dredging of the dock area has never detected or recovered ordnance.] [The safety record at Concord NWS is significantly better than that of ports in the private sector with similar activities. According to the Department of Labor statistics, for the category of marine cargo handling, the number of lost workday cases per 100 full-time workers for 1993 was 7.1 nationwide, which is typical (1994 data is not available). The number of lost workday cases per 100 workers at Concord NWS for the first three quarters of fiscal year 1995 was 5.3, which is also typical for Concord.]

ISSUES RAISED	DOE RESPONSES
A comment was made that the Concord NWS has been a good neighbor for 50 years. The City of Concord has no official position [on the proposed action] but wants all potential environmental, safety, and health issues explored. Commentor expressed concern about public safety, transportation routes, long-term impacts, and terrorism. The City of Concord will also submit written comments.	[Health and safety were primary considerations during the evaluation of environmental effects for the proposed action. Sections 4.2.2 and 4.5 of the EIS demonstrate that risk associated with bringing spent nuclear fuel to any port analyzed in the EIS is low.] [Transportation routes are not yet selected because ports, sites, and transport modes have not yet been determined. Transportation routes would be chosen in accordance with applicable routing regulations and guidelines. Risks to the general population and workers during transportation of spent nuclear fuel from foreign research reactors were found to be low for normal operation and for severe accidents. Estimates of radiological and non-radiological risks during shipment of spent nuclear fuel over land and sea are given in Section 4 of the EIS.] [Acts of terrorism by a determined group or individual cannot be completely precluded. However, security measures at any port would meet or exceed Federal requirements (10 CFR Part 73). A discussion of terrorist attacks has been added to Section 2.8 and Appendix D, Section D.5.9 of the EIS.] [Appendix H of the EIS discusses general provisions of the Transportation Plan which is a document that provides the details associated with the transportation of spent nuclear fuel from foreign research reactors.]
A question was asked as to why DOE would choose Concord, with shipments passing under the Golden Gate Bridge and a population of 6 million people.	[Marine passage from San Francisco Bay to Concord NWS meets the requirements of Criterion 2 (Favorable Transit From Open Ocean) for port selection in the EIS. The port selection process also considered the population of the port and surrounding areas in determining that Concord NWS was an acceptable port. Other considerations, such as population along the route to the management site, port experience with handling containers, and adequate port facilities were also considered in selecting ports of entry. See Appendix D, Section D.1.9 of the EIS for details of the port selection process.]
A question was asked as to whether DOE has considered the ports of Vallejo or Mare Island.	Both these ports were reviewed but rejected because they had almost no container handling experience.

ISSUES RAISED	DOE RESPONSES
A comment was made that the draft EIS does not identify or address the issue of a high minority population in Bay Point.	[As shown in Table A-1, Appendix A of the EIS, about 26 percent of the population residing near the port was comprised of minority persons in 1990, while approximately 33% of the populations in surrounding counties were comprised of minority persons. Population criteria for port selection are discussed in Appendix D, Section D.1.9.5 of the EIS. Section 3.2.1 identifies low-income households and describes racial and ethnic composition of minority populations around each candidate port. Environmental effects were evaluated and found to have no significant beneficial or adverse effects on the general population, including minority and low-income populations (Chapter 4 of the EIS).]
A question was asked as to why Oakland was taken off the port list.	The Defense Authorization Act states "to the extent possible the government should use low population ports." Population of the port and surrounding areas to a radius of 10 miles is one of the port selection criteria [that determined that] the Port of Oakland would not be included [among the ports in the draft EIS]. [The population criterion for port selection (Criterion 5) are discussed in more detail in Appendix D, Section D.1.9.5 of the EIS.]
Comment was made that DOE needs to address economic assistance to localities. Questions asked were: Who pays for additional security, such as local law enforcement, for large demonstrations? Is there an accident fund? Who pays for social services associated with proposed action?	[Nuclear Regulatory Commission and DOE regulations require escort of shipments of spent nuclear fuel on public highways. Normally the escort is supplied by State and/or local police, but arrangements and payment are the responsibility of the shipper. No additional personnel would be required to secure the port area or temporary storage area. Historically, shipments of foreign research reactor spent nuclear fuel have been treated the same as any other hazardous material shipment. Some State and local governments, however, may impose additional requirements on shipments of foreign research reactor spent nuclear fuel. These requirements such as additional security and other services may impact State and local agencies.] [There is no "accident fund". However in the event of a nuclear accident or incident, liability coverage would be provided under the provisions of the Price-Anderson Act.] [Dealing with demonstrations is the responsibility of local and State governments, as well as the military if such demonstrations occur on military bases. However, if the demonstration were the result of the receipt of foreign research reactor spent nuclear fuel, DOE would support local or State governments or the military organization in dealing with the demonstrations.]

ISSUES RAISED	DOE RESPONSES
Comment was made that the draft EIS included inadequate analysis of economic issues for long-range land use planning.	[Concord NWS would only be used as a trans-shipping point, so no long-range land use planning is required.]
Comment was made that DOE needs to address social impacts, such as the reduction in housing value close to the Concord NWS.	[No significant negative social impacts would result from the proposed action (Chapter 4 of the EIS).]
A question was raised as to what will happen to the proposed action if there are reductions in the DOE budget and changes in areas of DOE responsibility. A comment was made that the DOE Baseline Management Environmental Report (BMER) reports excessive cleanup costs, and yet the DOE budget is being cut. What happens if responsibilities for this action are transferred to another government department?	[The management of foreign research reactor spent nuclear fuel containing United States-enriched uranium will be an issue for the United States government regardless which Federal agency has responsibility for it. The potential lack of DOE program funding is outside the scope of this EIS.]
A comment was made that costs of managing [spent nuclear] fuel should be borne by the foreign research reactor operators who benefitted from the fuel.	[Alternative financing arrangements, including full cost recovery, are discussed in Sections 2.2.1.2 and 2.2.2.3 of the EIS.]
A question was asked as to how much of the project costs will be recovered through "competitive fees."	[The range of cost recovery alternatives considered run from full cost recovery to full subsidization. The decision on the financing arrangements will be presented in the Record of Decision.]
Comments were made opposing United States' use of nuclear energy in general. Specific comments included the following: - DOE appears to be trying to subsidize nuclear programs. - The nuclear power industry covers for the nuclear weapons industry. - DOE should stop producing nuclear fuel. - Energy must be cheap and a nuclear reactor does not produce more energy than it consumes. - There should be a Manhattan Project to develop safe and renewable energy. - The United States should stop promoting nuclear power.	[Long-standing policies of the United States support peaceful applications of nuclear technology for foreign nations who agree not to develop or proliferate nuclear weaponry (Section 1.1 of the EIS). The proposed action is intended to advance U.S. nuclear weapons nonproliferation goals and encourage foreign research reactor operators to convert from HEU to LEU fuel. Foreign research reactors are not used to provide commercial power or to develop nuclear weapons. Applications for these reactors are summarized in Section 1.1 of the EIS. Regarding the development of alternative energy sources, DOE has on-going programs, beyond the scope of this EIS, to develop and promote use of alternative energy sources such as solar and wind. The production of nuclear fuel and the promotion of nuclear power are beyond the scope of this EIS.]
A question was asked as to whether DOE is planning to ship more spent nuclear fuel (other than covered under the policy), e.g., commercial fuel.	No. The proposed action of this policy does not include shipment of commercial fuel. The receipt of spent nuclear fuel from power reactors is outside the scope of this EIS.

ISSUES RAISED	DOE RESPONSES
Comments were made that the city and county should be made Nuclear-Free Zones. A commentor said that nuclear technology is not safe and peaceful.	[The establishment of Nuclear-Free Zones has been found to violate the Interstate Commerce Clause of the U.S. Constitution. Research reactors can be operated safely and they serve peaceful purposes, including medical, commercial, and educational applications. Section 1.1 of the EIS describes these applications.]
The question was asked as to why the United States should be responsible for this foreign research reactor spent nuclear fuel.	The spent nuclear fuel contains U.S.-origin enriched uranium, which is the focus of this EIS. [The intent of the proposed action is to support United States nuclear weapons nonproliferation policy seeking to reduce and eventually eliminate the use of highly enriched (weapons grade) uranium in civil programs worldwide.]
A question was asked as to why the United States is supplying nuclear material, such as low enriched uranium, to other countries.	[The United States has encouraged the use of low enriched uranium in research reactors because it cannot be used to make nuclear weapons. Converting foreign research reactors from highly enriched (weapons-grade) uranium fuel to the low enriched uranium supports the United States nuclear weapons nonproliferation policy.]
Comment was made that the draft EIS does not look holistically at nonproliferation policy.	[The EIS evaluates effects that would result from implementation of policies which support overall nuclear weapons nonproliferation objectives of the United States.]
A question was asked as to whether highly enriched uranium is the only nonproliferation problem. Comment was made that low enriched uranium reactor fuel generated plutonium.	Both highly enriched uranium and plutonium are potential nuclear weapons proliferation problems, but plutonium is a smaller risk than highly enriched uranium with respect to foreign research reactor spent nuclear fuel [because very little plutonium is produced from highly enriched uranium fuel]. When low enriched uranium is used as research reactor fuel, uranium^{238} amounts increase and plutonium production increases. However, because research reactor fuel is enriched to contain less than 20% uranium^{235} the plutonium poses less risk than the highly enriched uranium. The amount of plutonium in shipping casks would be 7 ounces. [On the average, a loaded foreign research reactor LEU spent nuclear fuel transportation cask would contain less than 13 ounces of plutonium.]
A comment was made that the seven ounces of plutonium in each cask would total 315 pounds for all the expected casks. Commentor stated that this amount is sufficient for 63 nuclear bombs and asked how this fact fit into United States nuclear weapons nonproliferation policy.	[Although the focus of this proposed policy is to return HEU, any plutonium that would be controlled by this policy is a positive aspect. Language has been added to Section 1.2 of the EIS to explain the relationship between HEU and plutonium in spent nuclear fuel from foreign research reactors.]

ISSUES RAISED	DOE RESPONSES
A comment was made that commentor did not object to receipt of spent nuclear fuel at the Concord NWS and would prefer managing spent nuclear fuel in the United States rather than having it in the hands of the Chinese, Iranian, and South African governments. Commentor requested that there be additional emergency measures in the case of an accident in the United States.	[Emergency measures are part of the port's and DOE's planning and procedures. Each port considered in the EIS has developed an Area Contingency Plan. This plan outlines response capabilities, procedures, and authorities for responding to, and recovering from, hazardous material incidents. Additionally, DOE would provide assistance to local authorities to ensure that appropriate measures were taken in the event of an accident. As part of this assistance, DOE's Radiological Assistance Program teams from the eight offices, strategically located throughout the country, would be used to coordinate and to provide remediation assistance. Details of emergency response requirements would be included in the Transportation Plan prepared prior to actual shipments. General provisions of the Transportation Plan are included in Appendix H of the EIS.]
A comment was made that most people agree that it is better to bring spent nuclear fuel to the United States safely than leave the material in other countries. Commentor stated that the real problem is the [spent nuclear] fuel storage.	[The technology for safely storing spent nuclear fuel has been in use, in one form or another, for over 40 years in the nuclear industry. Storage technologies and site management options are discussed in Sections 2.6.5.1 and 2.6.5.3 of the EIS.]
A question was asked as to the United States policy on eliminating our nuclear weapons production.	[This topic is outside the scope of this EIS.]
Comment was made that nuclear weapons production continues 15 miles away in Livermore. Livermore has 880 pounds of plutonium on an earthquake fault.	[Activities at Livermore National Laboratories and the amount of plutonium at that location are not the subjects of this EIS, nor do they have any bearing on the issues raised here.]
Comment was made opposing indefinite extension of the Non-Proliferation Treaty and opposing the pressure applied [regarding this Treaty] by the United States to other countries. Commentor stated that these countries have a right to nuclear technology.	[While the Treaty on the Non-Proliferation of Nuclear Weapons establishes the "inalienable right" to peaceful nuclear technology, it also stipulates that this provision be in conformity with the Treaty's fundamental prohibitions against providing or seeking any assistance in the manufacture of nuclear weapons or other nuclear explosive devices. While non-nuclear weapons states agree not to pursue development or acquisition of nuclear weapons or other nuclear explosive devices, the nuclear weapons states commit themselves to assist non-nuclear weapons states with peaceful applications of nuclear energy. The Reduced Enrichment for Research and Test Reactors (RERTR) program is an example of how the United States helps nations with peaceful application of nuclear energy. The Non-Proliferation Treaty was extended indefinitely by the Review and Extension Conference of the Parties to the Treaty on the Nonproliferation of Nuclear Weapons at the United Nations in New York on May 11, 1995.]

ISSUES RAISED	DOE RESPONSES
A question was asked as to how the United States can expect China to cooperate on nuclear technology when China will not even agree to United States' patent and copyright issues.	[The non-proliferation of nuclear weapons is in China's best interest as well as the best interest of the United States and the world as a whole. China's perception of the patent and copyright issue is a separate issue.]
Commentors oppose United States acceptance of foreign research reactor spent nuclear fuel and oppose storage and transshipment in the United States.	[The commentors' opposition to management of spent nuclear fuel from foreign research reactors in the United States is noted.]
A comment was made that in this public hearing, DOE appears to be trying to "sell" the policy.	[Public hearings on the draft EIS allow the public to express opinions, voice concerns, and ask questions. In addition, the intent is to provide responses whenever possible and appropriate and to offer additional information to increase public understanding of the issues involved in the proposed action.]
A comment was made that spent nuclear fuel should remain at reactor sites until permanent disposal is developed.	[Due to financial or regulatory constraints, some research reactor operators may not be able to store spent nuclear fuel in their own country. This alternative would not fulfill the nonproliferation policy pursued by the United States to reduce and eventually eliminate highly enriched (weapons grade) uranium from civilian programs worldwide.]
A question was asked as to what percentage of incoming shipments to the United States would be from developed/developing countries.	[Approximately] 78% of the shipments would be from developed countries and 22% from developing countries.
A comment was made that if most of the shipments are from developed countries, the United States should negotiate for overseas management of their spent nuclear fuel.	[The EIS has evaluated the potential for implementing the proposed action overseas (Management Alternative 2; Section 2.3 of the EIS). However, many reactor operators cannot, at this time, manage their spent nuclear fuel in their own country (See Sections 1.1 and 1.2 of the EIS). An objective of the proposed action is to provide foreign research reactor operators with a limited period of time to develop arrangements for disposition of their spent nuclear fuel outside the United States, while avoiding reactor shut downs, and discouraging conversions from low enriched uranium fuel to highly enriched uranium fuel.]
A comment was made that foreign research reactor operators should handle their own problems.	[Due to financial or regulatory constraints, some research reactor operators may not be able to store spent nuclear fuel in their own country. This alternative would not fulfill the nonproliferation policy pursued by the United States to reduce and eventually eliminate highly enriched (weapons grade) uranium from civilian programs worldwide.]

ISSUES RAISED	DOE RESPONSES
A comment was made that the EIS policy makes no sense until there is a final disposal policy.	[Although ultimate disposition of spent nuclear fuel from foreign research reactors is outside the scope of this EIS, the impacts of ultimate disposition are discussed in Section 4.2.7 of the EIS. DOE's position is that the foreign research reactor spent nuclear fuel would be disposed of in a geologic repository. A detailed qualitative discussion of ultimate disposition of spent nuclear fuel will be the subject of future NEPA documentation.]
A comment was made in support of international monitored retrievable storage.	[Monitored retrievable storage at a single location for all of the foreign research reactors spent nuclear fuel is not an option considered in this EIS as it is not a plausible near- or mid-term option.]
Comment was made that "Temporary Storage" is a misnomer for 40-year storage.	A 40-year management period is assumed between receipt of spent nuclear fuel and final disposal in a geologic repository [It is unclear how long it would take to ready the ultimate disposition site. The option of disposal at the Yucca Mountain site is still under consideration.]
A comment was made that if the United States begins reprocessing, it must consider that other countries may restart reprocessing and may have faulty facilities (commentor referred to the explosion at Krasnoyarsk).	[Chemical separation of spent nuclear fuel in existing facilities is not a preferred technology. Nonetheless, chemical separation remains an alternative, especially in light of DOE's substantial technical expertise in these operations and the availability of existing facilities.]
A 1970 Oak Ridge Study detailed how much it would cost to develop a reprocessing facility -- six months and $25 million.	[This comment is noted. However, as stated in the EIS, if chemical separation was used, it would be done in existing facilities.]
Several requests were made for more specific information as to which local transportation routes would be used. A question was asked as to whether DOE could do a "transportation menu" and plug in data as shipments proceed.	The Department of Transportation and the Nuclear Regulatory Commission regulations require selection of the shortest route to the nearest interstate. Final routes are not selected until implementation of a decision to use a particular port and site. [In addition to the applicable routing regulations and guidelines, the selection of the actual route would be responsive to environmental and other conditions that were in effect or could reasonably be predicted at the time of shipment. Such conditions could include adverse weather conditions, truck or road conditions, and bridge closures. In effect, the collection, analysis, and selection of these factors could be viewed as a "transportation menu."]

ISSUES RAISED	DOE RESPONSES
Comments were made, and questions asked, about transportation routes. These included the following: - routes in EIS are incomplete and there are route uncertainties; - concern about local road conditions and local traffic patterns; - use of 580, danger of Highway 4; - inadequate rail routes in Bay Point; - Benicia Bridge is the only way to Tahoe; - and Amtrak runs along transportation corridor.	[Ports, sites, routes, and transport modes have not been selected for managing foreign research reactor spent nuclear fuel in the United States since no policy of acceptance has been adopted. If Concord NWS is selected as a port of entry, then routes would be chosen in compliance with the Department of Transportation Code of Federal Regulations (49 CFR Part 397.101 (a)(2)). Routes selected could include Route 4, Route 24, and/or Waterfront Road. The State of California routing agency can designate a preferred route, which the shipments would be required to follow, in accordance with 49 CFR Part 397.103. Routes take into consideration accident rates, transit time, and population density.] [The trucks would carry ISO containers of standard size, so they would have no trouble with overpasses or bridge crossings. Existing railroad structures are strong enough to carry a fully loaded marine transport shipping cask. Results presented in Appendix E and Section 4.2.3 of the EIS show that the ground transport risks would be low along the representative routes. Other routes would also be expected to have similarly low risks including those along the Amtrak route.]
A question was asked about the number of transshipment sites and whether DOE will authorize other ports to accept the spent nuclear fuel.	The EIS identifies three ports on the West Coast, six on the East Coast, and one on the Gulf Coast that could accept the spent nuclear fuel.
A question was asked as to whether Oak Ridge or Savannah River Site shipments would be transshipped from Asia through California or through the Panama Canal.	They could travel through the West Coast ports. [However, there is no legal restriction to shipping the spent nuclear fuel through the Panama Canal.]
Questions were asked as to the type of advance notifications for truck and rail shipments and whether there will be advance notice to the California Highway Patrol.	[Shippers are required to submit proposed routes for spent nuclear fuel shipment to NRC for approval, and NRC publishes a public information circular that lists routes that have been evaluated and approved for specific spent nuclear fuel shipments. DOE is also required to notify State officials in advance of the shipment of hazardous cargoes and to notify the Governors of each State along the route at least seven days prior to each shipment. No further notifications are made by DOE.]
A request was made for exact shipment dates for every shipment and the day of the first shipments.	Shipments could begin in 1996. Exact dates are not available.

ISSUES RAISED	DOE RESPONSES
Comments were made that the draft EIS does not contain sufficient specifics on transportation safety and emergency response. Questions and comments included: - What is DOE's contribution to additional emergency response services? - Who would assist the Concord NWS emergency responders--who is responsible for emergency response and who issues special instructions to responders once the spent nuclear fuel is on the highway? - Will the Nuclear Regulatory Commission (NRC) or DOE monitor for radiation? - Will there be military security? - Accident analyses should be broken down to the local level. - It is safer if NRC is involved in the spent nuclear fuel shipments.	[Primary responsibility for emergency response to an incident would reside with State, Tribal, and local authorities. DOE would provide coordination, financial and technical assistance, and training to the State, Tribal, and local emergency response personnel. In addition, DOE has Radiological Assistance Program teams that operate from eight strategically located DOE offices around the country. Upon State, Tribal, or local request, these teams can provide technical expertise and assistance to monitor and assess radiological hazards. The teams are activated on an "as-needed" basis and generally can be ready to deploy from their home station within four hours of notification.] [Nuclear Regulatory Commission regulations relevant to shipment of radioactive material include a requirement of security escort of the shipment during land transport.] [DOE will provide radiation monitoring as needed to meet DOE and NRC regulations.] [Additional military security is unnecessary. See Appendix H of the EIS for basic security requirements. Ground transportation accident analyses are provided in Section 4.2.3 of the EIS.]
Concerns were expressed regarding construction and safety of the transportation casks. Reference was made to deteriorating casks at the Lawrence Livermore Laboratory, death resulting from exposure to the casks, and inability of the casks to exist for 24,000 years. Questions were asked about the construction of spent nuclear fuel transportation casks and whether they are lead-lined.	[Spent nuclear fuel transportation casks are designed to safely transport and shield spent nuclear fuel, not to provide long-term storage. They are also designed to preclude release of radioactive material. To date, after more than 40 years of spent nuclear fuel shipments, no radioactive contents have ever been released from a transportation cask containing spent nuclear fuel, nor has a spent nuclear fuel transportation cask ever been punctured, even as the result of an accident.] The casks are made with steel inner and outer shells. Casks are designed with different materials for different types of radiation. Lead is used to attenuate gamma radiation.
A question was asked as to whether the container ships have cranes, and, if crane availability is limited at the Concord NWS, would the Navy or contractors handle off-loading of casks.	Ships can have their own cranes, in which case the ship's crew could unload. If floating cranes are used, however, the Concord NWS would off-load. Currently the Concord NWS has a floating crane that routinely handles containers.
A comment was made that ship barge cranes are not safe.	[Standard containers are routinely unloaded at Concord NWS. Concord is scheduled to add container cranes by 1999.]

ISSUES RAISED	DOE RESPONSES
A comment was made that ISO containers are unreliable.	[ISO containers are widely used to transport various kinds of cargo, including spent nuclear fuel casks. Undamaged and well-maintained ISO containers are strong and reliable. ISO containers that would be used to transport spent research reactors fuel would be inspected for integrity prior to use. ISO containers used to carry spent nuclear fuel transportation casks have additional reinforcement.]
A question was asked as to whether ships for spent [nuclear] fuel transportation will be self-contained.	[If "self-contained" is taken to mean that the ship would be designed exclusively for this purpose, there is no need to restrict the types of vessels that might be used for transport of the spent nuclear fuel. The EIS evaluates the use of four types of ships, including purpose-built ships, for use in transporting foreign research reactor spent nuclear fuel (Section 2.6.3.2.1). No significant difference in the incident-free or accident risk were found between any of the types of ships (Sections 4.2.1 and 4.2.2). The responsibility for shipping would be with the foreign research reactor operators. However, DOE will require that only reputable shipping firms, United States or foreign flag, be used for the transport.]
A comment was made that all shipments of spent nuclear fuel should be escorted so that truckers do not make unnecessary stops within the community.	[Transport of spent nuclear fuel would be conducted in compliance with NRC regulations for physical security, including requirements for armed escorts and two-way communications with a communications center during the journey (Section 2.8, Section 5.4.2, and Appendix H of the EIS). This requirement would make the chance of unnecessary stops in a community by trucks transporting foreign research reactor spent nuclear fuel highly unlikely.]
Concern was expressed for the cancers that may be caused by this DOE action and the action of DOE to respond to health risks.	[Radiological and non-radiological environmental risks resulting from the proposed action were evaluated under conservative assumptions and found to be low (Section 4 of the EIS). The methods used in this EIS to estimate risks of cancer due to radiation exposure are accepted by the U.S. Nuclear Regulatory Commission and the International Commission on Radiological Protection.]
A comment was made questioning the accuracy of the risk estimate of one in a million chance of an accident.	[Section 4 of the EIS describes the calculational techniques, assumptions, and results of the evaluation of radiological and non-radiological health effects. More detailed discussions of the calculations and results are given in Appendices C through F.]

ISSUES RAISED	DOE RESPONSES
A comment was made that exposure to workers is inadequately explained in the draft EIS.	[Appendix D, Section D.4.3.2.1 of the EIS provides a time/distance analysis of spent nuclear fuel transportation cask handling; Section D.4.5 provides the resulting doses and risks; Appendix F, Section F.5 presents and evaluation of other dose rates from a transportation cask containing research reactor spent nuclear fuel. Marine transport workers, port workers, and ground transport workers are subject to the same limits as members of the general public: 100 mrem per year. DOE and the Department of State would also monitor the radiation doses to the workers during inspection and handling. If a worker dose approaches 100 REM in any year, other workers would be used.]
An explanation was requested about the level of exposure to school children. Commentor stated that adult exposure rates should be correctly converted for child exposure rates.	[NRC regulations limit the exposure of children, as members of the general public, to 100 mrem/year, as explained in Section 4.1.3 of the EIS. There are no separate dose rate limits set for children in unrestricted areas.]
A comment was made that, in determining impacts, DOE "levels the spike" by averaging the risk numbers of a catastrophic accident.	[The use of risk (consequence multiplied by probability of occurrence) is the appropriate technique to evaluate the negative impacts. High consequence events, such as a meteor striking Earth, must be considered with the probability of occurrence. Section 4 of the EIS describes the calculational techniques, assumptions, and results of the evaluation of radiological and non-radiological health effects. More detailed discussion of the calculations and results are given in Appendices C through F.]
An objection was made to the graph in the draft EIS comparing management of spent [nuclear] fuel radiation risks to diet soda and peanut butter consumption.	[Table 4-60 provides a comparison with risks presented in the basic implementation of the proposed action, acceptance and management of the foreign research reactor spent nuclear fuel in the United States. The table lists risks estimated to increase an individual's chance of death in any year by one in one million.]
A comment was made that the DOE risk assessment on the Livermore incinerator was off by a factor of seven.	[This comment is outside the scope of this EIS and has no bearing on the analysis of alternatives for this proposed action.]
A comment was made questioning the extent of the "affected area." Commentor suggested that everyone is affected and emphasis should be on "thinking globally and acting locally."	[The EIS evaluates accident impacts in a 50-mile radius around each candidate port. Sections 4.2.2 and 4.5 demonstrate that the risk associated with bringing spent nuclear fuel to the Concord NWS, or to any of the candidate ports analyzed in the EIS, is low, even for the most-affected individual. The proposed action is, in fact, based on "thinking globally" by implementing appropriate local activities that reduce the use of highly enriched nuclear weapons grade uranium in civilian programs worldwide.]

ISSUES RAISED	DOE RESPONSES
A comment was made that the Figures on pages 29 and 30 of the draft EIS Summary dealing with latent cancer fatalities are misleading. Commentor stated that DOE flip-flops between probabilistic and simple numbers and advocated use of latent cancer fatalities instead of simple numbers.	[Probabilities are used to compute the expected number of latent cancer fatalities under each alternative. In the calculations for this EIS, the number of latent cancer fatalities was often less than one, which can cause confusion. The results would be easier to interpret if the number of fatalities were whole numbers. When the number of fatalities is so low that it is a fraction, then it can only be interpreted as a chance of incurring cancer. Section 4.1.3 of the EIS provides more information.]
A comment was made that the accuracy of software used in the evaluation of radiological risks is debatable. Commentor suggested that RADTRAN/RISKIND variances should be stated; there should be a sensitivity analysis; sampling methods should be addressed; and underlying assumptions should be stated.	[Software used in the evaluation of radiological risks is accepted in the nuclear safety community, including the U.S. Nuclear Regulatory Commission. For more information on these computer codes, see "Validation of the Transportation Computer Codes HIGHWAY, INTERLINE, RADTRAN 4, AND RISKIND," report number DOE/ID-10511, dated May 1995.] [The RADTRAN and RISKIND codes are discussed in Appendix E, Section E.5.1 of the EIS. The variances and sensitivity analysis are incorporated in the lower bound and upper bound risk factors in many of the tables in Appendix E. There are no sampling methods involved in performing these calculations. Underlying assumptions for this analysis are stated throughout Appendix E and Section 4 of the EIS.]
A comment was made that DOE's use of theoretical projections does not match real world scenarios.	[The EIS evaluates the risk associated with plausible incident-free and accident conditions (Section 4.2 of the EIS). The evaluation includes impacts from routine activities and credible accidents, including shipboard fires and truck accidents. The probability of a truck accident involving foreign research reactor spent nuclear fuel is estimated from historical records of similar actual truck shipments (Section 4.2.3.3). The EIS also evaluates a worst-plausible-accident in which a ship carrying spent nuclear fuel collides with a petroleum tanker, and the maximum risk is presented (Section 4.2.2.3).]
A comment was made that latent cancer fatalities in the draft EIS only address the back-end of the nuclear fuel cycle. Commentor stated that DOE must also address health risks from minimization, processing, and other fuel cycle activities and look at the long-term health risks from spent nuclear fuel.	[Section 4.3.6 of the EIS evaluates the potential impacts due to chemical separation and associated onsite activities at the Savannah River Site and Idaho National Engineering Laboratory. Other nuclear fuel cycle activities are beyond the scope of this EIS.]

ISSUES RAISED	DOE RESPONSES
A request was made that DOE examine the cumulative impacts of congested freeway travel in which individual drivers/passengers are in close contact with spent nuclear fuel truck shipments.	[The maximum radiation dose rate near a spent nuclear fuel transportation cask would be 10 mrem per hour at 2 meters from the truck. The maximum radiation dose that an individual member of the public could legally receive is 100 REM per year. Thus, for an individual driver or passenger to receive a radiation dose equal to the annual limit on a congested freeway, he or she would have to be stuck in traffic right next to the same truck for 10 hours. This possibility is implausible, so no mitigation measures are planned.]
A comment was made that DOE is dividing the environmental impacts of actions between the foreign research reactor spent nuclear fuel and military spent nuclear fuel.	[Although this EIS does deal with spent nuclear fuel, the thrust of the proposed action and the source of the fuel are different than military spent nuclear fuel. The spent nuclear fuel of interest is already overseas and the thrust is to properly manage it so that U.S. nuclear weapons nonproliferation goals are served. The two subjects, military spent nuclear fuel and foreign research reactor spent nuclear fuel, are so different as to require a separate EISs.]
Concern was expressed about terrorism (i.e., Oklahoma City type incident).	[Neither acts of terrorism nor theft of materials by a determined group or individual can be completely precluded. However, proper security measures greatly reduce the risk. Shipments of foreign research reactor spent nuclear fuel would be conducted to meet or exceed security requirements in the Code of Federal Regulations (10 CFR Part 73). Nuclear Regulatory Commission regulations for physical security include requirements for armed escorts and two-way communications with a communications center during the journey (Sections 2.8 and 5.4.2, and Appendix H of the EIS). The risk that the spent nuclear fuel could be diverted or sabotaged is also reduced because of the size and weight of the casks. Section 2.8 and Appendix D, Section D.5.9 of the EIS discuss terrorist activities that might be associated with the transportation of spent nuclear fuel from foreign research reactors. To better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel, Appendix H has been added to the EIS. Appendix H presents the general provisions of the Transportation Plan which is a document that provides the details associated with the transportation of the foreign research reactor spent nuclear fuel.]
A request was made that the EIS include information about the effects of fire and earthquakes on gas and oil pipelines that run through the Concord NWS.	[No information was put in the EIS on the subject of pipelines that pass through the candidate ports. While it is true that pipelines may rupture during an earthquake and that there may be a significant fire as the result, this type of accident was not individually analyzed because the worst plausible accident, the collision between a tanker and the ship carrying the foreign research reactor spent nuclear fuel with a resultant severe fire engulfing the damaged cask, is worse than an undamaged cask being subjected to a severe fire. See Appendix D, Section D.5.4 for a discussion of the accident analyses and their results.]

ISSUES RAISED	DOE RESPONSES
A comment was made that DOE should factor into its calculations the level of petroleum shipping that goes through San Francisco Bay. It is plus or minus 47 million tons -- more than Los Angeles or Long Beach. A calamity could destroy bridges and transportation routes. The ships have to cross under 6 bridges and openings are 300 feet wide. Thirteen ships have hit the Benicia Bridge (rail) since 1975.	[The port selection criteria do not specifically consider the amount of marine traffic. In general, the number of ship mishaps is not proportional to the amount of ship traffic, because port ship traffic is slow and, even when heavy, is normally a small number of ships per hour. Hence, increasing this volume does not significantly increase the probability of an accident.]
A concern was expressed about spent nuclear fuel casks falling off trucks.	[In the unlikely event that a spent nuclear fuel transportation cask fell from a truck, the potential risks would be low. As Section 2.6.2 of the EIS states, these casks are designed and constructed to withstand significant stress without releasing their contents. The dose rate at 100 feet from a transportation cask containing foreign research reactor spent nuclear fuel is essentially zero. Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material In more than 40 years of spent nuclear fuel shipments, no spent nuclear fuel transportation cask has ever been breached or released its radioactive contents as the result of an accident.]
Concern was expressed about shipboard fires and a request was made that DOE review a 1991 Greenpeace study on ship fires.	[The memo written by Dr. Resnikoff of Greenpeace was reviewed. However, Dr. Resnikoff (Greenpeace) does not provide adequate information on the cask inventories, release fractions, and meteorological assumptions that he used in his analyses, nor does he explain any changes he may have made to the code used to predict consequences. Without full disclosure, it is impossible to determine exactly why his estimates are orders of magnitude greater than DOE's well-documented and publicly available estimates. His statements that large economic impacts would be incurred and are ignored in the DOE analyses are untrue. In fact, DOE's economic analyses are presented in the EIS (Section 4.2.2.3) and show that economic impacts would be low.] [Severe accidents involving a breach of the cask and fire sufficient to oxidize the contents were analyzed during preparation of this EIS. Information on accident analysis, including fire scenarios, is in Appendix D, Section D.5.3.1. No significantly increased impacts are predicted due to the presence of foreign research reactor spent nuclear fuel.]
A question was asked as to how it is possible to contain nuclear material for 240,000 years without a human accident.	[Intact or processed foreign research reactor spent nuclear fuel would be transported to a geologic repository for final disposition when a repository is available. This EIS does not analyze environmental impacts of disposal at a geological repository. However, Federal policy is to provide deep geologic permanent disposal that would contain nuclear material for thousands of years without human accident. See Section 4.2.7 on ultimate disposition of the spent nuclear fuel.]

ISSUES RAISED	DOE RESPONSES
A comment was made that the draft EIS should include more disaster scenarios, and commentor asked if these were required in the EIS.	Analyses of reasonably foreseeable events is required. A broad range of accident scenarios, including severe accidents, is evaluated in Section 4.2 of the EIS.
A question was asked as to whether DOE explored Concord's local hazards, such as earthquakes, the Concord Fault, and weather (snow in the mountain pass). Commentor noted that the Association of Bay Area Governments has put together information based on a 7.1 earthquake.	[The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of seismic event is low. These casks are designed and built to withstand significant stress without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at Concord NWS to fail, is not expected to compromise the spent nuclear fuel transportation cask. While local hazards such as earthquakes, may slightly increase the probability of an accident, they would not increase the consequences of the accident, which were found to be minor for both marine and land transportation accidents (Section 4.2.2.3). Therefore, the overall low risk is essentially unchanged in seismic areas.] [Appendix E, Section E.5.2 discusses the accident assessment methodology for overland transportation. As in the case of earthquakes, the local weather hazard of snow may slightly increase the probability of an accident, but would not increase the consequences of the accident.]
A comment was made that the Western States Legal Foundation was involved in a successful campaign to keep spent nuclear fuel out of Oakland.	[Comment is noted.]
A comment was made objecting to the DOE process. Commentor stated that people in government are too far removed from the people and the people do not trust the "nuclear giants."	[The DOE public hearings and public comment response process surpasses requirements of the National Environmental Policy Act, which emphasized public participation and disclosure during evaluations of the environmental effects of Federal actions (Section 5.2.1 of the EIS). The public comment process provides a forum in which individuals and organizations may voice their concerns and state positions on the proposed action. DOE has worked towards greater involvement of the public in its present and future activities. Numerous public hearings that DOE conducted for the draft EIS reflect DOE's understanding of the importance of meaningful participation of the public in its planning process.]
Comments were made indicating lack of trust in the government and DOE. Commentors mentioned the DOE tests near Los Angeles and the town of St. George, cover-ups of testing on military personnel, Hanford activities and lack of tank monitoring, radiological tests on children, and the bombing of the Shoshone in Idaho. A comment was made that DOE cannot be trusted to tell the community if something happens during a shipment.	[DOE Secretary O'Leary has made a concerted effort to encourage public trust by providing information on past DOE actions. The public hearing format provides opportunity for an increased interaction between DOE and the public, thus serving to facilitate communication and build a sense of trust. DOE provided fact sheets, videos, and exhibits at the hearings to assist the public in gathering factual knowledge about the proposed policy alternatives and their environmental impacts.]

ISSUES RAISED	DOE RESPONSES
A comment was made about the Concord NWS's "export of death and poison."	[The commentor's opposition to the use of Concord NWS is noted.]
A comment was made opposing exploitation of women in DOE public relations videos.	[DOE policy is not to allow exploitation of any group or individual in its information products.]
A comment was made that "Grizzly Bay" and "Suisun Bay" are misspelled in the draft EIS.	[The corrections have been made in the final EIS.]

List of Attendees at Concord, CA Public Hearing

Ace, Carol A.
Altaha, Ali
Anello, Elizabeth R.
Arnold, Joan
Attiga, S.A.
Bandet, Marilyn
Begor, Jana
Benson, Jim
Benuvante, J.
Beyl, Judith
Blackard, John F.
Briant, Michael
Briant, Cicily
Bridges, Tom
Bridges, Margaret
Brookins, C.V.
Brown, Betty
Burman, Deborah
Burmeister, Judy
Butler, Joel
Cabasso, Jackie
Carunchio, Kevin
Cerrachio, Ted
Cerrachio, Judy
Chase, Barbara
Chinn, Michael
Chinn, Beverly
Coburg, Simon
Colling, Kent
Cooper, Myles
Cooper, Jan
Cork, Victor
Craft, Suzanne
Crane, Richard
deBellis, Joan
deBellis, Tony B.
Delacruz, George
Dewey, David D
Dod, Ray
Dodson, Wallace
Drobatz, Kim
Everette, Oliver
Fisk, Rod
Fitzgerald, Sue
Fitzsimmons, J.E.
Fleming, Craig
Flori, Norman
Fons, Filbert T.
Frazer, Julian
Friedman, M.A.
Frye, Karen
Frye, Marilyn
Getty, Greg
Goldberg, Robert
Goldberg, Sheilah
Gouan, Tom
Granger, Mark
Granger, Rochelle
Hanewald, Karl
Hanson, Janess
Harrott, Edita
Harvey, Charlene D.
Harvey, Loretta
Heidt, Jill
Helmka, Charles J.
Helmka, Brenda
Hendrickson, Kristine
Hilder, Lara
Hoffman, Kathy
Holt Russ
Jacobsmeyer, Elizabeth
Jamerson, Janet
Jenkins, Kelly
Johnston, Candice
Karaim, Dennis
Karas Jim
Karrott, Edita
Kelly Marylia
Kilcoyne, Dee
Killoran, Jim
Kiplinger, Carol
Koeppel, Jim
Kolman, Isadore
Kory, David
Kuan, Yu Chu
Lane, Heather
Leone, Sherri
Lou, Paul

List of Attendees at Concord, CA Public Hearing (Cont'd.)

Lucas, Lisa
Lucas, Stan
Maier, William
Mailloux, Serge
Mancuso, William
Mannaberg, Bob
Mason, Lloyd
Mason, Susan
Mason, Debra
Matin, Fred
Matin, Jean
McEvilly, Kellie
McLeod, Dean
McNamar, Hugh
Micallef, Paul
Miller, Celia
Mills, Anne
Mond, Jayne
Moore, Alpha O.
Mores, D A
Nagy, Mike
Nagy, Sandi
Naumann, Michael
Nelson, Austin E
Nesbitt, Dale
Nicholson, Wes
O'Brien, Ray
O'Connell, Terry
O'Connell, Jeff
O'Hagan, C.M.
O'Hagan, Henry P.
Olsen, Cathy
Palombi, Mrs.
Palombi, Victor
Pascelli, Lewis G. Jr.
Patrick, Bill
Pence, Alison
Pence, David
Peterson, Linda
Pierce, Julie
Potter, Lewis B.
Price, Juanita
Protheroe, Pam
Reimer, Nancy
Rood, Marion
Rood, Peter F.
Roodkowsky, Tatiana
Rowles, Barbara
Roy, Catie
Runninghorse, Frank
Russell, Natalie
Russell, Bob
Salter, Gayle
Schneider, Janet
Schofield, Katy
Seawell, Patti
Seeno, C. Marina
Sewelson, Bess
Simpson, Marie
Sloan, Cat
Smith, Teri
Smith, Susan
Smith, Dr. Barbara M.
Smithson, Thelma A.
Stanley, Mark
Stone, Pete
Stradley, Donnis
Susag, Karen
Suttles, Thomas M.
Tapac, Susan
Tavernier, Marc
Theresen, Thomas R.
Tibbits, Lisa
Torlakson, Tom
Toro, Mercedes
Van Slambrook, Kevin
Veilova, Michael
Viereck, Jennifer
Wadington, J.A.
Walker, William
Warnock, Hope
Wcwewrrw, Olicwe
Wenslawski, Frank
White, Terry
Williams, David B.
Yee, Ronald
Zahn, Charles A.

The public hearing at Galveston, Texas, a candidate port of entry, was held at the Tremont House on May 17, 1995. Forty-eight people attended the hearing. The hearing discussion was interactive in nature and the following is a summary of the comments and issues that were raised. Information in brackets [ ] was not provided during the hearing.

ISSUES RAISED	DOE RESPONSES
A comment was made that the United States should assist foreign countries in reprocessing their spent nuclear fuel.	[The Commentor's support for implementation of Management Alternative 2 is noted (Section 2.3 of the EIS).]
A comment was made that recent Waste Isolation Pilot Plant studies indicate that it is better not to move spent nuclear fuel.	[Moving any hazardous material is not without risk and should be avoided when not necessary. In this case, however, the United States Government considers that foreign research reactor spent fuel should be removed from international commerce. As discussed in Section 4 of the EIS, implementation of the proposed policy would pose no significant risks to health or the environment.]
A question was asked as to whether DOE could account for every gram of HEU and, if not, how could this policy be effective?	DOE cannot guarantee that every gram of HEU could be recovered. However, DOE considers that gaining control of 80% of the HEU is safer than retrieving none. [DOE has a record of all HEU, leased or sold, to foreign research reactors.]
A question was asked as to the chance of extending the policy beyond 13 years.	DOE has stated in the EIS that it will not extend the policy.
A question was asked as to whether this policy applies only to foreign research reactor spent nuclear fuel.	Yes. The proposed policy in this EIS applies only to foreign research reactor spent nuclear fuel [containing uranium enriched in the United States]. A separate programmatic EIS addresses all of the DOE-owned spent nuclear fuel at United States facilities.
A question was asked as to DOE's position on nuclear-free zones.	Nuclear-free zones have not been upheld by the courts because they violate the Interstate Commerce Clause of the U.S. Constitution.
A question was asked as to whether the Port of Galveston would be required to accept these shipments if they are not wanted.	The Interstate Commerce Clause prevents Galveston from rejecting these shipments. However, DOE would work with State and local officials to determine transport routes, emergency preparedness training, etc. [Appendix H has been added to the EIS to address some of the emergency response issues.]
A question was asked as to why, since Galveston is far away from storage sites, it was selected as a candidate port.	The process through which Galveston was chosen is recorded in Appendix D. DOE notes that Galveston is closer than East Coast ports to the Idaho National Engineering Laboratory, the Nevada Test Site, and the Hanford site.
A comment was made that DOE should consider the ports of Beaumont, Corpus Christi, and/or Texas City.	[All three ports were included in the 153 commercial ports originally considered. All three were eliminated on the basis of applicable experience (Appendix D of the EIS).]

ISSUES RAISED	DOE RESPONSES
A question was asked as to what the actual point of entry would be at the Port of Galveston and whether or not any container terminal could be used.	No. Only certain terminals would be used.
A question was asked as to whether the recent announcement of the West Texas Low Level Waste Site played a role in DOE's selection of the Port of Galveston as a candidate port.	No. The West Texas Low Level Waste Site was not involved in the selection of the Port of Galveston as a candidate port.
A question was asked as to the rationale for transporting spent nuclear fuel across land and why the Port of Savannah could not be used instead.	Galveston is closer to the Idaho National Engineering Laboratory, the Nevada Test Site, and the Hanford site than any of the East Coast ports. The Savannah port is also under consideration.
A question was asked as to what the EPA requirements are and whether Tier II State requirements are being followed.	[A preliminary review of Texas Tier II requirements indicates that no report would need to be filed because foreign research reactor spent nuclear fuel is not a hazardous chemical. If the decision is to accept foreign research reactor spent nuclear fuel into the United States and if Galveston is to be one of the ports of entry, the requirements of Texas Title II would be more thoroughly reviewed. All local, State, and Federal requirements would be met.]
A question was asked as to whether the City of Galveston could establish its own safety requirements for transport within the city.	Yes. DOE would work with the State and local officials to satisfy local communities' safety requirements, if a decision is made to accept any of the foreign research reactor spent nuclear fuel into the United States.
A question was asked as to the cost of the EIS.	This EIS cost about $7 million.
A question was asked as to the estimated cost of the entire project.	The estimated cost of the entire project will be about $1 billion, but that figure is not based on any specific alternative.
A question was asked as to how much all the transportation will cost.	DOE is unsure about the cost for transportation, because DOE has not adopted a policy nor selected a preferred alternative.
A question was asked as to whether there is the possibility of a "Chernobyl effect" in a worst case scenario.	A "Chernobyl effect" is not possible because its physical characteristics are not conducive to a Chernobyl-type explosion. It is a much more stable fuel form.

ISSUES RAISED	DOE RESPONSES
A question was asked as to what would happen if a ship containing spent nuclear fuel blows up in the Houston Ship Channel and sinks.	[In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel is sunk in any United States coastal waters, it will be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). See Appendix C, Section C.5.5 of the EIS for information on the probability of a cask being sunk in coastal and deep ocean waters. The impacts of a foreign research reactor spent nuclear fuel transportation cask being sunk in coastal and deep waters are estimated in the EIS (Appendix C, Section C.5). The results of this analysis show that both the consequences and the risk of these accidents are low (Appendix C, Sections C.5.4 and C.5.5).]
A question was asked as to what would happen if a cask breaks up in the water during transport.	That is unlikely. [Spent nuclear fuel transportation casks are designed and constructed to retain their radioactive material contents, even in severe accidents. Were a cask to sink in water, it would not break up, even in the deepest waters. If the water were deep enough, the cask seal would fail due to water pressure, which would allow water to enter the cask and equalize the pressure within the cask.]
A question was asked as to how many accidents DOE has had.	DOE has had seven traffic accidents [involving spent nuclear fuel] with no radioactive releases in 40 years.
Questions were asked as to what a lethal dose of radiation would be if the cask breaks open; and what would be the impacts of an explosion that results in pieces of the cask "lying around."	This is very unlikely to happen. However, if a cask was breached, a person would receive a lethal dose of radiation if that person was within 1 to 7 meters of the cask unprotected [in the worst case]. If pieces of the casks were scattered around, the surrounding soil would have to be removed and treated. [These unlikely scenarios are discussed in Appendix D to the EIS, section D.5.9.]
A request was made for information on how many deep water ship accidents have occurred and what would be the health effects (actual numbers) of a deep water accident.	[According to data from Lloyd's of London, between 1978 and 1993, there have been 414 collisions between ships that occurred at least 10 miles offshore. See Appendix C, Section C.5.4 of the EIS for the results of sunken casks in deep water. Health effects in actual numbers are included.]
A question was asked about the impact of an accident on cities "downwind," such as Texas City.	The radiological impact would be localized. Spent nuclear fuel is a solid and its radiation will not be picked up by wind and transported "downwind." [In the unlikely event of a severe accident including partial vaporization of the solid metal fuel, the analysis performed for the EIS shows that some radioactive material could be released from the cask and distributed into the environment. However, the analysis also shows that the resultant contamination is so small that no cleanup would be required in any of the ports or surrounding areas. See Section 4.2.2.3 of the EIS for port accident impacts.]

ISSUES RAISED	DOE RESPONSES
A question was asked as to what would happen if a petrochemical truck hits a truck with a cask.	This scenario is accounted for in the traffic risk calculations presented in Section 4 and Appendix E of the EIS.
A question was asked as to whether a history of all accidents can be included in the final EIS.	Yes. A history of all accidents can be included in the final EIS. [A history of spent nuclear fuel shipments, including accidents is presented in Appendix E, Section E.9 of the EIS.]
A question was asked as to what would happen if terrorists destroy the casement on the piers, and whether there could be an "Oklahoma City-type" explosion.	The shipments are guarded. If an Oklahoma City-type explosion occurred, the truck and surrounding area would be destroyed. However, the integrity of the cask would be maintained. The cask would be examined, monitored for radiation, and reloaded onto a truck to continue its trip. [See EIS Section 2.8 and Appendix D, Section D.5.9 of the EIS for further discussion.]
A question was asked as to what proximity [to the spent nuclear fuel would cause] prompt death would take place versus a latent cancer fatality.	It is difficult to answer this question without a specific accident scenario. [The EIS discusses health risks in Section 4.1.3, "General Radiological Health Effects." A large dose of radiation can cause prompt death, but such a dose is not possible in any reasonable accident scenario involving the transport of foreign research reactor spent nuclear fuel.]
A comment was made noting a September 1980 toxic release in Galveston and the resulting health effect on the community.	[The comment is noted.]
A question was asked as to what sensitivity analyses of the environment around each port was considered since the Galveston area is a central flyway for migratory birds.	Appendix D of the draft EIS provides details on the environmental analyses. [Sensitivity analyses of the environment were not performed for individual ports, because there were judged to be no significant environmental impacts.]
Comments were made concerning the negative economic impacts, depreciation of property values, and decreased tourism in Galveston if spent nuclear fuel was shipped through the port. Commentors suggested that these perceptions may be greater than the actual risk but nevertheless requested that DOE consider "offsets" to economic impacts upon the community.	There are no [significant adverse or beneficial] economic impacts noted in the draft EIS. [The use of any of the ports indicated by the port selection process would not impact normal commercial operations, and therefore, there should be no adverse commercial impacts or economic reaction to the use of the port. Historically, there were no adverse economic impacts on the ports that received foreign research reactor spent fuel for the thirty plus years it has been received.]
A question was asked as to who would pay port fees.	Reactor operators in developing countries will be assisted by DOE in covering the port fees. Reactor operators in developed countries are responsible for paying the port fees.
A question was asked as to who will pay for extra security.	Extra security and radiation monitoring will be borne by either DOE or the reactor operators.

ISSUES RAISED	DOE RESPONSES
A question was asked as to whether Galveston would receive compensation for the use of its port.	[The Port of] Galveston will be compensated the same as for accepting other hazardous cargo.
A question was asked as to whether DOE will supply the list of all the hearing attendees.	Yes. DOE will supply the list of all [registered] hearing attendees. [The list is included in Volume III of the EIS.]
A question was asked as to who does the emergency planning and what is considered a timely response to an accident.	There are Transportation Plans developed for each shipment. These plans are developed by DOE along with State and local officials. DOE has rapid response teams around the United States; the closest one to Galveston is in Amarillo. DOE works with local responders to provide emergency response and other assistance training. [The general provisions of the Transportation Plan are provided in Appendix H.]
Concern was expressed about the ability to evacuate Galveston in the event of an accident since Galveston cannot adequately evacuate people in the event of a hurricane. Commentor pointed out that Galveston is an island, and the only exit is by the causeway on I-45. Commentor suggested that DOE consider transportation routes.	[Each port considered in the EIS has been required to develop an Area Contingency Plan outlining the response capabilities, procedures, and authorities for responding to, and recovering from, hazardous material incidents.]
A question was asked as to what land transportation routes would be used.	DOE cannot give specifics because the routes are designated by the Nuclear Regulatory Commission. [Representative routes were evaluated for the purpose of risk analysis, but these exact routes may not be the ones selected. All routes must be approved by the Nuclear Regulatory Commission. DOE would notify the Governor of each State at least seven days in advance of each shipment.]
A comment was made that DOE should address what happens if the causeway is closed along a planned route.	[As discussed in Section 2.6.4.2 of the EIS, NRC regulations concerning route notification are set forth in 10 CFR 73. This regulation requires DOE to notify the Governor of each State along the route at least seven days prior to the shipment. Any impediments along the route would be addressed at that time.]
Questions were raised as to the type of vessels used for marine transport and requirements of these vessels. These included: Can "special purpose" ships be used, or will the "low-bid" approach be used? Can foreign flag vessels be used? Are there provisions to protect United States transportation jobs? Are there stipulations on the age and condition of the equipment?	DOE can use "special purpose" ships. Some carriers might be foreign flag. There will be equipment inspections and certifications by international authorities such as IAEA, International Maritime Organization (IMO), etc. There will not be enough shipments to impact United States transportation jobs.
A question was asked as to how many shipments will go through Galveston by month and year and how many shipments over 30 years.	If all of the fuel came through Galveston, 3 to 4 casks per month would travel through Galveston. Shipments could be made for up to 13 years. There would be about 720 marine shipments during that time.

ISSUES RAISED	DOE RESPONSES
A comment was made stressing the importance of advance planning with State and local officials prior to each shipment.	[As discussed in Section 2.6.4.2 of the EIS, NRC regulations concerning route notification are set forth in 10 CFR Part 73. This regulation requires DOE to notify the Governor of each State along the route at least seven days prior to the shipment.]
A question was asked as to whether the casks are vented.	No. The casks are not vented.
A question was asked as to who owns the shipping casks.	In some cases the shipper or the transportation company owns the shipping casks. [Some research reactors also own casks.]
A question was asked as to whether there is a chance of a back-up of shipments at the port of entry.	Spent nuclear fuel would probably leave a port within four to six hours after receipt of shipment. If there is inclement weather, the shipment would be brought onto land and kept guarded until it could be safely transported. [The spent nuclear fuel transportation cask, in most cases, would be at the port no longer than 24 hours.]
A point was made that this is the first hearing in Galveston; Galveston was not included in the scoping process. Commentor asked who made the decision to add Galveston to the list of candidate ports, and what recourse does Galveston have.	The scoping process took place in late 1993. DOE accepted comments from the public at that time. [The scoping process was open to anyone, regardless of the locations of the public hearings]. These comments were factored into the port selection process and, as a result, DOE's criteria were revised. Galveston was then included in the list of acceptable ports.
A question was asked as to how the final decision on the policy will be reached. Commentor asked if it will be a unilateral decision, and how and when will the public know where they are in this process.	The final policy will be decided upon by the Secretary of Energy and announced in the Record of Decision. The final EIS will include all public comments.
A question was asked about the impact of the public's letters and statements on DOE's decision.	Public comments do impact the development of EIS's. For example, public comments did result in changes between the scoping process and the draft EIS for this proposed policy. [Public comments are also considered in DOE's decision as to the preferred alternative in the EIS.]
A question was asked as to whether an administrative appeal process exists at DOE.	DOE does not have an administrative appeal process.
A comment was made concerning inadequate public notification, i.e., newspaper ads were too small to be noticed and not enough advance notification.	[DOE advertises public hearings in local newspapers and in radio and cable-access television announcements, as well as announcing them in the Federal Register notice. The comment on the need for better media advertising is noted.]

ISSUES RAISED	DOE RESPONSES
A comment was made referencing the lack of instruction given to public reading room officials on what to do with the EIS. At the Rosenberg Library, commentor had to get argumentative before they would look for the document. DOE should have enclosed an instruction letter.	[Comment is noted.]
A request was made for Galveston to receive a copy of all issues raised by Dr. Whorton.	[No written comments were received from any Dr. Whorton.]
A comment was made that DOE should provide videos to the public reading room and to the port authorities.	[The commentor's request for additional availability is noted. Videos were available for viewing in the exhibit area before the public hearings and were provided to attendees who requested copies.]

List of Attendees at Galvedston, TX Public Hearing

Biondolico, Philip M.
Bircher, Lavinia
Bowers, David
Bradford, Lawren Ethridge
Brown, Gini
Brown, Harry
Camerana, Joe
Camerana, Kim
Carwana, Joe
Cole, Jackie
Connor, Ernest
Conrad, Terry
Conrad, Deborah
Crews, Barbara
Curran, Bernie
Essex, Graucis
Evans, Dee
Fish, Sally
Freudenburg, Henry
Fulmer, Beth
Goolishion, Leslie
Gourley, William
Guidry, Jim
Hardy, Bill
Jeffcoat, Dorothy
Kingsbury, Tim
Laurence, Monica
Levin, Dr. William
Levin, Edna S.
Lising, Bebe
Locki, Louisa
Martillotti, Joseph A.
Matteson, Kathy
Matteson, Robert
McBride Essex, Judith
McClure, J.R.
McMahon, Diane L.
Mitchell, Kirk
Muhich, Mark
Peck, Diane
Railey, Barbara
Somers, John
Unbehagen, John G.
Weaver, Joan
Weber, Denise
Whorton, Dr Elbert
Williams, Chris
Zamora, Gilbert, Jr.
Zimmerman, Roger

The public hearing at Richland, Washington, for the candidate Hanford Site, was held on June 14, 1995 at the Columbia Basin College. Two people perused exhibits and obtained materials, but no one attended the discussion portion of the hearing.

ISSUES RAISED

DOE RESPONSES

List of Attendees at Hanford, WA Public Hearing

Bradford, Eric

Clayton, Danetu

The public hearing at Idaho Falls, Idaho, for the candidate DOE management site at Idaho National Engineering Laboratory, was held at the Weston Quality Inn on May 18, 1995. Eight people attended the hearing. The hearing was interactive and the following is a summary of the comments and issues that were raised. Information in brackets [ ] was not provided during the hearing.

ISSUES RAISED	DOE RESPONSES
Questions were raised as to whether DOE has the current capacity to reprocess non-aluminum-clad fuel, and whether the Savannah River Site canyons could process aluminum-clad fuel.	DOE currently does not process non-aluminum-clad fuel (although the Idaho National Engineering Laboratory could be upgraded to process non-aluminum-clad fuel). The Savannah River Site currently has chemical separation facilities and the capability to process the aluminum-clad fuel.
A question was asked as to whether DOE has considered French reprocessing facilities.	DOE has considered reprocessing at French facilities but currently France only reprocesses its own spent nuclear fuel and does not accept foreign [spent nuclear] fuel. However, the United Kingdom is actively soliciting reprocessing business.
A question was asked as to what agreements and obligations the Dounreay facility in the United Kingdom would be subject to under the Treaty for Non-Proliferation if it reprocesses spent nuclear fuel.	[The Dounreay Site in the United Kingdom is open to international inspection by the IAEA under the terms of the Treaty for Non-Proliferation.]
A question was asked as to the amount of money that DOE is providing for research and development on chemical separation.	DOE is providing $5 to $7 million over the next 2-3 years for pyroprocess research and development.
A question was asked as to whether a small group of people is driving the DOE policy of this EIS, and if this affects the chances of reprocessing fuel in the United States.	Reprocessing [chemical separation] is a sensitive question and it is difficult to predict its use. DOE sites may have different opinions, and these may differ from the opinion of the candidate ports and from various [members of the] public.
A question was asked about other processing techniques for spent nuclear fuel and the amount of research and development done in the United States on this issue.	Most of the proposals for new reprocessing techniques exist [only] on paper and are 10-15 years away from being usable techniques.
A comment was made that reprocessing foreign research reactor spent nuclear fuel would address the United States "balance of payment" issue.	[Under full cost recovery, a positive balance of payments would be realized for the effort.]
A question was raised as to the major obstacle to reprocessing.	The obstacles associated with reprocessing [chemical separation] include other waste streams that are produced as a result of reprocessing, and the policy of the United States not to encourage this technology. For example, the United States is encouraging the Russians to stop reprocessing spent nuclear fuel.
A question was asked whether the Japanese are building a reprocessing facility.	[The Japanese are planning to start their first industrial-scale reprocessing plant at Rokkashomura sometime after the year 2000.]

ISSUES RAISED	DOE RESPONSES
Clarification was requested of the burn-up rate of HEU.	In 1994 the burn-up rate was 60%. This information can be found in Appendix B of the EIS.
A question was raised as to the size of one metric ton of heavy metal.	One metric ton of heavy metal [MTHM] is about 200 cubic feet, including structural materials. [One MTHM of pure uranium in metallic form occupies about 1.9 cubic feet.]
A comment was made that about 19 metric tons of heavy metal spent nuclear fuel could come into the United States in Management Alternative 1, with about one metric ton going to the Idaho National Engineering Laboratory and 18 metric tons going to the Savannah River Site. The question was how much of the 18 metric tons would enter northwest ports and travel across Idaho highways.	Generally, the fuel [that would be accepted through West Coast ports] would be from southeast Asia. The specific numbers are not available, but of the total 19.2 metric tons of heavy metal, about 4.8 metric tons could come to West Coast ports and 14.4 metric tons to East Coast ports.
A comment was made that processing spent nuclear fuel into a form for dry storage is preferred.	[The commentor's preference for processing the foreign research reactor spent nuclear fuel into a suitable form for dry storage is noted.]
A question was asked as to whether the calculated risk in the EIS included chemical separation risk.	DOE has included chemical separation risks [under Management Alternative 1, Implementation Alternative 6].
Explanation was requested as to the method of calculating latent cancer fatalities and whether Environmental Protection Agency (EPA) methods were used.	DOE did not use the EPA methodology for calculating risk and latent cancer fatalities.
A comparison of the risk as presented in the EIS with other industrial occupational hazards and risks was requested.	DOE did not compare these calculations [with industrial hazards. However, a comparison with a range of common hazards in provided in Section 4.9 of the EIS.]
A comment was made that the methodology used in the EPA regulations on natural background radiation data were incorrect and should not be used in the EIS.	[DOE did not use the referenced methodologies for radiation exposure calculations.]
A question was asked whether this was the only hearing in Idaho. It was noted that the Snake River Alliance, along with Representative Crapo, asked for hearings in Twin Falls, Pocatello, and Boise.	[Although the applicable regulations require a single public hearing, DOE held 17 public hearings nationwide. The Idaho Falls hearing, in combination with the 90 day period for submitting written comments, was considered by DOE as adequate for Idaho citizens to comment.]

List of Attendees at Idaho National Engineering Laboratory Public Hearing

Braitsford, Beatrice

Downs, Terry L.

Hansen, Dick

Heiselmann, Harry W.

Jobe, Lowell A.

Pole, Joyce

Wadkins, R.P.

Whitaker, Kathleen B.

The public hearing at Jacksonville, Florida, a candidate port of entry, was held in the Prime F. Osborn III Convention Center on May 12, 1996. Five people attended the hearing. The hearing discussion was interactive in nature and the following is a summary of the comments and issues that were raised. Information in brackets [ ] was not provided during the hearing.

ISSUES RAISED	DOE RESPONSES
A question was asked as to the location of reactors that still use HEU.	Of the countries that have research reactors, about 30 have converted to LEU and the others are in the process. Only a few of those that could convert have not yet done so. These include reactors in France and the Netherlands.
An explanation was requested as to why a country such as France would not convert to LEU.	Not all countries share the United States goal of eliminating commerce in HEU. In addition, HEU fuel for reactor operations provides more efficiency (than LEU) with an increase in operating performance at lower costs.
A question was asked as to how the decision is made on where to store the foreign research reactor spent nuclear fuel, if the fuel is to be managed in the United States.	The DOE Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs EIS [SNF & INEL EIS] identifies the Savannah River Site as the preferred storage site for all DOE-owned aluminum-clad spent nuclear fuel, and the Idaho National Engineering Laboratory for TRIGA and other non-aluminum-clad spent nuclear fuel. [The Record of Decision for the SNF & INEL EIS was issued May 30, 1995 and includes the explanation for DOE's decision to manage types of spent nuclear fuel in this manner.]

ISSUES RAISED	DOE RESPONSES
Clarification was requested on how Price-Anderson liability coverage applies to transportation carriers in the event of an accident. Questions asked included the following: Does Price-Anderson coverage apply to incidents causing closure of a rail route or highway? Who determines if and when Price-Anderson goes into effect? Is a cask that falls off a rail car considered an accident covered under Price Anderson? Commentor noted that CSX (a transport company) supports the government in the proposed action but needs more information on how Price-Anderson would be applied. These questions will also be submitted in writing.	[The Price-Anderson system provides very broad financial protection to compensate victims for damage or injury in the event of a nuclear incident or precautionary evacuation within the United States, including accidents that might occur during the transport of spent nuclear fuel to a DOE facility.] [In addition, the Price-Anderson system provides indemnification to parties such as railroads or trucking companies who might otherwise be found liable for injury or damage to third parties, including loss of profits or damage due to the closure of a rail route or highway, if such injury or damage were caused by a nuclear incident or precautionary evacuation ordered by an authorized State or local official. However, in the absence of a particular set of facts, it is difficult to determine whether or not Price-Anderson would apply to a particular situation.] [DOE would normally determine, in the event of a nuclear incident, whether or not the provisions of Price-Anderson would be available under a particular DOE contract or as a result of a particular DOE program. Ultimately, Price-Anderson applicability could be decided by a court of law.] [If a cask were to fall off of a rail car, and this event subsequently leads to either (1) a nuclear incident (damage or injury caused by the nuclear material), or (2) a precautionary evacuation (no actual damage or injury caused by nuclear material but imminent danger of such damage or injury) that has been ordered by an authorized State or local official, Price-Anderson is likely to apply. In the absence of a nuclear incident or precautionary evacuation, liability questions would be settled through normal legal processes.]
A question was asked as to whether the final EIS will delineate the preferred type of transportation.	Yes. See Section 2.9.]
A question was asked as to whether workers unloading the casks will be aware of their contents.	Workers handling spent nuclear fuel [transportation] casks will be aware of the cask contents.
A question was asked as to how long it will take to unload spent nuclear fuel casks at the Jacksonville port and how long will it be before the casks are transported on to the Savannah River Site.	The EIS assumes 24 hours for unloading at the ports. A more realistic estimate of the duration is about 4 hours.

ISSUES RAISED	DOE RESPONSES
Clarification was requested of the volumes of spent nuclear fuel involved if foreign research reactor spent nuclear fuel is accepted into the United States.	22,700 spent nuclear fuel elements, or 19.2 metric tons of heavy metal, would be shipped to the United States [if such a decision is made] over a 13 year period. If all of the spent nuclear fuel were to be accepted through the Port of Jacksonville, the volume would be equivalent to about 3 International Shipping Organization (ISO) containers per month.
Clarification was requested of the percentage of [spent nuclear] fuel in each category of fuel type (e.g., aluminum-clad and TRIGA).	About 75% of the foreign research reactor spent nuclear fuel covered under the proposed policy is aluminum-clad fuel; the remaining 25% is TRIGA fuel.
An Edlow Group representative read a statement presenting the position of about 14 foreign research reactor operators. (A written statement was also submitted.) Statement is summarized as follows. (1) Foreign research reactors provide benefits; (2) Foreign research reactor operators always relied on United States assurances to take back U.S.-origin fuel; (3) United States acceptance of foreign research reactor's spent nuclear fuel supports nonproliferation goals; (4) With United States acceptance of foreign research reactors' spent nuclear fuel, reactor operators willingly cooperated in the RERTR program and converted to LEU; (5) Foreign research reactor operators are making long-term plans to deal with their own fuel overseas; (6) In the short-term, foreign research reactors do not have safe storage capacity; (7) Foreign research reactors' spent nuclear fuel makes up only 1% of heavy metal content of entire DOE-owned spent nuclear fuel inventory; (8) United States acceptance can be done without significant impacts; (9) While United States acceptance adds a small amount of spent nuclear fuel to DOE inventory, the trade-off is taking HEU out of world commerce; and (10) DOE should move forward with United States acceptance of foreign research reactor spent nuclear fuel.	[For DOE's response to comments in the statement, see comment document number 7 and 1130 in this Volume 3 of the EIS.]
A question was asked as to whether there are other alternatives besides reprocessing and storage.	DOE is evaluating newer technologies, but those technologies are about 10-15 years away from being ready for use. Currently, storage and reprocessing are the options.
A question was asked as to whether storage at the Idaho National Engineering Laboratory (INEL) is wet or dry.	Both Idaho National Engineering Laboratory (INEL) and the Savannah River Site use wet storage methods (spent nuclear fuel pools). INEL also currently uses dry storage methods, and the Savannah River Site could potentially use dry storage methods in the future.
A question was asked as to how DOE will deal with short- and long-term management.	DOE will use spent [nuclear] fuel storage facilities in the short-term until long-term management facilities are available.

ISSUES RAISED	DOE RESPONSES
A question was asked as to what the policy is regarding conversion of research reactors in the United States to the use of LEU.	The United States has encouraged domestic research reactors to convert to the use of LEU fuels. Most domestic research reactors have either converted, or are in the process of converting, to the use of LEU fuels.
A question was asked as to whether the proposed policy is for a finite action.	The proposed policy covers a finite amount of spent nuclear fuel to be accepted over a finite period.
A question was asked as to whether the proposed policy will be subject to renewal after the 10-year duration.	No. The 10-year duration of the policy is finite. There are no plans for extension of the policy. The intent is that foreign research reactors will have developed their own means of managing future spent nuclear fuel by the time the 10-year policy expires. [The policy would allow shipment of foreign research reactor spent nuclear fuel for a 13 year period; the additional three years is to account for the cooling of fuel discharged from the reactors during the last year of the policy.]
A question was asked as to the timeframe for final disposal of spent nuclear fuel.	The EIS assumes 40 years before a permanent disposal facility is expected to be available.

List of Attendees at Jacksonville, FL Public Hearing

Buehler, Robert

Joy, Ted

Julian, M.

Kyte, John

Stowell, Charles

The public hearing at Cashman Field, Las Vegas, Nevada, for the candidate DOE Management site at the Nevada Test Site, was held on June 12, 1995. The hearing, which was attended by fourteen people, was interactive in nature. Below is a summary of the comments and issues that were raised. Information in brackets [ ] was not provided during the hearing.

ISSUES RAISED	DOE RESPONSES
Comments were made that low-turn-out of public citizens at the hearing is indicative of insufficient advertising for, or general apathy-among members of the public. DOE should focus on ways to reach the public, including better advertising of draft EIS availability at time of issuance. The Federal Register Notice is not sufficient advertising; and DOE should do more to get the media involved in communicating DOE programs, activities, and risk information.	[DOE complied with NEPA and other applicable laws and regulations in advertising for the public hearings. Specifically, advertising included sending public service announcements to local radio stations and to local cable access television, and placing advertisements in major newspapers in each of the hearing locations. Newspaper advertisements were published one week before each hearing and again one day before each hearing. Also, in accordance with NEPA, announcements of the hearings were published in the Federal Register.]
A comment was made stating that Nye County was not aware of the draft EIS and may not have received a copy when it was mailed to those on DOE's distribution list. Commentor stated that Nye County officials should not be overlooked.	A copy of the Draft EIS was mailed to Mr. William Offutt, Nye County Manager, Tonopah, NV; The Honorable Cameron McRea, Chairman, Nye County Commissioners, Pahrump, NV; Mr. Les Bradshaw, Manager, Nye County Nuclear Waste Repository Project Office, Tonopah, NV; and the Amargosa Valley Community Library, Amargosa Valley, NV. Copies of the Final EIS will be forwarded to the same individuals and organizations.
A comment was made that the public's perception of risk is often the result of the perpetuation of myths. Although there has been some improvement by DOE, more focus is needed on how to better communicate "the basics", i.e., rationale behind proposed action, the nature of radiation, comparison of radiation risks with other risks (e.g., hazardous chemicals), etc.	[The comment on the need for improved communication is noted. A series of fact sheets, displays, exhibits, and a video were prepared in an effort to communicate the issues addressed by the EIS.]
A comment was made that options for dealing with nuclear materials should be debated at the national level through a public consensus process.	[Under the NEPA (Section 5.2.1 of the EIS) and environmental regulations of the DOE (Section 5.2.3 of the EIS), public participation and comments are an important component of the environmental process. Although the final decision concerning management of spent nuclear fuel from foreign research reactors will be made by the Secretary of Energy, public comments on the draft EIS will be considered in reaching the final decision.]
Concern was expressed that U.S. acceptance of foreign research reactor spent nuclear fuel could be just "the foot in the door" and that DOE might eventually bring spent nuclear fuel to Nevada from all over the world--given that Yucca Mountain is the only repository site under study.	[This EIS and proposed policy apply only to foreign research reactors spent nuclear fuel containing uranium enriched in the United States. Another EIS would be required to store other nuclear material in Nevada or at any other DOE management site.]
A comment was made that the draft EIS discusses the possibility of using the Engine Maintenance and Disassembly (EMAD) facility for Phase 2 storage, but EMAD is not suitable without major modifications for spent nuclear fuel storage.	The draft EIS makes it clear that EMAD would not be used in the near-term for spent nuclear fuel storage. It is considered for Phase 2 (longer-range) storage if EMAD upgrades are made.

ISSUES RAISED	DOE RESPONSES
Concern was expressed about the cumulative risks of storing the foreign research reactor spent nuclear fuel in the United States. Commentor stated that even one additional latent cancer fatality is not acceptable and asked how many people in the room would volunteer to be that "one" latent cancer fatality.	[Cumulative impacts at the DOE management sites were found to be low and are discussed in Section 4.2.4.3 of the EIS.]
A comment was made that the United States should not store foreign research reactor spent nuclear fuel in this country or perpetuate its continued existence. Options recommended include: reprocessing, high burn-up of fuel in a reactor, transmutation and reduction of the spent nuclear fuel to its least obtainable quantity, launching of the spent nuclear fuel into the extra-terrestrial environment, and leaving the spent nuclear fuel where it is overseas.	Launching material into space has been discussed in the past but was eliminated from consideration due to consequences from a Challenger-type accident. [All realistic options are addressed in Section 2 of the EIS.]
A comment was made that commentor was not convinced of the rationale for U.S. acceptance as it relates to furthering nuclear weapons nonproliferation objectives. Commentor stated that the potential for proliferation of nuclear materials is uniform across the world and that it is not a question of "who owns it" but of "who does it best." Commentor stated that plutonium or HEU are no more secure here in the United States than overseas.	[It is in the interest of the United States to maintain leadership within the world community in the reduction of global nuclear weapons non-proliferation risk. In this leadership role, the United States has initiated the RERTR program and encouraged other nations to support it. It is important that the United States consistently support a program that has thus far proven successful in helping to prevent the spread of nuclear weapons.]
A comment was made that the draft EIS states that its main objective is to get HEU out of civilian hands; yet in certain countries, such material is already in non-government or para-military hands. Commentor suggested that the United States needs to focus on finding out "who has what," especially in light of government changes in Russia and other countries.	[The United States Government is very interested in "who has what" in regard to HEU and to remove as much of the HEU from international commerce as possible. The main objective of this proposed action is to remove foreign research reactor spent nuclear fuel containing HEU enriched in the United States from international commerce.]
A comment was made that no one has enough information on when the next earthquake, typhoon, ship sinking, or terrorist attack will occur to be able to make a decision on where to store or dispose of nuclear waste. For example, if a ship sinks or an accident happens, who gets sued? Commentor stated that there are a lot of open questions. Commentor stated that DOE needs a comprehensive, decisive approach to consider these things every step of the way and what DOE needs is "ensured utmost quality effectiveness."	[This EIS takes a comprehensive approach to considering the risks associated with the proposed action. Each alternative is analyzed and resultant risks are estimated in order to compare the various proposed alternatives and the No Action alternative. Natural events such as earthquakes and hurricanes were considered (EIS Appendix D, Section D.1.9.6), as were terrorist actions (EIS Appendix D, Section D.5.9), sinking ships (EIS Section 4.2.1). All of these evaluations concluded that the risks would be low.]
A question was asked as to who owns the foreign research reactor spent nuclear fuel.	The spent nuclear fuel contains uranium that was enriched in the United States. When the United States leased the fuel, the United Stated maintained title [ownership]. As the United States built relationships with foreign research reactor countries, it began to sell the fuel [and these] countries then assumed title. If the foreign research reactor spent nuclear fuel is accepted by the United States, the United States would then accept title.

ISSUES RAISED	DOE RESPONSES
A question was asked as to the average life of research reactors and the length of time the fuel rods are in the reactor.	The useful life of a reactor [extends from] 20 to 40 years, depending on the type of reactor and its purpose. The length of time that fuel stays in the reactor depends on the reactor type. It varies from 45 days to 40 years.
A question was asked as to when the proposed policy would start.	If DOE decides to adopt a policy, the policy would begin following issuance of the Record of Decision.
A question was asked on plans for ultimate disposition of the foreign research reactor spent nuclear fuel if it comes into the United States.	The EIS evaluates management of the spent nuclear fuel for up to 40 years, by which time it is expected that a decision would be made to dispose of the fuel in a geologic repository. [Disposal of the foreign research reactor spent nuclear fuel in a geologic repository is discussed in the EIS, Section 4.2.7.]
A question was asked if the United States is still sending HEU fuel to foreign research reactors.	As directed under the Energy Policy Act [of 1992], the United States can no longer send HEU to any research reactor except under special circumstances (i.e., reactor unable to convert). There are three reactors in Europe which would still be eligible to receive HEU under the special conditions, but the United States has not sent HEU overseas since the passage of the Energy Policy Act.
A question was asked as to the duration of the proposed policy.	The duration of the proposed policy is specified in Sections 2.2.1.1 and 2.2.2.2 of the EIS.
A question was asked as to whether U.S. storage sites are adequately secured against theft or terrorism, given the recent bombing incident [at Oklahoma].	All DOE management sites have security measures to prevent unlawful entry and sabotage. The nature of spent nuclear fuel and [the weight of transportation] casks preclude ease of theft. The bigger concern is diversion of spent nuclear fuel material in other countries.
A question was asked as to the cost for implementing the proposed policy.	Cost information for the range of alternatives is contained in the draft EIS [Section 4.8].
A question was asked as to whether international organizations have positions on this proposed policy.	The IAEA [International Atomic Energy Agency] wrote to DOE asking for renewal of the Off-Site Fuels Policy.
A question was asked as to whether private entities in Europe expressed interest in taking the spent nuclear fuel.	The (United Kingdom) Atomic Energy Authority [UKAEA] and Cogema (France) have indicated [that they have the] capabilities to reprocess the [spent nuclear] fuel at their facilities in Dounreay [United Kingdom] and Marcoule [France], respectively. [The UKAEA has expressed an interest in reprocessing some of the spent nuclear fuel. No entity has expressed interest in taking the foreign research reactor spent nuclear fuel for storage.]

ISSUES RAISED	DOE RESPONSES
A question was asked as to who will make the final decision on the proposed policy and its alternatives.	The decision, which will be documented in a Record of Decision, will be made by the Secretary of Energy.
A question was asked as to whether overseas reprocessing would decrease the amount of spent nuclear fuel coming to the United States.	Yes, although some countries do not have the capability to store the high-level waste products resulting from reprocessing. [Under Management Alternative 2, high level waste from overseas reprocessing might be accepted in the United States.]
A question was asked as to how many fuel elements would come from Europe if the fuel is brought to the United States.	[The total amount of spent nuclear fuel from 16 countries in Europe would be 12,291 elements (9.4 MTHM [metric tons of heavy metal]) under the basic implementation.]
A question was asked as to which country has the largest amount of foreign research reactor spent nuclear fuel.	Canada has the largest amount of foreign research reactor spent nuclear fuel.
A question was asked as to who is the carrier for ocean transport.	[There has been no decision that any of the foreign research reactor spent nuclear fuel will be moved. Hence, no ocean carriers have been selected.]

List of Attendees at Las Vegas, NV Public Hearing

Barrows, Jim

Doerr, Ted

Gertz, Carl P.

Grassmeier, Katie

Hurley, Bruce

Lechel, Dave

MacDonald, Kenneth A.

McGowan, Tom

McSpadden, W.R.

McSpadden, Carolyn

Morgan, Darwin

Poles, James

Sims, Stanley H.

Standish, Paul

The public hearing in the Hampton Roads area, a candidate port of entry, was held at Old Dominion University, located in Norfolk, Virginia, on May 15, 1995. The hearing was attended by 14 people. The hearing was interactive in nature and the following is a summary of the comments and issues that were raised. Information in brackets [ ] was not provided at the hearing.

ISSUES RAISED	DOE RESPONSES
Clarification of the choices for spent nuclear fuel separation technology was requested.	There are two choices in separation technology. One is chemical separation in existing facilities at either the Savannah River Site or the Idaho National Engineering Laboratory. The Savannah River Site is currently operating on a limited basis. The other choice is to develop processing technologies that are an improvement over the current methods and use these to process the foreign research reactor spent nuclear fuel. One new process under development is about a year from test runs.
Clarification was requested on whether isotope separation technology was available in the United States.	Isotope separation technology already exists and is the technology by which the DOE enriches uranium for fuel. The United States began this process in 1942 for use in bombs.
Information about the costs and sources of money for the foreign research reactor spent nuclear fuel program was requested.	The assumptions for the cost analyses are described in the EIS [Section 4.8]. The options range from the United States paying all costs to the [research reactor] operators paying to return this material. The nominal approach is for the United States to pay the full costs of transporting and managing the spent nuclear fuel from developing countries and to charge developed countries a competitive fee. Numerous cost scenarios range from one billion dollars if the United States pays all costs, to nothing if the foreign research reactor operators pay these costs.
Clarification was requested about storage requirements and how the United States will pay the program costs in these times of budget/deficit reduction.	Regarding storage, DOE estimates that if all the foreign research reactor spent nuclear fuel were brought back to the United States under this program, adequate storage space would occupy about four acres of land. The question of who will pay is a valid one and has not yet been decided by DOE.
A question was asked as to whether any foreign research reactor spent nuclear fuel comes from countries that have not signed the Treaty on Non-Proliferation, such as Israel.	Yes. Israel is on the list of countries from which foreign research reactor spent nuclear fuel will be accepted. It is advantageous to include Israel [in the proposed policy] because of the United States' intent to recover nuclear weapons grade materials, such as HEU. DOE is working with the Department of State's Non-Proliferation Office on this EIS and this issue. [The only other nation involved in this proposed action that has not signed the Treaty is Pakistan.]
A question was asked if any foreign research reactor spent nuclear fuel destined for West Coast ports will go through the Panama Canal.	[Possible] transport through the Panama Canal will depend on arrangements made for each shipment. Most shipments are expected to come on regularly scheduled container ships which usually do not go through the Panama Canal. [There are no known regulatory prohibitions to using the Panama Canal for shipping spent nuclear fuel from foreign research reactors.]

ISSUES RAISED	DOE RESPONSES
A question was asked as to which method of ground transportation has the highest risks--train or truck.	Risk in either mode is so low that, from a risk standpoint, there is no practical reason to distinguish between the two. Rail transport to a site generally takes place at a further distance from the public than trucks, which travel on the public highways and make stops at truck stops where people are located. [Impacts of ground transportation are presented in Section 4.2.3 and Appendix E of the EIS.]
A question was asked as to the criteria for port selection.	Appendix D, Section D.1.9 of the EIS provides detail on the criteria for port selection. DOE began with 153 potential commercial ports and considered routine handling experience, equipment availability, ready ocean access, transportation from port, population at the ports, and populations along transportation routes from the port to the [management] site.
A question was asked as to whether uranium is enriched in other countries.	Yes. Both Russia and China enrich uranium for their own use and for sale to client states. These countries are not included in this EIS because the scope is limited to United States-enriched HEU. The United States is trying to convince both Russia and China to establish programs like the Reduced Enrichment for Research and Test Reactors (RERTR), which is a program aimed at promoting the conversion of foreign research reactors from HEU fuel to LEU fuel and thereby further eliminate HEU from civilian commerce. [Eleven countries are known to have at least some enrichment capabilities.]
Justification was requested as to why it matters who enriched the uranium if the program goal is to reduce proliferation.	[It doesn't. However, it would be impractical to try to address all non-proliferation issues in one EIS. The established scope of this EIS is focused on U.S. origin enriched uranium.]
A request was made for information on the amount of uranium enriched in other countries in comparison with the United States.	[The United States provides approximately 40% of worldwide enrichment demand.]
A question was asked as to how many spent nuclear fuel rods are in a cask.	There could be 30 to 33 elements [in an average cask].
A question was asked if generally there is one spent nuclear fuel cask per International Standards Organization (ISO) container.	Yes. There would generally only be one cask per ISO container.
A question was asked as to how many casks are on one shipping vessel.	The number of casks could range from one to eight.
Clarification was requested on how many casks would stay at the port if eight casks were to come into Norfolk.	The intent is that [all] the [spent nuclear] fuel would be removed as soon as feasible, and 24 hours is the limit used in the EIS analysis. DOE's experience is that the shipment could be quickly moved out from the ports.

ISSUES RAISED	DOE RESPONSES
A question was asked as to whether eight casks could be in a port at one time.	DOE would restrict loads to [no more than] eight casks per shipment. In addition, there are a limited number of casks available for [research reactor spent fuel] shipments, and that will also control the number of casks per shipment.
A question was raised as to whether empty casks pose hazards.	Empty casks do not pose hazards. They are checked for radiation and purged at the DOE management site.
Clarification was requested as to whether there were other program goals, such as the United States purchasing wastes from Russia.	Purchasing waste is not part of the program. There is a DOE program, however, that involves the purchase of HEU from dismantled Russian warheads because of concern about Russia's ability to safely store HEU.
A question was raised as to whether Greenpeace might resist the foreign research reactor spent nuclear fuel activities.	Although in the past Greenpeace has strenuously resisted nuclear transport and activities, DOE believes that Greenpeace understands the importance of nuclear weapons nonproliferation and promotes actions that reduce proliferation risks. [See the written comment from Greenpeace for information on the Greenpeace position (comment number 1137, Section 2 of this volume).]
A question was asked about what sites and options are available if the program is "enacted offshore."	Most countries are as sensitive as the United States to storing spent nuclear fuel from other countries. A single storage site does not exist to handle this material from many countries. If DOE decides to store the spent nuclear fuel overseas, it would probably do so at the reactor site where it is produced. This would be expensive due to the number of sites involved. The EIS evaluates this option and explains that it is unmanageable. [See Management Alternative 2, subalternative 1a, Section 4.4.1 of the EIS.] There are two possible sites in Western Europe that could reprocess [this type of spent nuclear fuel]--[Dounreay] in the United Kingdom and Marcoule in France. France's facility in Marcoule currently does not accept spent nuclear fuel from other nations for reprocessing. The United Kingdom is willing to accept spent nuclear fuel from other countries, but is limited, as is Marcoule, to accepting HEU fuels for reprocessing. They also require the reactor operator to take back the wastes from reprocessing and permit the separated uranium to be HEU or LEU--whichever the customer requests.
Questions were asked about France's position on the DOE options, France's promotion of breeder reactors to other countries, and whether the United States could obtain the spent nuclear fuel from other breeder reactors in other countries.	This issue is out of the scope of the EIS. However, while France has sent research reactors to other countries, it has not promoted breeder reactors in other countries.

ISSUES RAISED	DOE RESPONSES
A comment was made pointing out risks from terrorist activities. Commentor observed that, in 1968, DuPont developed "red mercury," and current literature suggests that this could be used in the ultimate bomb by terrorists. Commentor asked what contingencies exist to protect against terrorists and, if red mercury is like a tiny neutron bomb, what will happen if it is used by terrorists.	The [foreign research reactor spent nuclear fuel] shipments will be guarded. However, the real protection is in the nature of the material itself and the container in which it is housed. [Transportation casks used for international shipment of foreign research reactor spent nuclear fuel weigh between 10 and 25.5 tons] A typical cask [used for inter-DOE site rail shipments] weighs between 100 and 120 tons; both are very robust. An explosion near the [smaller] container would probably knock it over and destroy everything around it, but the spent nuclear fuel elements would be expected to remain intact. [Section 2.8 and Appendix D, Section D.5.9 of the EIS discuss terrorism and sabotage.] ["Red mercury" is outside the scope of this EIS.]
A question was asked as to what might be the main problem for this spent nuclear fuel program.	There are two major problem areas: costs and convincing the public that managing the spent nuclear fuel is an appropriate option.
A question was asked as to whether or not DOE expected public resistance to the program.	[If you mean physical resistance, the answer is "No."] There were no major road blocks to the Urgent-Relief shipment of spent fuel from four countries which took place in late 1994. Although there were high public tensions in some communities, it should be noted that nothing adverse happened during the shipment.
A request was made for DOE to review an article that proposed use of an incinerator to dispose of radioactive waste.	Incineration, a treatment technology using combustion at high temperatures to burn materials to destroy hazardous waste, is a chemical reaction. The character of atoms in the nucleus of radioactive material remains unchanged by fire [or high temperatures. Therefore, incineration is not an option for disposing of radioactive waste, although it is used to reduce the volume of certain radioactive wastes.]
A comment was made that the United States is looking at future problems if it does not encourage further nuclear technology development. Commentor stated hope that fission technology will break through political powers and provide links to countries like North Korea and Iran.	[The commentor's concerns and aspirations are noted.]

List of Attendees at Norfolk, VA Public Hearing

Anderson, Kim

Bowers, Kenneth Wendell

Budiyte, Dovile

Day, Kimberly S.

Edlow, Jack"

Graybeal, Priscilla G.

Harrill, Bill

Jimencz, Rene

Joy, Ted

Legg, Paul

Ravenscroft, Norman

Schmid, Chris

Specht, Elaine

Urbelis, Marivs

The public hearing was held on June 16, 1995 at Pollard Auditorium in Oak Ridge, Tennessee, for the candidate DOE Management site at Oak Ridge. Fifteen people attended the hearing. The format of the hearing was interactive in nature. Below is a summary of the comments and issues that were raised. Information in brackets [ ] was not provided at the hearing.

ISSUES RAISED	DOE RESPONSES
A comment was made that there appear to be two separate issues DOE is addressing: (1) What to do with spent nuclear fuel whether it is highly enriched or not; and (2) whether the United States will allow the continued use of HEU in research reactors. Commentor requested elaboration.	The proposed policy addresses two primary goals of the United States. One is to obtain control of all U.S.-origin HEU. The other is to create an environment whereby foreign research reactors will continue with an LEU fuel cycle. This latter goal is why the proposed policy includes U.S. management of LEU. Without creating an incentive for conversion to an LEU fuel cycle (i.e., U.S. acceptance of their spent nuclear fuel, whether HEU or LEU), foreign research reactors are likely to send their fuel to reprocessing facilities in the United Kingdom or France and receive back HEU for their fuel. [Regarding the issue of what to do with spent nuclear fuel, the proposed management alternatives include options for managing materials containing both LEU and HEU, as discussed in Sections 2.2 through 2.4 of the EIS. As to whether the United States will allow continued use of HEU in research reactors: the United States has not sold HEU for 3 years and is only allowed by U.S. law to provide HEU to reactors that are unable to convert to LEU at present. The proposed policy is intended to encourage conversion to LEU and ultimately eliminate the use of HEU in worldwide commerce.]

ISSUES RAISED	DOE RESPONSES
A question was asked concerning the relationship of this draft EIS to the "Urgent-Relief" Environmental Assessment, against which the State of South Carolina filed suit. Commentor asked about the status of that lawsuit.	As DOE started planning for the EIS, some foreign research reactor operators indicated critical situations in which their reactors would have to be shut down in the very near-term unless they received "urgent relief." The "Urgent-Relief" Environmental Assessment was prepared to address the need for urgent-relief shipments to the United States of [up to] 409 fuel elements [to ensure that the reactor operator continue to cooperate with U.S. nuclear weapons non-proliferation programs until the EIS could be completed and a Record of Decision issued]. A Finding of No Significant Impact was issued on the Environmental Assessment in April 1994, and the first shipment took place in August 1994 (144 elements from 4 countries). While the first shipment was at sea, the State of South Carolina filed suit. The primary concern was the separation of the urgent-relief shipments from the EIS. The Court allowed DOE to accept the first shipment into the Savannah River Site, but the second shipment was halted, and no shipments into the United States from foreign research reactors have occurred since. The lawsuit is still pending. DOE recently argued its case before the Court, stating its position that the Environmental Assessment was sufficient for the urgent-relief shipments, and that DOE wants the remaining elements to be shipped to Savannah River Site. [On August 23, a Federal appeals court overruled the District Court's order blocking the shipment of fuel. This opens the way for shipment of the remaining Urgent-Relief fuel.]
Elaboration was requested on the attitudes of foreign research reactors and their governments with respect to the proposed policy.	As expressed in comments at other public hearings by the Edlow Group, which represents 14 foreign research reactor operators, they believe that the United States is legally obligated, from past agreements and commitments, to accept the spent fuel containing U.S. origin enriched uranium. DOE disagrees that is it legally obligated and considers it has the right to choose the "No-Action" Alternative in the EIS. Foreign research reactor representatives have stated that if the United States takes no action to relieve them of their spent nuclear fuel, many of them would likely send their spent nuclear fuel to reprocessing facilities and convert back to HEU, [which is] more efficient and less costly. The State Department and DOE consider it important to get our allies on an LEU fuel cycle to help in our negotiations with Russia and China (the other major providers of enriched uranium) to do the same.
A question was asked as to whether the United States owns the foreign research reactor fuel and whether that is why some believe the United States has a legal responsibility to take it back.	Early on, the United States leased fuel to foreign research reactors and thus maintained title. As operation of the foreign research reactors matured, the United States began selling the enriched uranium fuel and, thus, gave up ownership. The proposed policy applies to enriched uranium of U.S. origin--whether or not the fuel is owned by the United States. If the spent nuclear fuel is accepted into the United States, the United States would assume ownership.

ISSUES RAISED	DOE RESPONSES
A question was asked concerning the basis for giving foreign research reactor spent nuclear fuel priority over U.S. commercial fuel--given that commercial U.S. utilities have paid over $6 billion into the Nuclear Waste Fund and that the Nuclear Waste Policy Amendments Act of 1987 calls for DOE acceptance of commercial spent nuclear fuel by 1998 (for interim storage in a Monitored Retrievable Storage Facility). Commentor stated that DOE appears to be sending a message that commercial spent nuclear fuel is low on the priority list and that this is not a good message to send.	[The foreign research reactor spent nuclear fuel that might be accepted by DOE under the proposed action would comprise only about 1% of the spent nuclear fuel (measured in MTHM - metric tons of heavy metal) that is already being managed by DOE. It would be less than about 0.05% of the commercial spent fuel currently being stored in the United States. Thus, there is a vast difference in the resources that would be needed to manage the two spent nuclear fuel types. Furthermore, due to the significant differences in the size and characteristics of the two different types of spent nuclear fuel (EIS Section 2.6.1), the facilities that would be used for management of the foreign research reactor spent nuclear fuel could not be used for commercial power reactor spent nuclear fuel. At the same time, due to the weapons-grade uranium content of much of the foreign research reactor spent nuclear fuel, there is a pressing need for action by DOE to manage it (EIS Sections 1.1 and 1.2). The proposed action by DOE to manage the foreign research reactor spent nuclear fuel now is not a case of giving this spent nuclear fuel priority over the commercial power reactor spent nuclear fuel. DOE is simply proposing to deal with this separate issue now because it is feasible to do so, and necessary to do so. DOE will separately continue to work toward a solution to the commercial power reactor spent nuclear fuel disposal issue as rapidly as possible.]
A comment was made that in the past, the United States adopted a policy to bring back U.S.-origin HEU foreign research reactor spent nuclear fuel for reprocessing. U.S. reprocessing has since ceased. Now the United States appears to be trying to convince people that it is better to bring in the foreign research reactor spent nuclear fuel and sequester it for storage. Commentor asked whether U.S. storage is the preferred option by the State Department and DOE.	[There was no preferred alternative in the draft EIS. Section 2.9 of the final EIS for the preferred alternative.]
A comment was made that, in the past, it was hard to convince environmental groups that United States acceptance of foreign research reactor spent nuclear fuel was a preferable option. Commentor asked what was their position now?	Environmental groups such as Greenpeace and NRDC [National Resources Defense Council] have consistently opposed reprocessing, whether overseas or in the United States. NRDC has indicated its general support for United States acceptance of U.S.-origin HEU foreign research reactor spent fuel as long as it is not going to be reprocessed.
A question was asked as to the time-frame covered in the EIS.	The EIS covers a policy duration of 10 years for acceptance in the United States or management overseas of the foreign research reactor spent nuclear fuel, with an additional 3-year window to allow for completion of shipments. The EIS assumes interim management of the [spent nuclear] fuel, if brought into the United States, for a 40-year period, at which time it is assumed that a geologic repository will be available.

ISSUES RAISED	DOE RESPONSES
A comment was made that the EIS should address the implications of not having a permanent repository available for disposal of foreign research reactor spent nuclear fuel within 40 years, which is likely to happen if Yucca Mountain is found to be unsuitable. Commentor stated that communities around interim storage sites should be informed of the potential for longer-term storage beyond 40 years.	[Due to the speculative nature of spent nuclear fuel ultimate disposition, this subject is out of the scope of this EIS.]
A comment was made that the draft EIS shows higher risks (primarily to workers) from reprocessing than for storage of spent nuclear fuel. However, the risk analysis does not show the true risks of not reprocessing. Those risks could be higher because some highly enriched uranium fuel may not be suitable for geologic disposal without further action on the waste form due to criticality concerns. Commentor further stated that performance assessments by Sandia National Laboratories indicate that some fuel would not be acceptable for geologic disposal without some form of reprocessing.	Waste acceptance criteria are not yet available for the [geologic] repository. Some intact HEU may not be acceptable in a repository without some change in the nature of the spent nuclear fuel. However, this does not necessarily mean reprocessing is the only option. Because waste acceptance criteria are not currently available, ultimate disposal of the foreign research reactor spent nuclear fuel in a geologic repository is only qualitatively addressed in the draft EIS (Chapter 4). With regard to reprocessing, the draft EIS states that reprocessing is not a preferred technology. In the Interim Management of Nuclear Materials draft EIS, issued in March 1995, DOE addresses the alternative of reprocessing for only DOE-owned fuel that may present a health and safety concern.
A comment was made that the draft EIS risk estimates (exposures to radiation) are based on the maximum possible activity (conservative estimates) rather than what is more likely to occur. Commentor requested that the EIS include more discussion emphasizing the conservatism of the analyses or use more realistic assumptions. Commentor stated that this is important to public understanding, particularly with respect to risks of spent nuclear fuel transportation, which is of most concern to the public. Commentor suggested that DOE could use the next best approximation of dose estimates, showing a range of estimates to account for burnup of the fuel.	[The evaluation of incident-free doses for marine and port activities were calculated using both the regulatory limit and the "historic" dose rates. See Appendices C and D of the EIS for the results. Ground transportation doses were calculated only at the regulatory limits, but the "historic" doses would be approximately 10% of the regulatory limit doses. The risks can be scaled the same way. As discussed in Section 4 and Appendices B through E of the EIS, risks associated with handling and transporting spent nuclear fuel from foreign research reactors would be low. Foreign research reactor spent nuclear fuel has been transported to management sites in the United States for over three decades without radiological incident]
A comment was made that the Nuclear Waste Policy Amendments Act (NWPAA) of 1987 prohibits development of a Monitored Retrievable Storage (MRS) Facility in Nevada. If foreign research reactor spent nuclear fuel were stored at the Nevada Test Site, couldn't that be considered an MRS and contrary to NWPAA?	The NWPAA [prohibition in Nevada] applies only to [development of an MRS for U.S.] commercial spent nuclear fuel.
A comment was made that DOE may not have as many interim storage alternatives as it thinks if the States choose to fight alternative selection in the courts (i.e., Idaho).	[The comment is noted.]

ISSUES RAISED	DOE RESPONSES
Elaboration was requested on spent nuclear fuel storage facilities at the Savannah River Site.	The Savannah River Site would accept aluminum-clad fuel, consistent with the May 30, 1995 Record of Decision on the Programmic EIS [Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement]. In the near-term, spent nuclear fuel would be received for wet storage at the Receiving Basin for Off-Site Fuels (RBOF), which currently stores foreign research reactor spent nuclear fuel. When RBOF reaches capacity, foreign research reactor spent nuclear fuel would be received at the L-Reactor Disassembly Basin. During the 13-year period of shipments, it is anticipated that L-Reactor Disassembly Basin will also reach capacity, and new storage capacity will be needed at Savannah River Site. The draft EIS assumes under the basic implementation of [Management] Alternative 1 that new facilities will be for dry storage. Wet storage of aluminum-clad spent nuclear fuel is a disadvantage because of the corrosion potential. RBOF and L-Reactor Disassembly Basin are sufficient for near-term storage, but dry storage is assumed for longer-term storage.
A comment was made that DOE should consider financial benefits for localities for accepting foreign research reactor spent nuclear fuel under this policy. Such benefits have been considered for other DOE programs. Commentor suggested that the cost analyses in the EIS should address such payments.	[No "payments" are planned to localities for accepting foreign research reactor spent nuclear fuel, due to the minimal impacts such an action would entail and the subsequential nuclear weapons nonproliferation benefits that would result.]
A comment was made that Appendix F, concerning potential impacts to Oak Ridge, states that the use of Bear Creek for wet storage of the foreign research reactor spent nuclear fuel is consistent with land use plans. Commentor pointed out that it is unclear whose land use plans are being addressed and asked for further elaboration.	[DOE's plans are referenced in Appendix F of the EIS (MMES, 1994).]
A question was asked as to what is going to happen with the current spent nuclear fuel stored at the Savannah River Site.	The Interim Management of Nuclear Materials EIS [issued in March 1995] addresses the alternatives for managing the Savannah River Site spent nuclear fuel.
A comment was made urging DOE to extend the comment period to demonstrate a genuine interest in receiving public comments in a meaningful way. Commentor stated that the sincerity of DOE is tied to how long it gives the public time to comment.	[The public comment period was extended from 60 days to 90 days, ending on July 20, 1995.]

ISSUES RAISED	DOE RESPONSES
A comment was made that DOE would get more people at its hearings if the hearings were not held on Friday nights.	[Comment is noted.]
An interest was expressed concerning attendance at hearings at other sites.	DOE identified the number of attendees at the various public hearings. [The number of attendees at all public hearings is included in Volume III of the Final EIS.]
A question was asked as to the means of advertising the public hearings other than newspaper advertisements.	Advertisements in the form of announcements on the radio and on cable-access channels were used in addition to the Federal Register announcements.
A comment was made that if DOE is genuinely interested in receiving participation in hearings and obtaining comments from local governments, these entities should have received formal requests, with sufficient advance notice, so that they have time to respond. The Mayor of Oak Ridge did not receive advance notice, according to commentor.	[Comment is noted, and the Mayor of Oak Ridge has been added to DOE's mailing list for future notifications. DOE complied with NEPA and other applicable laws and regulations in advertising for the public hearings. Specifically, advertising included sending public service announcements to local radio stations and to local cable access television, and placing advertisements in major newspapers in each of the hearing locations. Newspaper advertisements were published one week before each hearing and again one day before each hearing. Also, in accordance with NEPA, announcements of the hearings were published in the Federal Register.]

List of Attendees at Oak Ridge, TN Public Hearing

Anderson, Lois

Anderson, Joyce

Brown, Doyle R.

Burch, William D.

Fitzgerald, Dr. Michael R.

Fitzgerald, Amy

Forsberg, Charles

Joy, Ted

Munger, Frank

Nephew, Edward A.

Peelle, Robert

Perry, Walter

Sitzlar, Charles

Turner, Douglas W.

Weinberg, A.

The public hearing at Portland, Oregon, a candidate port of entry, was held at the Portland Marriott on May 25, 1995. About 85 people, 61 of whom registered, attended the hearing. The hearing attendees requested a format in which they presented public statements with little or no dialogue between attendees and the DOE. Therefore, most DOE responses were not given at the hearing, but are provided in brackets [ ]. The following is a summary of the comments and issues that were raised.

ISSUES RAISED	DOE RESPONSES
Objections were made to the question and answer hearing format and to the lack of a recording system. Commentors objected to notetakers summarizing key issues as opposed to recording the hearing verbatim. Specific comments supporting the objection included: - DOE failed to meet DOE regulations and the National Environmental Policy Act (NEPA) regulations. - It is not clear that NEPA would permit this format. DOE may be asking us to take part in an illegal hearing. - Without a recorded hearing, people cannot have a statement considered for the record or monitor the administrative record for accuracy in reflecting issues and responses. - Commentors wish to read their name and comments in the final EIS. - DOE cannot be trusted to correctly report the testimony. - Notetakers and the hearing facilitator are DOE contractors and may not be objective. - Page 49 of the draft EIS Summary refers to the hearings as hearings. - Recorded public testimony protects DOE and the public in case of an adjudicatory process. - The onus should not be on the people attending the hearing to write down their comments and use their stamps. - DOE was un-democratic in not including the public in the decision not to record the hearing.	This hearing format is acceptable according to the National Environmental Policy Act (NEPA), and DOE plans to use the format for all 17 public hearings. [At the majority of hearings the format was well received. The method of recording comments was determined by DOE General Counsel to be in compliance with DOE requirements and the Council on Environmental Quality (CEQ) regulations implementing NEPA. During the hearings, an independent, professional facilitator recorded the major comment themes on flip charts that the audience could see. Notetakers in the audience provided additional information to supplement the points captured by the facilitator. DOE also encouraged the submittal of written comments on forms available during the public hearings or in any other written form.] [The names of those individuals who registered for the hearing are listed in Volume 3. DOE's responses to the issues raised at the hearing are included in Chapter 3 of Volume 3.] [DOE responded to the issues presented in general. Notetakers often used specific phrases of the commentors, but an individuals comments may be included in several of the issues raised.]
A question was asked as to the position within the DOE of Mr. Charles Head, the DOE hearing official.	Mr. Head is the Project Manager for the EIS.
A question was asked as to whether the law requires maintenance of an audio record of the hearing and whether DOE was obligated to have another hearing if the hearing format is illegal.	[An audio record of the public hearing is not required. The format adopted by DOE for the public hearings complies fully with the requirements of NEPA implementing regulations and DOE requirements.]

ISSUES RAISED	DOE RESPONSES
Comments were made about errors in comment response documents. A commentor stated that he was misquoted in DOE's Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement (SNF & INEL EIS) comment/response system and wants to see a correction. A question was asked as to the process of correcting mistakes made in the comment response document. The commentor stated that a written statement of the correction should be mailed to the commentor.	[The DOE Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement has been completed and was issued in final form in April 1995. DOE regrets if the commentor's position was misinterpreted.]
A question was asked as to what can be done about errors in the draft EIS.	DOE addresses errors in the final EIS.
Comments were made that DOE had done a poor job notifying the public of the hearing. Specific comments include the following: - The ad was not placed in a prominent position in the newspaper. - The ads were designed not to get public involvement. - There was insufficient local media coverage. The public in Spokane and Vancouver may not have seen or heard notice of the hearings. - In order to have a reasonable understanding of the concerns of the people of Portland, 75% of them need to be aware of the hearing. - If it were not for Heart of America, citizens would not have known about this hearing. - Individuals on DOE mailing lists did not receive any of the documents.	DOE used standard processes for disseminating the information including radio announcements and newspaper notices. DOE also requested that the ad be placed within the first 10 pages. [Newspaper notice was requested to be published both one week and one day before each hearing. This schedule was modified to fit some local newspaper publication schedules. The hearing was also announced in a Federal Register Notice and public service announcements were sent to local cable access television stations.]
A comment was made that information on the hearing was available through local radio and the newspaper. The commentor noted that KINK radio did a good job in advertising this hearing and the *Oregonian* placed the hearing notice on the 3rd page.	[The comment is noted.]
A comment was made that neither the Tacoma library nor the appropriate Portland officials received a copy of the EIS.	[Copies of the draft EIS were sent May 30, 1995 to the Tacoma Public Library, Tacoma Avenue South and the Tacoma Public Library-McCormick Branch, in Tacoma WA. The EIS was also distributed to local planning officials and civic institutions in potentially affected areas, as well as to DOE reading rooms, libraries, and federal, state, Tribal and local governments.]
An objection was raised to holding the hearing for the Port of Tacoma, WA in a location that was 30 miles from either Seattle or Tacoma.	[In order to provide a hearing opportunity within the city of Tacoma, DOE held a public hearing at the Tacoma Public Utilities Building in Tacoma on June 19, 1995 in addition to the May 24, 1995 public hearing near the Seattle/Tacoma International Airport.]
A comment was made in support of a workshop with off-the-record dialogue prior to a public hearing.	[The commentor's suggestion is noted.]
A question was asked as to why the people in Portland could not vote on the issue of accepting spent nuclear fuel in Portland.	This action is conducted under NEPA and not by a referendum process. The public, however, has an opportunity to comment during the comment period.

ISSUES RAISED	DOE RESPONSES
A question was asked as to the names of those in DOE responsible for the policy action. Commentor also asked who suggested bringing the spent nuclear fuel to Portland.	DOE and the Department of State are the responsible agencies. The heads of these agencies are Secretary O'Leary and Secretary Christopher, respectively. The draft EIS analyzed environmental effects of management alternatives and their implementation. The port selection process is outlined in Appendix D of the EIS. Portland was one of 153 potential ports (plus 8 military ports) considered. These ports were evaluated against selection criteria, resulting in 10 ports that met all the criteria.
A comment was made that if DOE does not respond to each question asked, DOE will be responding in the Federal District Court.	[DOE has responded to all issues raised at public hearings.]
A comment was made that the issue of hearing process needs to go to the Governor and City Council. Commentor stated that the City of Seattle will take DOE to court for indefensible process.	[DOE adopted a format that provided opportunity for increased interaction between DOE and the public. This hearing format is acceptable according to NEPA. The method of recording comments was determined by DOE General Counsel to be in compliance with DOE requirements and the Council on Environmental Quality (CEQ) regulations.]
A comment was made that Oregon Congressional Representatives Furse and Wyden submitted their statements for the record through Heart of America Northwest. Commentor said that Oregon Representative Bunn and Senator Packwood also signed a letter opposing this program.	[The commentors' opposition to bringing foreign research reactor spent nuclear fuel into the United States is noted. Sections 4.2.2 and 4.5 of the EIS demonstrate that the risk associated with bringing spent nuclear fuel to the Port of Portland, or to any of the ports analyzed in the EIS, is low.]
Concern was expressed that, according to the draft EIS, developed countries would pay only the shipment costs, not the long-term storage costs. Commentor noted that a disposal site is 20 years behind schedule--"a site that will never open." Commentor noted that DOE charges hundreds of thousands of dollars to deal with waste at Hanford; yet, our allies are not being asked to pay this cost.	[Several financing arrangements are discussed in Sections 2.2.1.2 and 2.2.2.3 of the EIS ranging from charging all countries full cost recovery fee to manage their spent nuclear fuel to full subsidization of all countries by the United States.]
A question was asked whether once HEU is blended to LEU, it could still be used in nuclear weapons and could the uranium be re-enriched.	[LEU is not suitable for use in nuclear weapons. However,] the uranium could be re-enriched, [but it would require high technology equipment.]
A comment was made stating that this policy incorporates less than 4 percent of the highly enriched uranium in the world. Commentor said that this amount of highly enriched uranium could be taken back in less than 10 shipments rather than the 780 proposed in the EIS.	[It is logistically, and technically impossible to bring back approximately 11,250 HEU research reactor spent nuclear fuel elements (which is half of all foreign research reactor spent nuclear fuel considered under Management Alternative 1) in ten shipments of the largest available power reactor spent fuel transportation cask. Examples of limitations include, but not limited to: research reactor facility capability to handel a heavy (125 or more ton) transportation cask, research reactor facility capability to prepare and package the research reactor spent nuclear fuel to emplace it in a larger power reactor spent nuclear fuel transportation cask, cask, and research reactor facility access to rail lines for transporting the transportation cask. Even if all these limitations were somehow resolved, then the HEU spent nuclear fuel elements require between 40 to 100 power reactor transportation cask shipments.]

ISSUES RAISED	DOE RESPONSES
Commentor suggests that the policy is a trade policy related to reactor and uranium sites. Commentor also stated a company in Washington has developed a dry cask storage technology; United States needs to export technology rather than import waste.	[The proposed policy is not a trade policy. The Energy Policy Act of 1992 prohibits the United States from selling HEU to foreign countries, with certain stringent exceptions. However, U.S. nuclear weapons nonproliferation policy is to reduce and ultimately eliminate worldwide commerce in HEU. Failure to accept the foreign research reactor spent nuclear fuel would undermine U.S. credibility needed for successful efforts to convert foreign research reactors to LEU, as discussed in Section 1.2 of the EIS. In regard to the purchase of LEU by foreign research reactor operations, several sources of supply are available worldwide.] [The EIS provides a discussion of applicable storage technologies, including dry cask storage (Section 2.6.5). If Management Alternative 2 is selected, there may be overseas opportunities for commercially-developed storage technologies.]
Comments were made questioning why the United States needs to accept spent nuclear fuel from countries that are not a proliferation risk. Commentor stated that only 3 casks--2 from Pakistan, and 1 from Iran--are from proliferating risk countries.	[Of the 41 countries that would be covered under the proposed policy, the majority do not pose a direct proliferation risk. However, many of these countries that have converted to LEU may switch back to HEU to fuel their research reactors if the United States does not accept their spent nuclear fuel. These countries could indeed buy HEU -- Russia and China have both supplied HEU in the past. The suggestion that spent nuclear fuel should be accepted only from nations that are proliferation risks also leads to the problem of identifying these countries. As discussed in Section 2.8 of the EIS, public identification of a nation as a proliferation risk would have adverse diplomatic and political consequences, and would likely insure that nations so labeled would refuse to cooperate further with the United States.]
Comments were made in support of Management Alternative 2, to provide assistance to those countries that can store this material. Commentors suggested that waste stay at generating sites.	[The commentors' preference for overseas management of the foreign research reactor spent nuclear fuel is noted. The EIS has evaluated Management Alternative 2, overseas management, in Section 4.4 of the EIS. However, many reactors in nations which are closely allied with the United States cannot, at this time, dispose of their spent nuclear fuel in their own country (Sections 1.1 and 1.2 of the EIS). The outcome of such an approach would be a concentration of weapons-grade material stockpiled in locations not directly subject to control by the United States. The intent of the proposed policy is to provide foreign research reactor operators with a limited period of time to develop arrangements for disposition of their spent nuclear fuel, and to convert to LEU fuel (Section 1.2 of the EIS).]

ISSUES RAISED

A comment was made stating that Greenpeace and the Nuclear Free Port Zone support the "No Action" alternative. Specific comments were as follows:

- Greenpeace will not engage in any dialogue with DOE until transportation and production ceases.
- DOE has yet to decide on final disposition, and the United States will be trying to manage spent nuclear fuel rods over 40 years.
- Facilities must be responsible for their own wastes.
- Greenpeace finds reprocessing is unacceptable and the Tomsk 7 accident in 1992 is an example of reprocessing plant problems.
- The byproduct of transuranic waste must be vitrified but the vitrification facility is not functioning as designed.

Additional comments opposing the proposed action included the following:

- People moved to Oregon for the pristine environment.
- Oregon Peaceworkers do not want any waste passing through the State from any West Coast port.
- The EIS proposal was "concocted fully" by the Defense Department.
- Humans should not be expendable in favor of economic benefit.
- The DOE lied about the Three Mile Island Accident. There is contamination from Hanford and Chernobyl.
- DOE is trying to put a happy face on the issue of radioactive material storage.
- There are no "Atoms for Peace."
- We do not trust the action of DOE.
- The Mescalero Apache were bribed to accept a MRS site.
- The spent nuclear fuel should be left where it is. (Commentor referred to disturbing facts stated in Marvin Resnikoff's "Next Nuclear Gamble.")
- If DOE wants the spent nuclear fuel, they can have it in their back yard.

DOE RESPONSES

[The commentors' preference for the No Action Alternative, which is described in Section 2.5 of the EIS, is noted. DOE addresses the potential detrimental impacts of No Action in Sections 1 and 4.6 of the EIS.]

[Although ultimate disposition of foreign research reactor spent nuclear fuel is outside the scope of this EIS, it is discussed qualitatively in Section 4.2.7 of the EIS.]

[Due to financial or regulatory constraints, not all foreign research reactor operators may be able to store spent nuclear fuel at their facilities. The intent of the proposed policy is to provide foreign research reactor operators with a limited period of time to develop arrangements for disposition of their spent nuclear fuel and to convert to use of LEU fuel (Section 1.2 of the EIS).]

[The advantages and disadvantages of domestic chemical separation are discussed in Sections 2.2.2.6 and 4.3.6 of the EIS. It is included in the EIS as a reasonable alternative.]

[Disposal of transuranic waste is not related to this proposed action.]

[The commentors' opposition to the proposed action is noted. Based on the evaluation of impacts presented in Section 4 of the EIS, however, the risk to the Portland environment associated with the shipments of foreign research reactor spent nuclear fuel is low. No significant impact to land, water, or air quality is anticipated in any of the ports or any of the waterways used in the transport of foreign research reactor spent nuclear fuel.]

[The intended purpose of the proposed action is to aid in safeguarding the citizens of the United States against the threats of proliferation of nuclear weapons (Section 1.1 and 1.2 of the EIS). The Department of Defense has not been and will not be involved in this proposed action, other than through voicing its support for the necessity of action by the United States, and possibly through use of one or more of its ports as ports of entry for the spent nuclear fuel, if any is accepted into the United States. The financial implications of the proposed action are discussed in Section 4.8 of the EIS. The human health and safety considerations associated with the proposed action are also fully addressed in the EIS (Section 4).

[The statements comparing spent nuclear fuel shipments to Chernobyl are inappropriate. The Chernobyl reactor accident was far worse than any possible accident involving a shipment of spent nuclear fuel. The health risks due to accidents are discussed in Section 4.2 of the EIS.]

ISSUES RAISED	DOE RESPONSES
A comment was made that we need to find a way to store the spent nuclear fuel even if nuclear technology is not supported. Commentor did not support shipping from country to country but supported educating countries to take responsibility for their own waste and nonproliferation. These countries benefitted from the spent nuclear fuel.	[Many foreign research reactor operators located in nations which are closely allied with the United States cannot, at this time, dispose of their spent nuclear fuel in their own country (Sections 1.1 and 1.2 of the EIS). The intent of the proposed policy is to provide foreign research reactor operators with a limited period of time to develop arrangements for disposition of their spent nuclear fuel and to encourage conversion to LEU fuel (Section 1.2 of the EIS).]
A question was asked as to whether the United States would now agree to also accept other countries' commercial fuel.	[No. The proposed policy does not include U.S. acceptance of commercial fuel. The receipt of spent nuclear fuel from nuclear power reactors is outside the scope of the EIS.]
A comment was made that action on the spent nuclear fuel issue should be held under local control.	[Consistent with its responsibilities under the National Environmental Policy Act, DOE has solicited comments and has encouraged public participation in preparing a final Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. DOE has considered public comments in this process. The selection of the actual port(s) of entry, if foreign research reactor spent nuclear fuel is accepted into the United States, would be made after consultation with the public, State, Tribal and local governments. This decision will be made in the Record of Decision subsequent to completion of the final EIS.]
A comment was made that spent nuclear fuel is not a commercial commodity and should be shipped in "purpose built" ships with lead-lining and lead lids.	[The commentor's preference for "purpose built" ships is noted. The EIS evaluated the use of four types of ships, including purpose-built ships, for use in transporting foreign research reactor spent nuclear fuel (Section 2.6.3.2.1). No significant difference in the incident-free or accident risk were found between any of the types of ships (Sections 4.2.1 and 4.2.2).]
A question was asked as to how long the shipment would be at sea.	It takes 10 to 20 days depending on the ship [where it is coming from, the route, and the port of entry].

ISSUES RAISED	DOE RESPONSES
Several questions were asked about the choice of ports. Specific questions included the following: - Is Portland considered a low-population density port? - Why is the Bremerton port not suitable? - With two military sites available, why are you considering a public dock. - Why not off-load spent nuclear fuel in Port Astoria, transport to barges down Columbia River and off-load to rail or truck?	[Portland is considered a medium-population density port and is therefore acceptable as a port of entry for foreign research reactor spent nuclear fuel. The fact that it is not a low-population density port is balanced by its experience in handling containers and the low population on the route to Idaho National Engineering Laboratory.] [As recommended by the Military Traffic Management Command, a total of eight military ports were evaluated as candidates given their experience with dry containerized cargoes. The facility at Bremerton was not among those evaluated.] [The port selection criteria show that there is no stated preference for military ports. Either military or commercial ports, if they meet the port selection criteria, are equally acceptable.] [There are two instances in which barge transport would be feasible as a substitute for truck or rail transport of foreign research reactor spent nuclear fuel: (1) up the Columbia River to the Hanford Site and (2) up the Savannah River to the Savannah River Site. New analysis on these two possible barge transport routes has been inserted into Appendix E, Section E.8.15 of the EIS. The net result of this analysis is that barge transport would present approximately the same level of risk to workers and the public as would truck or rail transport. This level of risk is very low and the most likely outcome would be zero latent cancer fatalities.]
Concern was expressed about the problems of International Shipping Organization (ISO) containers. Specific comments and questions were: corrosion of container by sea water; opening in the top of each container; possible inadequate repair, improper welding, and metal fatigue of old casks; inadequate testing of casks; does the testing of used casks include X-ray; accidents happening that result in release of radiation; inadequate and infrequent ISO inspection and maintenance; containers falling onto 15-ton hatch covers; and lower ratings against fire on DOE casks than on safes one can purchase at Sears.	Spent nuclear fuel is shipped in [transportation] casks that meet Nuclear Regulatory Commission (NRC) and International Atomic Energy Agency (IAEA) regulations. Casks are required to meet design conditions before certification and are tested according to NRC regulations intended to establish stresses on a cask more severe than is expected to be encountered. An example is the 30-foot drop onto an unyielding surface. Transportation casks shield the surroundings from harmful levels of radioactivity. Casks are leak-tested, visually inspected, and radiologically surveyed prior to use. This process complies with IAEA standards and is observed internationally. [Transportation Casks are radiographed (X-rayed) at the time of manufacture.] Spent nuclear fuel has been transported over United States highway and rail systems for more than 40 years without a release from a cask. [ISO shipping containers are used nationally and internationally to carry a variety of cargos by sea and land. Special reinforced ISO containers are used for spent nuclear fuel transportation casks. If well-maintained, these containers would safely carry a foreign research reactor spent nuclear fuel transportation cask. ISO containers would be inspected for integrity prior to being used to carry a foreign research reactor spent nuclear fuel transportation cask and containers that were damaged in a manner that would prevent them from safely performing their intended function would be replaced.]

ISSUES RAISED	DOE RESPONSES
A question was asked as to whether casks have been tested in earthquake conditions.	[No. Spent nuclear fuel transportation casks are designed and built to withstand significant stress without releasing their contents (Section 2.6.2 of the EIS). While local hazards, such as earthquakes, may be the cause of an accident such as those analyzed in the EIS, they would not increase the consequences of the accident, which were found to be minor for both marine and land transportation accidents (Section 4.2.2.3).]
An explanation was requested as to why a cask is tested on 30-foot drops and whether a cask has been tested with a 100-foot drop onto a dock. A commentor states that "normal package tests last until a package breaks."	Drop tests are made with the use of an "unyielding" or engineered surface. This surface test is more stringent than dropping onto a surface such as docks, roads, and soil that yield to the pressure.
A comment was made that the weight of spent nuclear fuel shipment containers is reaching the capacity for the off-load cranes.	[Criterion 3 of the port selection process evaluates the physical attributes of port facilities to determine whether they are appropriate for the safe handling of foreign research reactor spent nuclear fuel (Appendix D, Section D.1.9.3 of the EIS). To be suitable, port facilities were to possess at least one 30 metric ton capacity crane for off-loading spent nuclear fuel containers onto ground transport. Since a fully loaded standard shipping container would not exceed 30 metric tons, the minimum rated crane capacity evaluated in the EIS is considered suitable for the safe handling of spent nuclear fuel.]
Concern was expressed about the ramifications of shipboard fires on the casks, and commentors stated that shipboard fire conditions exceeded the parameters of the draft EIS analysis. A comment was made that estimates of 1475° F for one-half hour are misleading; it is not uncommon for house fires to reach 2000° F. A ship fire burned in 1988 for 36 hours; and hull temperature can reach more than 2000° F for 24 hours. A comment was also made that ship crews are not trained to handle such accidents, and the fire department is not capable of handling this type of fire.	Cask tests must be repeatable and generate clear results. The NRC temperature tests generate situations greater than expected as the test temperature of 1475°F is maintained for 30 minutes through the whole cask. During the tests, testing equipment holds the cask in the hottest part of the fire and the heat is raised to 2100°F to bring the cask temperature to 1475°F. In an accident, which is not a controlled environment, the ship is in a heat sink (the water) which would lower the temperature of the fire. It is unlikely that the temperature of 1475°F degrees would be exceeded. [In respect to the impact a ship fire might have on a spent nuclear fuel transportation cask, there are three factors that mitigate the potential damage. First, ship fires move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship fire's intensity is limited by the amount of oxygen that can reach the interior of a hold. Third, ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which, as a minimum, would keep fires below the temperatures needed to damage the transportation cask. For these reasons, it is unlikely the spent nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160°F), the melting point of research reactor fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (see Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).]

ISSUES RAISED	DOE RESPONSES
	(response continued from previous page) [The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt research reactor nuclear fuel. Appendix D, Section D.5.3 presents a detailed discussion of accident probabilities and radioactive material source terms and Section D.5.4 presents the results of the analyses.] [Ship crews are trained to combat fires, because fire at sea on a ship is a dangerous situation. Most large ports either have, or have access to, the equipment and people to combat a severe ship fire. As discussed above, the probability of a severe ship fire reaching temperatures high enough to melt fuel, is low.]
A comment was made that, unless technical experts explain otherwise, excess fire conditions cause the internal contents of the cask to expand under the heat until the cask bursts.	DOE will provide you with the specific answers in the EIS. [Spent nuclear fuel transportation casks are sealed with "O"-ring seals on the cask head. If the cask is heated, the air inside of the cask would cause an increase in internal pressure until the "O"-ring seal fails and the pressure is relieved. This would occur before the structure of the cask is threatened.]
A question was asked as to whether, in a shipboard fire, radioisotopes would remain contained in the cask when subjected to gas expansion and/or moisture. Commentor noted that NRC estimates that 2.7 percent of the cesium inventory could be released involving a commercial fuel element. An aluminum clad element is less stable under similar condition. A comment was given that a plume from the cask, containing cesium, could travel 60 miles downwind with a release up to 900 square miles. Commentor asked for the curie count in cesium casks.	There are about 28,000 cesium curies in a cask. Page B-24 of Appendix B in the EIS indicates the radionuclide inventories per cask, including cesium. [Appendix D, Section D.5.3.1 describes accident scenarios that involve fire. The most severe accidents analyzed assume cask damage and the release of radioactive material. The maximum plausible accident analyzed assumed that 0.1% of the cesium is released, however, sensitivity analyses included releases of up to 30% (see Attachment D5 to Appendix D).] [When the impacts of accidents were calculated (Appendix D, Section D.5.3.3 of the EIS), a 50 mile radius around the port, as well as the local meteorology and prevailing winds, were taken into account. The results of the analysis of these accidents can be found in Section D.5.4. The analysis shows that even in the event of a severe ship fire, both the consequences and risks would be low (Appendix D, Section D.5.5). Although such a catastrophic accident would obviously impact the local environment, no significant impacts are predicted due to the presence of foreign research reactor spent nuclear fuel. No decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS).]
A comment was made that railroad delays make it difficult to guarantee that the spent nuclear fuel casks would remain in port only 4 hours.	[The spent nuclear fuel would be expected to remain in the port less than 24 hours.]
A comment was made that if DOE ships spent nuclear fuel on highways or by rail, the commentor, and others, will protest by sitting on the rail tracks and highways. Commentors noted that at the last public resistance, 400 people, from 12 - 80 years of age, sat on the tracks.	[The comment is noted.]

ISSUES RAISED	DOE RESPONSES
A comment was made that potential radioactive contamination from nuclear technology is a worldwide problem. Commentor said that we cannot lie on railroad tracks and wish problems away; those who are unhappy should put their information on the record rather than present "negative, nonconstructive remarks."	[The comment is noted.]
Several comments were made that accidents happen despite planning. Comment was made that probable transportation accidents are a collision between railcars and a barge hitting a bridge.	[Chapter 4 of the EIS describes risks estimated for hypothetical accidents at candidate ports, along transportation routes, and at interim storage sites in which some radioactive material is released. However, because the amount of radioactive material released would be small, the amount of contamination is small and no cleanup would be required, except possibly in the immediate vicinity of the cask.]
Comments were made about the need for additional security to protect spent nuclear fuel shipments in the ports and along transportation routes. Specific comments and questions included the following: - Are we going to have the National Guard? - Who will pay for the National Guard to secure each shipment? - How do we separate security of nuclear spent fuel from other cargo? - Navy shipments have been accompanied by a gunboats. - There should be 24-hour guards.	[Shipments of foreign research reactor spent nuclear fuel would be conducted to meet or exceed all the security requirements in the Code of Federal Regulations (10 CFR Part 73). Nuclear Regulatory Commission regulations for physical security include requirements for armed escorts and two-way communications with a communications center during the journey (Sections 2.8 and 5.4.2 of the EIS and Appendix H of the EIS). The National Guard does not escort spent nuclear fuel shipments.] [To better describe the security and emergency preparedness associated with transport of the foreign research reactor spent nuclear fuel, Appendix H has been added to the EIS. Appendix H presents the general provisions of the Transportation Plan which is a document that provides the details associated with the transportation of the foreign research reactor spent nuclear fuel.]
A concern was expressed about acts of terrorism and sabotage. Commentor noted that the spent nuclear fuel is probably safer from terrorism in the United States than abroad. The commentor stated the need for city evacuation plans, guarded ports, and specially-built ships to guard against terrorist acts.	[Section 2.8 and Appendix D, Section D.5.9 have been added in the EIS to discuss the consequences of terrorism and sabotage. Security measures employed would meet or exceed all the security requirements in the Code of Federal Regulations (10 CFR Part 73).] [Security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel are described in Appendix H of the EIS. This appendix presents the general provisions of the Transportation Plan, which is a document that provides the details that would be associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.]

ISSUES RAISED	DOE RESPONSES
Comments were made that DOE must address vulnerabilities at each of the spent nuclear fuel sites. Specific vulnerabilities identified include the following: - The Hanford site does not have a fire suppression system or leakproof tanks and is in a seismic activity area. - Management of spent fuel at Hanford will delay cleaning the K-Basin; drainage of K-Basin for additional storage will contribute to a high radiation dose on the Columbia River. - Why we are taking this stuff to a facility with over 1600 spill sites, terrible contamination and with funding consistently being reduced. - Idaho National Engineering Laboratory and Savannah River Site have not been upgraded with appropriate fire suppression systems. - Some DOE sites have become Superfund sites. How many are Superfund sites?	[No spent nuclear fuel from foreign research reactors would be shipped to the Hanford site. As specified in the Record of Decision for the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement, issued on May 30, 1995, the Savannah River Site and the Idaho National Engineering Laboratory have been identified as the two sites selected for management of foreign research reactor spent nuclear fuel. Both of these sites have existing facilities capable of accepting the fuel on the effective starting date of the policy. Of the five DOE sites considered for temporary storage, all are Superfund sites, except the Nevada Test Site.]
NEPA requires consideration of impacts on site resources. The lack of funding to upgrade site safety standards and facilities was also identified as a concern.	[As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel would be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for that EIS, issued on May 30, 1995, specifies that the Savannah River Site and the Idaho National Engineering Laboratory as the two sites selected for management of foreign research reactor spent nuclear fuel. Both of these sites have existing facilities capable of accepting the fuel on the effective starting date of the policy. The EIS discusses the impacts on site resources and required new facilities in Sections 3.3 and 2.6.5, respectively.]
Comments were made about the safety of trucks used for shipments of spent fuel. Specific comments included the following: - DOE has contracted with unsafe trucking firms. In 1991, DOE wanted to employ a trucking firm whose trucks were in violation of the State's safety standards. The Washington Highway Patrol stopped and arrested at least 50 percent of the drivers at the border. Is DOE choosing the low bidder? - A truck with contaminated exterior crisscrossed the country before contamination was detected at Hanford. - DOE says States cannot stop trucks from moving into the Columbia Gorge. There may be dangerous snow conditions in this area.	[Transportation of hazardous and radioactive materials, substances, and wastes are governed by the Department of Transportation, NRC and Environmental Protection Agency regulations, as discussed in Section 5.4 of the EIS. Trucking firms under contract with DOE would be required to comply with applicable regulations.] [To better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel, Appendix H has been added to the EIS. This appendix presents the general provisions of the Transportation Plan, which is a document that provides the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port, transit to the management site, and plans in the case of severe weather or adverse road conditions.] [DOE checked the 50% citation statistic with the Washington Highway Patrol and found that no such statistic exists.]

ISSUES RAISED	DOE RESPONSES
A comment was made that Department of Transportation regulations state that each shipment must be transported through the lowest populated areas. Commentor asked why transport would be through downtown Portland. Commentor noted that highway route control studies state that interstates and by-passes or alternates would be selected by the State; adding that the Navy solved this transport problem by barging up the Columbia.	[The population residing near candidate ports and along transportation routes was an important factor that was considered in port selection and in the evaluation of environmental effects of the proposed action and management alternatives (See Section 4, Appendix D, and Appendix E of the EIS).] [Overland shipment by rail or by truck is regulated by Department of Transportation and NRC regulations dealing with packaging, notification, escorts and communication. Under Department of Transportation regulations, those specific routes designated by appropriate State agencies are enforceable if the Department of Transportation determines that such routes are likely to result in further reduction of radiological risk. Also, shippers are required to submit proposed routes for spent nuclear fuel shipments to the Nuclear Regulatory Commission for approval. NRC then publishes a public information circular that lists routes that have been evaluated and approved for specific spent nuclear fuel shipments. All the routes take into consideration accident rates, transit time, and population density.]
A concern was expressed that transport of spent nuclear fuel would reduce the bulk grain commodity shipping business because no other vessels would call at the Port. Commentor said the Port exports seven million metric tons of grain per year.	[The commentors' concerns about possible economic impacts to the grain commodity shipping at the Port of Portland as a result of foreign research reactor spent nuclear fuel shipments are noted. The use of any of the ports indicated by the port selection process, including Portland, would not impact normal commercial operations, and therefore not endanger the ports' status with respect to their clients. Foreign research reactor spent nuclear fuel would be shipped to the United States in standard shipping containers that would require no special handling. There would be no adverse commercial or economic reaction to the use of the port. Historically, there were no adverse commercial impacts to the ports that received foreign research reactor spent nuclear fuel during the 30 plus years that it has been received.]

ISSUES RAISED	DOE RESPONSES
Comments were made about the safety of dock workers and the possibility of work stoppage. Specific comments included the following: Cumulative impacts on longshoremen, up to 200 mrem/yr, are not acceptable; the Port can and will be relentless in establishing standards for worker safety and health if these shipments are forced on Portland; unions will engage in a work action that will cripple Terminal 6; the longshoremen have adopted a resolution not to handle spent fuel on the West Coast; and the Environmental Impact Statement does not address a work stoppage.	[The maximum allowable exposure for port workers would be 100 mrem per year, the same radiation dose limit established by the Nuclear Regulatory Commission to protect individual members of the public (Section 4.2.2.2 of the EIS). As the EIS demonstrates, both the dose and dose rate for the port workers are low. To avoid radiation doses which may exceed public dose limits, DOE would maintain records to track individual exposures so that worker rotation can take place if an individual worker approaches the 100 mrem/year exposure. Appendix D, Section D.4.3.2.1 sets forth the time/distance analysis of cask handling. Section D.4.5 provides the resulting doses and risks, and Appendix F, Section F.5 presents an evaluation of the dose rates from a transportation cask containing research reactor spent nuclear fuel.]
	[The two regulatory limits (200 mrem/h at the cask surface and 10 mrem/h at two meters away from the vehicle) would both apply simultaneously. For shipments of certain radioactive materials (e.g., small, intense cobalt-60 sources), the 200 mrem/h-at-the-cask-surface limit is the more stringent limit. For shipments of spent nuclear fuel, however, the 10 mrem/h-at-two-meters regulatory limit turns out to be more stringent because the source of radiation is large and distributed throughout the internal volume of the cask. Casks loaded with spent nuclear fuel up to the 10 mrem/h-at-two-meters limit radiate at a level well below the 200 mrem/h level at the cask surface (Section 4.1.5 and Appendix F, Section F.5 of the EIS). Longshoremen would be exposed to radiation from the cask for a relatively short time and would not come into contact with the cask due to the presence of the shipping container.]
	[Provision of time to resolve a work stoppage was one of the factors that led DOE to provide an extra three years for shipment of the foreign research reactor spent nuclear fuel under Management Alternative 1.]
	[The possibility of a work stoppage was not considered in the port selection process because this possibility has no impact on the actual capability of the port to safely receive containers carrying foreign research reactor spent nuclear fuel.]
A comment was made that there should be city evacuation plans.	[Section 4.2.2.3 shows that risks resulting from a severe accident would be so low that evacuation routes would not be necessary.]
	[To better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel, Appendix H has been added to the EIS. This appendix presents the general provisions of the Transportation Plan, which is a document that provides the details which would be associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the DOE management site.]
A comment was made that DOE's claim of "no significant impact" in the EIS does not take into account cumulative impacts from the actions in all the other EISs that DOE is completing.	[The EIS does, in fact, address the cumulative impacts of handling all of DOE's spent nuclear fuel.]

ISSUES RAISED	DOE RESPONSES
A question was asked as to the basis for the claim that an individual is exposed to less radiation living within 50 miles of a DOE site than flying in an airplane. A question was asked if the radiation was alpha or gamma.	The expected dose to an individual from 25 hours of flying at 35,000-40,000 feet is 13 mrem from cosmic radiation which [is neither gamma or alpha radiation, but] has the same biological effect as gamma radiations. [No member of the public would be expected to actually receive as much as 13 mrem per year under the proposed policy.]
A comment was made that DOE should stop using "harmless" comparisons such as riding in an airplane, eating peanut butter, and drinking diet soda. Commentor said that in one case the risks are ones for which there is a choice; in the case of spent nuclear fuel shipment risks, there is no choice.	[Table 4-60 is presented to provide a point of comparison with risks presented in the basic implementation of Management Alternative 1, acceptance and management of the foreign research reactor spent nuclear fuel in the United States. The table presents risks estimated to increase an individual's chance of death in any year by one in one million. Individual choice would not affect the actual risk associated with the activities.]
A comment was made that a report to the Senate Energy Committee indicated that radiation exposure levels to the public on the Columbia River are up to 200 mrem per year above the background level. Commentor indicated that this is the potential exposure rate for a Yakima Indian fishing on the Columbia River on State property.	[Since none of the foreign research reactor spent nuclear fuel would be shipped to Hanford, there is no connection between the comment and this EIS.]
A comment was made that, due to uranium mining, the rate of mental retardation on the Pine Ridge Reservation is 15 times the national average.	[The comment is noted. Appendix D, Section D.4 of the EIS demonstrates that the radiation dose that anyone would receive handling or near a transportation cask containing foreign research reactor spent nuclear fuel is less than the limit that is allowed to the public in an unrestricted area by NRC regulations (Title 10 CFR Part 20).]
A comment was made that DOE and NRC regulatory standards are antiquated. Acceptable radiation levels are lower than previously thought.	[The regulatory standards for radiation exposure limits are beyond the scope of this EIS. The established regulatory limit for radiation exposure is 10 mrem per hour at 2 meters distance from the vehicle, the ISO container in this case. Most spent nuclear fuel shipments are much lower than that. The radiation dose that anyone would receive handling, working or traveling near a spent nuclear fuel transportation cask is below the limit that is allowed to the public in an unrestricted area by NRC regulations (Title 10 CFR Part 20). The current annual limit is 100 mrem in an unrestricted area.]

ISSUES RAISED	DOE RESPONSES
Concerns were expressed about the possibility of radioactive releases. Specific comments included the following: radiation fallout patterns should be described in the EIS; at 20 rem there is immediate acute radiation sickness for fire fighters, and we do not want our fire fighters to be doomed; downwind of Terminal 6 is a major intersection of two rivers--Willamette and Columbia Rivers; in an accident, there could be a lethal dose for one year over 900 square miles.	[Appendix D, Section D.5.3.1 of the EIS describes accident scenarios that involve fire. When the impacts of accidents were calculated (Section D.5.3.3), a 50 mile radius around the port, as well as the local meteorology and prevailing winds, were taken into account. The results of the analysis of these accidents can be found in Section D.5.4. The analysis shows that even in the event of a severe ship fire, neither the consequences nor risks are great (Section D.5.5). Although a catastrophic accident would impact the local environment, low impacts are predicted to result from the presence of foreign research reactor spent nuclear fuel. In fact, the analysis of impacts associated with an accident involving foreign research reactor spent nuclear fuel also determined that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3 of the EIS). Section 4.2.2 demonstrates that the risk associated with bringing spent nuclear fuel to the ports analyzed in the EIS, is low.] [The threshold for immediate acute radiation sickness is considered to be 200 rem, not 20 rem.]
A question was asked as to when the United States began this program.	The precursors leading to this program started in the 1950s. [Since the 1950's, as part of the Atoms for Peace program, the United States has provided peaceful nuclear technology to foreign nations in exchange for their promise to forego development of nuclear weapons. A major element of this program was provision of research reactor technology and fuel.]
A comment was made in opposition to the manufacture of new reactors and the supply of fuel.	[The commentor's objections to the manufacture of new reactors and provision of reactor fuel are noted, but are outside the scope of the EIS. Any new reactor starting up would not be covered by the program.]
A question was asked as to whether there is an international public forum on this issue. Commentor asked if there should be more United Nations involvement.	There is no official international public forum at present. However, the International Atomic Energy Agency (IAEA) requested that DOE take action to accept foreign research reactor spent nuclear fuel in support of the nonproliferation of nuclear weapons.
A question was asked as to what would happen to the program if DOE is abolished. Concerns were expressed about how the program would be funded.	Spent nuclear fuel will be there whether DOE is or not. There have been various proposals for transferring responsibility to another agency.
A commentor expressed concern about the amount that citizens of Oregon will be taxed for the program.	[Costs of the proposed management alternatives are in Section 4.8 of the EIS, including uncertainties and financing options. Tax revenue implications, if any, are beyond the scope of the EIS.]
Questions were asked about the cost of the implementation of the total program.	The cost would be approximately $1 billion over 40 years depending on which alternative is chosen. Much of this cost would probably be paid by the research reactor operators.

ISSUES RAISED	DOE RESPONSES
A comment was made that the Tribal community was not included in the discussion with DOE. Commentor stated that these people still have inherent rights, they should be consulted first, and DOE ignored the beliefs of the Tribal community. Commentor stated that Tribal members had told DOE to keep the uranium in the ground and to work together for balance and harmony and unification of all people. Commentor stated that DOE should listen to those of us who are advocating "No Action."	[The commentor's preference for the No Action Alternative is noted. Consistent with its responsibilities under the National Environmental Policy Act, the Department of Energy has solicited comments and has encouraged public participation in preparing a final Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. The draft EIS was distributed to Tribal governments as well as Federal, State, and local entities. DOE has considered all public comments in this process and regrets that the commentor believes the Tribal community was not fully included in the process.]
A commentor questioned how profitable nuclear power really is after all the money DOE has spent on nuclear power, cleanup, and public relations. [Commentor referenced a Greenpeace report called "Fiscal Vision."]	That information is beyond the scope of the EIS. [Research reactors are not used for power production.]
A commentor made the following specific comments on sections of the draft EIS: - Page 3-29: The statement "some recreational fishing and boating..." should be "significant recreational fishing and boating...." - Page 4-11: The reference to cask damage and the statement that no human population on the ocean could be affected is not relative to an accident situation on the Columbia River navigational channel. This is not addressed. - Page 4-23: The port accident risk analysis does not include the navigational channel.	[The analysis of accidents in port (Appendix D, Section D.5 of the EIS) were also performed at the worst location in the approach to the port (Section D.5.3.2); these are called "channel" locations in the analyses. In the case of Portland, this analysis was assumed to occur at the St. Johns Bridge. The results of these channel calculations, like the port or "dock" locations, all showed low risk (Section 4.2.2.3).]

List of Attendees at Portland, OR Public Hearing

Ackerson, Amber
Anderson, Carola
Baker, Carol
Benner, David
Boyett, Keven
Brawner, Allan
Brenner, David
Butz, Andrew
Cali, Jeff
Carrigan, Michael
Cropper, Tom
Doying, David
Dreizen, Diane
Fantz, Ronald B.
Ferguson, Ken
Fisk, Rod
Ford, Mr. Lynn
Franzen, Mike
Gearhart, Frank
Glenn, William E.
Good, Melody
Greenfield, Del
Greenfield, Lou
Grover, William
Head, Tom
Henle, Bill
Horsley, Joe
Horsley, Janice
Jacobson, Brooke
Johnson, Chuck
Klausman, Steve
Knight, Paige
Kramer, Diane
Kramer, Stephen
Lee, Sharon
Logan, Patrick
Lohman, David
Lurch-Walters, Dan
Mahawk, Skip
Martiszus, Ed
Massler, Edward
McAdams, Paul
McKenzie, David
Moorehead, D. J.
Palazzolo, Michael
Palm, Charles C.
Patton, Jeanne
Peck, Gerri
Richardson, Ann
Richmond, Paul
Robinson, Bob
Ruby, Lawrence
Sims, Lynn
Soldsbury, Jalra
Stranahan, Jesse
Stranahan, Lois R.
Stump, John
Surface, Victor
Tate, Montie
Tewksbury, Ross
Wisman, Joel

The public hearing at Savannah, Georgia, a candidate port of entry, was held in the Coastal Georgia Center on May 11, 1995. Eight people attended the hearing. The hearing was interactive in nature and the following is a summary of the comments and issues that were raised. The information in brackets [ ] was not provided at the hearing.

ISSUES RAISED	DOE RESPONSES
Clarification was requested as to how decisions will be made on transportation modes.	The final EIS will identify the preferred transportation modes if a policy decision is made for United States acceptance of foreign research reactor spent nuclear fuel. The Record of Decision will document the policy decision. Specific modes, such as truck versus rail, will be decided on a case-by-case basis.
Clarification was requested as to how decisions will be made on ports of entry.	The final EIS will identify ports that could be used. It is anticipated that the final EIS will maintain the ten ports identified as candidates in the draft EIS. The use of a specific port [of the ten candidates] would be decided on a case-by-case basis and would depend on country of origin, sea route, and availability of the port at the time of shipment.
Clarification was requested as to the role of the Record of Decision with respect to selection of management alternative.	The final EIS identifies the preferred management and implementation alternatives. The Record of Decision, the key decision document, identifies decisions made with regard to which policy will be adopted if any and which alternatives will be used.
Clarification was requested as to the Department of State's posture with regard to overseas management of the foreign research reactor spent nuclear fuel.	Although the EIS includes overseas management as a management alternative, the Department of State does not consider it to be a wise option. A key driver for the United States management of the foreign research reactor spent nuclear fuel is the September 27, 1993, Presidential Policy Statement on [nuclear weapons] nonproliferation and export controls, which states the United States goal to eliminate overseas HEU stockpiles.

List of Attendees at Savannah, GA Public Hearing

Cajigal, George L.

Costikyan, T.W.

Dickey, James W.

Ravenscroft, Norman

Simonton, Barty

Slocumb, Bill

Wells, Nellie

Wells, Christopher

The public hearing at the Seattle/Tacoma airport area, for the Tacoma candidate port of entry, was held on May 24, 1995. Approximately 45 people attended the hearing. The hearing attendees requested a format in which they presented public statements with little or no dialogue between attendees and DOE. Therefore, DOE responses were not given at the hearing, but are provided in brackets [ ]. The following is a summary of the comments and issues that were raised.

ISSUES RAISED

Objections were raised about DOE's proposed interactive format for the hearing and DOE's decision to use note takers to summarize key issues as opposed to a court reporter to record the hearing verbatim. Specific comments supporting the objections included the following:

- DOE has an obligation under CEQ regulations to record comments; oral comments should be given the same weight as written comments.
- DOE will be subject to litigation if public testimony at this hearing is not recorded.
- There is lack in trust of DOE contractors to take hearing notes; contractors are not neutral -- they are paid by DOE; flipchart notes taken by facilitator do not correctly summarize comment.
- The purpose of a recorder is that if the EIS is legally challenged, there is an administrative record. Otherwise, there is human frailty and subjectiveness in the record.
- Given budget cuts at Hanford, why pay two notetakers instead of buying a tape recorder.
- Without a recorded hearing, the public has no effective mechanism to ensure that the record is complete and to see that the EIS reflects the issues that have been raised and has been responsive.
- Commentors wanted to read statements into the record, but that is not possible because there is no record.
- Since the question at hand is whether the proposed policy is an appropriate public policy, DOE's response to each public comment is necessary to ensure an appropriate public policy; otherwise this public hearing had no purpose.
- DOE is inhibiting public participation by asking people to come to a hearing and then provide written comments.
- Have never been to a public hearing that was a discussion and not recorded.
- DOE is presenting and defending.
- In the Summary, page 49, these hearings were described as public hearings. DOE did not disclose the proposed hearing format to the public ahead of time, and the public was "manipulated to preregister for nothing."

DOE RESPONSES

DOE adopted a new, more interactive format for these public hearings to more constructively address the issues raised by the public. Public comments during the hearings were summarized and it was requested that specific comments for the record be submitted in writing. This method of recording comments was determined by DOE General Counsel to be in compliance with DOE requirements and Council of Environmental Quality (CEQ) regulations, [and fully in compliance with NEPA requirements for conducting such hearings. This public hearing format provided opportunity for increased interaction between DOE and the public. In the majority of cases, this format has been well received by the public. Moreover, the public was afforded other opportunities to comment on the draft EIS, including a 90-day period in which to submit written comments. All such comments are presented in the final EIS along with DOE responses.]

ISSUES RAISED	DOE RESPONSES
A commentor stated that DOE did, in fact, indicate in the newspaper advertisement that the hearing would be an informal discussion. Commentor said that under the Washington Public Hearings Act there is no requirement of an official recorder for a public hearing.	[This comment is noted.]
Comments were made that DOE's provision of security at the public hearing was insulting to the hearing attendees and gave the impression that DOE believed the hearing attendees were violent.	Standard DOE policy is that security be provided at public hearings for the protection of the public and DOE in the unlikely event that someone would pose a physical threat.
Several commentors argued that foreign research reactor spent nuclear fuel should be managed overseas and not be accepted into the United States. Variations to this overall comment included support for the "No Action" alternative; support for Management Alternative 2 (overseas management with U.S. assistance); and increased verification of the spent nuclear fuel "where it is."	[Commentor's support for Management Alternative 2 or "No Action," is noted.]
Comments were made that: (1) the United States has no obligation to take the spent nuclear fuel; (2) allies pose no threat to the United States; (3) taxpayers should not have to pay for managing foreign spent nuclear fuel; (4) the International Atomic Energy Agency can easily monitor dry cask storage at reactor sites overseas; (5) the United States needs to take care of its own waste before it accepts others' wastes.	[The United States has no legal obligation to take the spent nuclear fuel; however, implementation of the proposed action would provide U.S. citizens and taxpayers increased security and the assurance that action has been taken to limit nuclear weapons proliferation, thus reducing the likelihood of a nuclear incident. While Management Alternative 1 or 3 to the proposed action would include the acceptance and management of foreign research reactor spent nuclear fuel from U.S. allies who do not pose a current proliferation threat, governments and alliances may change. The International Atomic Energy Agency could provide monitoring at overseas reactor sites; such monitoring would be considered if DOE adopts a policy using Management Alternative 2. Although the ultimate management and disposal of U.S. and foreign nuclear waste are beyond the scope of this EIS, the impacts of ultimate disposition are discussed in Section 4.2.7 of the EIS. DOE is currently working under NEPA and the Nuclear Waste Policy Act of 1982 to provide for ultimate disposition of the nuclear waste.]

ISSUES RAISED	DOE RESPONSES
Comments were made questioning the need to accept spent nuclear fuel from countries that do not pose a proliferation risk and the need to accept LEU fuel, which does not pose a proliferation risk. Sweden was cited as an example of a country that is not building bombs and should not be of concern. A commentor suggested that 98% of the risk could be eliminated by telling the other countries that they must take responsibility for their fuel. It was suggested that DOE should keep in mind that in order to divert the HEU contained in the spent nuclear fuel an agent would have to move the cask to a reprocessing facility. It was also questioned whether the United States could actually expect Iran, one of the countries involved, to turn over its spent nuclear fuel.	Of the 41 countries that would be covered under the proposed policy, the majority do not in and of themselves pose a [nuclear weapon] proliferation risk. However, many of these countries that have converted to LEU would be expected to switch back to HEU to fuel their research reactors if the United States does not accept their spent nuclear fuel containing the enriched uranium DOE originally supplied. These countries could indeed buy HEU -- Russia and China have both supplied HEU in the past. The United States is presently working with Russia and China to get them to adopt programs similar to the U.S. RERTR program. The suggestion that DOE should accept spent nuclear fuel only from nations that are proliferation risks leads to the problem of identifying these countries. [It is long-standing policy that the United States provide certain nuclear technology and services (including the acceptance of foreign research reactor spent nuclear fuel) to nations who cooperate in preventing the spread of nuclear weapons. As a result of this policy, few nations have acquired nuclear weapons over the past 50 years.]
A comment was made that if the United States wants to promote nuclear nonproliferation, it should start working toward disarmament. A related comment was made that other countries will have no incentive to diminish or stop using nuclear materials if the United States takes their spent nuclear fuel.	[Disarmament is not an issue in the proposed action and is not evaluated in the EIS. Regarding incentives to stop using nuclear materials, the United States is encouraging countries through the RERTR program to convert to LEU, and thereby to curtail the use of weapons-grade material such as HEU in international commerce.]
Concerns were expressed that the United States does not have a national policy on nuclear waste; there are no plans for disposal of DOE's waste streams; there is no safe method of disposal; and the United States was becoming the world's garbage dump.	[Although specific issues related to ultimate disposal are beyond the scope of this EIS, the impacts of ultimate disposition are discussed in Section 4.2.7 of the EIS. A detailed discussion will be the subject of future NEPA documentation. The Nuclear Waste Policy Act of 1982 specifies that U.S. policy is to dispose of high level radioactive wastes and spent nuclear fuel in geologic repositories.]
A question was asked whether the United Kingdom is one of the countries under consideration in the proposed policy.	Yes.
A comment was made questioning why the United States would take spent nuclear fuel from the United Kingdom when it has sent nitric acid shipments from Hanford to British Nuclear Fuels.	[The nitric acid that was purchased by British Nuclear Fuels Limited from Hanford is to be used in BNFL's [commercial nuclear power] reprocessing facilities in England. These shipments are outside the scope of this EIS.]

ISSUES RAISED	DOE RESPONSES
A comment was made that DOE's rationale that the United States must honor its commitments is weak. Commentor stated that the United States has long signed agreements and broken them, the commentor noted the breaking of Indian treaties as an example.	[It is important to show responsibility and reliability in our dealings with other nations to help maintain the U.S. leadership role in the prevention of nuclear weapons proliferation and in encouraging other nations to support U.S. efforts.]
A comment was made that the United States has a hypocritical attitude concerning nuclear nonproliferation. Supporting comments were that the United States has used the Treaty on Non-Proliferation to proliferate in that the Treaty allows those countries that have nuclear weapons to continue to have them; the United States is responsible for more than half of the weapons shipped all over the world, and $300 billion dollars a year is spent by the United States on military weapons; the United States is helping North Korea build reactors but North Korea will be keeping their spent nuclear fuel from the United States; the EIS fails to say the United States will no longer sell material to other countries so that it would not have to take back fuel in the future; the nuclear weapons industry is irresponsible and dishonest.	[The United States has never sold or exported nuclear weapons to other nations. Highly enriched uranium has been sold to other nations for use in research reactors in exchange for a pledge from those nations not to develop nuclear weapons. In fact, many nations that are non-nuclear weapons states did not develop weapons because of this arrangement.] [The sale of highly enriched uranium is no longer allowed by the Energy Policy Act of 1992, except in certain limited situations. Therefore, the management of the highly enriched uranium currently overseas is of importance. Once the highly enriched uranium used in foreign research reactors is recovered, this effort need not be repeated.] [Power reactor fuel, which contains low enriched uranium, is of much less concern for nuclear weapons proliferation. Therefore the proposal currently under discussion with North Korea has no bearing on this EIS or the proposed policy. Nor does the level of export of conventional weapons.]
A comment was made that the international activist position, based on commentor's experience on panels with activists from Japan, Russia, and other countries, is to keep nuclear waste where it is.	[Many foreign research reactor operators have no immediate means for dispositioning their spent nuclear fuel outside of the United States. An objective of the proposed action is to provide them with a limited time to arrange for disposition of their spent nuclear fuel outside of the United States.]
A comment was made that DOE is in the business of segmenting its EISs. The following examples were provided: The Savannah River Site, Hanford Site, and Idaho National Engineering Laboratory are being proposed to manage foreign research reactor spent nuclear fuel; the same sites are being proposed under a separate EIS to manage Navy fuel; and the same sites are being proposed under yet another EIS for commercial spent nuclear fuel.	Commercial spent nuclear fuel is not covered by any of the EISs mentioned by the commentor related to the three DOE sites. [Section 1.5 of the EIS explains the relationship of this EIS to other NEPA documents relating to spent nuclear fuel management. The DOE Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Restoration and Waste Management Program Environmental Impact Statement included consideration of the foreign research reactor spent nuclear fuel in its cumulative impacts.]
A comment was made that dry cask storage technology is available and is appropriate for use overseas.	[Dry cask storage technology is a proven storage technology. Section 2.6.5.1 of the EIS provides a summary of available storage technologies.]

ISSUES RAISED	DOE RESPONSES
A question was raised as to why DOE wants to prevent other countries from using the Sellafield reprocessing facility in the United Kingdom when DOE has issued a formal finding that reprocessing in the United Kingdom posed no proliferation risks, based on numerous international safeguards and monitoring to back up its assertion.	The Sellafield facility can only reprocess commercial spent nuclear fuel. DOE is considering, as an alternative, the use of Dounreay in Scotland [the United Kingdom] for reprocessing foreign research reactor spent nuclear fuel. Reprocessing by our allies is a difficult question. Whereas the United States does not reprocess, it nevertheless recognizes that its allies can safely reprocess. The United States recognizes that if it tried to prevent the United Kingdom from reprocessing, we would jeopardize their help in other areas.
A question was asked as to whether the Dounreay facility is subject to the same requirements as the Sellafield facility. Commentor asked whether DOE's finding that an inspection system ensures no diversion would apply if spent nuclear fuel was sent to Dounreay for reprocessing. Commentor stated that reprocessing at Dounreay appears to be a reasonable alternative and that British Nuclear Fuels Limited (BNFL) is more than willing to enter into an agreement with the United States.	Dounreay is subject to the same requirements as Sellafield. Dounreay has reprocessed spent nuclear fuel, extracted the HEU, and returned the HEU back to the country of origin. The concern of the United States is not with the Dounreay facility itself, but any diversion of HEU into international commerce after the HEU leaves Dounreay. However, reprocessing at Dounreay, with certain restrictions applied to ensure no diversion of HEU into international commerce, is an alternative being considered.
A comment was made that the best means of dealing with nuclear waste is to can it, transport it, and bury it.	[The commentor's position is noted. Underground dry storage is not one of the alternatives selected for interim management of spent nuclear fuel from foreign research reactors (Section 2.6.5.1 of the EIS).]
A question was asked about the difference between Navy and DOE spent nuclear fuel.	The characteristics of naval fuel are classified information.
Concerns were expressed about the threat of terrorist attacks or sabotage against the spent nuclear fuel casks, including the blowing up of a cask.	It would be difficult for a terrorist to divert a spent [nuclear] fuel [transportation] cask since a cask typically weighs at least 25 tons [10 to 25 tons] -- casks are extremely difficult to move. The explosion potential of a cask is very low. In the event of an explosion, the truck would likely be turned over and everything surrounding it may be gone, but the cask would remain intact. [Section 2.8 and Appendix D, Section D.5.9 have been added in the EIS to address terrorism and sabotage.]
Comments were made strongly opposing shipments of spent nuclear fuel through the Ports of Tacoma or Seattle.	[The commentor's opposition to the use of the Port of Tacoma or Seattle is noted. However, Sections 4.2.2 and 4.5 demonstrate that the risk to any port analyzed in this EIS would be low.]

ISSUES RAISED	DOE RESPONSES
A comment was made that DOE should use military ports because they are far superior to commercial ports when it comes to security.	[DOE considers that the foreign research reactor spent nuclear fuel could safely be received at commercial ports without additional security such as might be present at military bases. The security provided for the spent fuel shipments is required to meet or exceed all the applicable security requirements in the Code of Federal Regulations (10 CFR Part 73). If any port did not already provide security sufficient to satisfy these requirements, it would be the responsibility of the shipper to provide the required additional security. Nevertheless, the commentor's preference for the use of military ports is noted. Security measures are addressed in Section 2.8 of the EIS.]
A comment was made that the amount of ship traffic should be considered in the port selection process.	[In general, the number of ship mishaps is not proportional to the amount of ship traffic because port ship traffic is slow; and even when heavy, traffic is normally a small number of ships per hour. Hence, increasing this volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay. Therefore, the port selection process focused on favorable transit from the open water. See Appendix D, Section D.1.9.2 for a discussion of this criterion.]
A comment was made that it has taken years of hard work to achieve a worldwide port status, the receipt of spent nuclear fuel would stigmatize the port, and companies would not do business with the port.	[Historically, there have been no adverse commercial impacts or stigma attached to the ports that received foreign research reactor spent nuclear fuel over thirty years it has been received. Foreign research reactor spent nuclear fuel would be accepted into the United States in standard shipping containers that require no special handling.]
A question was asked as to whether Seattle could be considered -- based on commentor's understanding that ports may be added or dropped as a result of public input or changed criteria.	The selection and evaluation of the ten candidate ports, as detailed in Appendix D of the EIS, was based on specific selection criteria. It is possible that some comments may result in a change in the criteria, in which case other ports could be considered.
A comment was made that the spent nuclear fuel shipments under this EIS should come into the same ports that were used to ship HEU out of the country. Commentor stated that if Tacoma did not export nuclear fuel through the Puget Sound, then Tacoma should not have to receive the spent nuclear fuel.	[Accepting the foreign research reactor spent nuclear fuel through the same port from which the enriched uranium departed is not practical or necessary. Much of the enriched uranium was shipped overseas by airplane, an option not available for the foreign research reactor spent nuclear fuel. Tacoma was one of 161 ports (153 commercial and eight military ports) considered. These ports were evaluated against selection criteria, resulting in 10 ports that met all of the criteria and are currently considered capable of safely handling foreign research reactor spent nuclear fuel (Appendix D, Section D.1.9.2 of the EIS).]

ISSUES RAISED	DOE RESPONSES
A question was asked as to what ports were used when the United States originally shipped the HEU to the foreign countries. Commentor suggested that it would be helpful to know the history.	Some HEU was shipped by vessel; some was flown by plane. DOE will provide the information on ports. [All exported TRIGA fuel was flown out of Los Angeles, except for that going to Japan, which was shipped out of the Port of Oakland. The remainder of the HEU that was used for foreign research reactor nuclear fuel was all exported by air from Albuquerque, except for one shipment that was flown out of Memphis.]
A question was asked as to whether DOE would commit that, if another port was added to the list of candidate ports, DOE would hold a public hearing at that location.	A commitment to hold additional hearings would be the decision of the Secretary [of Energy].
A question was asked as to whether DOE is proposing to ship spent nuclear fuel through the West coast and then transport the fuel to East coast sites.	That is a possibility. [Analyses in the EIS demonstrate that the risk associated with using the West Coast ports, to receive foreign research reactor spent nuclear fuel bound for the Savannah River Site, would be low. If foreign research reactor spent nuclear fuel is accepted by the United States, the decision as to which port to use for each shipment would include consideration of the population along the land route to the designated management site.]
A comment was made that two of the port selection criteria -- adequate facilities and low population -- are contradictory. Commentor stated that a port with adequate facilities will have a lot of people.	[The commentor's observation on the correlation between particular port and population size is noted.]
A question was asked as to whether it was true that only one cask per ship would be shipped into the Port of Portland.	There would be one cask per International Standards Organization (ISO) container. The EIS calculates impacts from one-to-eight casks per ship. In September 1994, four casks came into the Military Ocean Terminal at Sunny Point, North Carolina on two ships.
A question was asked as to whether container ships are double-hulled.	No.
A question was asked as to what the regulatory requirements are concerning how far apart casks are stored on a vessel. Commentor noted that containers on vessels coming into Portland were stacked according to manifests.	DOE is not aware of regulations regarding spacing for radioactive shipments. [The transportation of hazardous material is governed by the International Movement of Dangerous Goods (IMDG) Code, which is associated with the International Maritime Organization. This code establishes the international rules for shipping hazardous cargos, which includes foreign research reactor spent nuclear fuel.]

ISSUES RAISED	DOE RESPONSES
A comment was made that there are commercial ships that could be carrying food. Commentor asked what DOE is doing to guarantee that loading in foreign ports is in compliance with U.S. regulations.	There would be [cognizant] people at the loading site to ensure that casks are loaded properly at foreign ports. In terms of what would be done if there are other materials on board, DOE does not believe there would be a problem since the casks provide shielding, but DOE will provide more information on this. [As to isolating the casks from other freight, this would not be necessary for radiation or any other reasons. The small amount of radiation coming from the spent nuclear fuel transportation cask would be gamma radiation which does not activate or contaminate other materials, so there would be no need to isolate it. Also, see the response immediately above.]
A comment was made that ships carrying spent nuclear fuel should be loaded entirely with the spent nuclear fuel and nothing else.	[See second paragraph of the response above.]
Concerns were expressed about the possibility of transportation accidents. A commentor noted that if fuel is moved enough times, "you will guarantee an accident."	[The EIS shows that the risks associated with an accident are low (Section 4.2.2.3).]
A question was asked as to whether DOE will notify communities of an accident if one were to occur.	Spent nuclear fuel shipments from foreign research reactors would not be classified. Under regulations of the Nuclear Regulatory Commission, the Governor's designee would be notified of shipments. Satellite-based tracking systems are capable of pinpointing within 15 minutes where any particular shipment is -- each State has access to this type of monitoring. [Notification of communities about accidents would be the responsibility of the State and local emergency management organizations. DOE would have a supporting role. State Troopers would be among the first to know about an accident, if one were to occur. See Section 2.8 of the EIS for details.]
A comment was made that each community should be publicly notified well in advance of each shipment.	Advance public notification of shipments to communities cannot be given because it would violate regulations of the Nuclear Regulatory Commission. [Notification would be provided to the Governor of each state along a transportation route at least seven days prior to its scheduled occurrence.
A question was asked as to whether a member of the public could ask the Governor's office to be notified in advance of spent nuclear fuel shipments.	Only Governors and emergency responders would be notified [by DOE. Further notification by State Governors is a state function.].
A comment was made that the State of Oregon requested the ability to inspect and monitor Navy spent nuclear fuel shipments going to Idaho National Engineering Laboratory but was denied. Commentor asked what process has changed that would allow this activity by Oregon.	Navy spent nuclear fuel shipments are classified. States do not inspect classified shipments. [Any foreign research reactor spent nuclear fuel shipments would not be classified.]

ISSUES RAISED	DOE RESPONSES
A comment was made that the State of Oregon's emergency responders are not funded for training to handle these shipments.	[Detailed information regarding emergency response requirements and capabilities are found in Section 2.7.4, Appendix D, Sections D.2.1.1, and D.4.3 of the EIS. The EIS also provides information on the availability of well-trained and equipped national emergency response teams, including DOE's Radiological Assistance Program teams that are available for prompt, reliable assistance to first responders for long-term response and mitigation.]
A comment was made that half of the trucks carrying spent nuclear fuel that enter the State of Washington at the border have been arrested by State Patrol inspectors for safety deficiencies, and these same companies will be used for these shipments. Commentor also noted that Canadian shipments will enter the State of Washington at its borders by truck.	DOE contacted the Commercial Vehicle Division of the Washington State Highway Patrol in response to this comment, but was not able to ascertain the source of the commentor's statistic about 50 percent of the trucking firms having serious safety defects for low-level waste shipments to the Hanford Site. From January 1 through August 15, 1995, however, out of 301 radioactive shipment inspections performed by the Highway Patrol at Plymouth, WA, only ten vehicles were issued citations. This is a citation rate of only three percent, n by the Highway Patrol at Plymouth, WA, only ten vehicles were issued citations. This is a citation rate of only three percent, not fifty percent. Furthermore, none of the ten citations were for serious safety defects. DOE is committed to ensure safe transportation through the implementation of the MCEP.] [DOE would contractually require that only reputable shipping firms are used to ship the foreign research reactor spent nuclear fuel covered by this proposed policy. Trucking firms with poor safety records would be excluded from transporting the foreign research reactor spent nuclear fuel under the mandatory MCEP, which is described above.] [DOE recognizes its responsibility to assure that its hazardous materials are transported safely. DOE developed and implemented in 1992 a mandatory Motor Carrier Evaluation Program (MCEP). The MCEP is revised every year to keep it up to date with changing regulations. The criteria for evaluating motor carriers in the MCEP are: – Hazardous Material Transport Experience, – Equipment Profile, – Insurance Requirements, – Financial Stability, – Carrier Safety Programs,

ISSUES RAISED	DOE RESPONSES
	(continued from the previous page) – Drivers (including: Training Program, Selection Criteria, Turnover Rate, and Incentive Program), – Carrier Management, – Equipment Maintenance Program, – Hazardous Material Routing Policy, – Security, – U.S. DOT OMC Safety Rating, and – Carrier Interviews.]
A comment was made that each transport vehicle should be well and visibly marked.	[Every vehicle transporting foreign research reactor spent nuclear fuel would be clearly marked in accordance with Department of Transportation regulations. See Section 5.4 of the EIS for details.]
A comment was made that every ship or truck should be escorted by a team of people who are fully and effectively trained.	[To better describe the security and emergency preparedness that would be associated with transportation of the foreign research reactor spent nuclear fuel, Appendix H has been added to the EIS. This appendix presents the general provisions of the Transportation Plan, which is a document that provides the details that would be associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the management site.]
A comment was made that clean-up money has been misappropriated and diverted to other programs. Commentor cited earmarked funding that was eliminated to protect the Columbia River and clean up contaminated soils, groundwater, and tanks. Commentor also stated that Strontium-90 levels were 1500 times the drinking water standard. Commentor asked when the government was going to wake up and take care of these problems.	[The comment is outside the scope of the EIS.]

ISSUES RAISED	DOE RESPONSES
A comment was made that Hanford, Idaho National Engineering Laboratory and Savannah River Site all have problems with storage facilities and that there is no basis yet to safely store our own spent nuclear fuel. A commentor elaborated on problems at Hanford and why it is not an acceptable site for storing spent nuclear fuel, citing the K-Basins as an example of a leaking storage facility and having seismic vulnerabilities. Commentor stated distrust in what DOE Richland officials tell the public.	[The potential impacts of storing the spent nuclear fuel are discussed in Section 4.2.4 of the EIS. The data presented demonstrate that the risks resulting from the spent nuclear fuel storage are low.]
A comment was made that the Savannah River Site only has storage capacity for 844 spent nuclear fuel rods and that the site is the only place that the spent nuclear fuel could be received.	The Savannah River Site currently has storage capacity for 1400 spent nuclear fuel rods. [If the Record of Decision indicates that the spent nuclear fuel will be accepted by the United States, additional storage capacity will have to be constructed. See Section 2.2.1.9 of the EIS.]
A concern was expressed about cuts in the DOE budget and DOE's ability to properly manage wastes and clean-up activities.	[DOE will continue to fund vital functions, such as spent nuclear fuel management.]
A question was asked as to whether a fiscal study was done on the costs associated with building facilities, transporting nuclear fuel, storing the waste, and disposing of the waste.	[Section 4.8 of the EIS addresses costs of the proposed action.]
A comment was made that, of the three locations where DOE intends to store the spent nuclear fuel, not one has sufficient funding to expand the storage capacity so it can store the fuel. Commentor asked if DOE would address the cumulative impacts of additional spent nuclear fuel, including resource impacts (marginal and capital costs) and long-term costs of storage, and address the inadequate funding according to Activity Data Sheets for the sites.	The EIS does address cumulative impacts [Section 4.2], and costs [Section 4.8], associated with the management of foreign research reactor spent nuclear fuel. Other DOE-owned spent nuclear fuel is addressed in the DOE Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Restoration and Waste Management Program Environmental Impact Statement (SNF & INEL EIS) [Section 1.5 of the EIS].
A comment was made that the law requires DOE to consider cumulative impacts in this EIS, not in the Programmatic EIS. Commentor asked whether DOE was going to consider cumulative impacts in this EIS.	Both the DOE Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Restoration and Waste Management Program Environmental Impact Statement and this EIS address cumulative impacts that would result from management of the DOE-owned spent nuclear fuel and foreign research reactor spent nuclear fuel.
A comment was made noting that the EIS stated that there were no significant impacts associated with the proposed policy and that there must have been a lot of assumptions associated with this statement. Commentor asked what those assumptions were and whether DOE considered the possibility of accidents in its assumptions.	The EIS used conservative assumptions in the analyses of impacts and did consider accidents. Assumptions for each of the alternatives analyzed are presented in the EIS. [The EIS shows that the risks associated with an accident are low (See Sections 4.2.1.3, 4.2.2.3, 4.2.3.3, and 4.2.4.1 of the EIS) and that the risks associated with incident-free handling of and potential accidents associated with the foreign research reactor spent nuclear fuel casks are also low (See Sections 4.2.1.2, 4.2.2.2, 4.2.3.2, and 4.2.4.1 of the EIS).]

ISSUES RAISED	DOE RESPONSES
A question was asked as to how DOE reconciles low significant environmental impacts with anecdotal information, such as families dying of cancer. A related question was whether there is a correspondence between the results of the DOE analyses and "actual numbers."	Considerable [scientific] work was done to correlate radiation doses with cancer incidents. The data analyzed were from real-life incidents. For example, people who were exposed to radiation as a result of Hiroshima and Nagasaki were tracked to monitor ill-health effects. [The internationally accepted results on which the EIS analyses are based are presented in Section 4.1.3 of the EIS.]
A question was asked as to the regulatory limit for radiation exposure.	The regulatory limit for radiation exposure is 10 mrem [per hour] at 2 meters away [from the vehicle]. Most spent nuclear fuel shipments are much less than that. [The radiation dose that anyone would receive handling, working or traveling near a cask is below the limit that is allowed to the public in an unrestricted area by NRC regulations (Title 10 CFR Part 20).]
A comment was made expressing concern about the health effects of spent nuclear fuel on people. Commentor stated that there is no consensus among scientists regarding the impacts of low-dose, long-term exposures. Commentor asked if DOE had any additional data on this and whether DOE considered other views besides the viewpoint that no danger exists.	There are varying views. DOE has not conducted scientific research on this subject on its own. Rather, DOE has used parameters recognized by the scientific community [the United State Nuclear Regulatory Commission and the International Council on Radiation Protection].
A comment was made that the distance from Tacoma, Portland, or Seattle to Hanford is about 700 miles, which is a long trip, and a lot of things could happen. Commentor stated that, although DOE says there is no danger, there are incidents of cancer and deformed children at Hanford and that "it isn't that simple and clean and free from danger."	[The commentor's opposition to use of the Hanford site is noted. In the Record of Decision for the Programmatic Spent Nuclear Fuel Program, the Savannah River Site, and the Idaho National Engineering Laboratory were designated as interim management sites for spent nuclear fuel from foreign research reactors. The Hanford site was not so designated.]
A comment was made that the radiation levels and latent cancer fatalities discussed in the EIS apply to adults and do not address exposures to children. Commentor stated that it is important to answer what radiation levels cause what impact. Under United States regulations, casks are allowed to emit 200 mrem per hour of radiation at the surface, which is equivalent to about 10 full-body x-rays per hour. Commentor stated that this translates to 8 fatal cancers per 10,000 people exposed and that the number is 2-to-8 times greater for children.	[The relationship between radiation exposure and latent cancer fatalities (LCF) used in the EIS was for the general population, which includes children, pregnant females and other higher risk individuals. The exception is where only workers are present, such as at DOE facilities. In these instances, a worker dose-LCF relationship was used.] [While the limit at the surface of a cask is 200 mrem/hr, the limit 2 meters from the surface of the container (an ISO container in this case) is only 10 mrem. See Section 4.1.3 of the EIS for a discussion of the general radiological health effects.]
A comment was made that no safe level of radiation exposure has been determined.	[While regulatory limits have been established, the comment is noted. Section 4.9 of the EIS describes risks associated with U.S. acceptance of the spent nuclear fuel (Management Alternative 1 or 3) and compares these risks with those due to the natural background radiation and other common risks.]

ISSUES RAISED	DOE RESPONSES
A comment was made that the cause of the air's movement is not fully understood and that we are not positive about what causes the movement of air -- perhaps air is an intelligent form of life. Commentor suggested that this be taken into consideration.	[The comment is outside the scope of the EIS.]
A question was asked as follows: Given DOE's statement that a cask would emit 10 mrem per hour if a person was standing at a distance of 2 meters away from the cask -- what if a person was sitting on Interstate 5 during rush hour 2 meters away from the cask on a truck receiving a dose equivalent to a full-body x-ray per hour -- what is the number of latent cancer fatalities?	[As explained in Section 4.1.3, the relation between dose and LCF for the general public is 0.0005 LCF per person-rem. If a person were to sit next to the cask for one hour, he or she could receive 10 mrem or 0.01 person-rem. Therefore, the probability of the person dying from cancer as a result of this exposure is 0.000005, or one in 200,000.]
Comments were made on behalf of the Longshoremen Local in Tacoma expressing concern about possible exposures to workers and the community at large in the event of an accident.	[In the improbable event that an accident should occur, the impact analysis results demonstrate that, although there is a linear relationship between the population around the port and the accident consequences expressed in population dose (Section 4.2.2.3 and Figure 4-1 of the EIS), the highest risk of a latent cancer fatality is 0.000029 for the full range of ports considered. The risk number assumes the acceptance of all of the foreign research reactor spent nuclear fuel into the United States and the use of very high population-density ports such as Elizabeth, New Jersey which is just across the Hudson River from New York City.]
A question was asked as to whether there is special handling training for drivers and dock workers.	If a decision is made to ship spent [nuclear] fuel through a particular port, a Transportation Plan will be developed that would identify any special or additional training that may be required for workers. Truck drivers are required to have additional training to be licensed to handle spent nuclear fuel.
A comment was made that every worker should be given fully informed consent of the hazards involved, including worst-case scenario accidents.	[The radiation dose that anyone would receive handling or working near a spent nuclear fuel transportation cask is below the limit that is allowed to the public in an unrestricted area by NRC regulations (Title 10 CFR Part 20). As such, no signed consent form would be required from anyone associated with the cask carrying foreign research reactor spent nuclear fuel.]
A comment was made that in the event of an accident, the DOE-trained people at Hanford that deal with radioactive accidents "do not do us any good" if there is an accident in Tacoma.	[The DOE Radiological Assistance Program team that operates from Hanford can be deployed upon State, Tribal, or local request. These teams can provide technical expertise and assistance to monitor and assess radiological hazards. The team generally is ready to deploy from their home station within four hours of notification.]

ISSUES RAISED

Comments were made expressing concerns about the potential impacts of, and EIS analyses on, ship-board fires. Specific comments included the following:

- In 1986 a Court barred DOE from importing fuel through ports since there was no adequate analysis of a shipboard fire. The EIS is invalid because spent nuclear fuel has already been received into South Carolina.
- In the event of a shipboard fire, there would be a release of radioactive gas.
- The fire test of 1475 degrees Fahrenheit for 30 minutes is not sufficient. Tacoma has experience with shipboard fires that reached 2000 degrees Fahrenheit for 24 hours (September 1991). Had other hazardous cargoes been onboard, the fire would have burned hotter and may have been uncontrollable.
- If one cask of spent nuclear fuel was onboard during a ship fire inland, results show that plumes would extend 60 miles downwind from a ship accident for up to an area of 900 square miles. Contamination levels would be high enough to require evacuation and decontamination. The gamma radiation dose would be lethal to any person within one mile downwind for a period of one year.

DOE RESPONSES

With regard to the incident that was mentioned involving a 2000 degree Fahrenheit shipboard fire, only a small portion of the flame reaches peak temperature during an actual incident such as the one described. When DOE conducted the heat tests on the type of casks that will be used for these shipments, the casks were subjected to sustained temperatures. Casks onboard the ship will not get to peak temperature. Even if they did, the outcome would be that some of the lead shielding would melt and redistribute. The spent nuclear fuel would still be contained inside the cask. Some of the shielding, however, would not completely encompass the cask. After the fire was extinguished, new external shielding would be used to continue the transportation process. [Cask certification standards were developed for use of the casks on land, hence the 30 minute fire test, which is considered to be the extent of a high intensity fire resulting from a collision with a tanker truck. A ship fire has the potential for a longer duration fire due to the amounts of combustibles carried by some ships. In spite of this potential, the number of severe fires on ships is relatively small. Data available on the last 15 years from Lloyd's of London indicates that of 1,073 ship collisions in port worldwide, only eleven led to fires, and of those, only five caused extensive damage, with only one actually causing buckling of structures.]

[In respect to the impact a ship fire might have on a spent nuclear fuel transportation cask, there are three facts that mitigate the potential damage to the spent nuclear fuel. First, ship fires tend to move to different areas of the ship as the combustible material is consumed, so the cask would not be exposed for the entire duration of the fire. Second, a ship fire's intensity is normally limited by the amount of oxygen that can reach the interior of a hold. Third, all ships that would be used to transport foreign research reactor spent nuclear fuel have built-in fire suppression equipment, which as a minimum would keep fires well below the extreme temperatures necessary to damage the transportation cask. For these reasons, it is almost impossible for nuclear fuel inside the transportation cask to reach 900 degrees Kelvin (1,160°F), the melting point of foreign research reactor spent nuclear fuel. The probability of reaching such a temperature was calculated to be less than one in a billion (see Attachment D5 to Appendix D of the EIS). To put this temperature into perspective, steel used in a ship's structure buckles at around 700 degrees Kelvin (800 degrees F).]

[The EIS contains the results of an analysis of the effects of an accident that involves a severe fire (severity category 6), which does not reach the temperature to melt research reactor nuclear fuel. See Appendix D, Section D.5.3 of the EIS for detailed discussion of accident probabilities and radioactive material source terms and Section D.5.4 for the results of the analyses.]

ISSUES RAISED	DOE RESPONSES
	(continued from the previous page) [In conclusion, although long duration ship fires are possible, and have occurred, they are uncommon events. Analyses in the EIS show that even in the event of a severe ship fire involving a transportation cask, neither the consequences nor risks are great (Appendix D, Section D.5.5 of the EIS).] [The massive accident contamination projections that are cited by the commentor appear to come from a report by Dr. Resnikoff (Greenpeace). Unfortunately Dr. Resnikoff does not provide adequate information on the cask inventories, release fractions, and meteorological assumptions that he used in his analyses, nor does he explain any changes he may have made to the code used to predict consequences. Without full disclosure, it is impossible to determine exactly why his estimates are orders of magnitude greater than DOE's well-documented and publicly available estimates. DOE's analyses are presented in Section 4.2.2.3 of the EIS and show that contamination from a severe ship accident and fire are small.]
With regard to the 30-foot drop test for Type B containers, a comment was made that the distance from the cranes to the dock is much more than 30 feet.	DOE's 30-foot drop test was on to an unyielding surface. Even if the actual distance from the crane to the dock is greater than 30 feet, there would not be the same type of stresses at a port dock that would result from an unyielding surface. [An unyielding surface is a theoretical, perfectly flat surface that cannot be moved, dented, or cracked in any way. An acceptable "unyielding surface" for the Nuclear Regulatory Commission consists of a monolithic concrete base, reinforced by rebar and covered with a plate of battleship armor (Section 5.4.1).] [In one experiment, a real cask was dropped from much higher than 30 feet from a helicopter onto ordinary soil with no damage to the cask.]
With regard to the crash test for Type B containers, a comment was made that crashing a truck into a wall at 84 miles per hour is not the same as trains crashing into trucks. This type of an incident has happened.	[In another experiment, a real cask sitting on a truck trailer was struck by a locomotive traveling at 80 miles per hour. The locomotive was destroyed, the transportation cask was dented, but cask containment remained intact.]

List of Attendees at Seattle/Tacoma, WA Public Hearing

Amdahl, Drew

Barton, Mike

Braekins, Lonnie R.

Brown, Rachel

Clark, Tim

Crandall, Kathy

Detamore, Cindy

Devoy, Tiffany

Dyson, Jessica

Evans, Robert W.

Fisk, Rod

Gordon, Susan

Hackmack, Gregov

Herbst, Rodger

Keller, Sherry F.

Koppel, Anci

Kraft, Roger

Marzano, Dick

Meyer, Collin

Notro, Jennifer

O'Malley, Pat

Pangborn, Sally

Rayson, Chris

Rogerson, Pete

Ryan, Laura

Syracopoulos, Thalia

Topel, Anoko

Walters, Bennie E.

Wilhite, Melody R.

Yerxa, Jon

Zepeda, Barbara

The public hearing at Southport, North Carolina, for the candidate port of entry at the Military Ocean Terminal at Sunny Point, was held at the Southport City Hall, on May 23, 1995. Twenty-one people attended the hearing. The hearing was interactive in nature and the following is a summary of the comments and issues that were raised. Information in brackets [ ] was not provided at the hearing.

ISSUES RAISED	DOE RESPONSES
Clarification was requested as to which countries are involved in the proposed policy and the size of their research reactors?	As identified in the EIS, 41 countries are covered under the proposed policy. These countries have spent nuclear fuel containing uranium that was enriched in the United States. [Section B.1.1.3 of the EIS provides information on foreign research reactors that are eligible for inclusion under the proposed action.]
Comment was made that each nation should take care of its own wastes and should have the option to reprocess its wastes at overseas facilities. A doubt was raised about arguments in the draft EIS that foreign countries would continue using HEU since their security would also be at risk.	[Management Alternative 2 considered in the EIS includes the option of overseas reprocessing. However, as discussed in Section 2.3 of the EIS, certain arrangements in support of U.S. nuclear weapon nonproliferation policy would have to be established, including blending the HEU down to LEU, developing the capability to reprocess high density LEU, and converting reactors to LEU. Some foreign research reactor operators would have no option except to continue using, or convert to, HEU fuel.]
Comment was made that other countries should bear financial responsibility for management of their spent nuclear fuel -- even if the fuel is accepted into the United States for management.	[As discussed in Section 2.2.1.2 and 2.2.2.3 of the EIS, several financing options have been considered, ranging from collection of fees from the research reactor operators that would pay all of the costs of the program, to full subsidization of the program by DOE. A compromise between these extremes would be for developed countries to be charged a competitive fee to accept and manage their spent nuclear fuel. U.S. taxpayers would absorb the full costs of the program for developing countries and absorb the amount above a competitive fee for developed countries. The reasons the United States would pay some of the costs for other countries are: 1) some countries would be unable to afford the cost of the proposed action and would have no safe alternative means of managing their spent nuclear fuel (i.e., the developing countries); and 2) some countries would continue to use and trade weapons-grade nuclear material indefinitely unless the U.S. charges a competitive fee and absorbs any costs above that fee.]
A question was asked as to whether the sea shipments would be on dedicated ships (i.e., exclusively carry spent nuclear fuel).	The EIS analyzed shipments via commercial vessels, chartered vessels, and specially-built vessels. DOE is maintaining the options for decisions to be made by the foreign research reactor operators and their shippers at the time of shipment, depending on specific circumstances. [Whether the shipments come as cargo on a scheduled carrier or on a chartered ship, no special precautions are expected to be required by the Coast Guard or any other authority. Therefore, DOE sees no need to use dedicated ships.] An Edlow Group representative reiterated the long-standing experience in shipping spent [nuclear] fuel on both commercial and dedicated shipments, as well as special-built ships. Decisions depend on the amount and nature of the spent nuclear fuel.

ISSUES RAISED	DOE RESPONSES
A question was asked as to how many ships would come into the United States with spent nuclear fuel.	The number of ships depends on how many casks are loaded onto a ship. About 720 casks are estimated to be shipped by sea over a 13-year period.
A question was asked as to how many ship-loads of spent nuclear fuel could come up the river to the Savannah River Site.	With a total amount of 720 casks that could be shipped over a 13-year period, the total number of ships would be about 500. The number of ships coming up river to the Savannah River Site would depend on how many casks are on a ship and what other ports are selected for entry.
Clarification was requested on how DOE estimates the number of sea shipments.	If one cask is shipped per ship, the maximum number of shipments would be 720. However, it would not be economical to ship only one cask per ship.
Concern was expressed about the vulnerability of North Carolina and South Carolina to hurricanes and earthquakes.	[The EIS considered severe natural phenomena as part of the port selection process (Appendix D, Section D.1.9.6 of the EIS). The probability of each phenomenon impacting foreign research reactor spent nuclear fuel is low.]
Several commentors stated their opposition to spent nuclear fuel entering the State of North Carolina.	[The commentor's opposition to receipt of the foreign research reactor spent nuclear fuel at MOTSU and to transport across the state is noted.]
A comment was made that the draft EIS did not accurately portray the population estimates in the Wilmington and Southport areas, particularly the summer and autumn populations, which were stated as being larger than the average population.	[Accident analysis populations were based on the 1990 census (Appendices A, D, and E of the EIS). Transient populations cannot be accurately estimated, therefore only permanent resident populations were considered.]
A question was raised as to whether DOE would designate specific ports of entry in advance, or simply state which ports are acceptable and allow the shippers latitude to select the port of entry.	The approach to be used in port selection will be determined when the Secretary of Energy issues the Record of Decision. However, the most likely approach to be taken is for the shippers to have maximum flexibility to designate the port of entry based upon DOE's determination of acceptable ports.
Concern was expressed about the potential for sinkholes underneath the rail lines in the Southport area and the ability to safely retrieve a cask that falls into a sinkhole.	[Spent nuclear fuel transportation] casks have been designed to be robust and withstand severe accident conditions. These casks have been subjected to simulated severe accident tests, such as a crash, fire, and the dropping of a cask onto an unyielding surface. If a cask were to fall into a sinkhole, DOE would immediately retrieve the cask. [The transportation cask would not be ruptured by virtue of falling into a sinkhole.]
A suggestion was made that DOE should take into account the Consent Agreement between Martin Marietta and the Army Corps of Engineers that allows lime mining to continue in spite of documented sinkholes in the Southport area.	[Additional language has been added to Section 3.2.1.5 of the EIS to address this issue.]

ISSUES RAISED	DOE RESPONSES
A comment was made that road conditions in the Southport area were inadequate for spent nuclear fuel transportation. It was noted that, according to State documents, there are no plans in place to correct poor road conditions.	[The North Carolina Department of Transportation was contacted regarding this issue. Although the roads servicing MOTSU are primarily small, two-lane roads, they would be adequate to transport foreign research reactor spent nuclear fuel as long as State regulations for normal traffic are met. Appendix D, Section D.2.1.5 of the EIS has been changed to better describe the road access to MOTSU.]
A suggestion was made that the public in Brunswick County should be notified if and when spent nuclear fuel shipments will be transported through their communities.	[DOE is required to inform State officials in advance of the shipment of hazardous cargos. DOE would also work with State and local officials to ensure that channels of communication remain open and that emergency response preparedness is coordinated.]
A question was asked whether the shipment schedule will be deemed safeguarded information, thus precluding public notification.	Under Nuclear Regulatory Commission regulations, [information on the] spent [nuclear] fuel shipments is considered safeguarded information. This is not meant to be secretive but to balance against a security threat. However, DOE will work with States to assure that proper authorities know the specifics about a shipment and will be prepared to respond to any emergency.
A question was asked as to whether local emergency and highway patrols will be trained to respond to accidents involving spent nuclear fuel.	When it is known that a shipment would take place, DOE would work with the State to assure that local communities were trained and equipped to respond to any emergency involving spent nuclear fuel.
A suggestion was made that DOE should provide its own security teams and not drain the State and local response capabilities.	Most shipments are escorted by the shipper's security. Trucks are also continually tracked by a DOE satellite tracking system.
A suggestion was made that DOE should take total responsibility for emergency response and security.	[As discussed in Section 2.7 of the EIS, responsibility for emergency response would reside with State, Tribal, and local authorities. DOE would provide coordination, financial and technical assistance and training to the State, Tribal, and local emergency response personnel. In addition, DOE has Radiological Assistance Program teams that operate from eight strategically located DOE offices around the country. Upon request, these teams can provide technical expertise and assistance to monitor and assess radiological hazards. The teams are activated on an "as-needed" basis and generally can be ready to deploy from their home station within four hours of notification.]
	[Nuclear Regulatory Commission and DOE regulations require escort of shipments of spent nuclear fuel on public highways. Normally the escort is supplied by State and/or local police, but arrangements and payment are the responsibility of the shipper. Section 2.8 and Appendix H have been added to the EIS to address security measures.]

ISSUES RAISED	DOE RESPONSES
A request was made for DOE to consider extending the public comment period.	[The deadline for submission of comments in response to the draft EIS was extended thirty days from June 20 to July 20, 1995, a total of 90 days.]
A comment was made that there should be total nuclear disarmament and that the Treaty on Non-Proliferation does not provide an incentive for nuclear disarmament. Commentor expressed disagreement with extension of the Treaty on Non-Proliferation.	Comment noted but is beyond the scope of the EIS. [The United States supported the indefinite extension of the Treaty on the Nonproliferation of Nuclear Weapons, which is the foundation for the international nuclear weapons nonproliferation regime.]
A comment was made that taxpayers should be alerted that "94 more nuclear reactor plants will be operating around the world in the next 15 years and that they should be aware of the huge costs for nuclear waste cleanup associated with these plants." Commentor asked how many of these plants "have deals" with the United States to "dump their waste" in our country.	The proposed policy in this EIS deals only with spent nuclear fuel at foreign research reactors that contains uranium enriched in the United States.
A question was raised as to whether, in light of the United States encouragement of foreign research reactors to downgrade their use of reactor fuel to LEU, the United States was requiring the same of its own research reactors.	The United States is encouraging its own research reactors to convert to the use of LEU instead of HEU. Most United States research reactors have either converted to the use of LEU or are in the process of converting to the use of LEU.
A question was asked as to whether the United States is purchasing the spent nuclear fuel.	No. The United States sold the fuel to the foreign research reactors. The uranium was enriched in the United States. Under the policy, the United States would merely be accepting the spent [nuclear] fuel containing U.S.-enriched uranium if a decision is made for the United States to manage the spent [nuclear] fuel.
A question was asked as to whether the United States is still supplying the enriched uranium to other countries.	The United States has not exported HEU for 3 years [since enactment of the Energy Policy Act of 1992 prohibited the export of HEU, except under special circumstances].
A question was asked as to whether the United States will continue to produce nuclear weapons from the spent nuclear fuel at the Savannah River Site.	No. Production of nuclear weapons from spent nuclear fuel is against current United States policy.
A question was asked as to how many spent nuclear fuel casks were currently available.	According to an Edlow Group representative, there are about 8-10 [spent nuclear fuel transportation] casks available.
A question was asked regarding what casks would be used and whether they would be standard spent nuclear fuel casks or new casks.	The cask type depends on the characteristics of the spent nuclear fuel to be shipped and the arrangements made by the shippers. Cask descriptions are contained in Chapter 2 of the EIS and Appendix B.

ISSUES RAISED	DOE RESPONSES
A question was asked as to how the casks were tested.	In order to be certified, casks undergo simulated [severe] accident tests, including a crash test, a drop onto an unyielding surface, and a fire test. [Engineering analysis may be used to demonstrate an ability to pass these tests, rather than performing physical tests.]
A suggestion was made that casks should be full-scale tested, with spent nuclear fuel in them.	[Full-scale demonstration testing of casks were conducted in the United States in the 1970s to confirm that Type B casks built to Federal standards (10 CFR Part 71) could protect and retain their contents in the most severe accidents. Similar tests have conducted in the United Kingdom, Germany and Japan. In each of these tests, the cask prototype was deformed as predicted by analysis, but no simulated radioactive material was released.]
A question was asked as to how casks are approved.	Before entering the United States, the cask [design] goes through an evaluation process by the Nuclear Regulatory Commission (NRC) and certification by the Department of Transportation (DOT). If the NRC evaluation concludes that the cask is certifiable to NRC standards, DOT issues a certification for the United States acceptance of the cask.
Clarification was requested as to the meaning of the statement that spent nuclear fuel under this policy represents about one percent of the DOE inventory.	The one percent of DOE inventory refers to one percent of the metric tons of heavy metal (MTHM) of spent nuclear fuel in the DOE inventory. MTHM is a standard measurement used for the content [the quantity of the mass of heavy metal] of uranium and other heavy metals.
A comparison of foreign research reactor spent nuclear fuel with commercial spent nuclear fuel was requested.	The EIS Summary and Chapter 1 contain illustrations that show the differences between the two types of fuel. DOE's current inventory of spent nuclear fuel is about 10 percent of the commercial industry's inventory. The DOE inventory is about 2,500 metric tons of heavy metal. [Currently about 2,700 MTHM of DOE spent nuclear material is being stored at various DOE facilities.]
A question was asked as to whether uranium is enriched in nuclear power plants.	No. Nuclear power plants produce energy; they do not enrich uranium. Uranium enrichment requires complex processing plants.
A question was asked regarding the United States plan for ultimate disposition of spent nuclear fuel.	The current plan is disposal of spent nuclear fuel in a geologic repository.

ISSUES RAISED	DOE RESPONSES
An Edlow Group representative read a statement presenting the position of about 14 foreign research reactor operators. (A written statement is included in Volume 3 of the EIS.) Statement is summarized as follows: (1) Foreign research reactors provide benefits; (2) Foreign research reactor operators always relied on United States assurances to take back U.S.-origin fuel; (3) United States acceptance of foreign research reactor's spent nuclear fuel supports nonproliferation goals; (4) With United States acceptance of foreign research reactors' spent nuclear fuel, reactor operators willingly cooperated in the RERTR program and converted to LEU fuel; (5) Foreign research reactor operators are making long-term plans to deal with their own fuel overseas; (6) In the short-term, foreign research reactors do not have safe storage capacity; (7) Foreign research reactor spent nuclear fuel makes up only 1% of heavy metal content of entire DOE-owned spent nuclear fuel inventory; (8) United States acceptance can be done without significant impacts; (9) While United States acceptance adds a small amount of spent nuclear fuel to DOE inventory, the trade-off is taking HEU out of world commerce; and (10) DOE should move forward with United States acceptance of foreign research reactor spent nuclear fuel.	[Comments are noted. Statement was also submitted as a written comment. DOE response is included in Volume 3 of the EIS, written comments section, document number 7.]

List of Attendees at Southport, NC Public Hearing

Bryson, Thad

Cameron, Billy R.

Cartier, Arthur

Glenn, Steve

Greenbaum, Howard

Hoffman, Renee

Holth, Cathy

Holth, Susan

Kyte, John

Lankshear, Ron

Muslim Sister

Osborne, Suzanne

Pendleton, Trois

Pennock, Joyce E.

Pope, Terry D.

Quinn, Bob

Ravenscroft, Norman

Roof, Charles

Shelton, Kelly

Trojanowski, Robert

Wells, Christopher

The public hearing at North Augusta, South Carolina, hearing site for the candidate DOE Management Site at the Savannah River Site, was held in the North Augusta Community Center on May 9, 1995. Twenty-one people attended the hearing. Below is a summary of the comments and issues that were raised at the hearing, which was interactive in nature. Information in brackets [ ] was not provided in the hearing.

ISSUES RAISED	DOE RESPONSES
A question was asked regarding the foreign research reactor operators' position on whether the United States should store or reprocess their spent nuclear fuel if it is accepted into the United States.	According to an Edlow Group representative, the foreign research reactor operators do not want to interfere with United States domestic policy and have taken no position on what DOE should do with the spent nuclear fuel upon United States acceptance. [The Edlow group is a group of 14, mostly European, foreign research reactor operators represented by Edlow International Company, an international traffic management firm.]
A question was asked as to whether foreign countries have experience in reprocessing.	France and the United Kingdom both have experience in reprocessing. [Germany and Japan also have experience in reprocessing.]
A question was asked as to what foreign research reactor operators would prefer if the spent nuclear fuel were to be managed overseas.	According to an Edlow Group representative, most foreign research reactor countries have circumstances that preclude near-term storage (laws, time-consuming licensing process, lack of capacity). Therefore, storage is not a viable option. Most foreign research reactors would likely revert to, or continue using, highly enriched uranium. [Management Alternative 2, the overseas management option, could be implemented by U.S. assistance in reprocessing as well as storage.]
A question was asked as to whether there are any demonstrated storage sites for dry storage of aluminum-clad fuel overseas.	Australia, Japan, and Canada have dry storage facilities for aluminum-clad fuel. [Denmark also has dry storage facilities for aluminum clad fuel.]
A question was asked as to what type of wet storage these countries require prior to dry storage.	[They use pool storage similar to that use in the United States.]
A question was asked as to whether foreign research reactor operators would consider paying to help the United States manage their spent nuclear fuel.	According to an Edlow Group representative, the official position of the foreign research reactor operators (that belong to the Edlow Group) is that they do not want the United States to subsidize their shipping of spent nuclear fuel to the United States for management. They are willing to pay actual costs as long as they are real costs (cost-based pricing as opposed to market-based pricing). The Edlow Group representative noted that the September 1994 cost of the urgent-relief shipment into the Savannah River Site was more than twice what DOE had charged prior to termination of the program in 1987.

ISSUES RAISED	DOE RESPONSES
An Edlow Group representative read a statement presenting the position of about 14 foreign research reactor operators. (A written statement was also submitted.) Statement is summarized as follows. (1) Foreign research reactors provide benefits; (2) Foreign research reactor operators always relied on United States assurances to take back U.S.-origin fuel; (3) United States acceptance of foreign research reactor's spent nuclear fuel supports nonproliferation goals; (4) With United States acceptance of foreign research reactors' spent nuclear fuel, reactor operators willingly cooperated in the RERTR program and converted to LEU; (5) Foreign research reactor operators are making long-term plans to deal with their own fuel overseas; (6) In the short-term, foreign research reactors do not have storage capacity; (7) Foreign research reactors' spent nuclear fuel would make up only 1% of heavy metal content of entire DOE-owned spent nuclear fuel inventory; (8) United States acceptance could be done without significant impacts; (9) While United States acceptance would add a small amount of spent nuclear fuel to DOE inventory, the trade-off would be taking HEU out of world commerce; and (10) DOE should move forward with United States acceptance of foreign research reactor spent nuclear fuel.	[Comment is noted. DOE's response to the written submittal is included in this Volume 3 of the Final EIS, document number 7.]
A comment was made that, from the perspective of a group of foreign research reactor operators, the United States is legally committed through contractual obligations and other expressed and implied means to accept foreign research reactor spent nuclear fuel.	DOE's position is that the United States is not legally obligated to accept foreign research reactor spent nuclear fuel. [With the exception of cases in which DOE has executed contracts for acceptance of spent nuclear fuel from specific foreign research reactors, DOE considers that neither the DOE nor the United States Government has any legal obligation to receive spent nuclear fuel from foreign research reactors. Even in cases where there may be signed contracts for shipment of spent unclear fuel to the United States, there are two cases, as follows, in which DOE considers that neither DOE nor the United States Government have any legal obligation to accept the spent nuclear fuel. 1. In the absence of a completed Appendix A for each shipment, mutually agreed to by DOE and the research reactor operator, DOE considers that the contracts have not been completed and are not binding. 2. In the absence of a completed review under the National Environmental policy Act (up to and including issuance of a Record of Decision or Finding of No Significant Impact specifically covering the proposed shipment), DOE considers that any contract would be subject to successful legal challenge and would not be enforceable.]

ISSUES RAISED	DOE RESPONSES
A comment was made that, although the commentor supports the nonproliferation policy and supports the Savannah River Site, in light of the budget situation, DOE should look carefully at the cost of bringing foreign research reactor spent nuclear fuel into the United States and that foreign research reactor operations should consider sharing the cost. The commentor asked if a cost analysis would be done.	A cost analysis is included in the EIS [Volume 1, Section 4.8]. According to an Edlow Group representative, the foreign research reactor operators are willing to pay all costs associated with shipment of their spent nuclear fuel to the United States, provided the charges are cost-based.
A question was asked about the status of technologies for blending HEU down to LEU.	The physics for blending HEU to LEU is basic and the [technology and] capability to do so exists [in the United States, United Kingdom, France, and other countries].
A question was asked as to whether there is a Federal policy for weapons-grade uranium in power reactors.	[Presidential Decision Directive 13 specifies that it is U.S. policy to minimize and eventually eliminate the use of highly enriched uranium in civil programs worldwide. This policy would include the use of weapons-grade uranium in power reactors. As a practical matter, weapons-grade uranium is not used in power reactors.]
A question was asked as to whether a NEPA action relative to United States policy to no longer reprocess was completed.	No. NEPA actions usually apply to [and are required for proposed] actions to do something; not to cease something, [unless the cessation would have potentially significant environmental impacts.]
A question was asked as to whether the United States is paying countries to send the HEU to the United States.	[The United States has not proposed paying countries to send HEU to the United States under the proposed action. However, certain costs could be subsidized.] In a separate program [the U.S.-Russian HEU Purchase Agreement], the United States is paying Russia for its HEU [blended down to LEU] because of concerns about Russia's ability to store HEU safely [and to further U.S. nuclear weapons nonproliferation objectives].
A question was asked as to when the technology became available for reactors to run on LEU fuel.	The Reduced Enrichment for Research and Test Reactors program began in 1978 when the United States started encouraging foreign research reactors to convert operations to LEU fuel. [The technology has been available since the 1960s.]
A comment was made that the United States should focus its proposed policy on only "rogue" nations instead of worrying about NATO countries.	This was considered in preparation of the EIS. DOE does not consider that this alternative is appropriate because: (1) the status of governments can change; (2) the United States is looking to NATO countries to set an example for other countries; and (3) not all NATO countries agree with the U.S. goal of eliminating worldwide use of HEU.

ISSUES RAISED	DOE RESPONSES
A question was asked as to why the proposed policy is limited to only U.S.-origin enriched uranium and why there is a time limit.	The EIS addresses a finite action, which applies only to foreign research reactor spent nuclear fuel with U.S.-origin enriched uranium. The 10-year policy duration would accept from foreign research reactors all of the U.S.-origin spent [nuclear] fuel [containing HEU]. [The United States is encouraging Russia and China to retrieve the HEU that they supplied. The time limit is to encourage foreign nations to arrange for their own nuclear waste disposal outside of the United States.]
Clarification was requested of the NEPA actions that followed expiration of the HEU Off-Site Fuels Policy in 1988 for HEU and 1992 for LEU fuels.	As described in more detail in Chapter 1 of the EIS, an Environmental Assessment [and draft "Finding of No Significant Impacts" (FONSI)] were prepared following expiration of the Off-Site Fuels Policy to evaluate possible implementation of a new policy for United States acceptance of foreign research reactor spent nuclear fuel. Because of the strong negative comments received on the Environmental Assessment [and draft FONSI, this NEPA review] was never completed. Key concerns during public comment on the Environmental Assessment involved opposition to a United States acceptance policy in general and the need for a more comprehensive NEPA review, resulting in preparation of this EIS.
A question was asked about the relationship between the Environmental Assessment prepared in 1994 for the U.S. acceptance of Urgent-Relief shipments of foreign research reactor spent nuclear fuel and the South Carolina lawsuit.	The State of South Carolina filed a lawsuit in September 1994 while the first of two shipments under the 1994 Environmental Assessment was in progress. The second shipment has not taken place and the lawsuit is still pending. [On August 23, 1995, a Federal appeals court overruled a District court order that had blocked shipment of the spent nuclear fuel. This ruling clears the way for the remaining Urgent Relief shipment.]
A comment was made that the burn-up of plutonium and tritium in a reactor goes hand-in-hand with nonproliferation. Commentor asked if DOE is looking at multi-purpose reactors that would burn up plutonium and tritium.	DOE is studying burn-up reactors as part of a separate NEPA review.
A question was asked as to how DOE, in its public outreach, responds to the legal issues and States' opposition to storing spent nuclear fuel in their States. Was it a matter of "sharing the larger world issues"?	DOE's preferred approach is to conduct outreach activities that explain the reasons why an action is being proposed and how the action or lack of action may affect [the public].
Clarification was requested as to what fraction of worldwide HEU is represented in the proposed policy.	It is difficult at this time to estimate the amount of worldwide HEU. Currently, there is a major undertaking between DOE and Russian laboratories to identify the HEU in Russia. Efforts are also underway with China. Russia and China are also pursuing programs similar to the United States to retrieve the HEU that they have provided to others.

ISSUES RAISED	DOE RESPONSES
A question was asked as to whether more plutonium is generated as reactors convert to LEU.	Only a small increase in plutonium is generated [when the fuel is converted] from [HEU to] LEU. In comparison with HEU, there is a net decrease in weapons grade material [when reactors convert to LEU].
A comment was made that there does not appear to be a concern by DOE or the Department of State that any of the spent nuclear fuel could be stolen or hijacked. The commentor questioned the use of commercial shipping because of a terrorist threat and suggested that military shipping should be used.	The weapons-grade material is an integral part of the solid metal fuel elements. Before the weapons grade material can be usable, it must be separated from the fuel element. This can only be done by a reprocessing plant. A terrorist could not "run up and grab" a [spent nuclear fuel transportation] cask. [Casks used for marine and ground transport weigh about 10-25 metric tons. EIS Section 2.8 and Appendix H have been added to the Final EIS. They describe, among other items, the security that will be in place for shipments.]
A question was asked as to how dry storage of all aluminum-clad nuclear fuel at the Savannah River Site compares in scale to the aluminum-clad nuclear fuel in storage at commercial power plants.	About 4 acres would be required for the dry storage of all DOE-owned aluminum-clad fuel. This is comparable to the storage of spent nuclear fuel at just one commercial nuclear power plant. [Commercial power reactors do not use aluminum-clad fuel.]
A comment was made that aluminum-clad nuclear fuel should be chemically separated at the Savannah River Site. Reasons cited were the massive costs and increased exposures associated with the canning of failed aluminum-clad elements for storage and the availability of the chemical separation technology. Comment applies to the foreign research reactor spent nuclear fuel and existing DOE-owned spent nuclear fuel.	[The DOE Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement Record of Decision issued May 30, 1995 identifies the Savannah River Site for consolidation of aluminum-clad spent nuclear fuel. This EIS includes an evaluation of alternatives under which the aluminum based spent nuclear fuel could be reprocessed there.]
A comment was made that it seems incomprehensible for DOE to consider chemically separating some of its own fuel and not foreign research reactor spent nuclear fuel.	Under a separate NEPA action, DOE is evaluating the chemical separation of certain DOE-owned spent nuclear fuel at the Savannah River Site. The analysis contained in this EIS [Sections 2.2.2.6 and 4.3.6] include alternatives under which foreign research reactor spent nuclear fuel could be chemically separated, if other DOE-owned fuel is to be chemically separated.
A question was asked if, in order to store or dispose of aluminum-clad fuel, each element would have to be individually canned.	Only those elements found to be defective would require separate canning.
Clarification was requested of the amount of aluminum-clad foreign research reactor spent nuclear fuel.	The total amount of foreign research reactor spent nuclear fuel covered under the proposed policy is about 19.2 metric tons of heavy metal from about 22,700 individual spent fuel elements. Aluminum-clad fuel represents about 75% of this amount.

ISSUES RAISED	DOE RESPONSES
A comment was made that page 15 of the draft EIS Summary states that shippers would generally select the most direct route. Commentor noted that this was not the case with the August 1994 urgent-relief shipment into the Military Ocean Terminal at Sunny Point, where the shipment went from Sunny Point by rail to the Savannah River Site on a route that was not the most direct route.	[Once the port of entry is selected, the most direct route to the DOE management site will normally be selected. Sometimes, for reasons beyond the control of the shipper, alternate routes are used. In any case, the risk of ground transportation of the foreign research reactor spent nuclear fuel is low. NRC approval of the route taken is always required. Port selection will be part of the Record of Decision.]

List of Attendees at North Augusta, SC Public Hearing

Benjamin, Vickie

Coleman, Barbara

Darlington, Stephen

Egan, Joseph R.

Fernandez, Dr. LeVerne

Geddes, R.L.

Harris, John

Hoglund, Sarah

Jones, Michael W.

Manville, Paul

Martin, Donna

McFarland, Scott

McGehee, Berny

Pajeglio, John W.

Pittman, Randall

Rozelle, Martin

Sieg, Paul

Taylor, Linda

Tjersland, Gary T.

Walters, Vanessa

Wells, Christopher

The public hearing at Tacoma, Washington, a candidate port of entry, was held at the Tacoma Public Utilities Building on June 19, 1995. There were 123 persons who registered to attend the hearing, and about 220 persons did attend the hearing. A verbatim transcript of this hearing was made at the request of hearing participants; the transcript is included as Attachment 1 to this volume of the EIS. The hearing attendees requested a format in which they presented public statements with little or no dialogue between attendees and the DOE. Therefore, most DOE responses were not given at the hearing, but are provided in brackets [ ]. The following is a summary of the comments and issues that were raised.

ISSUES RAISED	DOE RESPONSES
Questions were asked as to how much the public's opinion mattered and whether the public opinion affected the final decision.	DOE is requesting public comments. All public comments are heard and considered by DOE as well as by local legislators and Congress. Public comments that directly affect the EIS and final decisions are those that show technical reasons that a certain action will result in unreasonable risk. It should be noted, however, that DOE does not hear unanimous opposition to the proposed action everywhere it goes.
Commentors stated appreciation that DOE was tape-recording the hearing and has extended the public comment period. One commentor stated that DOE would not have taped this hearing had the local public not made a fuss about it.	[DOE adopted a public hearing format that provided opportunity for increased interaction between DOE and the public in order to facilitate communication. In the large majority of cases, this public hearing format was well received by the public. During the hearings, the facilitator recorded the major comment themes on flip charts, and notetakers recorded additional information to supplement the points captured by the facilitator. DOE also encouraged the submittal of written comments, on forms distributed during the public hearings or in any other written form during the 90-day public comment period. Considering all the mechanisms that were provided to submit public comment, DOE considered that tape recording the hearing was not necessary. However, at the request of several groups, DOE tape recorded the Tacoma hearing. A transcript is included in Volume 3 of the EIS.]
Comments were made that there was insufficient notice and insufficient advertising for the public hearings and that, if it was not for action by local officials and grass roots organizations to get the word out, they would not have known about the hearings. Some commentors asked for more hearings. A comment was made that the public does not find out about DOE actions until after the fact. Commentor stated that these types of things are deliberately kept from them.	[DOE placed advertisements for the June 19, 1995 hearing in the Tacoma Tribune on June 12 and 18, 1995. In addition, interest groups placed advertisements in the same paper (one at least a quarter page in size). In all, seventeen public hearings were held on this EIS in the locations determined to be most directly impacted by the proposed action, specifically in the ports of entry and at the potential management sites. This is well in excess of the single public hearing the applicable regulations require DOE to conduct. In addition to accepting comments from the public during these hearings, written comments were also welcomed, and encouraged. DOE considers that these actions have provided ample opportunity for the public to comment on the draft EIS.]

ISSUES RAISED	DOE RESPONSES
A comment was made urging members of the audience to continue the fight against the proposed action. Specific comments included the following: - DOE has not met the burden of the last injunction, and the Heart of America Northwest is committed to a state-wide initiative to stop DOE. - We must keep the emotions boiling and not let up in our fight against this proposed action. This first came to our attention in 1988 and it was ignored -- now it has become a possibility. We must stick together. - When DOE decides what port to use it will be a political decision. That is where we come in. The campaign starts tonight. - The public must send the message repeatedly to DOE and must write and send letters to Congress, Mr. Head, and the President. - Skagit County was able to keep a nuclear power plant out if its county and the public here can do the same. - The City of Tacoma is united against spent nuclear fuel shipments through the Port of Tacoma. - We will take DOE to court if it attempts to bring in spent nuclear fuel through the Port of Tacoma.	[The commentor's opposition to bringing foreign research reactor spent nuclear fuel through the Port of Tacoma is noted. In evaluating and selecting acceptable candidate ports of entry for receipt of foreign research reactor spent nuclear fuel, the EIS developed and applied evaluation criteria which are described in Appendix D, Section D.1.9 of the EIS. The Port of Tacoma is included in this evaluation. DOE considers that the port selection criteria successfully identify ports than can safely handle the spent nuclear fuel. The decision as to which port(s) would be used if foreign research reactor spent nuclear fuel is accepted by the United States, will be made in the Record of Decision.]
A question was asked as to why Secretary O'Leary has not visited the Tacoma area or appeared at this hearing.	[Although Secretary O'Leary cannot be personally involved in every DOE action or hearing, she will be involved in reaching the final decision on this issue.]
A comment was made indicating that the public distrusts the Department of Energy.	[Secretary O'Leary has made a concerted effort to provide the public with information on past DOE actions to increase public trust. Public hearings provide opportunity for increased interaction between DOE and the public, thus serving to facilitate communication and build a sense of trust. DOE has provided fact sheets, videos, and exhibits at the hearings to assist the public in gathering factual knowledge about the proposed policy alternatives and their environmental impacts.]
A question was asked as to whether this EIS is conceptual in nature.	An EIS is not necessarily conceptual. Programmatic EISs are broad, but project-specific EISs such as this one [on foreign research reactor spent fuel] are not.
A question was asked as to whether Mr. Head (DOE) has a personal bond in case the EIS analyses were wrong. Commentor stated that since Mr. Head is promoting this action, he should be held liable if there was an accident and people were killed.	Mr. Head does not have a personal bond [to cover performance of his DOE functions. Mr. Head is not personally liable for DOE information or actions.] The United States has a law, known as the Price-Anderson Act [that would cover costs associated with a nuclear incident. Mr. Head is not personally liable for DOE information or actions. However, DOE considers that the EIS analyses are correct.]

ISSUES RAISED	DOE RESPONSES
A comment was made that the proposed action was short-sighted and that the United States would be taking on the liability as world police for the foreign countries for thousands of years.	[The proposed action has both short and long-term goals. The objective of the proposed action is to support United States nuclear weapons nonproliferation policy by seeking to reduce and ultimately eliminate the use of highly enriched (weapons grade) uranium in civil programs worldwide.] [The proposed action is not a "world police" activity, nor would the management of spent research reactor fuel from foreign research reactors continue beyond the limited proposed policy duration.]
Comments were made questioning why the United States needs to accept spent fuel from countries that are not a proliferation risk. Specific comments included the following: More than 75% of the countries covered in the proposed action are allies; only 1.4% of the proposed shipments come from countries that are nuclear proliferation risks; any nation can develop nuclear weapons; the nonproliferation argument is not strong; the EIS leaves the impression that some of the countries cannot be trusted, such as Japan, Sweden, Canada, France and Switzerland -- this is insulting to these countries; eliminate allied countries from the list and focus on the remaining countries, which would eliminate about 90% of the problem.	Unless the United States provides an incentive for foreign research reactor operators to switch to the use of low enriched fuels, these reactor operators may return to the use of highly enriched uranium fuel. In addition to operating research reactors, some of our allies are manufacturing and exporting research reactors. Countries also may continue exporting research reactors that run on highly enriched uranium fuel, and the market for highly enriched uranium will continue. The proposed policy seeks to provide an incentive for countries to convert to low enriched uranium. The United States is also working with Russia and China to do the same with their client states. [DOE believes it is not prudent to publicly label selected nations as allies or to label those seen as threatening to the United States (Section 2.8 of the EIS). Negative political and diplomatic reactions from nations designated as threats would likely preclude their cooperation in efforts to reduce international commerce in highly enriched uranium.]
A question was asked as to why the spent nuclear fuel is not contained and left in countries where it is generated.	An option, in addition to United States acceptance of the foreign research reactor spent nuclear fuel [Management Alternatives 1 or 3], is for the United States to assist in [overseas reprocessing or] developing secure storage facilities at more than 100 foreign research reactors worldwide [Management Alternative 2]. However, some governments are not stable, and there would be no assurances that the spent nuclear fuel would stay in those storage facilities. The spent fuel could be diverted to nuclear weapons production.
Comments were made that the United States should not bear the responsibility for other countries' spent nuclear fuel. Specific comments included the following: The United States should encourage responsibility and accountability on the part of the countries who have benefitted from the U.S.-origin highly enriched uranium; why should the United States be responsible for the whole world; first they take our jobs -- now they are shipping us their waste.	[The intent of the proposed action is to support United States nuclear weapons nonproliferation policy by seeking to reduce and eventually eliminate the use of highly enriched (weapons grade) uranium in civil programs worldwide. As discussed in Chapter 4 of the EIS, implementation of the proposed action would have no significant environmental effects, including economic or employment effects.]

ISSUES RAISED	DOE RESPONSES
A comment was made questioning why the United States provided highly enriched uranium to other countries in the first place. One commentor argued that there is no evidence that these countries will convert to low enriched uranium. Another commentor questioned DOE's statement that Japan would build reactors using highly enriched uranium.	[As a major component of the "Atoms for Peace" program, particularly in the early years, the United States provided research reactor technology, and the highly enriched uranium necessary to fuel the research reactors, to foreign nations in exchange for their promise to forego development of nuclear weapons. (Section 1.1 of the EIS.)] [In 1978, in response to concern about the potential diversion of highly enriched (weapons grade) uranium for use in nuclear weapons, the DOE initiated the Reduced Enrichment for Research and Test Reactors (RERTR) program. This program was aimed at reducing the use of highly enriched uranium (HEU) in civilian programs by promoting the conversion of foreign research reactors from HEU to LEU. Research reactors are of interest because the major civilian use of HEU is as nuclear research reactor fuel. The RERTR program has been successful and many foreign research reactors have been modified to operate with high-density low enriched fuel instead of HEU fuel. Appendix B, Table B-3 provides information on the status of operating reactors that have, or can be, converted to low enriched fuel.] [DOE knows of no intention by the Japanese to build an HEU reactor. Any such statement made by a DOE official would have been made in error.]
Comments were provided strongly opposing Alternative 1 and supporting either Alternative 2 or the No Action Alternative.	[Commentors' opposition to Management Alternative 1 and support for Management Alternative 2 or the No Action Alternative are noted.]
A comment was made noting that the EIS states that construction of storage facilities at reactors is not practical due to small quantities of spent nuclear fuel in each country. Commentor noted that seven countries comprise 70% of the inventory and suggested that those countries with small inventories should not be included in the proposed policy.	[An objective of the proposed action is to reduce and eventually eliminate all HEU from international commerce. Even relatively small amounts of HEU could be used to produce nuclear weapons.]
Comments were made that the United States does not have adequate facilities to reprocess the spent nuclear fuel. Commentors suggested that the United States consider reprocessing overseas. One commentor stated that nothing was mentioned in the EIS about allowing for overseas reprocessors to recycle diluted highly enriched uranium back to countries from which it came. Commentor noted that the facility at Dounreay has the capability to reprocess about 50% of material that is aluminum-clad but cannot reprocess the TRIGA material, which comprises about 10%, or the low enriched uranium fuel.	[The United States does have the capability to chemically separate spent nuclear fuel. However, the EIS also considers possible overseas reprocessing in Management Alternative 2 in Sections 2.3 and 4.4.2. The EIS also addresses the possibility that overseas reprocessors could return waste to countries from which it came.] [Subalternative 1b to Management Alternative 2 (Section 2.3 of the EIS) discusses overseas blending of HEU down to LEU. Once LEU, the disposition of the material would be unimportant from a nonproliferation point of view. It could be returned to the origin country. However, whether HEU or LEU, most countries do not have the capability or facilities to store this spent nuclear fuel.]

ISSUES RAISED	DOE RESPONSES
Comments were made that the United States does not have adequate storage facilities for the foreign research reactor spent nuclear fuel and suggested overseas storage. Hanford was a specific example of an inadequate storage site due to leaks. A comment was made that the EIS should contain equal discussion of placing secure facilities within the other countries. Commentors noted that the EIS paid inadequate attention to this alternative and was overly biased toward bringing the spent nuclear fuel into the United States.	[As explained in Section 1.5 of the EIS, the selection of the site or sites at which the foreign research reactor spent nuclear fuel could be managed is based on the analysis in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. The Record of Decision for this EIS was released on May 30, 1995. In accordance with this Record of Decision, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford site.] [If the Record of Decision indicates that the spent nuclear fuel will be accepted by the United States, additional storage capacity may have to be constructed after the first few years (Section 2.2.1.9 of the EIS).] [The United States has no authority for "placing facilities within other countries." Actions within other countries are subject to the laws and regulations of those countries. However, Management Alternative 2 does include possible assistance to other countries to manage their spent nuclear fuel as discussed in Section 2.3 of the EIS.]
Comments were made that the proposed action amounts to an "unfunded mandate" and that the government is "blackmailing its own people in order to control other countries."	[The Government of the United States encourages, but cannot force, foreign nations to support the nonproliferation of nuclear weapons. Costs of the proposed action, which are discussed in Section 4.8 of the EIS, would be borne by the federal government or foreign governments rather than by the States. Financial options are described in Section 2.2.1.2 of the EIS. No attempt has been or will be made to blackmail citizens of the United States or other countries to support the nonproliferation of nuclear weapons or the policy options described in the EIS.]
A comment was made that the United States should not accept any foreign research reactor spent nuclear fuel until ultimate disposal of spent nuclear fuel in this country is determined. Commentor stated that having no long-term disposal site sends the wrong message to other countries. A comment was also made that a 10-to-13-year solution is a band-aid fix and that a permanent solution should be part of the EIS.	The proposed policy is based on current plans that a geologic repository will be available [for permanent disposal]. The proposed action to [develop a policy to] manage foreign research reactor spent nuclear fuel has been supported by Administrations from both parties since President Carter. [Due to limitations in available overseas storage, many foreign research reactors face shutdown or conversion back to HEU fuel, unless some immediate action is taken.]

ISSUES RAISED	DOE RESPONSES
Concerns were expressed about the costs of managing foreign research reactor spent nuclear fuel in the United States. A question was asked as to whether a full and fair cost-benefit analysis was performed. One commentor compared the costs as being greater than $2 billion for implementing Alternative 1 and less than $1 billion for Alternatives 2 and 3.	[Costs of the proposed management alternatives are discussed in Section 4.8 of the EIS, including uncertainties and financing options.]
A question was asked as to when the decision will be made on which port to use.	There are ten candidate ports. Any one of these ports might be used. Under the proposed action, it would be up to the shipper to determine which port works best for particular shipments based on the availability of vessels. [If foreign research reactor spent nuclear fuel is accepted by the United States, the Record of Decision will indicate which ports may be used. Selection of the port of entry for a given shipment will be a joint decision of the shipper and DOE.]
A question was asked as to how DOE came to the conclusion that spent nuclear fuel would be shipped through the Port of Tacoma.	[The Port of Tacoma is one of 10 candidate ports.] The port selection process included 153 commercial and 8 military ports. DOE worked with the Merchant Marine Academy to develop criteria for the use of ports and applied these criteria to all potential ports. The list was then winnowed down. Appendix D of the EIS gives the details of the port selection process. [As discussed in Section 4.2.2 of the EIS, implementation of the proposed action would pose no significant benefits or risks to health or the environment at any of the candidate ports.]
A question was asked as to why the Port of Seattle was eliminated from the list. Commentor asked what the difference is between the populations of Seattle and Tacoma.	There are fine line differences. The Defense Authorization Act for Fiscal Year 1994 requires low population as a criterion for port selection. However, the Act is not explicit on how to apply this requirement. DOE analyzed the populations of port cities and transportation routes. There was a slight difference between port populations, and the Port of Tacoma was the more desirable of the two ports. [While the National Defense Authorization Act was written specifically to regulate the receipt and storage of foreign research reactor spent nuclear fuel at DOE's Savannah River Site, DOE elected to apply this criterion in identifying ports of entry for all five potential sites, to the maximum extent practicable.]

ISSUES RAISED	DOE RESPONSES
A comment was made that DOE has not explained how other ports were eliminated and why Tacoma remains on the list. Commentor noted that Seattle was eliminated due to population and asked why, if there is no risk, population was a criterion. A comment was made that DOE ignored fairness and equity issues by selecting a small port such as Tacoma.	[The port selection process is documented in Appendix D of the EIS. DOE initially considered 161 ports of entry for foreign research reactor spent nuclear fuel. These ports were evaluated against the five evaluation criteria described in Appendix D, Section D.1.9, resulting in ten candidate ports, including Tacoma, that met all of the criteria as being acceptable for the receipt and handling of the spent nuclear fuel. Criterion 5 of the port selection criteria indicates ports that can safely handle foreign research reactor spent nuclear fuel with the least risk to populations near the port. Although the Defense Authorization Act for Fiscal Year 1994 specifies that only low population ports should be used for receipt of foreign research reactor spent nuclear fuel, the Act is not explicit on how to apply this requirement. DOE analyzed the populations of port cities and transportation routes. By seeking to minimize the risk to populations surrounding the ports of entry, the EIS further diminishes the low risks associated with an accident (Section 4.2.2.3). DOE believes that the use of any of the ports indicated by the port selection process, including Tacoma, would not pose any significant risk to either the port personnel, local environment, or the population near the port.]
Concern was expressed that the Port of Tacoma is in close proximity to residential areas.	[The population residing near candidate ports and along transportation routes was an important factor that was considered in port selection and in the evaluation of environmental effects of the proposed action and management alternatives (See Section 4, Appendix D, and Appendix E of the EIS).]
Commentors expressed strong opposition to using Tacoma as a port of entry of spent fuel. Commentors cited resolutions passed by the Port of Seattle, the City of Federal Way, and the City of Fife. Also cited was a vote by the Board of Tacoma/Pierce County Chamber of Commerce opposing importation of spent nuclear fuel through Tacoma. Comments were also made that the longshoremen will not handle spent nuclear fuel at the ports.	[The commentor's opposition to use of the Port of Tacoma is noted. DOE has also noted the resolutions passed by local governments and local authorities. However, Sections 4.2.2 and 4.5 demonstrate that the risk associated with bringing spent nuclear fuel to the Port of Tacoma, or to any of the ports analyzed in the EIS, is low. The potential environmental impacts (including radiation exposure) to port workers is discussed in Section 4.2.2 of the EIS.]
A comment was made that the purpose of the hearing was to be talking about Tacoma -- "not wet and dry facilities or high-octane or low-octane fuel." Commentor did not believe it was necessary to explain technical reasons for not bring the fuel into Tacoma -- commentor had "people reasons."	[The National Environmental Policy Act requires federal agencies to evaluate the environmental effects of proposed actions. The environmental evaluation is required to assess environmental impacts as accurately as possible. The purpose of the public hearing is to inform the public and to obtain comments from the public concerning the proposed action and its environmental effects.]

ISSUES RAISED	DOE RESPONSES
Comments were made suggesting that DOE consider using military ports instead of commercial ports. Reasons cited were that military ports are better trained and equipped to handle these kinds of shipments and they have better security. One commentor expressed concern that DOE stated at another hearing that military ports were not considered due to costs.	[Both commercial and military ports were considered in selecting the 10 candidate ports in the EIS. Military ports are not better equipped than commercial ports. No special training or experience is required to handle spent nuclear fuel. Foreign research reactor spent nuclear fuel could safely be received at commercial ports without additional security such as might be present at military bases. To better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel, Appendix H has been added to the EIS.]
A comment was made that information in the draft EIS on the Port of Tacoma is outdated and contains errors. Examples cited were as follows: one terminal is listed instead of 6 terminals; the map depicting the Port of Tacoma is 15 years old. Commentor stated that these errors lead Tacoma residents to believe that the same errors carried forward to the population analysis done for the Port.	[Updated information on the terminals at the Port of Tacoma has been incorporated into Appendix D, Section D.2.1.9 of the EIS. Population data used in the analysis was obtained from the U.S. Bureau of the Census based on census data for 1990. Although corrected information has been included in the port information for the Port of Tacoma, the analyses provided in the EIS indicate that the use of any of the ports indicated by the port selection process, including Tacoma, would pose low risk to the port personnel, local environment, and the population near the port.]
Comments were made that the depth of Puget Sound would make it difficult to recover sunken casks. Specific comments included the following: Puget Sound is deeper than 50 feet; the casks could not withstand the deep water pressure in the Puget Sound and would buckle if they sank; the EIS states that casks can be recovered in water up to 200 meters deep -- however, there are numerous sites in the shipping channels that exceed the 200 meter depth; there is doubt that DOE would go after a sunken cask.	[In the unlikely event that a transportation cask loaded with foreign research reactor spent nuclear fuel is sunk in any U.S. coastal waters, it will be recovered, even from the deepest portions of Puget Sound, which reaches depths of 305 meters (1,000 feet). See Appendix C, Section C.5.5 of the EIS for information on the probability of a cask sinking in coastal and deep ocean waters.
A comment was made that the Puget Sound area has on average 20 minor earthquakes every month; it has shallow faults; and seismic activity is abundant.	[The risk of releasing radioactive material from a foreign research reactor spent nuclear fuel transportation cask as the result of a seismic event would be low. Transportation casks are designed and built to withstand significant stress without releasing their contents (Section 2.6.2 of the EIS). Therefore, a seismic event, even if it caused structures at the Port of Tacoma to fail, would not be expected to compromise the cask. While local hazards, such as earthquakes, may be the cause of an accident such as those analyzed in the EIS, they would not increase the consequences of the accident, which were found to be minor for both marine and land transportation accidents (Section 4.2.2.3). Therefore, the overall low risk is essentially unchanged in seismic areas.]

ISSUES RAISED	DOE RESPONSES
A comment was made that Commencement Bay is a Federal Superfund site, which makes it unsuitable.	[Shipment of foreign research reactor spent nuclear fuel would not jeopardize the Superfund cleanup effort undertaken in the area of Commencement Bay and the Port of Tacoma. The EIS indicates that there would be no adverse impacts to any of the ports or bays, or the quality of water or air (Sections 4.2.1.1 and Appendix C, Section C.2). DOE has added a sentence to the EIS (Appendix D, Section D.2.1.9) regarding Commencement Bay being a Superfund site, and a paragraph has been added to Section 4.2.2.2 of the EIS to emphasize the low impact these shipments would have on air and water quality.]
A comment was made that operational procedures are inadequate at the Port of Tacoma for handling spent nuclear fuel shipments.	[Spent nuclear fuel from foreign research reactors would be shipped in standard containers, and would not require special handling techniques (Section 2.6.3.2.2 of the EIS) or additional security beyond that required by NRC regulation, which can readily be provided in any of the commercial or military ports.]
A comment was made that the Port of Tacoma has regular commercial traffic and that highly enriched uranium has no place in commercial channels. Commentor suggested that ship traffic be considered when selecting ports.	[The commentor's concern about the amount of ship traffic in the Port of Tacoma is noted. In general, the number of ship mishaps is not proportional to the amount of ship traffic because the port traffic is slow and, even at its heaviest, only a few ships per hour. Hence, at this traffic level, an increase in volume does not significantly increase the probability of an accident. Rather, the number of ship mishaps is associated with navigational hazards and distances from the port to the open ocean or a large bay. As a result, the port selection process focused on the availability of a favorable passage to the open water. If the foreign research reactor spent nuclear fuel is accepted by the United States, sea shipments would arrive either in commercial or chartered ships. If commercial ships are used, the ship traffic into Tacoma would be unchanged because commercial ships would call at the Port of Tacoma whether or not they were carrying foreign research reactor spent nuclear fuel. If chartered ships were utilized, and all the West Coast-bound ships came to Tacoma, Tacoma's ship traffic would increase by no more than about one a month (186 shipments spread over 13 years under Management Alternative 1), fewer under Management Alternative 3.]
A concern was expressed about the fact that the Office of Marine Safety in the State of Washington was recently dissolved.	[DOE does not expect the loss of this State office to impact safety if spent nuclear fuel is accepted into the United States. Spent nuclear fuel from foreign research reactors would be shipped in standard containers, and does not require special handling techniques (Section 2.6.3.2.2 of the EIS) or additional security beyond that required by NRC regulation (which can readily be provided in any of the commercial or military ports). No special precautions would be required by the U.S. Coast Guard (Section 2.6.3.2.2 of the EIS).]

ISSUES RAISED	DOE RESPONSES
A comment was made that if the storage facility is in South Carolina, shipments should go through a port close to that facility.	A large portion of the spent nuclear fuel -- the aluminum-clad fuel -- would be shipped directly to the Savannah River Site. Other types would be shipped [to a West Coast port and then transported] to the Idaho National Engineering Laboratory. Spent [nuclear] fuel from Europe, West Africa, and Eastern South America would be shipped through an East Coast port, while non-aluminum-clad fuel from Europe would be shipped through a West Coast port and then shipped to the Idaho National Engineering Laboratory. [Although ports close to the DOE management site would require less ground transport to reach the management site, port selection considers a number of other factors -- port population, experience, safe transit from the open ocean, and port facilities (See Appendix D of the EIS).]
A question was asked as to whether the spent nuclear fuel transportation would be overseen by DOE or by private contractors. Commentor expressed concern that transportation would be overseen by "the lowest bidder."	[DOE would oversee the overall operation if foreign research reactor spent nuclear fuel is accepted by the United States. The responsibility for arranging the shipping and selecting the carrier would be in the hands of the owners of the material, the operators of the foreign research reactors. DOE would require, in the contract with the foreign research reactor operators, that only well-equipped, well-maintained ships and vehicles be used to ensure safety. Ships entering U.S. territorial waters and trucks, barges, and trains operating in the United States must meet U.S. safety regulations.]
A comment was made that if the spent nuclear fuel is shipped to the United States, it should be shipped in military vessels to military ports.	[Military vessels were not considered because transporting this material is not part of their mission. In addition, the risks associated with using either commercial or charter vessels would be low. As discussed in Appendix D, Section D.1 of the EIS, both commercial and military ports were evaluated. No significant environmental efforts would result from implementation of the proposed action at any of the candidate commercial and military ports (Section 4.2.2 and 4.5 of the EIS).]
A comment was made that DOE should consider flying the spent nuclear fuel on military aircraft.	[The option of air transport was considered, but dismissed for the reasons given in Section 2.10 of the EIS. These reasons include prohibitive costs, lack of standard operating procedures for air transport, lack of experience with this type of transportation, and lack of suitable casks for air transport.]

ISSUES RAISED

A comment was made that DOE cannot account for all nuclear properties transported in the United States and that some materials are lost, damaged, or stolen. A comment was made that there should be a complete team of experts accompanying the shipments.

DOE RESPONSES

[DOE can account for nuclear inventories. As a part of the Secretary of Energy's Openness Initiative, information has been declassified regarding inventory differences showing a net total decrease from book inventories for plutonium and highly enriched uranium. The inventory differences are a result of physical inventories after adjustments for transactions, removals, decays, corrections, transmutation, and production. Stringent safeguards and security measures have made theft or diversion highly improbable, and if these acts were attempted or had occurred, they would have been detected.]

[Theft of materials by a determined group or individual cannot be completely precluded. However, proper security measures greatly reduce the risk. All shipments of foreign research reactor spent nuclear fuel would be conducted hearing or exceeding all the security requirements in the Code of Federal Regulations (10 CFR Part 73). For the reasons discussed in Section 1.2 of the EIS, spent nuclear fuel from foreign research reactors cannot be easily stolen. Section 2.8 and Appendix D, Section D.5.9 discuss security measures against sabotage and terrorist attack activities.]

[To better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel, Appendix H has been added to the EIS. This appendix presents the general provisions of the Transportation Plan, a document that provides the details of activities that would be associated with the transportation of the spent nuclear fuel, including the security arrangements in port and in transit to the DOE management site.]

ISSUES RAISED	DOE RESPONSES
A commentor (former Congressman) referenced his introduction in 1994 of the Safe Handling and Shipping Act whereby a port could deny acceptance of nuclear waste unless there was a comprehensive emergency response plan in place, notification was made to communities, radiation exposures would not exceed regulatory limits, and the Federal government would bear the costs. Commentor stated that policies need to be re-evaluated.	[As discussed in Section 2.7 of the EIS, the primary responsibility for emergency response to an incident would reside with State, Tribal, and local authorities. DOE would provide coordination, financial and technical assistance and training to the State, Tribal, and local emergency response personnel. In addition, DOE has Radiological Assistance Program teams that operate from eight strategically located DOE offices around the country. Upon State, Tribal, or local request, these teams can provide technical expertise and assistance to monitor and assess radiological hazards. The teams are activated on an "as-needed" basis and generally are ready to deploy from their home station within four hours of notification.] [To better describe the security and emergency preparedness associated with transportation of the foreign research reactor spent nuclear fuel, Appendix H has been added to the EIS. This appendix presents the general provisions of the Transportation Plan, which is a document that provides the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the DOE management site.] [DOE is required to inform the Governor of each State seven days in advance of the shipment of hazardous cargos (10 CFR Part 73.37). Further advance public notification of shipments to communities cannot be given by DOE because it would violate NRC regulations. Additional notification to communities would be the responsibility of the Governor's office.]
Concerns were expressed about the adequacy of the Port of Tacoma's emergency response capability to handle spent nuclear fuel accidents. Specific comments included the following: The EIS does not adequately address training and first response issues; the Port of Tacoma would be financially responsible for emergency response, which is an undue burden to be placed on the community by a Federal mandate; Tacoma should not have to pay for training and equipment for emergency responders, truck drivers, and port authorities -- this should be provided by the United States government; the City of Tacoma does not have the equipment and training to handle radioactive waste accidents; the EIS is misleading when it relies on local governments' emergency response capabilities; the EIS fails to address clean-up from accidents; and what will DOE do to improve the Fire Department's capability in Tacoma.	[Each port considered in the draft EIS has developed an Area Contingency Plan. This plan outlines response capabilities, procedures, and authorities for responding to and recovering from hazardous materials incidents, including cleanup. Federal funding to State, Tribal, and local governments for maintaining emergency response programs is discussed in Section 2.7.1 of the EIS. This funding can provide opportunities for training such as those necessary for emergency fire response. In addition, DOE would provide assistance to local authorities to ensure that appropriate measures were taken in the event of an accident. DOE provides radiological monitoring and assessment assistance to State, Tribal, and local agencies involved with a radiological incident. As part of this assistance, DOE's Radiological Assistance Program teams from the eight offices located throughout the country could be used to coordinate and to provide remediation assistance.]

ISSUES RAISED	DOE RESPONSES
Comments were made regarding the integrity of spent nuclear fuel casks. Specific comments were: spent nuclear fuel that is not well-characterized should be double-packaged; all packages should meet 10 CFR Part 71 regulatory limits; the containers are too large and there are critical mass concerns -- DOE should not put "a lot of stuff together;" and there are no guarantees against construction flaws in the casks as there were flaws with the Challenger.	[If a policy to accept and manage foreign research reactor spent nuclear fuel is adopted, the spent nuclear fuel would be shipped in Type B casks (Section 2.6.2 and Appendix B, Section B.2 of the EIS). The shipper of record must comply with the Department of Transportation and Nuclear Regulatory Commission requirements for shipment by vessel and overland (10 CFR Parts 71 and 73 and 49 CFR Parts 171, 173 and 176). Spent nuclear fuel has been transported in Type B casks on highways and rail lines in the United States for over four decades without release of contents.]
Comments were made citing specific routing problems, such as the following: adding truck traffic to the I-5 corridor is putting an additional load on the fourth most congested highway system in the United States; and the M Street curve has a lot of accidents when icy.	[The commentors' transportation concerns are noted. Final routes would not be selected until implementation of a decision to use a particular port and site. If the Port of Tacoma was selected as a port of entry for a foreign research reactor spent nuclear fuel shipment, DOE would choose the best route to a DOE management site in accordance with Department of Transportation Code of Federal Regulations (49 CFR Part 397.010 (a)(2) and applicable Nuclear Regulatory Commission regulations). In addition to the applicable routing regulations and guidelines, the selection of the actual route would be responsive to environmental and other conditions that were in effect, or could reasonably be predicted, at the time of shipment. Such conditions could include adverse weather conditions and road conditions due to traffic, weather, and closures. Appendix E and Section 4.2.3 of the EIS show that all the ground transport risks would be low along all the representative routes. Other routes would also be expected to have similarly low risks.]
A comment was made that Tacoma is struggling with commuter rail and freight rail on the Burlington Northern tracks and that Tacoma has no more resources for transportation improvements.	[Appendix D, Section D.1.9.4 of the EIS specifically addresses the consideration of ready access to intermodal transportation in the port selection process. In applying this criterion, DOE found the Port of Tacoma to be acceptable . Other considerations such as port population, route population, port experience with handling containers, and access to the ocean have also been considered in selecting ports of entry. Appendix D, Section D.1.9 presents the details of the port selection process.]

ISSUES RAISED	DOE RESPONSES
A comment was made that the EIS fails to adequately address security issues. A comment was made that the farther these materials are shipped, the greater prospect of the materials falling into the wrong hands. A question was asked about the risk of "some lunatic that has a missile or something to blow this stuff up."	[Acts of terrorism and theft of materials by a determined group or individual cannot be completely precluded. However, proper security measures greatly reduce the risk. All shipments of foreign research reactor spent nuclear fuel would be conducted to meet or exceed all the security requirements in the Code of Federal Regulations (10 CFR Part 73). Nuclear Regulatory Commission regulations for physical security include requirements for armed escorts and two-way communications at two hour intervals with a communications center during the journey (Section 5.4.2 of the EIS). Section 2.8 and Appendix D, Section D.5.9 discuss security measures against sabotage and terrorist attack activities. To better describe the security and emergency preparedness that would be associated with transport of the foreign research reactor spent nuclear fuel, Appendix H has been added to the EIS. Appendix H presents the general provisions of the Transportation Plan which is a document that provides the details that would be associated with the transportation of the foreign research reactor spent nuclear fuel.]
A comment was made that, due to the history of safely transporting spent nuclear fuel in this country, commentor saw no physical risk in transporting the spent nuclear fuel, assuming that casks are sealed properly. Commentor stated that the chance of physical injury is "basically zero." Commentor elaborated on his experience working at the Three Mile Island nuclear power reactor from 1980 to 1990, during which time there were 49 shipments over 116,467 miles, and there were no mishaps. Another comment was made that shipments, if small enough, could be done safely and create jobs in the area. Commentor noted that Fort Lewis, McCord, Bremerton, and Everton have nuclear fuel and asked, for the audience's sake: "How did it get there? Have we been damaged?"	[The comments regarding the safe transport of radioactive material are noted. The EIS demonstrates that the risk associated with transport of the foreign research reactor spent nuclear fuel is low.]
Concerns were expressed about the potential for shipboard fires near and within the port. Commentors stated that the extent and impacts of shipboard fires were inadequately addressed in the EIS.	[Appendix D, Section D.5.3.1 describes several accident scenarios that involve fire. The results of the analysis of these accidents can be found in Section D.5.4. The analysis shows that even in the event of a severe ship fire, neither the consequences nor risks are great (Section D.5.5). Although the non-radiological effects of such a catastrophic accident would obviously impact the local environment, no additional impacts are predicted due to the presence of foreign research reactor spent nuclear fuel.]

ISSUES RAISED	DOE RESPONSES
Concerns were expressed about the risk to children who could be stuck in traffic next to a truck carrying spent nuclear fuel. Some argued that the equivalencies provided in the EIS to full-body x-rays did not take into account the health impact to children.	[The relationship between radiation exposure and latent cancer fatalities (LCF) used in the EIS was for the general population, which includes children, pregnant females and other higher risk individuals. The exception is where only workers are present. In these instances, a worker dose-LCF relationship was used.] [As explained in Section 4.1.3 of the EIS, the relation between dose and LCF for the general public is 0.0005 LCF per person-rem. If a person were to sit next to the cask for one hour, he or she would receive 10 mrem or 0.01 person-rem. Therefore, the probability of the person dying from cancer as a result of this exposure is 0.000005, or one in 200,000.]
Comments were made that the EIS underestimated the health and environmental impacts associated with spent nuclear fuel and underestimated the potential for accidents. Commentors argued that the estimates provided for latent cancer fatalities were either too low, were averaged so as to be misleading, or were still unacceptable. Other comments were that accidents will happen; there are still unanswered questions concerning the effects of the proposal; exposure to the contents of a spent nuclear fuel cask in the event of an accident would cause certain death; and DOE officials should put the spent nuclear fuel in their own backyards if they think the risk is so low.	[These same analyses calculate the maximum expected population dose for the worst plausible accident if it were to occur at any of the 10 candidate ports. The resulting population dose, multiplied by the industry accepted conversion to latent cancer fatalities, are the results presented in the EIS. Appendix D, Section D.5.9 has been added to the EIS to discuss the results of terrorism. In this section, the radiation dose rates from a fully exposed transportation cask load of research reactor spent nuclear fuel is presented. In the unlikely event of a severe accident, the analysis performed for the EIS shows that some radioactive material could be released from the cask and distributed into the environment. However, the analysis also shows (Section 4.2.2.3) that the resultant contamination would be so small that no cleanup would be required in any of the ports or surrounding areas.]

ISSUES RAISED	DOE RESPONSES
A comment was made that DOE uses its own self-regulating standard for how much radiation people can be exposed to and that this is not the same standard that NRC uses for exposure limits in one year. Commentor stated that the DOE standard is 4 times higher than the NRC and EPA standards, which are 25 mrem per year for radiation exposure. Commentor noted that DOE says it is conceivable that one could get up to 50 mrem if a person was stuck in traffic next to a nuclear waste cask.	[Appendix D, Section D.4 demonstrates that the radiation dose that anyone would receive handling or near a spent nuclear fuel transportation cask is less than the limit that is allowed to the public in an unrestricted area by NRC regulations (Title 10 CFR Part 20). See Section D.4.3.2.1 for the time/distance analysis of cask handling, Section D.4.5 for the resulting doses and risks, and Appendix F, Section F.5 for an evaluation of the dose rates from a transportation cask containing research reactor spent nuclear fuel. The maximum allowable exposure for port workers would be 100 mrem per year, the same radiation dose limit established by the NRC to protect individual members of the public (Section 4.2.2.2 of the EIS).] [DOE's public radiation protection standard (10 CFR Part 835.208) is identical to those of the NRC and all other Federal agencies as required by Executive Order, and is consistent with recommendations of all national and international radiation protection organizations. The limited dose is 100 mrem/year to members of the public (2% of that allowed for radiation workers), which is within the range of variation of natural background radiation levels in populated areas of the United States.] [As explained in Section 4.1.3 of the EIS, the relation between dose and LCF for the general public is 0.0005 LCF per person-rem. If a person were to sit next to the cask for one hour, he or she would receive no more than 10 mrem or 0.01 person-rem.]
Comments were made that DOE underestimated the exposures to longshoremen during unloading activities. Specific comments included the following: - The EIS underestimates radiation dose from unloading casks by 23% and to ships' crews by 27%. Ships' crews can get up to 760 mrem, which is 3,040% of the allowable dose to the general public. - DOE used 9 mrem per hour for radiation exposure during unloading activities, while it should have used 11 mrem per hour. If a person was standing for 20 minutes 2 meters away from the cask, the radiation exposure would go up by 33% in one hour.	[The two regulatory limits (200 mrem/h at the cask surface and 10 mrem/h at two meters away from the vehicle) would both apply simultaneously. For shipments of certain radioactive materials (e.g., small, intense cobalt-60 sources), the 200 mrem/h-at-the-cask-surface limit is the more stringent limit. For shipments of spent nuclear fuel, however, the 10 mrem/h-at-two-meters regulatory limit turns out to be more stringent because the source of radiation is large and distributed throughout the internal volume of the cask. Casks loaded with spent nuclear fuel up to the 10 mrem/h-at-two-meters limit radiate at a level well below the 200 mrem/h level at the cask surface. (See Section 4.1.5 and Appendix F, Section F.5 of the EIS.) See Appendix D, Section D.4.3.2.1 for the time/distance analysis of cask handling, Section D.4.5 for the resulting doses and risks, and Appendix F, Section F.5 for an evaluation of the dose rates from a transportation cask containing research reactor spent nuclear fuel. The maximum allowable exposure for port workers would be 100 mrem per year, the same radiation dose limit established by the NRC to protect individual members of the public (Section 4.2.2.2). As the EIS demonstrates, both the dose and dose rate for the port workers are low.]

ISSUES RAISED	DOE RESPONSES
A comment was made disagreeing with DOE that there are no technical problems. A commentor stated that she lived 100 kilometers from Hanford and was exposed to deliberate radiation releases from the Hanford site, having been exposed to 650 mrem. For this reason, commentor stated, she will not have any children.	[Sections 4.2.2 and 4.5 of the EIS demonstrate that the risks associated with bringing foreign research reactor spent nuclear fuel through the Port of Tacoma, or any other of the ports analyzed in the EIS, is low.] [No foreign research reactor spent nuclear fuel would be managed at the Hanford site. In accordance with the Record of Decision for the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement, all of the aluminum-based foreign research reactor spent nuclear fuel managed by DOE will be managed at the Savannah River Site in South Carolina. Any other foreign research reactor spent nuclear fuel to be managed by DOE will be managed at the Idaho National Engineering Laboratory. Accordingly, no foreign research reactor spent nuclear fuel would be shipped to the Hanford site.]
A comment was made that DOE refers to "unrealistic scenarios," but a worst-case "credible" accident is not the same as a worst-case accident. Commentor stated that the Navy trained for worst-case scenarios and accepted their possibility. Commentor stated that DOE has not acknowledged the possibility of worst-case accidents and, thus, is doomed to failure. Another commentor stated that DOE did not provide adequate technical responses to questions about the consequences of "abnormal radioactive releases" in worst-case accidents.	[There is no such thing as a "worst case scenario". For any "worst case" that is postulated, a still more severe accident can be postulated by adding one more drum of gasoline, one more wrecked rail car, one more terrorist, etc. In addition, for each assumption that is made to make a postulated accident more severe, the probability of the accident becomes more remote. Nevertheless, DOE did analyze the severe accident in which a ship carrying a spent nuclear fuel transportation cask is involved in a collision with another ship, severe enough to breach the shipping cask and then subject the cask to a fire resulting from the collision (Section 4.2.2.3 of the EIS).] [In the unlikely event of a severe accident, the analysis performed for the EIS shows that some radioactive material could be released from the cask and distributed into the environment. However, the analysis also shows that the resultant contamination would be so small that no cleanup would be required in any of the ports or surrounding areas. Close in to the accident, near the cask would likely require some cleanup, but would result in no significant effects on air and water quality at the port. Section 4.2.2.3 and Appendix D, Section D.5 detail the accident analysis and results.]

ISSUES RAISED	DOE RESPONSES
Concerns were expressed about the role of human error in accidents and accident response. The following examples were provided: The Three Mile Island was not an accident -- it was the result of consistent breaking of the rules, policies, and procedures. The Exxon Valdez may have been an accident, but the response after the accident took a very long time because people were not trained and equipment was not available.	[The probability of an accident at sea is discussed in Appendix C, Section C.5.5 of the EIS, while the port accident probabilities are found in Appendix D, Section D.5.3.1.3. The EIS shows that the risks associated with an accident are low (Section 4.2.2.3). The evaluation of accident probabilities, both marine and land, were based on national accident rates, which include human error factors as they impact the national statistics. However, while human errors might cause an accident such as those analyzed in the EIS, they would not increase the consequences of the accident, which were found to be minor for both marine and land transportation accidents. The likelihood of human error is further reduced since spent nuclear fuel from foreign research reactors would be shipped in standard containers and would not require special handling techniques (Section 2.6.3.2.2 of the EIS) or additional security beyond that required by NRC regulation which can be provided at the Port of Tacoma. Additionally, no special precautions are required by the U.S. Coast Guard (Section 2.6.3.2.2 of the EIS).]
	[Although response to emergencies is a local function, the Federal government, including DOE, would assist State and local governments in preparation for emergencies. Emergency response preparedness details would be part of DOE's Transportation Plan that would be prepared prior to any actual shipments. The general provisions of such a plan are identified in Appendix H of the EIS.]
A comment was made that the nuclear industry does not have a good safety record and what happens in Puget Sound affects the world.	[The safety record of the "nuclear industry" is beyond the scope of this EIS. Health and safety were primary considerations during the evaluation of environmental effects for the proposed action and its management alternatives. Conservative estimates of radiological and non-radiological impacts show that risks to the population and workers are low (Section 4.2.2 of the EIS). Section 4.9 describes risks associated with U.S. acceptance of the spent nuclear fuel and compares these risks with those due to the natural background radiation and other common risks.]
A concern was expressed about impacts to the fishing industry. Commentor noted that the Tacoma area is struggling in the fishing industry, and every year there are less and less fish.	[Spent nuclear fuel transportation casks are designed and built to preclude release of radioactive material. The EIS indicates no adverse impact to the quality of water in incident-free transport (Appendix C, Section C.4). If a cask was sunk in Puget Sound or any other U.S. coastal waters, it would be recovered, with no significant impact on the environment, including the fishing industry.]

ISSUES RAISED	DOE RESPONSES
Comments were made about the economic impacts to the Port and City of Tacoma as a result of spent nuclear fuel shipments. Specific comments included the following: - The Port of Tacoma is in competition with other West coast ports for shipping business and could lose business from other countries because of the nuclear stigma. - Spent nuclear fuel shipments will hurt the image of Tacoma as a safe, friendly and attractive place to visit. Tacoma enjoys a $365 million industry from visitors and does not want that destroyed. - Companies will not relocate businesses to the Port of Tacoma if nuclear waste is brought in -- they will go to the Port of Vancouver. Jobs are needed in Tacoma. - Tacoma exports 70% of all agriculture produced in the State of Washington. "We don't want our apples next to your waste."	[The use of any of the ports indicated by the port selection process, including the Port of Tacoma, would not impact normal commercial operations, and therefore not endanger the ports' economic development. Nor should it contribute to any stigma associated with the spent nuclear fuel because the EIS indicates that there would be no adverse impacts to any of the ports or bays, or the quality of water or air (Section 4.2.1.1 and Appendix C, Section C.2). This belief is based on the fact that the foreign research reactor spent nuclear fuel would be shipped to the United States in standard shipping containers that would require no special handling or precautions. Historically, there were no adverse economic or cultural impacts to the ports that received foreign research reactor spent nuclear fuel for the more than 30 years it has been received.]

List of Attendees at Tacoma, WA Public Hearing

Acheson, Frances
Allen, Roger E.
Amdahl, Oneta
Anderson, Stephen R.
Avery, John
Bamford, Caroline
Baarsma, Bill
Bates, Sonnie
Berry, John
Bestrom, Beth
Bresman, Larry
Brewer, Doug
Brosman, Larry
Buckingham, David F.
Campbell, Tom
Casey, Mary
Christiansen, Doris
Clark, Gary L.
Clayton, P. Marc
Cleaveland, Robert G.
Cobey, Michael
Conover, Steve
Cook, Leland E.
Crooks, Gregory W.
Cunio, Linda
Dalbalcon, Brian
Dalbalcon, Whitney
Dam, Donald
Dam, Natalie
Davis, B. B.
Eberson, Brian
Evans, Bob
Farm, Jerry
Fabulich, Jack
Fisher, Ruth
Fletcher, Mike
Folden, Mike
Franklin, Rosa
Georges, Grace
Giddings, Roxy
Golden, Lisa
Golden, Alta M.
Gorsline, Arden E.
Gregg, Loraine
Gubbe, Kim
Hamilton, Carol
Hammond, Mary W.
Hampton, Alphonso
Harris, Diane
Hart, Allen
Hawes, Robert E.
Haycheck, V. R.
Hazleton, Deanne
Healey, Joan
Healy, Lynn
Hebleton, Deanne
Hermansen, D.
Hess, George H.
Hittle, Craig
Holden, Leonard W.
Isensee, Michael
Johnson, Anita C.
Kaufman, Don
Keener, Edwin
Keener, Martha G.
Keightley, Philip D.
Keller, Beverly
Keller, Monty
Kelly, Margaret
Kelly, Eugene
Kendall, Ross S.
Kirtland, Kirk
Koch, Janet
Koon, Richard L.
Kreidler, Mike
Kueber, Mary
Lantz, Shirley A.
Lewis, Mr. Edward G.
Lewis, Mrs. Edward G.
Linville, Othel
Linville, Sue
Louie, Vernon
Macy, Mrs. Homer
Macy, Mr. Homer
Martee, Tom
Martin, Judy Ann
Marzano, Dick
McCord, Evan W.

List of Attendees at Tacoma, WA Public Hearing (Cont'd.)

McElroy, June
McGoldrick, Kelly
Melville, Marilyn
Metcalf, Sharon
Miller, Paul
Moss, Harold
Munro, Andrew
Navaro, Rudy
Nicholson, M.
Okazaki, Midori
O'Malley, Pat
Omero, Helja
Orchal, Alice
Otis, Glen
Pederson, Mary
Penter, J.C.
Peterson, H.E.
Petrich, Claire
Pohl, Dr. Geraldine L.
Pollet, Gerald
Powers, M. Sheila
Preston, Anita W.
Price, David
Rasmussen, Marilyn
Rayment, Bruce
Rhouds, Kathy
Ripple, Glen
Roberts, Laura
Robinson, Ray K.
Rogels, Lindy
Roth, Laureen
Ryan, Laura
Ryan, Rick
Schaus, Jeff
Sensel, Lorri
Sensel, Patrick
Shaughnessy, Robin
Shawl, Sallie
Simpson, B.
Slusarz, Donna
Smith, Linda
Smith, Stefanie
Spika, Nicholas C.
Sprinker, Patty
Stokesberry, Catherine
Sullivan, Maura E.
Sutherland, Martin A.
Terkovich, Valerie
Thorpe, Jerry
Trotter, Robert E.
Turosik, George A.
Turosik, Leona
Turosite, Barbara
Tyler, Valerie
Varner, Paula
Vaughn, Skip
Verburg, Rens
Wajahn, R. Lorraine
Waslery, Darlene J.
Watkins, Nancy
Watkins, Phil
Whitacre, Katheryn
Wilhite, Melody R.
Wojahn, Lorraine
Wood, Doug
Woolery, Darlene J.
Wright, Curtis
Yates, Henry
York, Barbara

The public hearing in Washington, DC, was held at the Omni Shoreham Hotel, on May 31, 1995. Fifty-nine people attended the hearing, including representatives from the foreign research reactor countries. The hearing was interactive in nature. Below is a summary of the issues that were raised. Information in brackets [ ] was not provided at the hearing.

ISSUES RAISED	DOE RESPONSES
A question was asked as to which countries are "inviting" United States participation to "control" their fuel.	The DOE is not aware of specific requests to "control" a country's fuel. The United States, however, has a sense of responsibility to control the use of the spent nuclear fuel because the enriched uranium in foreign research reactors originated in the United States. The United States' intention is to establish an environment that is in the best interests of the [United States and] countries who have received United States-enriched uranium.
Concern was expressed that EURATOM countries can ship to Dounreay, Scotland, for reprocessing without United States consent but others have to ask for United States consent.	Requiring non-EURATOM countries to obtain United States consent for reprocessing allows the United States to ensure that non-EURATOM countries arrange for blending down the HEU, separated during reprocessing, to LEU.
A request was made that DOE not base the selection of a management alternative on special interest group sensitivities.	[Concerns of all parties that submit comments (orally or in writing) have been considered in preparing a preferred alternative on the proposed action.]
A question was asked as to why the United States does not choose to have Europeans manage their own spent nuclear fuel since they have existing capabilities for reprocessing.	This option is considered under Management Alternatives 2 and 3, provided arrangements could be made so that reprocessing would be conducted in a manner consistent with United States [nuclear weapons] nonproliferation goals. This would include blending down the HEU to LEU.
A comment was made that the DOE spent nuclear fuel program is vital for many reactor operators, and consideration should be given to those sites that have storage problems. As a result of the expiration of the Off-Site Fuels Policy, it has been difficult for foreign research reactor operators to store their spent nuclear fuel longer than anticipated. It is unreasonable to expect those countries to develop facilities for the minute quantity of spent nuclear fuel that they generate.	[DOE is aware of this concern, and acted to relieve some of the most critical storage problems with the Urgent-Relief Acceptance of Foreign Research Reactor Spent Nuclear Fuel. An objective of the proposed action is to provide reactor operators with a limited period of time to develop disposition arrangements not dependent on the United States.]

ISSUES RAISED	DOE RESPONSES
A request was made to clarify the relationship of the proposed policy to the International Atomic Energy Agency (IAEA).	The following response was provided at the hearing by an IAEA representative: The IAEA supports the Reduced Enrichment for Research and Test Reactors (RERTR) program and urged reinstatement of the Off-Site Fuels Policy. To support IAEA nonproliferation goals, IAEA recommends an EIS decision of shipping foreign research reactor spent nuclear fuel (containing United States-enriched uranium) back to the United States. This includes (1) return of fresh HEU, (2) return of HEU that has lost its "self-protection", (3) return of spent nuclear fuel from low-security facilities, and (4) return of spent nuclear fuel that is in poor condition. The IAEA has also sent a letter to the Minister of Atomic Energy of the Russian Federation suggesting that Russia consider the take-back of spent [nuclear] fuel of Russian origin.
A question was asked as to why the United States is assuming responsibility for foreign research reactor spent nuclear fuel.	In order to comply with its [nuclear weapons] nonproliferation goals, the United States accepted spent nuclear fuel enriched in the United States for over thirty years. This action created an expectation that spent nuclear fuel acceptance would continue. If the United States does not adopt a policy, many research reactor operations could be shut down as the countries did not plan for, or have, long term storage facilities. In addition, the Dounreay reprocessing facilities can only handle HEU [at this time], and reactor operators would be likely to return to HEU use from LEU use if a policy is not adopted. The United States is seeking to eliminate world-wide commerce in HEU and needs a policy to manage United States-origin enriched uranium.

ISSUES RAISED	DOE RESPONSES
A comment was made that DOE has a legal obligation to accept foreign research reactor spent nuclear fuel. Commentor (on behalf of the Edlow Group, which represents 14 foreign research reactor operators) commented as follows: Many foreign research reactor operators have contracts, or other documents, evidencing written commitments that DOE will receive fuel. DOE has stated a moral and political obligation in affidavits, in Federal Register notices, in the Contract for Urgent Relief, and in contracts with Argonne National Laboratory. It is understood that DOE has been advised by its attorneys not to address legal obligation in the EIS. The legal obligation is a relevant consideration under NEPA and should be addressed in the EIS.	[With the exception of cases in which DOE has executed contracts for acceptance of spent nuclear fuel from specific foreign research reactors, DOE considers that neither the DOE nor the United States Government has any legal obligation to receive spent nuclear fuel from foreign research reactors. Even in cases where there may be signed contracts for shipment of spent unclear fuel to the United States, there are two cases, as follows, in which DOE considers that neither DOE nor the United States Government have any legal obligation to accept the spent nuclear fuel. 1. In the absence of a completed Appendix A for each shipment, mutually agreed to by DOE and the research reactor operator, DOE considers that the contracts have not been completed and are not binding. 2. In the absence of a completed review under the National Environmental policy Act (up to and including issuance of a Record of Decision or Finding of No Significant Impact specifically covering the proposed shipment), DOE considers that any contract would be subject to successful legal challenge and would not be enforceable.]
A comment was made that the United States appears to be trying to monopolize trade in nuclear development and technology and exclude countries from developing reactor technology.	There are no attempts by this proposed policy to influence such policy decisions. This policy deals only with [foreign research reactor] spent nuclear fuel. By alleviating critical storage situations until countries develop their own storage capabilities, the proposed action will allow for continued operation of foreign research reactors. If the United States does not take action, then countries would be responsible for waste treatment, storage, and disposal even though many do not have that capability.
A comment was made that new processing technologies would need to be developed if foreign research reactor spent nuclear fuel is chemically separated in the United States.	The United States does not need to develop a new process for chemical separation of spent nuclear fuel. The facilities at the Savannah River Site are technically capable of chemically separating the aluminum-based foreign research reactor spent nuclear fuel, and the facilities at the Idaho National Engineering Laboratory are technically capable of chemically separating all the foreign research reactor spent nuclear fuel.
A comment was made that if reprocessing is chosen as an alternative, HEU should not be stored. Potential proliferation use of HEU should be monitored throughout the process of blending down HEU to LEU.	[The commentors' position on storage of HEU and monitoring during blending down is noted. DOE states in the EIS its preference for blending sown any separated HEU.]

ISSUES RAISED	DOE RESPONSES
A comment was made that overseas reprocessing may have grave consequences to nonproliferation goals. The Reduced Enrichment for Research and Test Reactors (RERTR) Program and Off-Site Fuels Policy contributed to cutting off supply and demand for HEU. Overseas reprocessing would undermine this progress. The spent nuclear fuel should be managed with wet or dry interim storage in the United States and then placed in geologic disposal, setting a model for other countries.	[The commentor's opposition to Management Alternative 2 is noted and a preference for wet or dry interim storage in the United States prior to geologic disposal.]
A comment was made that there is little difference in reprocessing at Dounreay or in the United States. Dounreay reprocessing meets nonproliferation goals and the fuel can be conditioned.	[The current practice of the Dounreay, Scotland facility is to allow the customer (reactor operator) to specify the form of the separated uranium and its disposition (Section 2.3 of the EIS). This could mean that separated HEU could be returned as HEU, contrary to United States nuclear weapons nonproliferation objectives. Further, Dounreay does not currently have the capability to reprocess the new high density LEU fuel the United States is encouraging operators to use.]
A question was asked as to why Dounreay should listen to United States' wishes regarding spent nuclear fuel from countries other than the United States. If Germany, Belgium, the Netherlands, and France want to send spent nuclear fuel to Dounreay and receive fuel back, why would Dounreay listen to the United States and refuse to return HEU to the customer?	The United States is not telling the British (Dounreay) what to do. Both countries are discussing options that are mutually beneficial, including the business interests of Dounreay. The United States and Dounreay are in discussion regarding Dounreay's willingness to reprocess in ways consistent with the United States nuclear weapons nonproliferation goals. Also, as some of these countries support the United States' policy, it is not clear that the countries in question will ask Dounreay to send HEU back or that Dounreay would comply.
A comment was made that reprocessing at Dounreay is not an option for many countries because they cannot accept back the reprocessed waste.	[Under Management Alternative 2 (Section 2.3 of the EIS), the United States might accept reprocessing waste from countries that cannot take back their waste.]
A comment was made that if the United States can accept spent nuclear fuel from foreign countries, it should be able to take back Dounreay reprocessing waste for the countries who cannot take back this waste.	[Under Management Alternative 2 (Section 2.3 of the EIS), the United States might accept reprocessing waste from countries that cannot take back their waste.]
A comment was made that the foreign research reactor community expressed concern over the practicality and pricing implications, if DOE combines forces with Dounreay under Management Alternative 2 or 3 (i.e., resulting essentially in one option and one price for reprocessing). Commentor stated that this is a monopoly issue that would place foreign research reactor operators in an untenable position.	[The intent of the proposed action is to support United States nuclear weapons nonproliferation objectives, not to address the practicality and pricing of the disposal of foreign research reactor spent nuclear fuel. However, DOE is aware that the implementation of this policy, in compliance with the Record of Decision, would impact the disposal of foreign research reactor spent nuclear fuel and the price of that service. These considerations will enter into the development of the Record of Decision.]

ISSUES RAISED	DOE RESPONSES
A comment was made that the Reduced Enrichment for Research and Test Reactors (RERTR) Program will work only if all participate. It was suggested that DOE choose Management Alternative 1 and bring back all the United States-origin fuel. Commentor stated that reactor operators are in a competitive business, and some operators believe that conversion to LEU provides no benefits in cost or performance. There is unfair competition if some reactors can use HEU while others must use LEU. If there is overseas reprocessing, research reactors will take HEU back.	[The commentor's support for Management Alternative 1 is noted. The United States has offered the possibility of LEU acceptance as an enticement for reactor operators to convert from HEU to LEU use.]
A comment was made that only one alternative discussed in the draft EIS is consistent with President Clinton's Nonproliferation Policy Directive PDD-13, and reflects a preferred alternative jointly developed by DOE and the Department of State, which is subject to NEPA review requirements. That preferred alternative, which is to return the spent nuclear fuel to the United States over a ten-year period and place it in dry storage until it can be put into a repository, was specified in a July 1993 submittal by Secretary O'Leary to Secretary of State Warren Christopher.	[The draft EIS did not include a preferred alternative. However, Management Alternative 1 would support United States nuclear weapons nonproliferation policy objectives. A preferred alternative is selected in the Final EIS.]
A suggestion was made to bring all the spent nuclear fuel into the United States and maximize the nonproliferation benefit, because the environmental impact would be the same whether partial or total amounts of spent nuclear fuel were returned.	Environmental impacts would be nearly the same for partial or total spent nuclear fuel amounts. However, much of the United States public wishes to minimize the amount of radioactive material coming into the United States. South Carolina officials have indicated they might consider managing the minimum amount of foreign research reactor spent nuclear fuel but do not wish to manage all of it.
A question was asked whether South Carolina would be willing to accept spent nuclear fuel if its management included reprocessing, which provides jobs for the State.	Reprocessing [chemical separation] at the Savannah River Site is considered an option.
A comment was made noting the billions of dollars DOE has spent in cleanup and in managing its existing radioactive waste. Commentor questioned whether, given its track record, DOE should manage more spent nuclear fuel.	Even though there have been problems in DOE spent nuclear fuel management, it is of value to note that the best [managed] United States spent nuclear fuel [program] is the foreign research reactor fuel in the Receiving Basin for Off-Site Fuels at the Savannah River Site. [Foreign research reactor spent nuclear fuel has been safely managed in the United States for nearly four decades (Section 1.1 of the EIS).]
A commentor expressed disappointment that the draft EIS proposed only to "manage" foreign research reactor spent nuclear fuel and not "accept" spent nuclear fuel into the United States, as previously planned during the draft EIS scoping stage. Commentor felt this was inconsistent with the objective of "accelerated" return. The policy implications of reprocessing would result in delays; although the option of reprocessing should be kept open. The only option for this EIS should be to return the fuel to the United States.	[The commentor's support for United States acceptance of the foreign research reactor spent nuclear fuel is noted.]

ISSUES RAISED	DOE RESPONSES
A comment was made that Canada supports the incorporation of target materials, which are weapons-grade, into the management alternatives. Commentor noted that much of Canada's target material is used in medical isotope manufacture for medical diagnoses done in the United States.	[The acceptance of target material is subalternative 1c of Implementation Alternative 1 for Management Alternative 1, which is discussed in Section 2.2.2.1 of the EIS.]
A question was asked about the advantages of the Hybrid Alternative. Commentor stated that if some spent nuclear fuel can be received at Dounreay, why not all of the fuel.	Under the Hybrid Alternative (Management Alternative 3) DOE and the Department of State may consider adopting components of Management Alternatives 1 and 2, such as some reprocessing overseas and some storage in the United States. As not all countries can accept their reprocessed waste from a reprocessing facility, under the Hybrid Alternative the United States could accept and manage this remaining waste.
A comment was made that some research reactors must use HEU and, thus, will take HEU back from reprocessing because they cannot use LEU. It was suggested that a higher grade of research reactor fuel using LEU be developed for use in the reactors.	[Development of high-density LEU for use in these reactors is a high priority for DOE.]
A statement was made that Edlow International is prepared to ship by rail, truck, or barge through any port to designated sites under the terms and conditions decided by the research reactor operators, DOE, and the transporter and according to Department of Transportation and Nuclear Regulatory Commission rules.	[The comment is noted.]
A question was asked as to whether wording in the draft EIS precludes shipping on I-90 through Buffalo, New York.	The wording in the draft EIS does not preclude shipping on I-90 through Buffalo. The routes in the draft EIS are representative. Actual routing is selected at the time of shipping.
A comment was made that opinions from the Department of Defense (DOD) should have been included in the draft EIS, as DOD has urged that, for national security reasons, the spent nuclear fuel acceptance program be expedited.	[DOD opinions will be considered in developing the decision that goes into the Record of Decision.]
A comment was made that when the Off-Site Fuels Policy expired in 1988, the original Federal Register Notice should have been followed by a new Federal Register Notice.	[The comment is noted.]
A question was asked about the Record of Decision for the DOE Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement (SNF & INEL EIS).	At the time of this public hearing (May 31, 1995), DOE is in the process of preparing to release a Record of Decision on or about June 1, 1995. [The SNF & INEL EIS Record of Decision was released on May 30, 1995.]

ISSUES RAISED	DOE RESPONSES
Comments were made about the importance of keeping this EIS on schedule. Delay could cause several operational emergencies, and undue hardship already has been experienced by the foreign research reactor community. DOE should accept late comments rather than extend the formal comment process.	[Despite extending the comment period by 30 days, the need to avoid delay is understood. Every effort will be made to adhere to the schedule for release of the Record of Decision by the end of the calendar year.]
A request was made that DOE, given its responsibility under the RERTR program, reopen spent nuclear fuel return agreements at prices available when the 1988 spent nuclear fuel return agreement expired. It was suggested that DOE keep the prices reasonable, not competitive.	[Financial arrangements will be made after the Record of Decision, if spent nuclear fuel from foreign research reactors is to be managed by the United States.]
A comment was made that the draft EIS does not clearly discuss the risk of spent nuclear fuel sabotage. Commentor noted that the initial high radioactivity of spent nuclear fuel makes the material "self-protecting," because it has to be handled by remote tools. But, as it ages, the radioactivity decreases, thus increasing the risk of sabotage.	DOE will address this issue more clearly in the EIS. [Appendix D of the EIS, Section D.5.9 has been added to the EIS to discuss terrorism and sabotage, and new Appendix H has been added to discuss security. This appendix presents the general provisions of the Transportation Plan, which is a document that provides all of the details associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the DOE management site.]
A comment was made that the draft EIS does not adequately address the impacts of diversion of HEU resulting from overseas reprocessing and the ramifications of a resulting nuclear weapons explosion. Commentor stated that if a nuclear bomb explodes, the result will be greater than a latent cancer.	DOE will consider overseas reprocessing only if it complies with United States nuclear weapons nonproliferation goals. DOE is considering the vulnerability implied by the commentor.
Representatives from the following groups said they were submitting written comments: Nuclear Control Institute, Edlow Group, Egan and Associates, McMaster University, and Atomic Energy Canada Ltd.	DOE acknowledges the submission of written comments from the listed groups. [See Chapter 2 of this Volume 3 of the EIS for the public written comments and the DOE response.]

List of Attendees at Washington, DC Public Hearing

Ahern, Richard
Bartlett, John W
Busick, Eleanor
Casta, Jorog
Chronodovlos, Dimitris
Conde, Marilena
DeBlock, Marie-Jo
Dejohrte, Paul
Drake, Carolyn C
Dullahan, J
Edlow, Jack
Egan, Joseph
Ernst, Peter C.
Fulmer, Beth
Futo, John S.
Giognard, Peter A.
Gronberg, Lisbeth
Gruber, Gerhard
Heycu, Hajo
Hopkins, L.J.
Jager, Wolfgang
Katz, Jon
Keeling, F.
Krull, Dr. Wilfred
Kuperman, Alan
Kwapik, Michael
Lash, Fred C.
Laursen, Marianne
Linhart, Jim
Lipin, Heather
Lopez-Ofin, M.
Lpreciardo, R.A.
Matos, James E.
McDonough, Michael D.
Meigs, Marilyn F.
Mota, Jose
Murray, Allan
Raisonnier, Daniele
Ritchie, Iain G.
Saint-Jacques, Guy
Schmidt, T.
Shapar, Howard
Silverman, Jennifer
Stenberg, Bo
Sundman, Bo
Svenson, Erik A.
Temple, Jonathan
Thom, David
Tjersland, Gary T
Traverso, Jay
Umino, Yasao
von Arb, Christopher
Walter, Hajek
Wenzel-Constabel, Peter
Wiley, Patricia
Wolf, Walt H.
Yourish, Karen
Ziegler, Leopold A.
Zmora, Hagai

The public hearing at Wilmington, North Carolina, a candidate port of entry, was held in Cape Fear Community College Auditorium on May 22, 1995. Seventeen people attended the hearing. The hearing was interactive in nature and the following is a summary of the comments and issues that were raised. Information in brackets [ ] was not presented at the hearing.

ISSUES RAISED	DOE RESPONSES
Several commentors expressed support for overseas management of foreign research reactor spent nuclear fuel, provided there are appropriate storage technologies and security.	[The commentor's preference for Management Alternative 2 is noted. This alternative is discussed in Sections 2.3 and 4.4 of the EIS.]
Comment was made that American taxpayers should not have to bear the costs of managing spent nuclear fuel from other countries. Options suggested by commentors included the following: (1) foreign countries should pay for the management of their spent fuel; (2) foreign countries should contribute to the costs of storing their spent nuclear fuel in the United States for the 40 years assumed in the EIS; and (3) the fuel manufacturers who prospered from making the fuel should bear some financial burden.	According to an Edlow Group representative, foreign research reactor operators are willing to pay the full costs of shipping their spent nuclear fuel to the United States provided that the costs are reasonable. [As discussed in Section 2.2.1.2 and 2.2.2.3 of the EIS, several financing options have been considered, ranging from collection of fees from the research reactor operators that would pay all of the costs of the program, to full subsidization of the program by DOE. A compromise between these extremes would be for developed countries to be charged a competitive fee to accept and manage their spent nuclear fuel. U.S. taxpayers would absorb the full costs of the program for developing countries and absorb the amount above a competitive fee for developed countries. The reasons the U.S. would pay some of the costs for other countries are: 1) some countries would be unable to afford the cost of the proposed action and would have no safe alternative means of managing their spent nuclear fuel (i.e., the developing countries); and 2) some countries would continue to use and trade weapons-grade nuclear material indefinitely unless the U.S. charges a competitive fee and absorbs any costs above that fee (i.e., most Western European countries).] It should be noted that the United States government manufactured the enriched uranium.
A question also was asked as to how potential budget cuts would affect the proposed action.	The EIS evaluates a number of financing options for the proposed action, including one in which developed countries pay costs of shipping the fuel to the United States. [As noted above], foreign research reactor operators are willing to pay the costs of shipping their spent fuel to the United States (provided the costs are reasonable). [DOE does not anticipate budget cuts affecting essential activities such as the safe management of spent fuel. If DOE were abolished in response to action by Congress, the current DOE programs for management of spent nuclear fuel would have to be transferred to some other Federal government agency to protect the health safety of the public. Since the spent nuclear fuel will not simply go away, these programs cannot simply be abolished.]

ISSUES RAISED	DOE RESPONSES
Concern was expressed about the spent fuel's vulnerability to terrorist attacks. Comment was made that the Oklahoma City bombing changed the nature of what countries are at risk; domestic terrorism is on the rise; and terrorist opportunities are greatest as shipments cross over sea and land. Comment was made that the foreign research reactor spent nuclear fuel is safer in countries such as Sweden, Denmark, or Germany.	[Acts of terrorism and theft of materials by a determined group or individuals cannot be completely precluded. However, proper security measures greatly reduce the risk. All shipments of foreign research reactor spent nuclear fuel would be conducted to meet or exceed all the security requirements in the Code of Federal Regulations (10 CFR Part 73). DOE supports these regulations as being adequate to protect the foreign research reactor spent nuclear fuel. Nuclear Regulatory Commission regulations for physical security include requirements for armed escorts and two-way communications with a communications center during the journey (Section 5.4.2 of the EIS). Section 2.8 and Appendix D, Section D.5.9 discuss the issues of sabotage and terrorist activities. To more fully describe the security and emergency preparedness associated with transport of the foreign research reactor spent nuclear fuel, Appendix H has been added to the final EIS.]
Opposition was expressed to allowing the shippers to choose the shipment routes on a shipment-specific basis -- commentor expressed lack of trust in the shippers' judgment.	[Overland shipment by rail or by truck is regulated by Department of Transportation and NRC regulations dealing with packaging, notification, escorts and communication. Under Department of Transportation regulations, those specific routes designated by appropriate State agencies are enforceable if the Department of Transportation determines that such routes are likely to result in further reduction of radiological risk. Also, shippers are required to submit proposed routes for spent nuclear fuel shipments to the Nuclear Regulatory Commission for approval. NRC then publishes a public information circular that lists routes that have been evaluated and approved for specific spent nuclear fuel shipments. All the routes take into consideration accident rates, transit time, and population density. Hundreds of shipments of spent nuclear fuel have been transported for nearly four decades over highway and rail routes in the United States. No radiological incident involving spent nuclear fuel has occurred during that time (Section 4.2.3 of the EIS).]
A comment was made that if spent nuclear fuel is accepted into the United States, shipments should be on larger, more robust ships than were used for the August 1994 Urgent-Relief shipment into the Military Ocean Terminal at Sunny Point.	According to an Edlow Group representative, spent nuclear fuel shipments have been made in similar ocean-going vessels for the past 30 years, with a safe shipping history. [The EIS evaluated the use of four types of ships for transporting the spent nuclear fuel should it be accepted into the United States: container vessels, roll-on/roll-off ships, general /cargo ships, and purpose-built ships. No significant difference in the incident-free or accident risk were found between any of the types of ships (Sections 4.2.1 and 4.2.2 of the EIS).]

ISSUES RAISED	DOE RESPONSES
A comment was made that spent nuclear fuel shipments in the United States should be accompanied by security. A commentor noted that the 1994 Urgent-Relief shipment into the Military Ocean Terminal at Sunny Point would not have had transportation security if it were not for public demand.	[All shipments of foreign research reactor spent nuclear fuel would be conducted to meet or exceed security requirements in the Code of Federal Regulations (10 CFR Part 73). Nuclear Regulatory Commission regulations for physical security include requirements for armed escorts and two-way communications with a communications center (Section 5.4.2 of the EIS). To better describe the security and emergency preparedness associated with transport of the foreign research reactor spent nuclear fuel, Appendix H has been added to the EIS. Appendix H presents the general provisions of the Transportation Plan which is a document that provides the details that would be associated with the transportation of the foreign research reactor spent nuclear fuel, including security.]
Concern was expressed about the fact that the Urgent-Relief shipment that came into the Military Ocean Terminal at Sunny Point entered into the port during hurricane season and while the port was preparing for military combat readiness.	[While local hazards such as hurricanes might slightly increase the probability of an accident, they would not increase the consequences of the accident, which were found to be low for both marine and transportation accidents (Section 4.2.2.3 of the EIS).]
	[Activities at the port would be taken into consideration when scheduling shipments of foreign research reactor spent nuclear fuel. Receipt of spent nuclear fuel from research reactors would not be scheduled at the same time as other port activities that would increase a risk of accident.]
A comment was made that the draft EIS gives a false sense of security in terms of health risks to those who live along rail routes.	[The potential adverse environmental and health effects were found to be low along potential transportation routes (road or rail). Radiological health effects are quantified in Section 4.1.3 of the EIS.]
A comment was made that casks of spent nuclear fuel moving down the highway are like "eggs moving down the highway." Commentor stated that the material inside the casks is porous; the amount of radiation released in an atomic explosion is equivalent to the amount of radiation contained in some commercial spent fuel; and that spent nuclear fuel from overseas can be devastating if an accident happens.	As noted in the [EIS] analyses, the casks are robust and have passed severe accident testing. The foreign research reactor spent nuclear fuel is more benign than commercial spent nuclear fuel. [Section 2.6.2 and Appendix B, Section B.2 of the EIS describe the severe accident tests that the casks undergo in order to be certified and approved for use. Commentor's statements regarding the nature of the spent nuclear fuel inside the transportation casks and the amount of radiation are incorrect. Sections 2.6, 4.1, and 4.2 of the EIS describe the nature of the spent nuclear fuel and radiological doses that would be associated with a spent nuclear fuel transportation cask during normal and accident conditions.]

ISSUES RAISED	DOE RESPONSES
A comment was made that the draft EIS failed to consider data in numerous agency studies documenting the evidence of active and probable sinkholes in the Southport area and along nearby rail lines. Commentor stated that sinkholes were man-induced as a result of lime mining that disturbed an underground aquifer. Commentor cited a Consent Agreement with the Army Corps of Engineers concerning continued mining. Commentor provided supporting documentation on sinkholes and requested that DOE consider the data in the EIS analyses.	[Sinkhole data provided in written comment document 18 was considered. Local hazards, such as sinkholes, can serve as accident initiators and may therefore slightly increase the probability of an accident. However, they would not increase the consequences (results) of the accident, which were found to be low (Section 4.2.2.3 of the EIS).]
A comment was made that shipments are easily tracked by terrorists and that it does not take a genius to track them.	Although it may sometimes be possible to track shipments in the United States, it would be safer having the spent nuclear fuel in the United States, particularly that spent nuclear fuel which has cooled and is, therefore, more easily handled. [All shipments of foreign research reactor spent nuclear fuel would be conducted meeting or exceeding all the security requirements in the Code of Federal Regulations (10 CFR Part 73). Section 2.8 and Appendix D, Section D.5.9 discuss the issue of sabotage and terrorist activities. To better describe the security and emergency preparedness associated with transportation of the spent nuclear fuel, Appendix H has been added to the EIS. This appendix includes the general provisions of the Transportation Plan, which provides the details that would be associated with the transportation of the foreign research reactor spent nuclear fuel, including the security arrangements in port and in transit to the DOE management site.]
Concern was expressed about the potential for terrorists to shoot charges into casks, creating an explosion in route.	[Section 2.8 and Appendix D, Section D.5.9 have been added to the EIS to address terrorism and sabotage. These sections discuss the consequences of just such a terrorist act. In addition, the EIS analyzes several types of ship fires, the impacts of which would be worse, or "bound" by the results of an explosion involving a spent nuclear fuel transportation cask. The energy content of a severe fire greatly exceeds that of a severe explosion. With a severe fire not only would the transportation cask be violated, as it might be by a large explosion, but the heat of the fire would lift what would be released from the transportation cask, spreading the radioactive material farther, potentially affecting more people. The impacts of an explosion followed by a severe fire would be equivalent to the Category 6 accident analysis which would result in a violated cask being engulfed by a severe fire (Appendix D, Section D.5). The analysis in the EIS shows that neither the consequences nor risks are great and that no decontamination, interdiction, or condemnation of property would result from the worst plausible accident (Section 4.2.2.3).]
A comment was made that people along transportation routes have the right to know ahead of time when spent nuclear fuel shipments are coming through their communities. Nuclear Regulatory Commission regulations and DOE Orders require that Governors be notified in writing 7 days in advance of shipments.	During the Urgent-Relief shipment planning, DOE worked with North Carolina and South Carolina six months in advance to prepare for the shipment, including designations of routes. Several local and regional emergency responders were involved. It would be the State's responsibility to make sure proper local notifications are made.

ISSUES RAISED	DOE RESPONSES
A comment was made that people along transportation routes need to be better informed of the precautions being made by DOE to assure safety (e.g., emergency response assistance.)	[As discussed in Section 2.7 of the EIS, primary responsibility for emergency response to an incident would reside with the State, Tribal, and local authorities. DOE would provide coordination, financial and technical assistance, and training to the State, Tribal, and local emergency response personnel. In addition DOE has Radiological Assistance Program teams that operate from eight strategically located DOE offices around the country. These teams can provide technical expertise and assistance to monitor and assess radiological hazards. To better describe the security and emergency preparedness associated with transport of the foreign research reactor spent nuclear fuel, Appendix H has been added to the EIS. Appendix H presents the general provisions of the Transportation Plan which is a document that provides the details which would be associated with the transportation of the foreign research reactor spent nuclear fuel.]
A question was asked as to whether there is any storage capacity remaining at the Savannah River Site and how long it will be before the fuel would have to be moved again. A question was asked as to the lifetime of the Receiving Basin for Offsite Fuels.	There is currently enough capacity at the Receiving Basin for Offsite Fuels (RBOF) to accept spent nuclear fuel through 1996. DOE is in the process of upgrading L-[Reactor Disassembly] Basin for receipt of spent nuclear fuel after 1996. Alternatives are also being considered for new [dry] storage facilities at the Savannah River Site. To receive all foreign research reactor spent nuclear fuel, new storage facilities would be needed. DOE does not expect to have to move spent nuclear fuel out of RBOF, L-[Reactor Disassembly] Basin, or any new facilities until a repository is available.
A question was asked as to whether reprocessing is a viable option.	The draft EIS includes reprocessing (chemical separation) as a viable option [(See Sections 2.2.2 and 4.3 of the EIS). Reprocessing would not violate current United States policy as long as the separated uranium is not used in nuclear weapons.]
Concern was expressed that very few local emergency response personnel are adequately trained and equipped.	There is ongoing dialogue among DOE, the Federal Emergency Management Agency (FEMA), States, and emergency response associations as to the proper equipment for each layer of response. Once agreements are reached with the State, DOE will provide financial assistance for emergency equipment for local jurisdictions. For the Urgent-Relief shipment, DOE provided specialized emergency response training at State and some local levels [four courses in North Carolina and South Carolina and specialized training at MOTSU]. The Savannah River Site Radiological Assistance Team shadowed the train throughout the shipment to assist local responders in the event of an accident.
A comment was made that there are many small communities on the shipment route which were not involved in decisions on the AWE shipment (e.g., Awe, Monroe, Hamlet, Laurinberg). Commentor suggested that DOE should have more hearings along the transportation corridors in North Carolina and noted that citizens' fears need to be considered.	DOE went through a deliberative process in preparation of the Urgent-Relief shipment, coordinating with the State on route selection and emergency response. DOE looks to the State to assure that local communities are adequately represented in determining routes and emergency preparedness needs.

ISSUES RAISED	DOE RESPONSES
Concern was expressed that the impacts of bringing foreign research reactor spent nuclear fuel to the Savannah River Site would result in disproportionate impacts to minority and low-income communities. Reasons cited were: (1) storage at Savannah River Site would be temporary and DOE would need to move fuel many times, impacting minorities; (2) adding more "white people" into the mix and reducing the percentage of minority and low-income communities masks the true picture; and (3) the Urgent-Relief shipment through Sunny Point "zig-zagged" through communities that would also be affected if the shipments come through Charleston. (Commentor submitted written comments.)	[Appendix A of the EIS responds to Executive Order 12898 which directs Federal agencies to identify and address disproportionately high and adverse environmental effects of their policies and activities on minority populations and low-income populations. Environmental effects of Management Alternatives 1 and 3 (management in the United States) were evaluated and found to have no significant beneficial or adverse effects on the general population, including minority populations and low-income populations surrounding Wilmington, the Savannah River Site, Charleston, or any other port or site in the EIS. Section 3.2.1 of the EIS identifies low-income households and describes the racial and ethnic composition of resident minority populations surrounding each of the candidate ports. Environmental justice at candidate ports, along ground routes, and at interim management sites is discussed in Sections 4.2.2.6, 4.2.3.7 and 4.2.4.5 respectively, of the EIS.]
A comment was made that many people along the shipment routes are illiterate and cannot write, yet should be allowed a chance to participate in decisions that affect them. It was suggested that DOE establish a 1-800 line so they can call in their comments.	[Commentor was provided the 1-800 telephone number for Charles Head, Project Manager of the EIS.]
A comment was made that the proposed policy is mistakenly referred to as a nonproliferation policy and that providing LEU to questionable nations is only furthering the spread of nuclear weapons. Commentor cited the following examples: Iran has questionable intentions; the United States does not officially recognize Taiwan; it is widely known that Pakistan has the bomb; and Slovenia is unstable.	The countries cited by the commentor are on the list because they have spent nuclear fuel containing uranium enriched in the United States, which the United States wants back under its control. LEU will not be provided to countries, such as Iran and Pakistan, that are not committed to nonproliferation.
A comment was made that the Treaty on Nonproliferation of Nuclear Weapons is a failure and that, under this policy, we have managed to spread nuclear materials and technology over the world.	It is not in DOE's scope [of the EIS] to argue the merits of the Treaty on Non-Proliferation [of Nuclear Weapons] and whether or not it supports nonproliferation. However, it has been successful to date in minimizing the spread of bomb-grade material available world-wide [as well as the spread of nuclear weapons].
A comment was made that the nuclear weapon proliferation risk of countries included in the proposed action is not readily discernible.	[Of the 41 countries that would be covered under the proposed policy, the majority do not pose a proliferation risk. However, many of these countries that have converted to LEU may switch back to HEU to fuel their research reactors if the United States does not accept their spent nuclear fuel containing the HEU originally supplied by the United States. These countries could buy HEU -- Russia and China have both supplied HEU in the past. The suggestion to accept spent nuclear fuel only from nations that are proliferation risks also leads to the problem of identifying these countries. As discussed in Section 2.8 of the EIS, nations that were publicly labeled as proliferation risks would very likely withdraw from further cooperation in nuclear weapon nonproliferation efforts.]

ISSUES RAISED	DOE RESPONSES
A comment was made that there are a lot of exaggerations in the draft EIS, particularly the importance of shipments into the United States to the nonproliferation policy. Commentor stated that prior to the Urgent-Relief shipment, citizens were told that if the shipment was not allowed to come through Sunny Point, the entire nuclear nonproliferation program would "fall through."	[DOE and the Department of State consider it imperative that the United States maintain its leadership role in reducing the amount of HEU in global commerce. An objective of the proposed action is to reduce, and eventually eliminate, civilian use of HEU fuel in foreign research reactors (Section 1.2 of the EIS). This objective is a primary goal of DOE's nuclear weapons nonproliferation policy.]
A question was asked as to what degree the citizens in the foreign research reactor host countries are involved in these decisions.	[The foreign research reactor host countries are supporting this policy. Many of their citizens submitted comments on the draft EIS.]
A comment was made that the proposed policy is inconsistent with the United States government accepting Japan's use of plutonium-fueled reactors and reprocessing of its spent nuclear fuel in France.	Under the Treaty on Non-Proliferation of Nuclear Weapons, Japan has the right to choose its own energy options. The United States does not have the authority to stop Japan from using plutonium. The proposed policy deals with only U.S.-origin enriched uranium contained in spent nuclear fuel from foreign research reactors.
A comment was made that the United States appears to be seeking to monopolize world trade in nuclear materials and monopolize the current status of non-nuclear weapons states.	The United States is seeking to create a norm against use of highly enriched uranium in research reactors, thus seeking to eliminate world-wide commerce in highly enriched uranium.
A comment was made that the proposed policy represents a "no-end game."	The EIS includes a finite scope and time frame of policy [10-year policy, which should allow for management of all U.S.-origin highly enriched uranium].
Concern was expressed that the United States may never have a geologic repository and that decisions are being made when we do not know what to do with our own waste.	The EIS assessed impacts of 40-year storage, at which time a permanent solution is expected. Current plans are for operation of a geologic repository within 40 years.

ISSUES RAISED	DOE RESPONSES
An Edlow Group representative read a statement presenting the position of about 14 foreign research reactor operators. (A written statement is included in Volume 3 of the EIS.) Statement is summarized as follows: (1) Foreign research reactors provide benefits; (2) Foreign research reactor operators always relied on United States assurances to take back U.S.-origin fuel; (3) United States acceptance of foreign research reactor's spent nuclear fuel supports nonproliferation goals; (4) With United States acceptance of foreign research reactors' spent nuclear fuel, reactor operators willingly cooperated in the RERTR program and converted to LEU fuel; (5) Foreign research reactor operators are making long-term plans to deal with their own fuel overseas; (6) In the short-term, foreign research reactors do not have safe storage capacity; (7) Foreign research reactor spent nuclear fuel makes up only 1% of heavy metal content of entire DOE-owned spent nuclear fuel inventory; (8) United States acceptance can be done without significant impacts; (9) While United States acceptance adds a small amount of spent nuclear fuel to DOE inventory, the trade-off is taking HEU out of world commerce; and (10) DOE should move forward with United States acceptance of foreign research reactor spent nuclear fuel.	[The commentors' support for U.S. acceptance of foreign research reactor spent nuclear fuel (Management Alternative 1 or 3) is noted. The Edlow group written comments are responded to in Section 3 of this Volume, documents 7 and 1130.]
A comment was made that the draft EIS states that conservative assumptions were used to estimate impacts; yet, under the maximum estimated impacts of incident-free and accident conditions of transport and storage, the draft EIS continues to state that impacts are "zero" or there are "no" latent cancer fatalities. Commentor expressed view that zero impacts or no latent cancer fatalities, is unrealistic.	The EIS statement that there are no latent cancer fatalities expected from the EIS alternatives for ground transport and storage is based on over 40 years of experience in transporting and managing spent nuclear fuel. To date, there have been no accidents in which a transportation cask has ruptured or otherwise released its contents. Casks have been proven to withstand severe accidents through a series of tests and analyses in which the casks were crashed, dropped, and burned.
A comment was made that the draft EIS failed to assess non-cancer health risks, such as immune deficiencies and birth defects. (Written comments provided.)	Non-fatal cancers and other health effects were not calculated in the EIS because they are lower probability and because the higher probability fatal cancer rate was so low for all of the analyzed cases (Section 4.1.3 of the EIS).]
A comment was made that the draft EIS does not address new research on radiological health risks. Cited was a recent study of the North Carolina Public Health Department that assessed exposures of Oak Ridge workers. Commentor stated that the study showed that exposure of 140 mrems resulted in a significant increase in cancer. Also cited were studies by Resnikoff. (Written comments provided.)	[The effects of low level radiation is a topic currently being discussed among experts, with no resolution currently available. The dose of latent cancer fatality conversion used in the EIS is the current industry-accepted value (Section 4.1.3 of the EIS). These dose conversion factors are also accepted by the International Commission on Radiological Protection and the U.S. Nuclear Regulatory Commission.]

ISSUES RAISED	DOE RESPONSES
A comment was made that DOE is lying when it says LEU, which is enriched at below 20%, cannot be used in making a bomb. Commentor stated that if a country can turn 20% or greater enriched uranium into a bomb, it can also turn 5% enriched uranium into a bomb.	The average terrorist and country could not convert LEU to a bomb. The only way for it to become bomb-grade is for the enrichment to be increased to greater than 20%, which can only be done in a huge, complex facility. Only five countries currently have the capability to enrich uranium. [Eleven nations have some enrichment capability.] Most countries are faced with three choices: (1) shut down their reactors; (2) go to other enriched uranium suppliers, including countries that are not as careful with respect to nonproliferation (China or Russia--two of the five); or (3) develop their own enrichment capability.
A comment was made that DOE's use of "spent" in spent nuclear fuel is a miscommunication. Commentor stated that the term sounds like something is depleted when in fact it is more dangerous than before.	"Spent" fuel means that there is less Uranium-235 in the fuel than when the fuel originally started in the reactor.

List of Attendees at Wilmington, NC Public Hearing

Best, Denny

Brown, Paula

Bryson, Thad

Creech, Melainie G.

Glenn, Steven N.

Gold, Scott

Hoyle, Janet M.

Jackson, Buddy

Johnston, Russ

Kyte, John

Pearce, Wayne

Peterson, Ginny

Quinn, Robert

Ravenscroft, Norman

Summers, Dan E.

Vick, Therese

Williams, Blake R.

Zeller, Louis

ATTACHMENT 1

ATTACHMENT 1

Transcript of Public Hearing Held in Tacoma, Washington on June 19, 1995 on the Draft Environmental Impact Statement on the Proposed Nuclear Weapons Nonproliferation Policy Concering Foreign Research Reactor Spent Nuclear Fuel

Facilitator - Leslie Wilderson (LW): Welcome to the Department of Energy meeting on the nuclear weapons nonproliferation policy concerning spent nuclear fuel from foreign research reactors. This is a meeting to discuss the Draft Environmental Impact Statement (DEIS) that the Department of Energy (DOE) has developed in deciding their proposals.

My name is Leslie Wilderson. I am here as a neutral facilitator. I do not work for DOE, I work for a small company in Denver, Colorado. My job is to make sure that all of you who want to be heard tonight get an opportunity to be heard and that no one gets an opportunity to be heard more than their share. So, we have a lot of people here tonight. I am very pleased to see this many people turning out to participate in public policy determination for our country.

We have a deceptively simple agenda for this evening. There will be a presentation by Mr. Charles Head, who is the Program Manager for the foreign research reactors, and who is the Project Manager for the DOE's Environmental Impact Statement (EIS) on this project. He will give a brief overview of the DEIS for those of you who haven't had a chance to plough through all of the pages of that document, and so that everyone will have an opportunity to have a level playing field in terms of the knowledge of the project. After that, we'll have some questions and answers and discussions. This room, as some of you, I know, up front have heard us talking over the last few minutes, about how this room is not really conducive to discussion, which is really the purpose of this meeting -- is to talk and answer questions, and receive input from the Department, and to discuss things about this project. This room doesn't lend itself to that, very much.

We have, in order to make sure that the Department gets your input, we have a couple of note takers up at the front table. I'll be jotting some things on flip charts. There will also be a tape recorder that is plugged into the sound system. Now, the sound system isn't quite what anyone of us would like to have either and so Larry Burke (where are you?), Larry (in the back) is going to be a sort of an auxiliary sound system and he will be carrying a little lavaliere mike (like this) so (for whoever is speaking) he will have a mike for you so that you will be plugged into the sound system and all of your friends and neighbors can hear you and the Department officials can hear you, and the note takers and the tape recorder can hear you. So, that's what will be happening there.

We have a lot of people who have signed up to speak, 49 people so far. And, if we hold to about a 3-hour discussion (you can divide that up for yourselves) that is about 2.5 minutes a person, and that is just for speaking, that's not for discussion. So try to be respectful of your counterparts and your colleagues who will need some of their own time to make their presentations and to make their views known. ...[inaudible question from audience]... What we will have is Larry with the microphone -- no podium. Could you have a podium? I don't know, I suppose we could. [Podium was brought out so that speakers from the audience could use it.]

Okay, let me say one other thing, there are note pads (out in the ante room out there) and also some exhibits that I think most of you were able to take a look at (this is really loud is there something we

could do?) Anyway, there are exhibits and some printed materials out there, if you didn't get a chance before the meeting to avail yourself of those resources, by all means do so after the meeting. There are also note pads so that you can prepare written comments, if you would prefer doing it that way, and of course the Department is, I guess, still receiving written comments through normal channels (i.e., to say writing a letter to the address in Washington, DC). All of the comments are given the same weight. There is no particular advantage to giving a written presentation versus an oral presentation. As soon as Mr. Head finishes the overview, we will be taking people who signed up to speak in the order in which you signed up.

I see a question in the back row - Yes:

[someone from the audience, mostly inaudible, asked about taking a vote to see how many people were for and how many were against it].

Apparently that was a good suggestion, that's good. [Vote took place later -- after DOE presentation and Q/A session, but before formal audience presentation.] Would you like me to introduce you now? Okay, without further ado and especially because we are...excuse me? I don't know, those are not part of the Department's, it's the yellow...who is passing them out and who is collecting those? Okay, the gentleman in the red shirt, there.
Okay, without further ado, I'd like to introduce Mr. Charles Head, who is the Program Manager for this project.

Charles Head: Thank you very much, Leslie. Does this thing work better if I hold it a little further from my mouth? [audience: "NO"] Alright....okay, you think it works better further away, alright, I think you're right. Okay, this is an overview of the Environmental Impact Statement on a Proposed Nuclear Nonproliferation Policy concerning the Spent Fuel from Foreign Research Reactors. I'll tell you very briefly, at first, what might happen if we were to decide to accept any of this spent fuel and if it were to come into Tacoma. It would probably come in on a normal commercial container liner, the same as you see coming up the Sound all the time. We are estimating that there might be as many as one cask shipment a month, so in all likelihood, there would be no change in the number of ships coming up the channel, at all. The spent fuel would be loaded inside shipping casks, and the shipping casks would be loaded inside standard ISO containers. The ISO containers would be handled using the same equipment, the same mechanisms, and procedures as are used for any other commodity. There would be radiation surveys conducted on the containers to ensure that the shipping cask is performing as it's supposed to. But, in most aspects, the shipment would be done just as for any other commodity. On receipt in the port, the casks would be off-loaded onto either railcars or onto truck. These particular photographs that I'm showing you were taken during past transportation. Those onto railcars were taken in September of 1994 in a shipment that came into North Carolina. Once the spent fuel was loaded onto the railcars or onto the trucks, they would be taken either to the Idaho National Engineering Laboratory (INEL) or to the Savannah River Site (SRS) in South Carolina. Once they get to those two sites, the spent fuel would either go into wet or dry storage and, possibly, some of it, might be reprocessed. That which was put into wet storage would go into a facility that looks somewhat like this one: This picture was taken at the SRS in South Carolina. This is the Receiving Basin for Off-site Fuels. What you see here, is mostly spent fuel from foreign research reactors that has been accepted by the United States in the past. If it was to be stored dry, it would probably go into a...it could go into a facility that looks like this one: This particular photograph shows dry storage of commercial power reactor spent fuel. The spent fuel is loaded inside a hermetically sealed cylinder and it is then moved into this big concrete blockhouse. This thing is, basically, a concrete garage that you park the cylinder (that contains the spent

fuel) in. That, in a nutshell, is what would be likely to happen if we decide to accept any spent fuel and if it was to come in through Tacoma.

Now, let me explain, very briefly, why we are considering this. This goes back to the days, right after World War II, when everybody thought that nuclear power was going to be the great panacea that was going to help everyone. We were going to be driving around in atomic powered automobiles, flying in atomic powered airplanes, we were each going to have a nuclear power plant in our basement, and electricity was going to be too cheap to meter any more. Most of the countries around the world wanted to get into this act before they were left behind. They didn't want to have to buy their nuclear technology from the United States or from one of the developed countries, they wanted to be able to do it on their own. What we were concerned about was that, if other countries started developing their stand-alone nuclear technology, they would inevitably also develop the capability of making nuclear weapons. So we developed a nonproliferation concept which called for other countries to promise not to develop nuclear weapons if we would promise to help them with peaceful applications of nuclear energy. And the way we helped them with peaceful applications of nuclear energy, one of the major ways, was to help them obtain research reactors and operate those research reactors in their countries. Now, the type of research reactors that we provided them used highly enriched uranium (HEU) for fuel. HEU is weapons-grade material. It could be made into a nuclear weapon if you could take it out of the spent fuel. From the beginning, the way we kept that from happening, was to accept the return of the spent fuel after it was used. In fact, in the early days, we leased the fuel to the other countries and the provisions of the lease required that it be returned to the United States after they were through with it. As time went on and people got more comfortable with the program, those leases were eventually changed into sales, and the provisions that required that the material be returned to the United States were dropped. Nevertheless, the process of having the spent fuel shipped back to the United States continued and went on for about 30 years. Now, as time went on, the United States got more concerned about the proliferation of nuclear weapons, in general, and specifically about this weapons-grade material that was used in research reactors. In 1978, we started a program called the Reduced Enrichment for Research Test Reactors program that was aimed at developing a new type of fuel for the research reactors. By the time we got to 1978, the state-of-the-art was advanced to the point where we could make the fuel for these research reactors out of low-enriched uranium (LEU); that is, uranium that cannot be used directly in nuclear weapons. The United States developed this fuel and then started trying to convince the people (whom we had been supplying with fuel in the past) to stop using HEU and switch over to LEU. That is an expensive process, to convert the reactor. The reactors didn't operate as well on LEU as they did on HEU. Nevertheless, we were able to convince them to start switching over to this less troublesome fuel, but one of the major incentives that we used to get them to switch was that we continued to accept their spent fuel including the LEU spent fuel. This went on until 1987. The policy under which we were accepting this spent fuel was announced in the Federal Register every five years, basically the terms and conditions under which we would accept the spent fuel, and we renewed it routinely on about a 5-year cycle. In 1987, however, the Department decided, that before we renewed it again, we had better do a full environmental review of the actions to make sure that we were in full compliance with environmental laws. We extended the policy for one year to give us time to do the environmental review. However, that review ran into problems and was never completed. As a result, in 1988, the policy for accepting HEU spent fuel from foreign research reactors expired. Now, what we are doing, right now, is finally finishing that environmental review.

The DEIS has several alternatives in it for dealing with this problem, and one of the alternatives that is suggested is to do nothing whatsoever. Leave the spent fuel where it is, tell the research reactor operators that they are on their own, and walk away from the problem. The Department doesn't

recommend that approach. We are very concerned that, if we did, we would rapidly wind up with the situation where the availability of weapons-grade material would escalate around the world. Instead, we are proposing to take action to manage the spent fuel from these foreign research reactors. Now, the type of action that we might take, could vary. One alternative, is to accept and manage the spent fuel in the United States. Another alternative (that a number of people have asked me about tonight) is to deal with it overseas. And the third alternative, the hybrid, is basically a mixture of elements from one or more of these two alternatives. There are a number of lower-level alternatives, as well, that have to be dealt with. We have to determine how much of the spent fuel we are going to look at. The EIS addresses a nominal amount of 22,700 elements of spent fuel, but it also looks at other alternatives. We look at two alternatives that involve less spent fuel and we look at another one that involves all of the spent fuel plus target material. This is another material that is very, very similar to the spent fuel, so we bracket it. We have a nominal approach that we are considering and we bracket it on the high and the low side. Similarly, on the duration of the policy, we are looking at a policy duration that would nominally last for 10 years, but we look at an option on the low side and another option on the high side. We are looking at several options for how you would finance this proposed action. Options for where we would take title to the fuel, options for how we would transport it over the ocean. For ports of entry, we have started with a list of ports that are basically every commercial port in the United States, applied a series of criteria that are specified in the DEIS, and winnowed down that list of 153 ports to a list of 10. What we hope to be able to demonstrate is that acceptance through any one (or all of those 10 ports) is acceptable. We want to keep as many ports available as possible because over the 13 years that the shipments might occur there could be changes in the transportation industry that would cause one port to become much more effective than another one. We basically want to give latitude so that we can get this job done as effectively as possible. We looked at the use of rail and highway for ground transportation. We discussed barge transport, briefly, as well, but basically we expect most of it would go by rail or highway. For storage sites in the DEIS we considered the Savannah River Site, the INEL, Hanford, the Oak Ridge Reservation in Tennessee, and the Nevada Test Site.

Now, since we developed the DEIS, another major document was completed by DOE. It was called the Programmatic SNF&INEL EIS. It addressed the question of how DOE could manage all of the spent fuel that it is responsible for. This includes spent fuel from nuclear submarines, spent fuel from test reactors in the United States, spent fuel from R&D activities that are conducted in the United States, but (to ensure that we have covered the cumulative impacts of all these activities) it also considered what we should do with the foreign research reactor spent fuel, if it was accepted. The conclusion of that EIS was that, if we accepted foreign research reactor spent fuel, it should only go to only two places: All of the aluminum-clad spent fuel should only go to SRS and all of the rest of the foreign research reactor spent nuclear fuel should go to the INEL. So these last three sites are no longer being actively considered as sites to which we might ship foreign research reactor spent nuclear fuel.

We are looking at different storage technologies, basically dry storage technology, but we are considering wet storage, as well. As an alternative to storage, we are considering near-term chemical separation of the spent fuel in the United States and we are considering another alternative that could involve development of a new processing technology: One that would presumably have better environmental characteristics, and better nonproliferation characteristics, than any of the processes used in the United States at this time. This viewgraph shows, quickly, the distribution of ports that we are considering. Six ports on the East Coast and one Gulf Coast and three West Coast. As I said, all of the spent fuel would go to either the Idaho site or to the Savannah River Site. Now, the DEIS does have a number of preliminary conclusions in it. It indicates that (based on our analysis) the environmental consequences of all of the alternatives that I've just discussed a few minutes ago, are small. This is an activity that,

as I said before, we have been doing for over 30 years with no problems of any sort. We didn't run into problems in the past and we don't anticipate any in the future. The highest estimated risk to any member of the general public (living within fifty miles of any of the DOE management sites) from any of the alternatives would be less than 1/2 of an additional latent cancer fatality. This translates to less than one-in-one million chance of developing a latent cancer fatality. Basically, that same risk level applies to workers, as well, and none of the alternatives would significantly contribute to cumulative impacts.

As we finish this EIS, there are a number of decisions that have to be made. Most fundamentally, we have to decide if we are going to do anything at all. Are we going to adopt a policy to manage the foreign research reactor spent nuclear fuel or to take no action? If we decide to take an action, which one of the management alternatives would we take? Would we bring it into the United States? If we do that, what will we do with it? Do we store it, reprocess it? If we manage it overseas, what would we do there? These are all questions that we have to answer as we finish this EIS. Now, in closing, I want to emphasize that this is a DRAFT EIS. There have been no decisions made, at this time, that the United States is going to do anything. Before we would make any decisions, we have to finish the public comment period, consider the public comments and finish the final EIS, which is scheduled for October of this year. Then, we are required to wait for 30 days before we make any decision on the action to be taken. We basically expect that the decision (on what action would come out of this process) will happen shortly before the end of this calendar year. Let's see, these, this schedule, in fact, is old. We have slipped the schedule for about a month since it was made. In fact, the reason we slipped the schedule is that the public comment period was originally planned to run through the month of June. However, in response to a request that came out of Patty Murray's office, the Secretary of Energy is expected to, very shortly, sign an authorization to extend the public comment period through the 20th of July, adding another month to the comment period. Now, that finishes my overview.

At this point, I'd be happy to answer any questions that anybody has or to hear comments. We do have a makeshift portable mike that Larry, who is standing right back there, can walk around to you folks if you'd like to comment from where you are sitting, or if you'd like to come up to either the podium or one of these microphones, you're certainly welcome to do so as well. Larry, could you come down here to this gentleman?

LW: There is going to be some movement here with the podium.

Q: What port is this going to be shipped through, and when will that port be decided?

LW: We are waiting for the sound system to get reinstalled and please bear with us for a few moments.

CRH: Now, we are back on-line. You asked "which port, and when would we know?"

A: There are 10 ports listed in the Draft EIS. What we hope to do is show that any one of these 10 ports could be used. Then it will be up to the shipper who is making all of the arrangements for the transportation to determine which port works best based on the availability of the ships to bring it overseas and truck or rail to carry it over land when the shipment is made.

Q: So, in other words, we have no choice in this matter?

A: That's why we are going through this review process and asking for comments from the public.

Q: How does one affect or influence the decision?

A: If, and there are, 2 levels to answer that question. If some member of the public shows us a technical reason why it shouldn't be done here or why it would cause an unreasonable level of risk. Then that could make us to rule that port out.

Q: Will this be handled with the same level of expertise as at Hanford? If you want technical reasons you have to give us more information than the approximate minute and a half you spent on shipments.

A: Well, this was only intended to be an overview. If you want more detail, there is lots of it in the EIS itself. I don't claim that the way spent fuel has been managed at Hanford is a sterling example of how that process is supposed to be done. The fact is that we don't plan to take any of the spent fuel to Hanford. Where we do anticipate on taking it is to either Idaho or South Carolina where they have been accepting it for several decades. Those facilities happen to be the best that DOE has. The spent fuel that is in storage there is in excellent condition and we expect it to continue those operations at least as well as we have been doing so far.

Q: There are a lot of unanswered questions. The public comment period time...really Senator Patty Murray is to be commended for what she did... How did we come to the conclusion that we were to take the spent fuel from all over the world into Tacoma?.

A: Okay, the process of selecting Tacoma -- we started with a list of every commercial port in the United States. We didn't go to every marina and fishing port, but we did go to all of the big ports that we could identify. We did work with a panel of marine experts from the U.S. Maritime Academy in New York and came up with a series of criteria that would enable us to winnow down the list to a shorter list of ports that would have the types of characteristics that we would like for this type of job. That whole winnowing process is explained in Appendix D of the DEIS.

LW: Can I interject here? I know that there are a lot of you with your hands up, there are also over 50 people that have signed up to give presentations. Let's, if we could, agree on about ten more minutes for specific questions about the presentations or about the EIS. Then, we could move into specific discussions. And, there is some concern about the sound system and I apologize. For those of you who have questions, if you could shout, that would be good. For those of you who have presentations, and who want to, there will be a microphone down here or Larry with the portable mike. There are some hands in the back, I believe, that were some of the first ones, that gentleman, there.

Q: The majority of nuclear waste coming through here are from our allies and there is not much of an amount here. My concern is that you got Germany, and you got France in here and they reap the benefits of this. I don't see why you don't just leave it in place where they're at. I am concerned about places like Romania and places like that. Sure, I can see us getting that out. But, the rest of this...Japan and everything else...that's quite a bit that they want to bring in. They get the benefits of what we gave them for technology. We got our own problems, too. So I don't have any problems with leaving it where it's at.

A: Okay, there are a couple of reasons that we are considering accepting spent fuel from our wealthy allies. One of them is that those countries, several of them, manufacture and export research reactors and (if we don't accept spent fuel from them) they are probably going to switch their domestic reactors back to the use of HEU and then when they go about selling research reactors to other countries in the world, largely third world countries, they will be very likely to end up selling research reactors that operate on HEU which would wind up with having a demand for HEU in exactly the kind of countries that you are concerned about. Another problem is, we are not the only country in the world who started a process like this. The Soviet Union (back when there was a Soviet Union) did the same thing and so did the Chinese, in both cases, with their client states. The United States, right now, is in the middle of trying to convince both the Russians and the Chinese that they need to work with their client states to get them to stop using nuclear weapons material as fuel in their research reactors. If we take steps that cause our allies, no matter how rich they are, no matter how stable they are, to switch back to the HEU, we are not going to have a ghost of a chance of getting the Russians or Chinese to twist their allies arms to stop using weapons-grade material.

Q: Whatever happened to world-wide citizens' responsibility? These people are responsible for what they do in their countries. Why should we be the only ones responsible for the whole world? We're not. We have some responsibility for our own country.

A: That's a valid point of view. I would hope that we could get them to.

LW: Lady in the pink.

Q: I'd like to know the technicality of why Seattle was not selected and what the difference was between the population of Seattle and Tacoma and the impacts if there was an accident on the Columbia River.

A: It is, in fact, a very, very, fine line between the use of Seattle and Tacoma. In the Defense Authorization Act, for fiscal year 1994, Congress inserted a rider that told us to use to the greatest extent practicable ports that would expose this action to the lowest number of population. That particular phrase was not very explicit and we had to do some figuring to try to find out how to apply it. What we wound up doing, was to do an analysis of the populations of both the potential port cities, and the populations along the transportation routes, for both the rail lines and the truck lines. What we found was that there was a very slight difference between the potential population exposed between Tacoma and Seattle, but made Tacoma a more desirable port.

Q: You are worried about accidents, right? You have to come up with the least number, so you are worried about accidents, right?

A: We were concerned with complying with Congress' direction.

LW: Let's do it in order. There is a white sleeve that I see in the back there, a red short sleeve after that.

Q: If one of the storage facilities in South Carolina, why not send it directly there using a more direct route (east coast)?

A: Okay, a large portion of the spent fuel if we decide to accept it at all, we'd probably do exactly what you are suggesting. Remember, that the decision has been to put the aluminum-clad spent fuel at the SRS and the other types of spent fuel that are just physically different, out in Idaho. The aluminum-clad spent fuel from Europe and Western Africa and the Eastern part of South America probably would go in through the East Coast. The non-aluminum-clad spent fuel from Europe would probably go into the East Coast and be trucked across the United States to Idaho. The spent fuel from the Pacific Rim countries, if it was going on its way to Idaho, would probably come in through West Coast ports. If it was on its way to the SRS, it might well go through the Panama Canal and in through an East Coast Port.

Q: If we're concerned about not letting unfriendly people get a hold of this fuel, why don't we ship it through military ports, where they already have security trained in this. Why are we shipping it through a public port?

A: Okay, fair question! What you've got to recognize is that there is a world of difference between HEU that's trapped inside a spent fuel element and that which has been somehow extracted. If we leave the spent fuel overseas, in other countries where the governments in fact want to develop nuclear weapons or are willing to look the other way as a terrorist organization does it, if we leave it in a situation where organizations have the financial backing of a country and time to do it, you can extract HEU from spent fuel and manufacture it into a weapon. But, you have to have a lot of time and a lot of money and a very sophisticated chemical processing capability to do that. Now, when you are shipping the spent fuel....on the other hand, this weapons material is an integral part of the spent fuel element along with the highly radioactive fission products that are still in there as well. The net result of all this is that it is not a very attractive thing for somebody to try to steal during transportation. It also is inside of a shipping cask that probably weighs a minimum of 25 tons, probably more. If you're trying to make a quick get-away, its not very conducive to being able to move quickly.

Q: If it's not desirable to take it when it is contained while being shipped, why can't we contain it and leave it where it is? If it would be a costly, expensive quick get-away thing, why move it? Why can't we just spend our resources containing it there instead of shipping it? We just had 2 derailments of trains this last weekend. What's going to happen when they go?

A: Well, we could try to build much, much better, more secure, storage facilities at around the 100 reactors around the world. The problem with doing that is that all it takes is a change in government, like we had in Iran for example, and all of the sudden that spent fuel, even though its in the most secure storage facilities that we could possibly provide them, the government can decide to take it out of that storage facility and give it to their weapons production program. You have no assurance that it will stay in that storage facility.

Q: So, then I'm sorry to keep asking the same question, but are you saying that we don't have to have any special training or security to have this stuff come into our ports? The military would not be better equipped for doing this? We're already paying them.

A: The military would not be any better equipped to do this shipment than a standard commercial port.

Q: Then what is going to happen when the U.S. Government decides to phase-out DOE, where will we be then?

A: You'd be in somewhat the same situation as you were with those programs that were in the Atomic Energy Commission before ERDA [the Energy Research and Development Administration] was developed and with those programs that were under ERDA before DOE was developed. The spent fuel is still going to be there, and if Congress decides to do away with DOE, it will have to establish some other agency to pick up the program.

LW: Excuse me, but there are some hands up on the other side, and unless you decide that you don't want the presentations from the 50-some people coming up, we only have a few minutes left for questions. So those who have already signed up can ask your questions. The gentleman in the blue shirt.

Q: If the U.S. accepts the fuel, will the transportation be overseen by DOE or will it be done by private contractors?

A: The transportation will be subject to regulation by the Department of Transportation, by the Nuclear Regulatory Commission and, for those parts of it that are overseas or in international waters, by the International Atomic Energy Agency. The transportation would actually be done by private contractors, the same way almost all DOE activities are done here in the United States. There are not enough DOE Federal employees to actually do it. But, it would be subject to Federal oversight.

Q: Do these people still have oversight of spent fuel?

A: They've been overseeing spent fuel transportation for a number of years, both DOE spent fuel transportation and some done in the commercial sector.

Q: Overseas shipments?

A: In the overseas shipments...there have been overseas shipments, yes, it goes on.

LW: Gentleman in the green hat.

Q: No matter where you go, you're going to have people speaking against nuclear waste. How much does public opinion really mean if you decide that you are going to put nuclear waste here? I mean how much does it really mean? No matter where you go, you will find people speaking out against it. There are just as many people here speaking out against it in Seattle as there are in Savannah, Georgia or anywhere. How much assurance do we have that there won't be any leakage or damage?

A: Okay. You might be interested to know that, everywhere we go, we don't hear this. Interestingly enough, there have been...[audience: "go THERE, go THERE"] but then, what is the impact of meeting like this? As I've pointed out a minute ago, if someone points out to us a technical error that's been made or a technical point that has been overlooked, we absolutely have to address it. But, when it comes to the policy questions of whether we should be doing

this program or not, the Department is doing this because we've have been told to by the Administration.

LW: The gentleman in the white sleeve, in the back row.

Q: I'd like to point out a technical error. First of all, would you agree with me that an EIS is more or less conceptual in nature?

A: Not necessarily. Programmatic Environmental Impact Statements are very broad, but project-specific Environmental Impact Statements are much more specific.

Q: Do you have a personal bond since you've been working at this just in case you are wrong?

A: Well, I don't have a personal bond, but the U.S. government does have one. It's called the Price Anderson Act.

Q: You're talking about our taxes. But, I believe that when you're talking about something of this magnitude, I'd like to point out that you're putting us in jeopardy and I believe that whatever responsibility or claim you have or whoever is responsible for doing this should have liability. I don't know if you would be able to continue doing what you're doing if you had to sign a piece of paper waiving all your rights under legislative statutes and be subject to liability. I feel that any corporation or company or individual or department or anybody who would bring all the problems without being personally responsible...because you are the ones who would have to pick up the liability. I'd like to say yes, go right ahead with this, but I don't want you to go ahead with it when you're going to have people...unprotected and I think that unless you're willing to waive all your rights, along with your kids' inheritance and your grandkids' inheritance, have a nice day.

LW: Let's take a couple more. There is a gentleman in the back.

Q: My question to you, sir, is let's assume that there is an accident, and people are killed, who is going to apologize for it - YOU?

A: You would be getting apologies from DOE and the research reactor operators as well, I'm sure.

Audience Comment: "A lot of help that's going to do when there are people that are going to die because of that."

LW: Gentleman in the front row, with your hand up.

Q: I see no physical risk in the transportation of this material assuming these casks are sealed properly. Your chance of physical injury liability are approximately zero. However, what I see (and what has been my complaint about all along) is that the Port of Tacoma is in competition with every other major port on the West Coast. We have a number of Asiatic states including Japan, who are highly sensitive about the word "nuclear" even though they are (themselves) in the nuclear trade. We have a lot of companies in this country that we are trying to promote to use the Port of Tacoma. They hear the word 'nuclear' and they are out of here. This is an

economic issue. It's not a technical issue. And just as a point on the basis, I don't think that a nonproliferation treaty will stop any sovereign state that decides it must (for its own national reasons) need nuclear weapons. It won't slow them down more than a year anyway. No terrorist group is going to use spent nuclear fuel for a nuclear bomb. Any nation's state (if it decides that it must have one) if they have to go back to ground zero (like we did in the 1940's) they will.

LW: According to my watch, it is 7:30 or thereabouts. What I'd like to do is move into the presentations now and the comments that people have signed-up to make. We have a couple of ways to do that. There is a microphone at the podium which is not particularly convenient to anyone. We also have microphones up here and we have Larry with the portable mike. I apologize to you TV people, but this is the sound system that we have to work with. The first person who signed up is Sharon Metcalf, is she here? I have something like 55 people altogether.

If we could do one thing before that, because I feel that it is appropriate to do it now, there was a request earlier for a vote. Could the gentleman who requested it tell us what it is all about? [a member of the audience responded, but it is inaudible on tape.] Facilitator rephrased as follows: the gentleman asked that the audience vote on 1) how many people are in favor of spent nuclear fuel coming in through Tacoma and 2) how many are against spent nuclear fuel coming in through Tacoma. He would like to have a 2-part question: First, should we bring it into this country at all (Yes or No)? and, second, if it is 'Yes' should it come through Tacoma?

All those in favor of bringing it into the U.S. at all, please signify by raising your hand.

Those opposed to bringing it into the U.S. at all...[audience raised hands]...should we count?.

CH: I think we could say that the overwhelming majority said "no".

LW: So then, do we need to do the 2nd part?

Those in favor of bringing it through the port of Tacoma signify by raising your hands. [Audience raised hands.]

Those opposed to bringing it through the port of Tacoma? [Audience raised hands.] Unanimous. Thank You.

PRESENTATIONS:

Sharon Metcalf: I'm only first because I'm the only person who called the "800" number. If you want to sign up in the future, you should remember that little secret.

My name is Sharon Metcalf, I'm an Assistant City Attorney for the City of Seattle and representing Seattle this evening. I was asked by the City Council to come and convey to DOE the strong opposition of the City to the proposed action in so far as it would affect the people and resources in the entire Puget Sound Area. Of course, on behalf of the narrower interest of the citizens of the City limits of Seattle, we are gratified that the Port of Seattle is no longer on the proposed list of ports. But, our concerns apply equally to the City of Tacoma and the inappropriateness of using that port for receipt of these materials. We understand that it is still contemplated, also, that after the materials are brought in and unloaded in Tacoma, that they would be shipped through Seattle by truck or rail and this is certainly

unacceptable. As you know, the Seattle City Council has passed a series of resolutions stating its clear and unequivocal opposition to DOE's proposals to transport such intrinsically dangerous material through heavily populated areas of the country, including any Puget Sound Port. The City's concerns, expressed previously, have focused on the risks of shipboard fires, which we do not feel have been adequately analyzed in the EISs, and on transportation related accidents. We have a very highly congested transportation corridor. We know that we do not in any of our communities have adequate emergency response capability to deal with the problems that might arise from the type of accidents that would be associated with transport of radioactive materials. Seattle appreciates the opportunity to express its views. We earnestly ask that you reconsider this proposal. The statistical probabilities of the various eventualities discussed in the EIS may seem very low, but the consequences could be catastrophic. We do not believe that it is necessary, or appropriate, to expose the citizens of Puget Sound to those risks.

LW: The next speaker is Shirley Lantz. [the audience asks that the speakers be lined up behind the podium]. Shirley Lantz, Philip Keightley, Larry Brosman, Doug Wood, and Dr. Rens Verberg. So, I guess that you all are going to use the podium, that makes the TV people happy.

Comment: Something to hide behind.

Shirley Lantz: I want you to see what I think about this plan.

LW: Let the record show that it is a Mickey Mouse Tee-Shirt!

Shirley Lantz: This isn't going to be long. I just want to express that I am a citizen of Tacoma. I have neighbors here that I have told this waste problem to and I had not heard about it until about a month ago. Then I became frantic. By Thursday, I had received nothing in the mail pertaining to this. As a voter, I'm just wondering how many of you voters received information without having to look at the paper or watch TV? May I have a show of hands? ...Nothing, right? A flyer showing you as a taxpayer what was taking place? What form was it? [audience member: the Neighborhood Council] That's what I received -- one of these yellow forms, right? And, Pat O'Malley of the Port Commission said that he'd sent these out to as many people as possible. Only 3 here, counting me, have received it. Addressed to myself, not my husband and myself, or my neighbors, or anybody, just us. So why are they keeping it so secret? What is the problem? I understand that there were 30 at the first meeting, and 30 represented at the second meeting. These were all at the Sea/Tac airport. I'm proposing that you have more meetings if you want, that this has been illegal, that there has been very little representation to us from our politicians. I want to know what our Governor thinks about it. I want to know what Norm Dicks thinks about it. I haven't a word, and I want to know what Slade Gorton is doing about it. I end my case. I went to the grocery store and, for 72 cents, I got a bag of chopped liver. This is what I feel like right now. I end my case. Thank you.

Philip Keightley: I am Philip Keightley, Assistant City Manager, with the City of Federal Way. Mayor Gates apologizes for not being able to make this presentation, herself. She has asked me to put into the public record a unanimously passed motion by the City Council on June 6th on behalf of the citizens of Federal Way.

The resolution, and I'll just do excerpts out of it for interests of time: Resolution 95205, a resolution of the City Council of the citizens of the City of Federal Way, WA, opposing the shipment of spent nuclear materials through the Port of Tacoma. Whereas, the DEIS is inadequate in several respects, including that it fails to adequately address security issues at the port and in transit. It fails to adequately

identify emergency response in the event of a catastrophic mishap, and it fails to adequately address the socioeconomic impacts associated with the stigma of being within the proximity of a port of entry of spent nuclear waste. Whereas, the City of Federal Way is a major municipality of 73,500 persons located only one mile from the Port of Tacoma. Now, therefore, the City Council of the City of Federal Way hereby resolves as follows: Statement in opposition. The City of Federal Way City Council strongly opposes the shipment of spent nuclear materials through the Port of Tacoma and encourages the Department of Energy to choose a more suitable site to receive these materials. This is resolved by the City Council on June 6th. The City has also sent to DOE a letter that summarizes the EIS items that do not meet the environmental impact adequately.

I will give a copy of this resolution to you and the letters. Thank you very much.

Larry Brosman: My name is Larry Brosman and I am a resident of the city of Renton. It is pleasing to know that not just Tacoma residents feel the impacts of this possible action. We in Renton...the Seattle Attorney was here -- we're very concerned about this throughout the Puget Sound area. And that's as it should be because we're a community here. We're just not one city or two cities; we're a whole community. One thing, that I would like to address, is that DOE's recommendations don't really talk about Management Alternative 2 which says: "Do it abroad". Forty-one countries produce this nuclear waste, and one country is being seen as the depository of the nuclear waste. It just does not seem fair to me. Also, the belief that the U.S. managing nuclear waste will prevent nuclear proliferation, I think, is a vain belief. Nuclear proliferation will happen anyway. We have tried in the past to be the world's policeman with guns, and bombs, and things like that, and that hasn't worked too well. And now, we are trying to prevent nuclear proliferation by storing all the decaying nuclear fuel here. I don't think that will work either. There are three negative impacts, I think, that say: "Don't do this at all". First of all, the possibility of an accident. I'm not in shipping, but I respect shippers. Nonetheless, there have been accidents in Puget Sound with oil and that sort of thing. Well, an oil spill is hard to clean up. It has a negative impact on life, and on birds, and things like that, but the half-life of uranium is strongly greater and much longer than it would take to clean up than an oil spill. Secondly, the economic burden of transport and storage seems to be placed primarily on the United States in the DOE's alternative. That's not fair, either. Our nation's pockets only go so deep and those pockets shouldn't pay this bill. Thirdly, the perception of how Tacoma is seen is important to me. Mt. Rainier is a beautiful national and natural historic site. People come here to vacation because they love to see Mt. Rainier, they love to be around Tacoma. Well, let's go to Tacoma, let's go watch some nuclear waste being stored. Can you imagine? I mean, Tacoma is a nice town, now. But, if we allow nuclear waste to go in and out all the time, how will its value be affected? Well, thank you for your time.

LW: Excuse me, I need to be doing a mike check. Am I on? Am I not on? Let me alert a few more speakers: Monte Keller, Paul Miller, Maggie Kelly, Nadori Okazaki, and Michael Isensee.

Doug Wood: My name is Doug Wood, I'm the president of a company that does deep water research on pressure. I'm here because I had a nuclear nightmare last night and I came down here to find out what's going on. DOE is lying to Tacoma. They have a flaw in their casks. Those casks can't take deep water pressure. If a ship sinks, those casks will buckle. They are designed for 50 feet of water. Puget Sound has 500-700 feet of water, it is much deeper in the ocean. These casks are not safe for ships. I want that in the record.

Rens Verburg: Good Evening, My name is Rens Verburg. I'm the co-chair of the Environmental Commission of the City of Tacoma and we have prepared a statement. In light of the time constraints, I'll just read the most salient paragraphs of that:

The Tacoma Environmental Commission has reviewed the U.S. DOE's proposed policy to manage spent fuel from foreign research reactors and the accompanying environmental analysis. The Commission raises the following environmental concerns which have not been adequately addressed: Number 1, information about the Port of Tacoma -- it's terminals, it's operations, and the surrounding area contained in the environmental analysis -- is outdated and does not accurately reflect current conditions. The deep water depth of Puget Sound, as mentioned by the previous speaker, would cause substantial problems in the recovery of nuclear fuel shipping containers in the case of an accident. An explosion or fire on board a vessel navigating Puget Sound would pose considerable harm to the surrounding populations and environment. Commencement Bay is currently designated a Federal Superfund site. Considerable cleanup has already been undertaken by the Port of Tacoma, the City, and the industries of Commencement Bay to address contamination issues. The Port of Tacoma is in close proximity to residential neighborhoods despite what DOE may think in that regard. Operational procedures regarding handling of the shipments are inadequate. Permanent disposal of the spent nuclear fuel has not been determined and the security aspects of the shipments have not been addressed. The citizens of Tacoma have determined to live in a clean environment and have undertaken to restore to the City the highest standards of clean air, clean water, and clean land. High-level radioactive waste presents a threat of the most catastrophic injury to Tacoma residents. The potential release of radiation from high-level radioactive waste presents an unacceptable risk. Therefore, the Tacoma Environmental Commission strongly opposes the introduction, storage, or shipment of high-level radioactive waste through Tacoma's port, rail lines, or highways. And we further urge DOE to remove Tacoma as a possible United States entry site for these shipments.

Thank you. [applause]

Monty Keller: My name is Monty Keller, and I must admit that I came here tonight and found that I was very ignorant to the issues of nuclear waste. However, I came here tonight to represent my children. I don't want my child to become a statistic, or to be the one, or the first man to die. I believe our kids are very good technical reasons not to have nuclear waste come through the Port of Tacoma.

Paul Miller: Thank you. Paul Miller, Tacoma City Council. The Tacoma City Council has recently adopted a Resolution standing in opposition to the selection of the Port of Tacoma as a transhipment site. Many of my Council colleges are here tonight and I will allow them to speak to that issue. I want to speak, first of all, to the short-sighted attitude that DOE seems to be expressing. You talked about the naivete with which we approached nuclear waste and nuclear reactors in 1958. Yet, I believe that we are taking that same short-sighted approach to waste shipments, and the acceptance of waste shipments, in this proposal. We are taking on the liability under the guise of being the policemen for the world. We are taking on the liability, not for the next 10 or 20 years for these countries, but for the next 1,000 or 10,0000 years. Not only affecting my children or grandchildren, but generations beyond generations. I think that the DEIS has skirted the issue of Alternative Number 2. I encourage you to go back and in greater depth analyze the opportunity for equal investment in placement of secure facilities within the country of origin for the nuclear waste. I don't buy that France, or England, or Japan are in any greater risk of economic, or social, or governmental overturn than the United States is.

Speaking specifically to the DEIS and the shortcomings, there is a written document that has been forwarded on to DOE from the City of Tacoma. Specifically, the DEIS contains many errors with regard to the Port of Tacoma. In particular, it lists a single terminal in the Port versus the six container terminals that currently exist. The map displayed within the Port of Tacoma is incorrect and shows a configuration that is over fifteen years old. It does not show the on-dock rail configurations that exist

within the Port and leads the City of Tacoma to believe that the same errors and the same lack of thoroughness with which DOE has investigated and identified, the configuration and layout of the Port of Tacoma, has to carry forward to the configuration of the population centers and the impacts in the surrounding area. Secondly, as stated previously, DOE has, in its own document, indicated the difficulty or near impossibility of recovering fuel casks from depths greater than 200 meters and indicates that those depths only exist in the ocean. Whereas, simple investigation of the Puget Sound would identify numerous sites within the Puget Sound area, in the shipping channels leading to the Port of Tacoma, that exceed the stated 200 meter depth. Commencement Bay and the Port of Tacoma are located in a Federally designated Superfund site. Over 200 million dollars have been spent, or will be spent, in the cleanup of past contamination within the Port of Tacoma and Commencement Bay. We are endeavoring to remove the stigma, the economic stigma, that has existed on Tacoma because of past excesses, of not only industry, but Government, in the waste handling within this nation. We do not need to carry that process forward. DOE did not properly evaluate or determine the impact of a severe fire or explosion of a shipping cask which would cause severe damage and have long-term effects on a large area near the disaster site. Both within the Port of Tacoma and the economic impacts that would occur based on that damage, but also within the Puget Sound area, is an enclosed ecosystem which has very little flushing action within it to resolve any long-term impacts.

I would add that, onto your presentation tonight, your presentation in the back room, you talk in terms of the percentage of this shipment in comparison to all radioactive materials. I think that it is an oversimplification and an attempt to cloud the issue to include medical waste within your presentations. Clearly, we are talking something absolutely different than the material waste left over from an x-ray at a hospital than what we are talking about in these type of shipments. Secondarily, you talk, in terms of the DEIS, the potential risk of death or fatality when, in reality, the dangers go far beyond mere fatalities to health problems, and property damage, and economic loss; and those issues need to be addressed in DEIS.

The DEIS does not adequately address security requirements nor the training for port facilities and the basis of security around these shipments. I have to believe that if our concern is the potential for these materials to fall into the hands of individuals, or countries that can make use of them and pose a security risk to the United States, that the farther we ship these, the greater opportunity we provide for those materials to fall into the wrong hands, and that the closer we can contain them, and store them, and secure them to their original site, the less risk we have of that opportunity. Clearly, DOE did not properly address first response capability. It is put on the onus of the fire departments, the State, and the localities within the shipment area to have first response. There is no provision made in the DEIS for upgrading or training of the local first response team. Secondarily, it is on the onus of the City of Tacoma, the Port of Tacoma, Pierce County, and the State of Washington to have financial responsibility for that first response. And your own documents only say that, if and when it is determined by DOE that it is necessary to respond, you will respond. DOE did not analyze the effects of an accident classified as a disaster on the local area or the population. DOE did not address effects and cost incurred in a local area should a local accident occur. And, DOE fully ignored fairness and equity issues by selecting smaller ports. Lastly, I would like to indicate that I think that DOE, if you get beyond the first issue, of which I believe Alternative 2 is a more appropriate issue to be studied, and that is leaving the materials where they are generated. But, if you get beyond that to selecting an entry port, I believe that it's absolutely wrong for DOE to take the approach of isolating down to only commercial ports for entry. Clearly, we have military bases that are structured and set up, not for just security purposes, but already handle radioactive materials; Trident being one of those, where materials can come in through a port where radioactive material is handled on a regular basis, where security measures are in place, and where

the personnel are already trained in not only the handling, but in the safe and secure methodology of transportation of highly radioactive material. I resent, I resent, the U.S. government presuming that a population base of Tacoma is small enough to impose such a high risk on, and to pass on, the cost liabilities. [applause]

Maggie Kelly: A few years ago, a thief broke into my house. An alert neighbor called the police and, fortunately, he was unable to get away with anything. But in the meantime, he had gone through my personal possessions and he had strewn my lingerie and private items all over the house. As you can well imagine, I felt violated.

Mr. Head, local dignitaries, fellow citizens of Tacoma, my name is Maggie Kelly, and I'm here as a private citizen, to tell you that my sense of privacy and citizenry in this great city have been violated in the same way that a thief violated my home. I'm here to say also, that I am insulted. Now, I'm sorry that may sound like strong language for someone to come this distance and give us a presentation, but I am insulted because this presentation was supposed to be about Tacoma being the port of entry. Not about the wet and dry storage facilities, not about the differences between high octane and low octane fuel. No, we were to be talking, strictly, about the Port of Tacoma as the port of entry. And, the fact that it was assumed, I don't know, is it because we don't have enough people in Tacoma? Is that why we're supposed to sit and listen to this and take this as some real information? I'm not sure. I am insulted. I am insulted when someone comes to me and says, and I quote: "You have to demonstrate to us a technical reason". Ladies and gentlemen, Mr. Head, Department of Energy, I don't need one of your goddamn technical reasons. We've got PEOPLE reasons! [applause] Ladies and gentlemen, there is something very skewed about a government's reasoning that blackmails its own people in order to control other countries. [applause] There is something wrong with that kind of thinking. Tacoma does not need to be a port of entry to prove that Tacoma is already a global community. Let's look with pride at what Tacoma already does as a global community. Let's look at pride to the people. Let us be the port of entry for people, not for nuclear waste. Let us look with pride to the amount of medical aid, to the assistance that we have sent to peoples of other countries. We do not need to demonstrate any part of a global community by being a port of entry for somebody else's nuclear waste.

Finally, I have one invitation to any person who suggests that the risk is so small we don't have to worry about it. And, here is my suggestion: We don't need the wet and dry storage places. Just everyone of you people who think that it is so safe, you just take a vat of this and put it in your back yard! [applause]

LW: While our next speaker is coming, and for the "on deck" circle: Gerald Pollet, Linda Cunio, Alice Orchal, Kelly Golden, and Martin Sutherland.

Midori Okazaki: Hi, my name is Midori Okazaki and I'm from Senator Patty Murray's office. I'll just be very brief tonight since I know that a lot of you want to talk. I don't know if applause is for being brief, but anyway.

First of all, I want to thank DOE for responding to the Senator's earlier concerns that she had raised about lack of opportunity for input and access to information, and they responded by having this hearing here tonight, so I want thank you for that. Then, I want to thank everybody for coming here tonight and showing that this hearing was necessary and that there is a lot of concern in this community.

Despite your earlier actions in responding to our first concern, we still remain concerned over the possibility of the importation of spent nuclear fuel through Tacoma. There are numerous public health

and safety concerns that we think present a compelling case for DOE to preclude any further consideration of any commercial port, including Tacoma, as a port of entry. And, these concerns were addressed more fully in a letter that was sent to the Secretary of DOE by Senator Murray, Representative Dicks, and Representative McDermott. The Senator hopes that DOE would limit its focus to military ports, either those currently ID'd in the DEIS or any other appropriate military port. Thank you for coming again, tonight, and we hope that you will consider these and other comments. I'm sure you will hear a lot tonight. Thank you. [applause]

Mike Isensee: Hello, I'm Mike Isensee and I'm here tonight representing Citizens for a Healthy Bay. We're a Tacoma-based environmental non-profit organization that works the clean-up, restoration, and stewardship of Commencement Bay and its surrounding watersheds. I'm here tonight, speaking on behalf of my Board of Directors who voted unanimously to oppose the shipment of spent nuclear fuel through the Port of Tacoma. We do so knowing full well, at its face, that it is sort of a "not in my back yard" attitude and we don't believe that is an appropriate response to these issues. So we did look at what we thought were the appropriate alternatives to this issue, and I want to speak briefly to those tonight.

We believe that DOE and the State Department gave inadequate attention to Alternative No. 2 that is in their DEIS. In the EIS, only two pages, actually less than two pages, of space were given to this alternative. The Alternative No. 2 actually is two alternatives that could be looked at. First, is the storage of spent nuclear fuel at the nuclear facility where it has been used. We believe that this alternative should be looked at and that there are quite likely means of ensuring through international compliance and other means that it would be as safely stored at such a location as by shipping it through the Port of Tacoma or other U.S. ports for storage here. Secondly, is the potential to reprocess the HEU to become LEU at processors internationally. Unfortunately, the United States doesn't have any such facility. We don't reprocess this fuel, we just store it permanently. But, there are facilities, at least three of them internationally, that can reprocess this fuel to become LEU and, as Mr. Head spoke to earlier, as LEU, this material could not be utilized as nuclear weapons-grade material, thus satisfying the nonproliferation goals.

However, realizing that DOE might not listen to Citizens for a Healthy Bay and those of us in Tacoma, we also want to speak to some of the issues regarding if this material is shipped to the United States. We believe that it should be shipped on military vessels and only to military ports of entry where people are trained at handling these materials -- to such ports that were included in the EIS as such ports that were capable of handling these materials. And at an earlier public hearing last month, it was stated that the only reason that these ports weren't chosen was that it would increase the cost of the shipments. In addition to being secure port locations, these are typically located at much greater distances from population centers. This is borne out in the DEIS. They do not face the stigma, that we here in Tacoma do, of having a Superfund site -- being our bay. In addition, they don't face the possible interference of regular, commercial traffic and, thus, would limit the economic problems facing those areas that the shipments may come through. Whatever port this material comes through, Citizens for a Healthy Bay believe that the U.S. government must, at a minimum, provide several things: First, initial and ongoing training and education to port employees or military personnel and to local emergency response personnel. In the DEIS, there is no mention of providing this. It would be left up to the local governments to pay for this, for us locally to pay for this, when it is actually a national issue and all taxpayers, through the Federal government, should pay. The U.S. government should provide any response materials necessary in the case of an accident. Radiation monitoring should occur for dockside workers and for the environment. And, funds to carry out public education, training, and all emergency response capabilities to the port or ports of entry and surrounding communities, need to be provided.

In addition, at this time, we think that the DEIS is inadequate in responding to the potential of a catastrophic fire or explosion that involves one of the ships or trucks involved in the transport of this material and what the risks of such an event would be.

I appreciate those people, especially at the port and the city of Tacoma, that worked for this final public hearing. This was not a DOE scheduled public hearing. It was only because members of the local community stood up and said: "We need to have adequate public notice and a public meeting where you, the residents of Tacoma, can come and hear about this and speak about it". I want to thank you all for coming tonight. [applause]

Gerald Pollet: My name is Gerald Pollet and I am representing the citizens group, Heart of America Northwest, here tonight which, on behalf of our 16,000 members, we've have been fighting this fight against DOE's stupidity for about a decade and it seems to keep coming back.

There is one thing all of us in this room need to think about tonight about this proposal. Someone's already talked about it. It's our children, it's our children. Do you want your child to be stuck in traffic next to a high-level nuclear waste cask? A gentleman earlier said: "Well, there's no technical problems with this," and it's the only time that Mr. Head didn't respond. You can lie by failing to respond as well as by offering responses. If our children are stuck in traffic next to one of these high level nuclear waste casks, the EIS admits that our child, my daughter, your sons, your daughters, can get up to five full body x-rays from these shipments and not one iota of medical benefit. DOE uses its own self-regulatory standard for how much radiation you and I and our children can be exposed to in this process. It is not the same standard that the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Environmental Protection Agency (EPA) have for exposure of the public in a year. I have to get technical for a minute because Mr. Head said that: "I'm not going to listen to your complaints as citizens petitioning your government. I'll only listen to a technical rationale". Okay. DOE uses a standard that is four times the EPA and NRC standard for exposure to radiation in a year. That's why they can release so much radiation from their sites like Hanford. It's their history of self-regulation. The NRC and EPA have a standard that allows you to receive 25 millirem of radiation in a year. Maybe, write that down -- '25', okay? Now that level of radiation will cause, and here's why it is set, what the government says is an acceptable fatal cancer risk of one additional fatal cancer per 10,000 adults exposed to 25 millirems. Yes, I said adults, not our children. That's one fatal cancer for every 10,000 people exposed to 25 millirem. The EIS admits, that it is, quote, conceivable that you could get up to 50 millirem stuck in traffic next to this. That's twice an allowable rate. But, it gets worse for other members of our community. Far, far, worse and more frightening. And, I quote Mr. Head. Mr. Head says: "The environmental consequences of all the alternatives are small." I'll tell you what is small. My child is small. Our children need to be protected from someone who would play games with numbers. The way this EIS is written is the people who are going to be exposed to the doses of radiation that are conceivable are never addressed. Instead, they average the dose over the entire population and say "less than one in-a-million chance". Well, maybe if it is the average person in Tacoma and you play spent nuclear fuel roulette it is less than one in a million chance. But, if you're the parent of a child stuck in traffic next to one of these shipments, it is not less than one-in-a-million. In fact, it is a couple of times in 10,000 all of a sudden, which becomes fairly frightening in a year. There is an even more frightening point to this. Our neighbors, our brothers and sisters who work in the ports, are going to be exposed to levels of radiation that reach, basically, the equivalent of 10 millirems per hour, six feet away from the cask. Now, there is no mention of the radiation exposure to the longshore workers in this EIS. The EIS has a tremendous, and I would guess deliberate, mathematical error - set of mathematical errors - and it underestimates the radiation dose from unloading the cask by over 23 percent, and it underestimates the

radiation dose to the ship's crews, who are members of the public, by 27 percent. DOE, basically, will expose, potentially, the ships crew -- remember I said that 25 millirems is the allowable exposure. Recalculating using their own methodology, correcting their math errors, the ships crew can get up to 760 millirem which is 3,040 percent of the allowable annual radiation dose for the general public. That is a lot of radiation dose! How do we get that figure? Well, number one, without going through the math here, DOE says that, unloading a cask, the maximum exposed individual gets 9 millirem of radiation. They assume an average of 5.5 meters away from the cask. Any high school student, though, can calculate that at 5.5 meters for an hour, the average radiation dose should be over 11 millirems, not 9. That seemingly small error adds up and adds up, and it's important because the DOE has its own self-regulatory standard and says in the EIS: "Hey, someone unloading a ship once will not be in danger of exceeding our own self-regulatory standard for radiation exposure." They will be at 66 percent of our own self-regulatory standard, they say. Ah, but they will be at 2.5 times of what the public is supposed receive in a year. And, they'll be at far more multiples of that if they unload shipments more than once in a year. Now, there is no rational basis for assuming that someone is going to be 5.5 meters away from the cask, actually. It's an irrational assumption used to lower the figures. In fact, if you play with the figure and someone happens to walk a little closer to the cask for a little while -- let's say 40 minutes at 10 meters away, giving you the benefit of the doubt that they are further away for two-thirds of the time -- but, if they spent 20 minutes 2 meters away, 6 feet away from the cask, all of the sudden their radiation exposure goes up in an hour by 33 percent. This is how you can use statistics to try to say "there is no significant environmental impact, and ignore our children."

There are other errors throughout this EIS that impact our health and safety. First off, the risk of a fire on inland waters is not adequately considered, whatsoever. Puget Sound is inland waters. The calculations in the materials that we've handed out to people, and which we've submitted before, show that the radiation exposure risk from a potential shipboard fire, using DOE's and the NRC's own analysis of how much radiation can be released in a shipboard fire exceeding 1,475 degrees for 30 minutes -- it's all they are required to meet for their cask. We have shipboard fires that exceed 2,000 degrees -- heating up the hull to 2,000 degrees for 24 hours in Puget Sound, and I read from a consultant's report: "The results show serious contamination plumes extending over 60 miles downwind from a ship accident encompassing an area up to 900 square miles. The contamination levels are high enough to require evacuation and decontamination for areas of up to one mile downwind from a ship accident. The gamma radiation dose would be lethal to any person who remained in the contaminated area for one year." Yes, we all have something to worry about.

We have some choices. First off, we need to thank the Port of Tacoma, the City of Tacoma, Senator Murray for fighting to get us this hearing. But, we can't stop. We've got to go and ask the local governments to tell DOE, in no uncertain terms, we will take you to court for these violations. Let them know it, now, by Resolution. We have alternatives. People have talked about dry cask storage abroad. Why the heck should we be importing nuclear waste instead of exporting the technology we use in this country for safe storage? Only 1.4 percent of this waste comes from the countries that Mr. Head acknowledges the U.S. government says are proliferation risks, 1.4 percent only. Finally, if litigation threats won't work, and litigation is needed, we will litigate. Yes, we will sue you again. You haven't met the burden we put on you by the last injunction, Mr. Head. And, if that doesn't work, we must ask everyone in the State Congressional delegation to go back and fight for the legislation that former Congressman Mike Hydler introduced two years ago that would have given us the ability to say: "We can't expose our neighbors and children to more radiation than would otherwise be allowed just because the DOE self-regulates." And, if we can't get it through Congress, Heart of America Northwest is committed to do a State-wide initiative. We hope you will all be there with us. Thank you. [applause]

LW: Is there a portable mike available? Yes, it's alive.

Linda Cunio: My name is Linda Cunio, and I am here on behalf of myself and the next seven generations, the grandchildren that you will have, but I will never have, because a long time ago I had to make a very difficult choice. Back about the time that Captain Kirk was first hearing Scottie tell him that the anti-matter mixture was off and about to explode, I learned that since I had grown up in eastern Washington and lived approximately 100 kilometers from Hanford, that I had been the subject of deliberate radiation release experiments by our Government along with everyone else who lived in eastern Washington. But, I didn't find this out until I was in my twenties. Gerald cited statistics of acceptable levels of around 28/25. At times, when the Greenrun was being released from Hanford, which was what it was called, we were subjected to upwards of 650 millirems. I don't know what this is going to do to my body. But, I know that, for me, this was not an acceptable risk to have the choice or the chance of passing the problems on to my children. So, I won't have any. So, when I hear that our government assures me that this shipment is safe, that there are no technical problems, from personal experience, I can't put a lot of stock by that. Gerald very rightly pointed out that he's asking for technical reasons. We're not technicians, we're people. Our children, the next seven generations, the next ten generations, the next hundred generations are our technical reasons. I work in the transportation industry here in Tacoma. I work with truck shipments, and rail shipments, and water shipments. And I know the kind of things that can go wrong, even with the best of preparation, the best trained people. I don't want to be involved in one of these. I don't want to be in the same county, I don't want to be in the same hemisphere, if something goes wrong. Technical reasons. Mt. Rainier is beautiful, but it is not dead. Mt. Tahoma is very much alive. It's been placed at the top of the list of most dangerous volcanos in the world for 1995. Due to its proximity to population centers, due to its increasing seismic activity, volcanic activity, due to the history of seismic activity in our area, the Puget Sound area, as far away as Portland, Oregon, has, on average, 20 minor earthquakes every month. The experts tell us that we are due for a big one and that our chances of having more devastation far exceeds that of Los Angeles. They have newly discovered, or newly advised us, of faults, very shallow faults that run along the Bainbridge Island to Seattle corridor and others which in the past have caused as much as 200 feet instantaneous drop in the level of the areas around it, like Washington. There are cedar trees in the bottom of Lake Washington, 200 feet under water. Technical problems. I don't need any other technical problems. The grandchildren that I will never have on my knee are enough technical problems. I vote No. [applause]

Alice Orchal: My name is Alice Orchal. I'm in awe of these statements that have proceeded me. I am an individual, but I am a mother, a grandmother, a great-grandmother, a neighbor that is called Grandma Alice or Aunt Alice, a caring citizen that feels that each and every one of us need to stand up and be counted. I live in the area by Tacoma landfill. I fought pollution for many years. Now, I am asked to allow nuclear shipments to come through our city. I believe that we have been subject to enough pollution. I believe that the risk is far too great, not to us, but to the children and the generations to come. I believe that it is inconceivable, that we, as a city, should be deliberately placed at risk from a nuclear shipment. We deserve the right to be free from fear. He talked about how his child, coming next to one of these nuclear shipments, could be effected. Quite frankly, if I drove past one, it would scare the living daylights out of me. I think we have a right to be free from this kind of persecution. If these shipments come through our highly populated area, it would be like sitting on an unexploded, live, ticking time bomb. It must not be permitted to happen. We need to protect our environment. It is a God-given opportunity and obligation, not only for this generation, but the generations to come. I stand up to be counted. I say "NO" to nuclear shipments, not only in Tacoma, but in the Pacific Northwest. We have a right to live. [applause]

Mike Kreidler: My name is Mike Kreidler..

LW: I'm stunned, but I don't see you on the list.

Mike Kreidler: I was just about to say, that I was generously afforded the opportunity to take Kelly McGoldrich's place.

LW: Okay, great. And, let me read the on-deck list: Anita Johnson, Bob Evans, Bill Baarsma, Grace Georges, and Pat O'Mally.

Mike Kreidler: I don't believe that DOE has come into the changes that have taken place in the world today. There is a whole new world out there. The threat of the Soviet Union, the changes that are taking place across this planet of ours, really forced them to re-evaluate the policies and the commitments they made many years ago, and are attempting to fulfill here today, through the Port of Tacoma. I was born and raised here. My parents were born and raised here. I know the Puget Sound. I value the Puget Sound. I value this community. This is a community that has always been willing to step up and do its fair share. But, it's not a community that is willing to take responsibility for problems that should be resolved elsewhere. And, that means that we should not even be in the process, right now, of accepting shipments into this country until the thoughtful re-evaluation that should be taking place has been undertaken; the potential for reprocessing in other countries, the threats that realistically exist in this day and age, have been taken into consideration. That doesn't exist today in DOE. As a part of their thinking, it needs to be, before you come to this step. But, as I said before, Tacoma has always been willing to step up to its responsibilities. But, the way this whole issue has been approached, is one that comes at a time when it gives people reason to think that maybe there are conspiracies. Maybe there are reasons why things happen the way they do. Tacoma is a responsible community that has a history of doing the right thing. We are on the verge of seeing some major growth in our community by virtue of the kind of commitment we've made -- environmentalists, and business and industry groups together -- to see that that happens. But, now, you would subject us to the threat of what could happen with nuclear waste. That's why, in 1994, along with Congressman Norm Dicks, I introduced the Safe Handling and Shipment Act of 1994. That Act would have given the Port of Tacoma the authority to establish reasonable guidelines, and failure to meet those reasonable guidelines would have been cause for them to deny the acceptance of nuclear waste through the Port. It doesn't take an Act of Congress. This is something that DOE could enact itself. But, it would have called for the training of workers for the handling of these materials, a comprehensive response plan in case there was a fire, spill, or other type of contingency. Local communities would have been informed about the shipments and about the potential risks that existed. Radiation exposure levels for workers may not exceed standards for public exposure already set in regulation. And on top of that, for DOE and the Federal government to accept the costs that go along, and commensurate, with those activities. That's a bare minimum. But, as I said before, as we urge Congress, as we urge our leaders, to take responsible positions to make sure that happens. The bottom line is that DOE has not gone through the thought process to bring us into the changes that exist in 1995. We can do better. We will do better. I urge you to go back to the drawing board and re-evaluate your policies, take into account the types of programs and policies that should be granted to the Port of Tacoma, or any port in this country of ours, before shipment would be considered for them. This is the bare minimum for any community. Tacoma will do its part, but don't shove this at us and let us have these kind of risks. Thank you. [applause]

Martin Sutherland: Good afternoon, my name is Martin Sutherland and, first of all, I would like to say that it is a pleasure to see quite a bit of people to show up for this. I was kind of getting worried when I got here pretty early.

I would just like to mention some names here. I will refer to my notes the best I can, here: John Langdon, Rufus King, William Patterson, Robert Morris, James Wilson, George Read, Roger Sherman, John Blair, William Few, and these are just a few names of a group of men who brought forth one of the most important documents ever written in the United States and that was called the Constitution of the United States of America. The first three words are: "We The People". [applause] Thanks. These are the three most precious words I consider in the Constitution. And these words set forth that the people have a voice of what our government does and we as a people must be heard and that we are also heard in the process. The people in this city stand united against an unreasonable government entity that is supposed to hear our voice and has overlooked that very important element. The people of this great city of Tacoma have stated on numerous occasions the concern of unanswered questions and the effects of such nuclear waste entering these ports and, not just our ports, but our waters too. The City of Tacoma is going through an evolution in which our ports are being transformed into a cleaner and healthier environment. But, for the use of all nations, for commercial use. The thought of allowing nuclear waste, as proposed by DOE, to enter our ports is not just a concern at home to Tacomans, but also abroad. So the people of Tacoma have spoken loud and clear and we are not wanting these products entering our ports, and in the interest of all parties, that these countries that have benefitted from these technologies should convey the detriment. It must never be forgotten that the voice of the people are to be heard at all times. This is what our forefathers believed in, fought for, and died for through our brief history. And Tacomans stand united with other cities to keep nuclear waste out of our city and out of our ports. Thank you very much. [applause]

Anita Johnson: My name is Anita Johnson and I live on 36th and East K Street. And, I started out at a quarter to three yesterday, and someone conveniently handed me three of these, and I thought that I'd just go around and chat to my neighbors, and it turned out that I had more friends in my neighborhood than I thought. I only went two blocks and I filled up three. These are my friends and my neighbors, and this is my son, Matthew, and that is the reason that I don't want any nuclear waste coming through Tacoma. Because life is too precious. Thank you.

Bob Evans: Good evening, I'm Bob Evans, the Deputy Mayor of Tacoma, and I have some canned remarks which I'm trying to shorten, or get rid of, because I think what I'm seeing here and listening to tonight is really a voice of people. It's more than that. It's the emotions of people, as well as either your intuition or informed opinions, or your scattershot opinions -- it is all valid. Those kind of things are more effective than any DEIS statistic. I think you must keep those emotions boiling as long as this issue is before us. This came to the city several years ago, in 1988. It was ignored. It came again, and was regarded then as a kind of, perhaps, late hippie bloom of some sort which is really out of town and nobody's business, and we couldn't pass a Resolution. Now that it's an actual possibility, it is a Resolution which this city, and Seattle, and Fife, and Milton, and Federal Way; all of the entities around here, the county, the longshoremen -- what did I forget? -- the Port -- a major player -- the Port. In any event, finally, something draws us all together. And, it has to keep us together, as long as this is an issue. It's remarkable to me that all of the entities of government, which rarely really talk to each other on a genuine basis, have gotten together so uniformly, unanimously, to support resistance to this proposal. We value it greatly. And, it goes higher than that: Randy Tate and Norm Dicks are of one mind, if you can believe it, on this issue. And I'm hoping, I know that Senator Murray is, and I'm hoping that Senator Gorton is, equally, of one mind. We have our State Legislatures: Ruth Fisher,

Rosa Franklin, probably Steve Conway somewhere, also of like mind. We must, again, draw together, keep this package boiling hot while it lasts. I must say that I've heard some specifics about the DEIS, and it is in my view, in some measure at least, a fictional document. It goes for what it wants, ignores the problems which are not otherwise addressed, masks those things which are critical, exposes those things which are frequently scare-heads. And, one of them which has just come up today really offends me. We are given the impression, in some areas, that those other nations are not really to be trusted -- the ones which have those fuels now. And I might list those other nations for you. There are forty-one nations, some of which cannot be trusted, it's true. But the ones which we may trust, which also have 70 percent of the total material of what we are talking about are: The United Kingdom, France, Germany, Switzerland, Sweden, Japan, and Canada. I think those nations can be trusted, and if they have the material, and since they have not only the material, but the reprocessing and storage facilities, the trained personnel, and equipment, let it stay there, which is Alternative No. 2, which we heard about earlier. [applause] It seems to me entirely insane to drag that material halfway around the world and then pump it back into the middle of our nation, and it will only be there for ten years, or thirteen if we are lucky, and, at the end of that time there will still be no solution. This country has no reprocessing, no storage plume that I know, no storage facility that is adequate, and no means really of delivering it back where it came from. We have, at our Hanford, as you may know, a plume of radioactive water creeping out into the Columbia River and materials like this, low grade it's true, stored on the ground. We don't need to do this, we are spending 274,000 billion dollars to cleanup the Superfund site, which is Tacoma. Do we need to bring this in and pollute us back to where we used to be? No more. I think you must keep the emotion you've got, and keep it red-hot as long as you can until this issue is resolved. Thank you. [applause]

Bill Baarsma: My name is Bill Baarsma. I'm a member of the Tacoma City Council, and thank you, Deputy Mayor Bob, you did a terrific job. I would like to introduce very briefly, if I may, the Mayor of Fife, who will have to leave us. Mayor Stegham will you stand so the people can see you? The Mayor has given me a resolution that was passed by the City Council. I'll read the last line and just a few sentences from the letter of transmittal to DOE:

> "Be it resolved that the City Council of the City of Fife, strongly opposes the shipment of spent nuclear materials from foreign research reactors through the Port of Tacoma and the City of Fife. Passed on the 13th day of June." The cover letter -- I'm just summarizing some of the highlights -- "our city, our businesses and our surrounding population and businesses feel strongly that the risks involved in shipment through our area, or anywhere in the United States, represent an unacceptable burden and risk upon our citizens. Therefore, we strongly oppose option or Alternative No. 1 and support Alternative No. 2." I share those sentiments. Thank you, Mayor, for being with us today. [applause] I might note that Alternative 1 does make eminent sense to me. The logic for Alternative 2 escapes me. But we have to make comment on the EIS and have those references to deal with. Excuse me, I'm sorry! Excuse me, Mr. Head, for the record: Whoa, I almost made a BIG mistake. I DO support Alternative 2, the logic for Alternative 1 escapes me. Oh, my moment! I'd like to comment, if I may, on page 26 of the Summary of the EIS in reference to Alternative 1. In there, I would like to quote very briefly: "In the United States, local governments are required to have emergency management and response programs. These programs must be capable of managing all hazards ranging from natural disasters to hazardous materials incidents on a day-to-day basis. These programs include support from special emergency response teams and emergency operation centers." That observation is an appropriate one, but a bit

misleading one as far as our community is concerned. Yes, the Tacoma Fire Department has a hazardous materials unit. There is a four member team that provides coverage, seven days a week, around the clock. It involves 20 highly trained fire fighters. The unit is located in the tide flats area. Its charge is to handle and control the spillage of oil and other toxic materials. However, this unit has no equipment nor does it have the training or capability to handle accidents involving radioactive materials. Again, our fire fighters are highly motivated and skilled -- among the best anywhere. But, they do not have the resources to handle a catastrophe or an accident involving radioactive waste. And, I must say, that we as a city would not put that burden on them. Our emergency management division of the county government does have a hazardous materials management team. But, for radioactive spillage or accidents, its capability is limited to monitoring and detection of materials after the fact, using, I might note, 1950's and 1960's technology. It can, in concert with the Tacoma Fire Department, set up perimeters around an affected site. It has no resource capability or training to cleanup or control the extent of an accident. And finally, I would like to say that we've had a number of shipboard fires in this area and fairly recently. Two in Commencement Bay alone. In one case, the fire department had to tow the vessel to the center of Commencement Bay where it burned to the water line. Smoke congregated in the basin area of Commencement Bay, and then drifted north with the prevailing winds. The other fire of furnace intensity involved a container ship. We had to call in support services from Seattle to help control that disaster. So, the DEIS places the burden for response to any incidents on the local jurisdictions. This is viewed by us as yet another unfunded Federal mandate that must tax our citizenry -- that taxes our citizens. Bringing this high-level nuclear waste through the Port of Tacoma poses a financial risk, a security risk, an environmental risk, and a health risk; in sum, an unacceptable risk. We are philosophically opposed to buying a problem that has great cost and does not benefit this community. Thank you, Mr. Head. [applause]

Grace Georges: My name is Grace Georges, I live in Puyallup. Mr. Head, I'm going to give you an opportunity to say something. I will be very brief. I have three very short questions. The first one is that I'm curious as to why the United States has chosen to be the world's garbage dump and I want to know what is going to happen when the dumps become full? Number two, one small construction flaw in the space shuttle Challenger caused a major disaster. Do we have any guarantees that there will be no construction flaws in the capsules (what do you call them?), the waste casks as they're shipped? And, number three is a question that a young man in the audience posed earlier, and I didn't hear the answer to. Is this meeting really going to change anything or has the government made a decision and we truly have no voice? Thank you. [applause]

Charles Head: Okay. Could you go over the first question, again, so I make sure I remember it?

Grace Georges: Well, my first question was regarding the United States being the world's garbage dump -- that's what it sounds like to me -- and what happens when we run out of space to store this garbage?

Charles Head: Okay. This proposed action has been supported by every Administration on both sides of the political spectrum for the last several administrations. It's one that was supported by the Republican Administration, and one that was supported by the current Administration, and it's supported as being in the best interests of the United States to reduce the vulnerability of the United States and other countries to nuclear terrorism.

Grace Georges: Okay.

Charles Head: So, we are doing it for our own interests.

Grace Georges: What happens when our areas get full. Do we just keep getting more and more?

Charles Head: We're still anticipating that a geologic repository will be opened in which we can ultimately dispose of spent fuel.

Grace Georges: I'm sorry, but I don't know what that means.

Charles Head: That means that we plan to essentially dig a very deep mine and put the spent fuel back in the earth from whence it came.

Audience Member: Is there ever enough room for all of the United States' waste, that DOE's Yucca Mountain would...

Grace Georges: Excuse me (to audience), but these are my questions right now, you've had your turn. Okay. My second question is: Can we guarantee that there will be no construction flaws in the waste casks?

Charles Head: The casks are very carefully inspected as they're built. And, one of the interesting aspects of storing or transporting radioactive materials in them is that if they are not shielding it right you will know about it as soon as you load it and do your radiation surveys.

Grace Georges: Okay. And if that happens and there is a leak, what do they do then? Does somebody endanger themselves and weld a patch over it, or what?

Charles Head: No, if that sort of thing was identified, you would have to unload the cask and go get another cask.

Grace Georges: Okay. What do you do with the stuff that is in the cask that's leaking?

Charles Head: Well, you would put it..I mean you would discover this at the reactor as you were loading the shipping cask. You would unload it and put it right back into the reactor until you got another shipping cask.

Grace Georges: Okay, my third question that I heard the young man address, and I didn't hear an answer, but perhaps you did and I just missed it. Does a meeting like this really make a difference? Could it make a change or has the government already decided what they are going to do and we might as well have stayed at home and I missed out on the strawberry shortcake feed in my Mobile home tonight to come here.

Charles Head: The government has definitely not made any decisions on what will be done at the end of this environmental review. And yes, meetings like this do have an effect. They are listened to, not only by DOE, but also by your elected officials all the way up to Congress.

Grace Georges: I appreciate that. Thank you very much. [applause]

LW: Let me interject something here, get some more on-deck speakers, and say a couple of things. First of all, it's almost nine o'clock, and after I read the list of the next five speakers, what I'm wondering is: Would you like to take a very -- I'm not going to say a break -- but would you like to stand up and just kind of stretch...those chairs look comfy, but they're not very comfy for very long. So let me read the next list and, as the speakers are coming up, stand up and sort of stretch and then sit back down and we'll carry on. We've got, now, close to sixty people on the list and we've gone through twenty.

Audience Member: Excuse me; before you do that, we have state legislators here who have statements to be made. I'd like to have them come up at this point, if that is agreeable to the audience. [audience shouting no.]

LW: The State can be on record. The question is, wait, wait, wait, the question is, and this is for us all, I guess, to think about. We have a list of people who signed up in order and the question is: Would it be acceptable to this group to have some of your state legislators read a statement or present a written statement? Hand something in [audience saying no.] Okay, okay. I think the elected representatives have their answer. Let me read the next few names, there is: Ray Robinson, Jack Fabulich, Steve Anderson, Mike Fletcher, and Melody Wilhite. Okay, now as they are coming forward just take a real quick stretch in place and sit back down.

LW: Well, we've done...give you another minute or two. We are at number twenty, we just finished our twentieth speaker, if I could have your attention please! We've just finished our twentieth speaker, and we have forty more to go. So, in the interest of everybody's life, and I know this is very important to you, and what I'd like to encourage you to do is, as you give your written presentations, if you have some written remarks to hand those in and do a brief summary. Many of you who have previously spoken have been very successful with that. So I would encourage the rest of you to do that as well.

Pat O'Malley: Hello, I'm Pat O'Malley, President of the Port Commission. Along with my fellow port commissioners, Mr. Fabulich, Mike Fletcher, and Jerry Thorpe, we appreciate the opportunity to be here tonight, and we thank you all for coming.

The Port of Tacoma believes that HEU has no place in commercial channels. That's why we support the goals of nuclear non-proliferation. However, adopting Alternative 1, which calls for all HEU to be returned to the United States, is bad management. We believe it's bad policy, and it's bad finance. It's bad management because we believe Alternative 1 makes the United States -- makes us all custodians of a warehouse of nuclear waste that we are unable to reprocess, recycle, or store. Look at Hanford. We can't manage our own nuclear waste why are we taking on more? It's bad policy because storing nuclear waste, with no long-term operational storage site, sends the wrong message to other countries with research and commercial reactors. It encourages risk and irresponsibility. It's bad finance. Returning this fuel, and using Alternative 2, is at least one billion dollars less expensive that Alternative 1. There are no benefits to Tacoma, or to our region. There are no benefits to the port, there is no job that is created. Our longshoremen's union will be exposed to radiation. They've taken the position that they are unanimously opposing this. They've also said that they won't handle it under any circumstances. [applause] Some of the other speakers have noticed that this amounts to an ongoing unfunded mandate. And, why is that? Because we are, we, the City of Tacoma, going to be charged with the primary response in case there is a spill. That's going to require more training, more expertise; it is going to require equipment. I would suggest to you, that there isn't a fire department on the West Coast that could respond to a nuclear accident. This material is dangerous. In the DEIS, actually in a letter that

I received recently, the DOE admits that open contact with the contents inside one of these casks will cause certain death within two days. We believe the case is compelling for Alternative 2. It's a simple question and I want to phrase it properly. Since over 70 percent of the spent fuel under the proposed policy resides in seven countries having major commercial nuclear reactor programs, all having major spent fuel storage capability, three having spent nuclear fuel reprocessing capability, and all participating in the IAEA nuclear safeguards program, why not eliminate Germany, Sweden, Switzerland, France, Canada, Japan, and the United Kingdom from consideration and select Alternative 2 and focus on the remaining 30 percent of the problem? Alternative 2, we believe, focuses, as I said, on the short- and long-term disposal issues. It permits fuel to be recycled. France, United Kingdom, and Japan currently have the capability and are reprocessing and recycling this fuel right now. They have capability for long-term storage. In fact, the U.K. has a reprocessing facility in Scotland that they are considering shutting down because they don't have enough HEU to supply their reprocessing reactor. In short, the DOE should select Alternative 2. Returning this weapons-grade material to the U.S. risks our quality of life and those of future generations. There is a wonderful statement in management theory: That, if you make the wrong decision, that you will execute it poorly. It is clear to us, the Port, that bringing this material back to the United States when we have the inability to store it, to reprocess it, is a terrible decision. We thank also the Port of Seattle that is here, Henry Yates, and the other communities that have supported us in this venture, and we thank you, again, for coming out tonight. Thanks, Mr. Head. Oh, and I yield the rest of my time to Mr. Ebersol. [applause]

Brian Ebersol: Anita Preston yielded her time also, so you're going to get two for the price of one, here. I'm Brian Ebersol, the State Representative representing this area, and I appreciate the opportunity to very briefly comment on this issue that is very important, not only to the future for the Port of Tacoma, but also the future of Tacoma and the entire Puget Sound region. President Clinton has said, repeatedly, that his Administration would pay attention to ordinary citizens on issues such as this. Well, this is that kind of chance and I hope he'll will pay attention on this issue because both public officials and ordinary citizens in Tacoma want no part of this nuclear waste shipment scheme. Our port officials are unanimously against it, our port workers are unanimously against it, our city officials are against it, and common sense is very much against it. Puget Sound is one of the top five or six most heavily traveled transportation corridors in the entire country. How anyone would think that this is a good place to transport nuclear waste is beyond me. There is no way to tap dance around the issue that nuclear waste is one of the most deadly and persistent poisons known to mankind. The best engineers in the world have worked for decades to try to find ways to store it safely and without good result. It still poses a tremendous threat to people and material. This deadly material simply has no place in a commercial port, or near waters, or on our highways, or in a densely populated urban area. The DOE has not explained to anyone's satisfaction how other ports were eliminated from consideration while our commercial port remained high on the list of possible nuclear waste transport sites. Why was Seattle eliminated? Well, because there's a lot of people that live there. Well, if there is no threat, why do you care how many people live there? The answer to all these questions is "No", and that should be the answer we should give loud and clear tonight. We've worked very hard to have the Port of Tacoma be a world-class port that has global commerce of all kinds and we don't want Federal nuclear waste mandates threatening the progress that we've made. Let me close by saying that this issue is vital to Tacoma, but it is not just a Tacoma issue, it is a Puget Sound issue, it's a State issue because no one wants waste on State highways. That is why it is up to us to take the lead. We should take the lead on this issue by saying: "No, Hell no, we don't want the nuclear waste coming here." There has got to be a better way to solve the problem. Let's find it. Thank you very much. [applause]

Ray Robinson: My name is Ray Robinson. I've been retained by the Port of Tacoma to help them with the assessment with these three alternatives and I'd like to address one of those better ways, Brian. Before I do so, at the risk of correcting one of my five bosses, the five port commissioners, I believe Mr. O'Malley said something about a one-million dollar cost differential. As I read the EIS, the draft, I believe the high side cost estimate for Alternative 1 is close to 2 billion dollars, and I believe the high side cost estimate for Alternative 2 and 3 are like something slightly under 1 billion. So I believe that there is, roughly, a 1 billion dollar difference between Alternative No. 1 and the other two alternatives. Is that correct, Mr. Head?

CH: I would have to go back and check those numbers.

Ray Robinson: I believe that is correct, and if it is not correct, I would appreciate it if you would correct me, that would be useful. I would like to just briefly comment. A couple of things about my experience -- I have over twenty years of nuclear fuel experience in a wide variety of settings, mostly in the commercial nuclear fuel sector. I'm also a 25-year plus resident of this state, my family, my kids, my two kids, were born and raised on the east side of the state and also we lived on the west side on the Puget Sound, and they went to school on both sides of the state. We currently are residing in the state of Washington and we have a personal interest in this as well as a professional interest. I would like to say that Alternative 2 provides a significant advantage, in my opinion, to all the other Alternatives. And, I'd like to comment about a few objections I've found in the Summary on page 5. One of those is, and I believe that the DOE states: "Currently overseas reprocessing results in separated HEU that is placed back into commerce for use as new reactor fuel." Nothing is mentioned in the EIS, as far as I can tell, about the possibility of taking that HEU that can be reprocessed today at the Dounreay reactor in Scotland, and it can be diluted down to lower than bomb grade material, and it can be, yes, it can be recycled, but as a bomb-proofed and non-proliferation proofed material. Having high value, it can be recycled back to the countries from whence it came. You also state that the overseas reprocessing facilities, for example, Dounreay in Scotland, currently do not have the capability to reprocess the high density low-enriched fuels that the United States is encouraging the foreign research reactors to use to replace the HEU fuels. In talking to some of the top technical people at the Dounreay reactor in Scotland, I find that they do have the capability to reprocess, fairly immediately, approximately half of the materials identified in the DEIS. That material, specifically, is the HEU coming from the aluminum-based or metal-based type of fuel elements. They do not currently have the capability of reprocessing the TRIGA reactor, the fairly unique specialized fuel which comprises approximately 10 percent of the total 20 metric tons that are in question here. And, they currently do not have the capability to process the low enriched high-density uranium fuel. In speaking with these people, they are seeking business in this area. They have published a price for what they would charge for the HEU and, in informal conversations, they have an interest in pursuing alternatives that would allow them to take care of all three types of fuels at the Dounreay reactor reprocessing facilities in Scotland. So I believe that you are partially correct in the Summary -- they currently do not have the capability to do all three. They have the capability to do about half of it now and appear to be willing to work toward a solution for the other half that they don't have the capability to deal with at the present time. A final statement is, that is that's in page 5 of the Summary: "For most foreign research reactor operators, construction of a new storage facility would not be practical due to the very high cost of storing small amounts of spent nuclear fuel and the long time required to design, license, and construct facilities." Well, it is a problem for any country, anywhere, including the United States, to add new capacity to store and deal with the spent nuclear fuel. There are at least seven countries that I am aware of, and they were mentioned earlier, that have major commercial power operations that are trying to deal with the long-term geologic repository storage of their own fuel coming out of their commercial power reactors. Those

seven countries are on this list and, as mentioned by Mr. O'Malley, comprise roughly 70 percent of the total inventory that we are talking about in those 20 metric tons of foreign reactor fuel. In my opinion, and I think in the opinion of a lot of people, there are many issues that need to be addressed in resolving what is the best means -- issues of risk, cost, permanence of the solution, and let us underscore that the 10-13 year solution that is mentioned in this DEIS is really, on the scheme of things, a very short-term, band-aid fix to a long-term problem. So a permanent solution ought to be part of the consideration of this DEIS. Timing of the solution, and very importantly, establishing some responsibility and accountability in those countries pursuing the peaceful uses of the atom. We started it, but we need to also encourage some major responsibility and accountability for those receiving the benefit. That has been brought up earlier in one of the questions here tonight. And very importantly, the U.S. can act as a real role model for both the nuclear weapon countries, the countries that have nuclear weapons, and for the countries that have major commercial nuclear power capabilities. We can act as a role model on how to responsibly and, in a financially sound way, go about dealing with this problem. As one speaking to...that knows quite a bit about this whole problem, and one who very definitely supports the nuclear nonproliferation objectives that this policy is seeking to resolve, I really encourage you, on behalf of the port, we encourage you to look very, very hard at all the aspects of Alternative No. 2. Talk to the foreign countries that have the capability. Let's get into the bilateral and trilateral discussions that need to be held, and let's get on with resolving this problem overseas and keeping it out of this country entirely. Thank you. [applause]

Ruth Fisher: Thank you. First of all, I'm not Jack Fabulich. Commissioner Fabulich yielded his time to me. He asked me to inform you that he prefers Alternative No. 2. My name is Ruth Fisher. I represent the 27th District in the State Legislature. The Port of Tacoma is in the 27th district. I was the Chair of the House Transportation Committee and became the Ranking Member after the last general election. I wish to speak to the issue of transportation tonight. Adding truck traffic to the I-5 Corridor North is putting an additional load on the 4th most congested highway system in the United States. Not in Western Washington, not in the State of Washington, not even on the West Coast, the 4th most congested corridor in the United States! If we are addressing rail traffic, you will be adding to another crowded corridor. The State of Washington has invested a good chunk of money in the tracks going north and south. We have been designated a priority corridor by the United States Department of Transportation (DOT). We are struggling with commuter rail, inner city rail, and freight rail on the Burlington Northern tracks in this State. We are also struggling with a political climate that has said: "No more money for transportation improvement." If you're considering air traffic, we're in the middle of controversy surrounding the third runway at Sea/Tac Airport, and that may not be resolved for ten or twenty years. You cannot add to the transportation system without severe consequences. And, I'm not talking only about collisions. I'm talking about the additional traffic on an overloaded system. We, in this State, must continue planning for the growth which will occur in the next decade. And, the transportation system is not adequate, now. As a public official who is concerned, I object. As a resident who must use this system, I object! As a long-time Representative focused on transportation problems and solutions, I object. [applause]

Jack Fabulich: I think you did a better job than I would have done! [applause]

Lorraine Wojahn: Port Commissioner Anderson has yielded his time to me. My name is Lorraine Wojahn, I represent the 27th District as State Senator and also as President pro temp of the Washington State Senate. I'm also here on behalf of Senator Marcus Gaspard who is our Majority Leader with whom we have written a letter. I'm not going to read the letter to you because it's not that long, but it said everything that has been said before; and it was said best, I think, by Mrs. Kelly who

put herself in the place of you as a citizen in the State of Washington. She was outstanding in her projections. The one thing I do want to suggest to you, though, after we've talked about the dangers of shipping nuclear waste, which we stated in the letter, through the corridors of Washington, I think there is an additional problem here. We think that the DEIS, prepared by the Federal government, is incomplete and inaccurate. Now, this has been stated more clearly and at length by others, but I wanted to re-emphasize this so that the State of Washington recognizes this, also. We believe that it is based on outmoded information about port terminals, and the information is outmoded, and it fails to adequately address critical security and cleanup concepts. So that we not only have the problem, we have also the additional problem of a group from DOE that refuse to listen or prepare a statement that was accurate. And all I want to say, other than that, is that someone sitting next to me as I came in at six o'clock tonight, someone said: "First they take our jobs, now they are shipping us their waste." Thank you very much. [applause]

Mike Fletcher: I've got to put my glasses on to see what I've written here. My name is Mike Fletcher. I'm one of the unanimous voices from the Port of Tacoma Commission that is opposing the shipment of nuclear waste coming through the Port of Tacoma. I want to take you back, Mr. Head, to May 22nd. One of the questions that the Commission posed to your representatives was that of: "What if we had a catastrophic accident?" Your DEIS goes through and basically says it can't happen and it won't happen. The response was promised in writing within three days. I have in front of me, here, your letter of June 16th, which is more than three days by quite a bit. And, one of the other things, just to bring it back to perspective and timing, is that you promised that DOE would respond in case there is an accident in Hanford. And, if it takes the same amount of time to get here, we have a serious problem on our hands. Okay? Just wanted to add a little levity in there, but seriously, you get the point. What I'm saying is, a non-responsiveness, an attitude of -- "Okay, we're doing this and we are not really going to listen to what you have to say." I read through this and the scenarios that you answered didn't really answer the questions that we wanted, that were really posed. Maybe we need to re-do that in writing, again, for you so that we can get the proper response, and it will be: "I'll get to what we really want to get to in a minute." But in your Item 3, you keep using the word "unrealistic case scenario". And, you're right. What I see there, in Item 3, is really a very unrealistic scenario and it's not the most probable scenario at all. I agree with you, it is indeed unrealistic. A worst case credible accident is not the same as a worst case accident. You refer to credible accidents, quite frequently, in your responses and in your DEIS. To give you a little background: I am a graduate of the Navy's nuclear power program. I operated a nuclear power plant. I've lived with this. I've dealt with it for a good part of my life. One of the things that we did in the Navy was we trained for worst case scenarios. We acknowledged that they can happen. You are not acknowledging that it can happen. We didn't sweep them under the rug. We faced them. We learned how to deal with them. We accepted the possibility that it can and could happen. If you are not prepared for it, if you are not willing to accept that they can happen, you can't prepare for it. And if you can't prepare for it, you are doomed for failure. So, I submit to you, that you're doomed for failure! [applause]

The question I would like to re-propose to you is, and let me read what I've written down here. The Port of Tacoma Commissioners and others are interested in knowing what the consequences are of abnormal radioactive releases. One of the things you've brought to us was you've analyzed release fractions for worst-case credible accidents. I am not interested in credible accidents. I'm interested in worst-case possibilities. Even if you only gave us 50 percent, I think you would be shocked at the figures you would get for us -- what we would be exposed to. You asked for technical responses. You have not been willing to give us technical responses to our questions. I want technical responses. The Commission and the people of Tacoma deserve your technical responses. The people of Pierce County,

the people of Washington State deserve your technical responses. Please give them to us. You've been presented with technical reasons why Alternative No. 2 is a very acceptable alternative. I suggest, as the other Commissioners have, as Dr. Robinson and many other speakers have, that you look hard at Alternative No. 2. I think you'll find that it is a very acceptable means of solving your problem. Thank you. [applause]

Melody Wilhite: My name is Melody Wilhite, and I'm down here from Everett tonight. I'm a private citizen and this whole thing, to me, is ludicrous. I was born and raised in Seattle. I grew up in the fifties, you know. During school, one of the things we did was to practice getting under our desks because Russia might drop the bomb. I never thought that it was going to be the U.S. that was going to be threatening me. You know, I mean, it terrifies me. You know, the fires and the sinking, that has been covered, but an accident by nature is something unforeseen. You talk about not needing security because: "Gee, we can't reprocess" and you can't do anything with this unless you reprocess it. You know, there are lunatics out there that have access to armor piercing shells who wouldn't have a qualm in Hell of shooting something and releasing this stuff. You know, it doesn't have anything to do with sanity. It shouldn't be here. It shouldn't be happening. We don't need to have this conversation because we had a vote. You know, everybody here is against this. You know, I don't understand. The only alternative is number 2. Help the people that are producing the waste find a way to solve the problem. Leave it there! [applause]

LW: We have five more speakers on deck: Jerry Thorpe, Doris Christiansen, Robert Hawes, Darlene Woolery, and Vernon Louie. That will take our next five.

Jerry Thorpe: Good evening, I'm Jerry Thorpe, and I'm one of the Port Commissioners, and I also teach school here in Tacoma, and I teach American Government. And I want you to know that this very type of activity is what I talk with my students about. About people becoming concerned, and coming out and expressing their views for their government officials to hear. I only wish that I could have my students here, right now, to see real government in action. This is the very heart of the democratic process. I get my kids out to some meetings, and this is a great meeting, and I really appreciate what's going on. We've heard some very eloquent comments. I think the comments that have been made are just absolutely outstanding. There are three points that I'd like to make. And I only want to focus on some areas that have not been touched on because I don't want to go over what has already been touched on. Number one is that, and it has been touched on a little bit, but my first comment is that we've been given some figures about what causes cancer or what could cause cancer and, I would submit to our learned gentlemen from DOE, that our doctors are still very unsure of exactly what causes cancer, and how much is too much radiation, and they're constantly mystified by this disease. It's a terrible disease and I think that there's hardly a person in this audience whose family has not been touched by this particular disease. And, why would we want to do anything that would even possibly cause increased dangers of cancer in our community? I can't imagine why we would. Number two, Mr. Head kind of made a mistake that a lot of people make when they are debating an issue. And he made the statement about Japan and he said the comment was made, well, "Why are we taking the nuclear waste from Japan?", and he said: "You know, if we don't take their nuclear waste then they're going to build reactors, and they'll build reactors that will use more of this high-energy nuclear waste." And, given the very background of Japan and what they have gone through, I can't even imagine Japan doing anything to perpetuate use of high nuclear energy or nuclear material after what they have been through. I can't even, it doesn't even, it's beyond the pale and I think you made a big mistake. As a debater, you suffered a lot of minus points on that. And then a third comment is that we are going to be taking this nuclear energy from these countries that have this high nuclear waste material, and of the 50 percent of

these that have these reactors, we can see no evidence that any of these nations are about to move from the use of high energy materials to low energy materials. And, if they are not going to move to the low energy materials, that means that they are going to continue shipping out this high energy material forever, and I see no end to it. In fact, Mr. Head said in answer to a very nice question from a lady, "Well, we are planning on building this huge, deep mining shaft to even put more nuclear waste into." So, I think he kind of betrays himself by saying: "There is no end in sight." Now, we are looking to where we can put the rest of this, and even more of this, and he is still looking for the best spot for this, and so I find... I think...these are three things that I would like to point out that have not been touched on so far.

And one last point, and that is just for the record: The Puyallup Tribe of Indians has gone on record opposing the shipment of this nuclear fuel into the Port of Tacoma. And, they have quite a statement here and I will give you this statement because they, as we know, the Indians are very much concerned about their environment and the effect of this danger to their environment, and they go on record unanimously to register their opposition to receiving these shipments based on the information available. That was signed by their Director, William C. Sullivan, Director of Environmental Programs, Puyallup Tribe of Indians. Thank you very much. [applause]

Doris Christiansen: Good evening. My name is Doris Christiansen and I'm a Tacoma resident. During the accident in Chernobyl, I was still living in Germany. And in Germany we have a big radioactive cloud coming from Chernobyl. And for years, we couldn't eat vegetables and fruit from our own yard; we couldn't go and pick berries in the woods or mushrooms. Our kids couldn't play in sand boxes and on the ground because the ground was highly contaminated. And nuclear waste is highly dangerous and accidents happen all the time. And I'm worried, and so are my family, and neighbors, and friends. Thank you. [applause]

Robert Hawes: I'll try and get this right. My name is Robert Hawes. I'm just here as a private citizen. But, I have to tell you my background. I spent over ten years in the Air Force and most of that was in the area of munitions and special weapons. I was trained in the handling of radioactive material and to decontaminate radioactive warfare or accidents. So I think I have a little bit more than a fair knowledge of what's involved when you're handling these things and the possibility of some type of accident or contamination. First off, I would like to state that Three Mile Island was not an accident. It was the result of consistent breaking of rules of policies and procedures, decisions by several individuals that were based on personal gain or fear for their jobs, or money, or something else. But they were not based on safety. That has cost us billions of dollars, already, and nobody knows what the final cost will be. The Exxon Valdez may have been an accident or something that could have been avoided; it was just one of those things. But the response after the accident left no doubt. There wasn't any for a very long time. Now, there was supposed to be, because one of the things that the State of Alaska, and Unions, and everybody said about this was: "In case there is a spill, we want to be able to clean it up quickly. Well, because of budgetary crunches and things over the years, and they hadn't really had any problem with oil spills, people were no longer trained, crews were no longer available, equipment was no longer available, so when the accident did happen there wasn't any response. And the results, of course, were far more catastrophic then they needed to be. Now, I spent quite a few years in the military. I worked for some government contractors, General Dynamics by name, one of the biggest, and I wouldn't say one of the best, but certainly no worse than a lot of the rest of them. So I'm very much familiar with governmental operations, and contractor operations, and things of this type. Now, I'm not necessarily opposed to the United States bringing into this country, for safekeeping, some of this nuclear waste from countries that they feel it may be a hazard, you know, or take it from the international community. But,

as it was pointed out tonight, most of this being proposed doesn't fall into this category. Absolutely not! The other part of the thing is that we've had atomic bombs and things flying around for years up in the air, handled on the road, on railroads, and things like that, but usually by very competent people that were very, very, you know, conscious of what they were dealing with. The problem is, from what I'm reading in here, of what is proposed for the way that this thing is to be handled, by ships, by containers and the rest of that, it scares me a great deal. These people are not prepared for this. To them, it's just some other type of cargo. When, in actuality, it is far from that. You haven't done your homework or if you've done your homework, you have blatantly ignored the safety of a lot of people. And I think it boils down to economic expediency because the proper handling of this, and it can be done reasonably safely and properly, costs a lot of money. But they don't want to spend the money like having a complete team travel with every shipment. These containers, that you take and have this stuff being traveled in, are way too large. There should be very, very small quantities, so if there is a rupture in one of them, the actual contamination is very, very small. The other thing, that anybody who knows anything about critical mass knows, is that you don't put a lot of that stuff together in that kind of quantity. No, you just haven't done the job right, plain and simple. Why not fly it in? Why not take it and have military aircraft or contractor aircraft that can handle this stuff for AEC and the rest of it, fly it in to a close place or where you have good road transportation to it. Why bring the thing all the way across the water in ships, in container ships, along with just everything else? Money! The way to handle the thing, to handle safely, takes a crew of trained people; it takes the right equipment, and the right process, none of which I see in anything that has been presented here tonight. Now, you know the feelings. I think I've taken...I didn't come here particularly worked up about it. But, after hearing some the information from other people about some of the things and getting a few of the statistics that probably mean a little more to me than most I feel that you really need to go to work. And, if it is a matter of money, then say so! Thank you. [applause]

Darlene Woolery: I'm Darlene Woolery and I'm a citizen of Tacoma. I have been all of my life. And, I'd like to speak to DOE. I'm disappointed in you people. First of all, this part of the country is extremely spoiled. We are used to having a tape recorder being made of every conversation that we have at a hearing. And, upon having that tape recording, we are able to go back to our people and we are able to get exact copies of the minutes. I pick up a letter about this thing and I get: "Oh by the way, they are not taping this thing;" and I say: "What do you mean, they are not taping this thing?" So, now we got somebody from CNN, and I said: "He was here tonight?" And, they got a cable channel from our own city here that is having to record this because DOE doesn't have the ability to take this stuff and feed it to us? It is recorded tonight only because we made a fuss before. It wasn't recorded before then! Only because there was a fuss made before and not because you were planning on it.

Now, let's get into something else, you guys. All the magic stuff about this nuclear energy. You keep bringing up this word cancer. I hope to God, you never have to deal with a friend or a loved one that is dying of cancer. That person represents an awful lot of people. It's not an easy disease to die of. I've watched people -- I have a neighbor who is dying of it, and I've watched my whole neighborhood go into tears at night because we cannot help her.

Now, my fire department. We are having some meetings here in Tacoma, right now, because we are having some reorganization in our fire department. We have a four-minute response time. I haven't seen anything from you people as to what you are going to do to improve the fire department in the corridor. What are you going to do? Are you going to give us some money, supposedly, to improve this? Or, is it going to come out of my pocket again? No, wrong, you come up with it! Are you going to train our port people? This means an ongoing training program. It's not just one shot. It means over, and

over, and over, and over, and over again training. The drivers, are they going to be especially trained to handle this cargo? Right now, they're not! They have to take a DOT test and if they pass the test they get the thing slapped on their wallet and they can drive it. That means they can get out here on the freeway, and most of you that live in this part of the country know what happens on the M Street curve in the winter when it gets to be a little bit icy. We spent four hours waiting to go someplace and we don't get to go, right?

I just want to know, do you really care what we think? I don't think you do! I don't. All I see is a: "Oh, boy, will these people ever stop talking and leave me alone so I can home?" look on your face. Well I'm sorry, we care an awful lot because when this meeting was called very shortly -- this is a meeting where people you see here tonight were called with less than 24 hours of notification that this meeting was going to go on). In the meantime, before these people were notified there was going to be like 20-30 people, mostly our elected officials. It doesn't work that way. I think you recall -- you are on the public payroll -- you are not a private entity. As a public payroll person, you owe more to us than just getting up there and saying: "This is what we are going to do." Thank you. [applause]

Vernon Louie: My name is Vernon Louie. I'm Chairman of the Puyallup Tribe Fish Commission. And, when I first heard about this stuff coming into the waters, you know, I was astonished. I mean how could we let this happen? How could we, as Indians, let this stuff come into our waters? We've had to fight all of our lives just for the right to put a net into the water to catch fish. And every year, fewer and fewer of our fish come back. When they do come back, they're smaller, they're diseased. And these are things we have to contend with every year. Here now, they are talking about bringing this stuff in that is going to do more to our fish, there, in the water. I shouldn't say "our fish." The fish belong to everybody. It's part of our mother, Mother Earth, and the stuff that you take out of our Mother Earth should have never been taken out in the first place. It has caused nothing, but misery to Mankind and to our Mother that it was taken. From the first day, it was taken from the Earth. And now that it is out, and these people from other countries want to send it over here back to us. I have no answers to why they want to do this. The only answer I have is a question: "Why was it taken out in the first place?" Leave it there. Our people, Indian people, for years since the white man first came here have fought, and fought, and fought -- we're still fighting just for the simple thing: So that we can watch our children eat a piece of fish just as our forefathers ate a thousand years ago. And day-by-day, second-by-second, this right has been taken away from us and it has been taken away from you. So now I say, it is time we put a stop to this and don't let this stuff come in here. Because I know the Puyallup Tribe fishermen do not want it here, or the Puyallup Tribe people. One more thing, too. There are laws against playing Russian roulette. If you take a pistol and put one bullet in that pistol and spin the cylinder and put it against your head, that's against the law. But here, this nuclear stuff that they're bringing in here, they're playing Russian roulette with all of our lives and our Mother -- our Mother Earth. If it comes in here and something happens, it is going to destroy everything. And when the salmon is gone, mankind will be gone. Thank you. [applause]

LW: Okay, thank you. Our next five speakers are: Deanne Hazleton, Roxi Giddings, Robert Trotter, Gary Clark, and Dick Marzono.

Deanne Hazlelton: My name is Deanne Hazlelton and I don't have any specific qualifications to speak here. My family is five generations in this State. And I am a mother, and a grandmother, and I am a person who has followed the nuclear industry and technology story for the past twenty years. Twenty years ago, my nine year old twins called me up on the telephone and asked if they could testify at the NRC hearings in Seattle, WA, against the construction of a nuclear power plant on the Skagit

River. And I would like to tell you folks here tonight that the people of Skagit County kept the nuclear power plant out of their county and we can do the same here. I would like to bring up one point that I have not heard mentioned tonight. As I've said, I've been following the nuclear industry and one of the things that I have read over the years is that the DOE and the DOT cannot account 100 percent for all nuclear properties that are transported in the United States by either highway, air, or rail. This may not seem very significant. It's my understanding, that some of these nuclear materials are lost due to theft; they're just lost and sometimes from damage. If that figure were even one-tenth of one percent, when we're talking about 20 million metric tons, that is an incredible amount of material. And, this could be lost, damaged here. When we talk about anything that happens in the Port of Tacoma as a result of a nuclear accident, we are not just talking about our children in our community. We are talking about the world's children and the community of the world. When that material gets into our Puget Sound waters, it is carried all over the globe. The nuclear industry does not have a good safety record. We heard tonight how what happened in Chernobyl affected people in Germany. We heard from a lady who lived in Hanford. What happens here affects the rest of the world. Not only do I not want, nor does my family want, nuclear waste shipped into the Port of Tacoma, we do not want it shipped into the United States. We believe that the United States policy on nuclear energy is ill advised. Rather than supporting and facilitating foreign nations' continued and increasing reliance upon nuclear energy so that their level of consumption can reach our own level of consumption, we should be encouraging the people of our nation to reduce our reliance on nuclear energy. We need to stop it. Forty years from now, if I'm fortunate enough to be alive, I do not want to read how what happens tomorrow in Tacoma is now just coming to light. This has been the history of the nuclear industry. We don't find out about it until after the fact. These things are kept from us, and I believe deliberately are kept from us. We are not children. We do not need to have the facts hidden from us. I do not want this in my community or any community. Thank you. [applause]

Roxie Giddings: It's Roxie Giddings. It's okay. It's a nickname anyhow. I go back a long, long, time. I live out in Pierce County, in Parkland, and I've been around here for a long time. I was born over on Woodby Island and it's an island in the Puget Sound. We have a rotten record of taking care of this stuff. We don't want it here. We can't handle it. We're not willing to handle it. The DOE is us. The port is us. The Tribes are a different nation, but they are also us. The City and the County governments are us and, for once, we are finally trying to tell ourselves that we need to deal with this. I carried around an initiative once, in 1976, trying to get nuclear safeguards, and those of you with grey hair -- you'll remember that one. That was the first initiative I ever carried. I just, I don't think as a people we are willing to pay to clean up this mess. We are talking now about getting rid of DOE. They're the only people working to clean up the mess as far as I can tell. And now, we've got people back in the government that we've elected and put in there that are not willing to clean up Hanford. I'm also a downwinder. I lived in Pasco for eight years. My sister has had a mastectomy now and my brother has a little heart trouble, and we just, I mean you don't put tracers on this stuff, you can't prove anything. I don't really believe, that we would, as DOE, have the will to remove a cask if it did go in the water! And especially if it was imploded, we wouldn't do it. We've got casks all over California, off the coast, which we put out there because we buried them out there. And they imploded when they went underneath the water and we haven't taken care of those. We're not willing to a ..actually we were not willing to have the Atomic Energy Commission, and we changed it to DOE, if you remember that. And, now we are not willing to have the DOE because we can't take care of this stuff. And we tried to tell people, when they put the WPPSS in here and they wined and dined us, we wined and dined ourselves, through, what-is-it, Westinghouse or something, trying to tell ourselves that we could put this stuff into some kind of ceramic cask and it would be okay and, maybe, we would put it on the surface of the ground over at Hanford, and then we would do what with it? Blow air through it at 600 degrees F for

every cask that they had? And then, and then -- they told us they were putting waste in these things and they hadn't even started ..they were just working on the glass, at that time, they hadn't even started putting radioactive materials with it when they took our people from our utilities to Richland, and wined and dined them, and showed them how great it would be to do five nuclear power plants at once in this State, which we couldn't. You can tell I'm a little angry about this. I don't think we are willing to pay to have these ships come in here safely. We're not willing to pay. We just dissolved the Office of Marine Safety in the State of Washington, and their job -- which they never really did -- to start to accomplish their job -- was to prevent oil spills in the Puget Sound area, and that was their total and complete job. It was not connected with any cleanup of this sort of thing. Which brings us to cleanup. We are not willing to clean up a mess. And so for my final statement, I want to say that the people in the United States are not willing to pay for nuclear messes and I don't want to be the next nuclear mess that is sacrificed. [applause]

Linda Smith: Hi, my name is Linda Smith and I'm here tonight on behalf of Bob Trotter who was speaker number 35 and I lucked out because I was supposed to be here for my boss on number 50, so I'll go in and take number 35 instead. Once again, Good Evening, my name is Linda Smith, and I'm here on behalf of Tacoma County Visitor and Convention Bureau. We're an organization that represents Pierce Counties tourism and its interests. We're in the image building business. And the Visitor and Convention Bureau promotes our community to tourists, tour operators, meeting planners, convention delegates, and travel writers. We not only promote our area's attractions, facilities, and visitors services, we promote Pierce County as a safe, friendly, and an attractive to visit. Transporting spent nuclear waste through the Port of Tacoma will harm Pierce County's public image. It will destroy the visitor's image of a safe destination. And it will destroy the recognition that Pierce County has won from travel writers and their readers in the past years. If spent nuclear fuel is transported through the Port of Tacoma, travel writers will have another story, a new story. Instead of writing about Tacoma's new history museum, the future development of glass, and maritime museums, this story will be about a warning to visitors. Instead of praising our waterfront development efforts, our customers will read about the dangers of radiation Tacoma residents must prepare for in the event of a nuclear accident on our waterfront. The visitor industry is a 365 million dollar industry in Pierce County. It directly employees about 5,500 people here. The Pierce County visitor industry has a bright future and we don't want to destroy it with a negative image such as this. The DOE should drop the Port of Tacoma from its list of public ports considered as entry points considered for the world's spent nuclear fuel. If it is unsafe to transport this spent nuclear fuel through larger population centers, such as Seattle, then it is obviously unsafe for Tacoma and its neighboring communities. We are no more willing to cope with the devastation of a nuclear accident than any other community. I urge DOE to rethink its use of the Port of Tacoma and all other public port facilities, and encourage the Department to use a military port or to work with other nations to safely store their own nuclear waste within their own countries. Thank you. [applause]

Gary Clark: My name is Gary Clark, I'm here as a private citizen, but I'm also familiar with transportation packages used for the transport of radioactive materials. I've been in this business for ten years designing and licensing these packages, so I know what it takes to do it and do it right. For example, DOE has a bad track record when it comes to Hanford. But, when it comes to transportation of nuclear materials, I want to give you an example of how to do it right. And that was to remove the damaged fuel elements from Three Mile Island Unit 2 to Idaho National Engineering Laboratory (INEL). That occurred over forty-nine shipments. It occurred from July 1986 to April of 1990. A one-way trip totalled 2,383 miles for a total of 116,767 miles of shipping nuclear waste in a transportation package. There were no mishaps whatsoever in that package. I've also been studying - done studies - for DOE looking at the spent nuclear fuel of all DOE fuels. So I'm familiar with that phase of it and I would

submit that this fuel that is off-shore that is highly enriched -- I know the enrichment level is very hazardous -- can be easily turned into nuclear materials if it is diverted, or nuclear bomb-grade material. It needs to be put into a safe area. After hearing testimony today, I would say that we should only be looking at the 30 percent, not the 100 percent of the 20 or 21 metric tons to bring back into a safe area. Whether that's in the U.S. or somewhere else to reprocess it, it is, I think, up for negotiations with the U.S. government and the potential hosting States. In regard to utilizing packages for this work, I would submit to the DOE that they only utilize NRC certified packages that have been reviewed, and they do not use Certificates of Competent Authority through DOT for foreign packages, and they do not use DOE-certified packages. In addition to that, if the fuel is not well characterized, and I believe over two-thirds of the DOE fuel is not well characterized, then they should overpack this in another sealed containment structure that goes inside the transportation packages, which is also leak-tight. And, for example, that I can name off my head that affects the people in the State of Washington, K-basin fuel is in that classification. There are over 2100 metric tons of that fuel sitting over there, so that gives you an idea of the magnitude that we are talking about. One of my last points that I would like to make is that if DOE is going to utilize any ports, whether it is Tacoma, or Portland, or anybody else on the West Coast, they need to provide the funding levels to train the workers that are going to handle these shipments at each port of entry. For people's information, all transportation packages have radiation limits set by Title 10 of CFR 71 and I believe that all DOE packages that they would use for this potential action would fall into that category and meet those limits. Thank you. [applause]

LW: Our next speakers are: Rick Ryan, Roger Allen, Anita Preston, Andrew Munro, and Phil Watkins.

Dick Marzano: My name is Dick Marzano and I am President of the Longshoremen Local of Tacoma. I have a statement I would like to read, but before I do, I would just like to comment on a couple of things. First of all, a lot of gifted and talented speakers that have spoken before me have done an eloquent job and I agree with everything that they have been saying. It says here in the EIS on proposed nuclear weapons about how you can make a difference. And in it, I'll read one little, small, thing: "Your input on the DEIS will play a key role in DOE's and the Department of State's decision-making process." Then it states: "Does your input matter?" and on the very end -- I won't read the whole thing -- it says: "Yes, your input does matter." Then we've heard from the Port of Tacoma; we'll hear from the Longshoremen, the Puyallup Tribe, Citizens for a Healthy Bay, City Councils of Tacoma, Fife, Milton, Ruston, Federal Way, Pierce County Visitor and Convention Bureau, the Pierce County Chamber of Commerce and the Pierce County Central Labor Council. Every one of those agencies and Commissions have adopted resolutions or drafted policies that are saying simply: "No". They, gave you all...the Port of Tacoma, came and gave you time and effort and gave you Alternative 2 and what could be done. So, what I am saying, Mr. Head, is that, yes, there has been input and the State of Washington and the citizens feel they have paid their dues and we're saying "no". When our union was informed that we may be chosen as a port of entry for the spent nuclear waste, many questions immediately came to mind. The natural fear of what would happen if there was an accident and what precautions would be taken in order to prevent this from occurring. The Longshormen's Union of Tacoma is not only concerned with possible exposure to themselves if an accident would occur; we are also concerned with what devastation could happen to our community. Also, if any, what local agencies are trained to handle such an accident? Security is another concern. The Port of Tacoma has relatively easy access. Whereas the security in the two government ports under consideration, Military Ocean Terminal at Sunny Point, NC, and the Naval Weapons Station in Concord, CA, have a far superior degree of security already in place. This must be considered with today's social climate. The Puget Sound has two of the busiest ports in the nation, Tacoma and Seattle both being in the top ten in activity. Therefore, the amount of ship traffic should have been considered when choosing possible sites and we feel that this was not done.

Tacoma is proud of its port and the Longshore Union is equally proud of its accomplishments. It has taken years of dedication, cooperation, and hard work from city officials to laborers, from port officials to shipping companies. The entire community has contributed to making the Port of Tacoma achieve its major port status world-wide. We believe that to choose the Port of Tacoma as a port of entry for spent nuclear waste would turn that completely around, and that this could make companies take a second look at having their business in the Port of Tacoma. We have mentioned cost as being a factor and we wonder if you have given any consideration to what price we, in Tacoma, may have to pay? We loudly say: "The price is too high!". Thank you [applause]

LW: As our next speakers are coming up, let me say that I've just been told that we have to vacate this room at eleven. So according to my watch, it's a little after ten and we still have lots of people on the list although several people have traded their time . With your permission, I would like to suggest that those of you who have something that has not yet been said be thinking about how you would say things; and for those of you who have things to say that repeat or amplify something that has already been said, you might think about putting it in writing and submitting it rather than taking some of your neighbors' time here. That's just a suggestion, but keep in mind, we do have to get out of here in a little less than an hour and we've got a lot of speakers to go. So be generous to each other on your time.

Andrew Munro: Thank you. I think we've skipped a couple of people. I'm Andrew Munro with Congressman Norm Dicks' office. I'm pleased to be here. I want to read a statement, briefly, from Congressman Dicks, and I know that Congressman Dicks is following up with Secretary Grumbly regarding this issue and will be interested in hearing Mr. Head's report about this public hearing. I know what my report is going to be to him: It's very clear what the sentiment is. Without further ado, I'll read this statement from Congressman Dicks:

> "As a United States Congressman representing portions of the Tacoma/Pierce County area, I've received numerous communications from constituents and from public officials from this area strongly protesting the use of the Port of Tacoma as one of the points of entry for spent fuel shipments from foreign reactors. Let me take this opportunity to join them in their opposition and to urge DOE to look elsewhere for a more appropriate candidate site. My objections to the use of the Port of Tacoma as a port of entry are related to the nature of the port and to the selection process which I believe was overly biased in favor of bringing these materials into the United States. To begin with, the Port of Tacoma is the fastest growing container port on the West Coast and, as such, is a primary economic force in Pierce County and the entire Pacific Northwest region. In addition, it is a major transshipment port for military cargo during a mobilization, acting synergistically with Fort Lewis and McCord Airforce Base. Over the past several years, I have been supportive of actions which enhance the port's commercial intermodal capability and competitiveness, as well as the military capability that remains in reserve. Likewise, I have attempted to discourage the port from pursuing opportunities unrelated to those missions. In this regard, I believe that the spent fuel mission would detract from this direction in that it would require the unnecessary expenditure of scarce resources for the enhanced safety and security requirements of the fuel shipments. Moreover, I am not convinced that the DOE's EIS process resulted in a thorough enough evaluation of alternatives that are readily available outside the United States. After review of the DEIS document, I believe that closer examination of Alternative 2 should have been conducted, which appears to offer the clear advantage of encouraging a longer term solution to the issues of storage and reprocessing. With at least eight nations, other than the United

States, interested in a similar objective and willing to participate in this program, I believe greater priority should have been given to this international option in the EIS process. I will be discussing this and other related matters with Assistant Secretary Grumbly in the near future. But, I want to express my strong opposition at this time to proceeding with the evaluation of the Port of Tacoma option based upon what I consider to be faulty assumptions in the EIS process. Sincerely, Norm Dicks." [applause]

Phil Watkins: Mr. Head, ladies and gentlemen, my name is Phil Watkins. I am here on behalf of Congressman Randy Tate who represents the Port of Tacoma, the Cities of Fife, Federal Way, and some of the other communities that have been represented here tonight. The Congressman wanted me to be here on his behalf -- he's in Washington, DC -- and to make some brief remarks. Admittedly, briefer than they were going to be at 6:00 pm tonight. First of all, the Congressman wants to thank DOE for holding this hearing tonight. As you'll remember, the original plan was to only have one hearing on this issue in Sea/Tac. And the Congressman thought that it would be better if we had a hearing in Tacoma where the people who are most directly affected could be heard. He would also like to thank DOE for responding to several of his requests with reference to this issue, including his request that this evening's hearing be recorded and that the public comment period, be extended. These events are significant because they are all based on one fundamental principle: That government must be responsive to the people in our community. As we all know, the Port of Tacoma is one of the ten ports of entry under consideration for receiving these hazardous waste shipments. Shipping spent nuclear fuel through the Port of Tacoma, the sixth largest container port in the country and the Tacoma community is not a prudent approach. Hundreds of thousands of our families could be hurt in the event that a tragedy occurs. Our community is not prepared to handle some of the circumstances that could potentially occur. What would happen if the shipping cask or the nuclear waste was breached? What are the possible effects on humans and the environment? What agencies are responsible for putting out the fire, an explosion, or an act of terrorism? What are the plans if a catastrophe takes place? There are also other issues that need to be addressed, such as: Was a full and fair cost-benefit analysis performed? What does the risk assessment study say? Are our allies being asked to share the burden of storing and disposing of this spent nuclear fuel? The second critical issue in this debate is the final destination of any nuclear hazardous waste delivered through the Port of Tacoma. Hanford is struggling with the financial burdens of its cleanup. The Idaho National Engineering Laboratory has also expressed concerns with receiving shipments of the radioactive waste. Congressman Tate looks forward to working with the City of Tacoma, the Port of Tacoma, the surrounding community, Congressman Dicks, and other members of this delegation on this very important issue. Again, thank you for giving us a chance to make our remarks tonight. I have extended written remarks for the written record. [applause]

LW: Would the omission of three speakers mean that those speakers elected not to speak or are they going in a different order? Rick Ryan, Roger Allen, and Anita Preston.

Anita Preston: Thank you. I'm Anita Preston, Anita W. Preston, and I am a lifetime native of Tacoma, and I live in old Tacoma near the Commencement Bay. In fact, it's in about my backyard. So speaking of having something in your back yard, believe me, this is a big thing in my back yard. Especially with the shipping lanes if these ships come in with the nuclear waste. But, the effect of any nuclear accident would be much more extensive than in just my backyard. As we heard tonight, it may cover an area of 900 square miles. That's a pretty big one. Referring to the comments in the EIS, and I refer to Page 9, the 'No Action' selection is my preferred choice. I haven't heard that much tonight. 'No action', someday I'm going to see that somebody's going to pass that alternative "no action". So I keep trying. The second choice is Management Alternative No. 2, and that's to keep the nuclear fuel overseas and

have it monitored there. Primarily for public health, I strongly oppose the nuclear fuels from being transported through the Port of Tacoma. In addition, I oppose the storage of the fuels at Hanford, Washington. The State of Washington has done more than its share in dealing with nuclear waste. You've heard tonight, many comments, and I'm not going to go into any detail anymore because you've heard so much already. It concerns me also that the DOE has not provided funding for the local implementation of safety training, and monitoring, and providing necessary equipment for emergency personnel - completely omitted. There is also concern of tarnishing the image of Tacoma, and we have been improving this steadily in Tacoma. We've had problems in the past, and we've tackled them, and we've done pretty well with doing things like the odor of Tacoma, etc., and this has changed a lot and we don't want to have anymore problems. So I urge the DOE to not appoint Tacoma for their nuclear port of entry. Thank you. [applause]

LW: Are there other -- Rick Ryan or Roger Allen. Okay, we have five more speakers on the list: Jerry Farm, John Avery, Lynn Healey, Harold Moss, and Whitney DalBalcon.

John Avery: I'm John Avery, I assume that the gentleman before me is not here, so I'll go ahead. I'm with the North-end Neighborhood Council and we're the folks who passed around of these petitions and got the information out. We wanted to make sure that the citizens of Tacoma came to this and I'm just delighted. We've had so many people here tonight. Not only the two hundred and some that this auditorium holds, but I want you to also know that there were 75 to 100 waiting outside that couldn't get in. I want to present Mr. Head and the DOE 858 signatures on a petition against having the waste shipped through Tacoma, and over 130 comment cards that people have taken the time to write -- all of them expressing opposition to having this waste coming through our town. I'm not going to take a lot more time. I think though, to summarize, there are questions of safety, and the handling of this waste, and those answers have not been adequate. I think there are questions of equity, of our allies dealing with this in an equitable way, and those questions have not been answered. And may I say, that as a person who has spent a lot of time in countries in the world, I think that we can trust that we have environmental allies in countries like the United Kingdom, France, Sweden, Japan, Denmark -- I know we do -- and those are good people, and they will help us to come up with solutions. I think if we stigmatize them as using negative ways of dealing with this waste, we do them a disservice. I think there are questions of believability. We've had debacles in this state with the WPPSS scandal, the whole Hanford situation. We've had eloquent people expressing themselves from eastern Washington tonight, obviously having suffered from that. And I think they are right in questioning the believability. Those answers have not been adequate. We have questions of security. How are we going to deal with this? How are people going to be trained? What about cleanup? Those answers have not been adequate. So I urge DOE and, basically, as a citizen talking to his government, to our government, I urge you all to listen to the citizens, reconsider the alternatives, and not bring this waste through Tacoma. Thank you. [applause]

LW: Okay, let's see, where are we..Lynn Healey...is Lynn Healey here? Okay, Harold Moss, you're on.

Harold Moss: It's been a long evening, but a good one. I come just to remind you of what really is important. Technically, we can talk about your engineer being smarter than my engineer. My engineer has a better idea than yours. You can talk about all the technical, split-hair issues that you want to. And you can talk about public safety, and you can parade everything you want to in front of this body. There are two issues: One is the technical issue of how can we retrieve spent fuel from overseas. How can we make those countries who exhibit capability for handling it themselves handle it themselves? And,

how can we safely retrieve what's left from those countries who cannot? The second half of that thing is: 'Us'. That is the political decision that will be made. Remember, when the decision of what port is going to be used it will be a political decision. Political! That is where we come in. The lady who got up and said they wanted to put a nuclear plant in Scagit country and defeated it spoke to the issue that is before all of us. This campaign starts tonight -- doesn't end. I think it was wonderful that we filled the house and that we, in our way, directed our responses and our concerns to Mr. Head, but he alone will not make this decision. This is a political decision. That means that we not only send the message tonight, we must be prepared to send that message repeatedly. You are going to have to write. You're going to have to stay on our political, our legislative bodies. You're going to have to continuously send in those letters to your Congress-people, to your Senators, to the President, and to Mr. Head. If you fail to do that, we all may be looking at the loss of our own identity. We may face the loss of the identity that we have worked so hard to put in place. And that is a decent community, a safe community, one that takes its responsibilities very seriously. We have not come through this far to now turn it over to become somebody's dump. But, the only way we are going to do that is to get the attention, and keep the attention of those who are actually going to do the voting as to where this nuclear dump is located. As a Mayor of the City of Tacoma, it's been such a pleasure to work towards the improvement to our city. I see this as a major threat. Just a major threat. Not so much from the security, not so much from the safety. I see it as a major threat to every effort that we make, to every effort that we make to make this a livable community. I urge you to take it someplace else. I'd like to... well I can't do this... okay. Thank you very much. [applause]

LW: Whitney DalBalcon? Okay. We're getting down to it. The next five are: Nancy Watkins, Rosa Franklin, Claire Petrich, Tom Martee, from the Peninsula Neighborhood Association, and Mike Kriedler, who has already spoken.

Henry Yates: Hello, my name is Henry Yates. I am taking the place of Rosa Franklin. She graciously gave me her time. I'll be brief. I am representing the port to the north, the Port of Seattle. I'm the Director of Public Relations for that port. In 1986, the Port of Seattle passed a Resolution that strongly objected to the presence of high-level nuclear fuel waste within waters of the State of Washington. We stand by that resolution. We support, very strongly, the position that has been taken by the Port of Tacoma in regard to the waste coming to this particular port. There's currently, now well defined and widely understood, a comprehensive, coordinated policy -- a plan -- among Federal, State, local, and other government agencies that will assure the safe shipment of this material. Not only are we concerned about the safe handling of it, but we're also concerned about the commercial impact of bringing this particular waste into the waters of Puget Sound. The Ports of Seattle and Tacoma, as you know, are linked by Puget Sound. They are only 30 minutes away from each other. We have been very successful at building a strong and vibrant business, mostly containers and other types of cargo. We can compete and do compete with other West Coast ports very successfully. As most of you know, our cargo, the cargo that comes through the Ports of Seattle and Tacoma, doesn't really have to come here. Most of it can come to just about any West Coast port. We have worked hard to get the cargo that we get through our docks into our ports. An accident with this sort of material or simply a work stoppage that's related to this sort of material could damage the reputation that we have around the world for being premier container ports. And that cargo that I just mentioned, that could go to other West Coast ports, just might do that. The Port of Vancouver, BC, in spring of 1996, will be doubling its capacity to handle container cargo and other kinds of cargo. Again, this sort of material -- a problem with this sort of material -- would make the Port of Vancouver a pretty attractive place for the other kinds of cargo, the container cargo that we get, to go through. We don't want to create a situation like that. What ends up happening is: Not only does the cargo go through ports like Vancouver, the container cargo, the big

container cargo, go through ports like Vancouver, but the jobs that are so much needed in our community do, as well. We urge you to evaluate other ways of handling this material and we strongly oppose its coming through the Puget Sound Area, the Port of Seattle, the Port of Tacoma. Thank you. [applause]

Claire Petrich: Thank you. I'm Claire Petrich and I'm here tonight as Chair of the Port Industrial Committee which is a Committee of the Tacoma Pierce County Chamber of Commerce. The Chamber of Commerce represents business owners -- small business owners and large business owners, hundreds of them -- and also all of the employees of those businesses within Tacoma and Pierce County. The Chamber of Commerce promotes an environment that's good for business. We promote an environment that is good for manufacturing, for jobs, for development, for services. And with that as our purpose, the Board of the Chamber of Commerce has voted to oppose the importation of spent nuclear fuel through the Port of Tacoma as not in the best interest of the region or of this community. We are opposed to it for a number of reasons many of which have been mentioned tonight. But, I will repeat a couple of them. First, we are opposed because of the health and safety issues that have been mentioned innumerable times this evening. We are also concerned because of the commerce that goes through the Port of Tacoma. It has been mentioned what the impact of the radiation in the spent nuclear fuel rods can be on individuals. What has not been questioned is the impact or the effect, in fact, of those shipments on other cargo that is placed aboard the commercial vessels that will be shipping them into this port. We don't know the answer to that. Our longshoremen have refused to handle the containers, the casks, that will be brought through with spent nuclear fuel. Does that mean, also, that other cargoes aboard other commercial vessels might be impacted? We do not want to see businesses impacted in a negative way in our community. We are concerned also because by identifying such trans-shipment points such as the Port of Tacoma, and also then stating that we have security concerns, we feel that security has been compromised in that way. We are concerned because no provisions have been made to fund or to train nuclear HAZMAT teams locally. We are concerned because transportation routes that travel through high population areas and both road and rail in our Puget Sound area are nearing capacity. Our community, the businesses in our community, our city government, and environmental groups have worked hard to cleanup environmental toxic wastes. We've worked hard to cleanup arsenic, PCPs, lead, and other items that are in our soils and in our waters. We believe that these are nothing, absolutely nothing, compared to the devastation that could occur should there be a nuclear accident in this community. To conclude, the Chamber of Commerce stands for the exchange of goods and services that are promoted throughout our community, throughout our country, and throughout our world. We categorically reject commerce in this particular instance that threatens our future and that we see to be of no benefit to our community. Thank you. [applause]

LW: I feel like a football umpire, flipping the thing on --now I do the hand signals here. Alright, Tom ...the State Representative from the 2nd District - Tom Campbell, Marilyn Rasmussen -- let me just read all the rest of the names and we'll see who is here. Tom Campbell, Marilyn Rasmussen, Laureen Roth, Leonard Holden, David Price, Henry Yates has already spoken, and Stephanie Smith - that's it!

Tom Campbell: My name is Tom Campbell. I'm a member of the House of Representatives of the State of Washington, and I'm here tonight to categorically say that, Mr. Head, we would appreciate it if you would take your fuel dump or toxic waste dump and take it somewhere else. Without a doubt, we have faced many problems in this State. And this is one, that I think you've heard from many of us: That we simply do not, and wish not, to try to find a way to solve it -- it's not our problem! We do have enough nuclear waste in our State. It really comes down to a matter of trust and a matter of confidence. Being an Army veteran, I often think about those members of the 82nd airborne who were asked to walk over the ground zero back at the Nevada Test Site and they were told that it was a minimal risk. It

wasn't a problem. Most of them aren't with us today; most of them are dead from cancer and related diseases. The downwinders have been here and they've told us a little bit about their story. They continue to suffer and die as a result of an unknown risk. In my private life, I'm a Doctor of Chiropractic and every year I'm updated about exposure to x-ray because that's part of my job, and we're told every year that maybe last year's was a little too high. So what we know today certainly is outdated by tomorrow. And I don't think we can have any confidence, Mr. Head, of being told that these exposures are, in fact, acceptable. I contend that any exposure is an unacceptable amount. This policy, frankly, is ridiculous -- that we have to, once again, be the policemen of the world. Have we learned nothing from the Vietnam experience? Have we got to the point where we have to go out and make moral judgments for everyone else to decide what is best for them? I think from what we heard tonight, that we've got enough problems here. We certainly haven't done a very good job with our own nuclear waste. I would certainly like to see that industry start winding down at the very least. And, I would like to see us take care of what we have, not bring in millions and millions of metric tons of more waste that could definitely cause death and destruction in our country. Again, being a Washington resident and thinking about that nuclear waste flowing into the Columbia River, at the very least causes a great level of discomfort, as well as the unknown of what's going to happen with that. I guess, to really sum this thing up, is do we really trust the Federal Government do the right thing, to tell us what we need to know, and that our community will be safe? I contend, Mr. Head, that we do not trust the Federal Government even close to that. We're tired of being pushed around and being told, frankly, after the fact that we are a site for this ridiculous policy and that we, the people of the State of Washington will have to find a way to deal with it and pay for it. Although, frankly, that is a secondary issue to me, payment of it. I want to let you know that the State of Washington, and I'm speaking now as a State Representative, we'll fight you. We will go forward within the State Legislature, if necessary, as well as the Governor's office -- I will go to the Governor's office, and I'm not alone, there are many of us in the Senate and the House that feel exactly the same way. We feel you are way beyond your authority in doing this, frankly, and I am going to talk about policy and not technical details because it was said so well by our Mayor. It's not a technical matter, it's a people matter. And, we the people say: "No!". We'd ask you to take your nuclear waste and leave. And please, don't take it into the borders of this state. We will not stop. And, if you think that the people in the state of California put up a fight -- look out! We are a nice, easy-going people, but when we're riled, we're right there until the finish line and we won't quit. Thank you. [applause]

Marilyn Rasmussen: Thank you. For the record, I'm Marilyn Rasmussen and I'm a State Senator from the 2nd District which is just south of here, and it does have our beautiful Mt. Rainier. But, I chair the Agriculture Committee; I serve on the Transportation Committee; I also serve on Freight and Rail, and I had the major bill this year to help freight rail, and all their infrastructure across the State. And what I submit to you, is that you're going to leave a paper trail. Not just in Tacoma, but across the State. A paper trail that will go on for generations and generations. I come from rural, rural Pierce County, and we're farmers. We protect our environment, we care about out environment. I'm really embarrassed and ashamed that the bureaucracy hasn't listened from the last meeting they had in our city. I'm really embarrassed and ashamed, as a taxpayer, that the bureaucracy is so far behind that they send out inadequate, not accurate descriptions of what our port is all about. And, I guess I am ashamed and I'm embarrassed, as a legislator that helps fund, helps do the policies that come through to us that this is something we have to deal with. I sent you a letter, I submitted a letter tonight, and I am also part of the letter from the other senators from this area. I think you have heard from the people, and our Mayor Moss said it very well when he said that it is people and it is political. We don't want the paper trail. We don't want this here. Last week we had Secretary Pena come to the Port of Seattle and I sat and listened to him talk about transportation issues. That was on Thursday. On Friday, Secretary Glickman

was here. He is head of the Department of Agriculture. He came to talk about agriculture in this State. Where is our Secretary of Energy? Is he going to listen? If he doesn't, I'm embarrassed and ashamed. But yes, as Representative Campbell said: "We will fight you." It will not happen, and I guarantee it, it won't happen. But, take these words back. Of all the people that came here to speak, take them back, and if they're recorded, as you say they are, have him listen to it. This is a beautiful state and this is a beautiful country. Let's not let the bureaucracy ruin it. Let's let the people say what is best for this country because they do know best. I have to tell you that, as far as being a farmer, I'm very, very, proud of what the Port of Tacoma and the Port of Seattle does for our industry. We export 70 percent of all the agriculture that is produced in this State. We export it, mostly through our ports. And, we don't want our apples alongside of your nuclear waste. It just doesn't sound good. I can't go home to my kids and my grandkids and say: "You didn't listen and you don't care." So please, I implore you, take the message back and let's not waste people's time with more meetings like this because I think that this meeting was very well attended tonight. I think everyone here spoke from their heart and they told you how it's going to affect our beautiful city, our countryside, the paper trail across our State. We have worked hard. We have worked hard to make the best use of our tax dollars in this State, for our wonderful quality of life. A third of the people that live in this state didn't live here 10 years ago, so we're fighting with a lot of growth and we acknowledge that, and we work to make this a better State. So, I implore you. Just say: "No"- okay? It won't work. Thank you. [applause]

Stephanie Smith: Wow, I wasn't expecting to be last! My name is Stephanie Smith. I'm a 21 year old college student; I'm a mother, and a wife, and a voter. I'm a representative of my generation and we're sick and tired of environmental accidents. These accidents have been caused by overworked and untrained handlers of toxins. It's ridiculous! Coincidentally, I just finished an environmental science class at my college. So all the statistics are pretty fresh in my mind, still. The pollution of Puget Sound is inexcusable and possibly irreversible. Don't you think we've abused Puget Sound enough? It's getting pretty bad out there. I'm begging you to reconsider Tacoma as a possible route and to think about the health of the public instead of the amount of money that you can save on safely transporting this waste. In the past, we've trusted you guys to come up with reliable ways to store high-level nuclear waste. Most of them are leaking now. As a citizen of this planet, not just Tacoma, I don't trust you. Please reconsider, and if you do import, no matter what port you use, keep the people and the wildlife safe. Thank you. [applause]

Laureen Roth: I'm Laureen Roth and I have been a political activist since the 1950's. I oppose this, the transportation of this waste through our city, and I agree with most of the people who are opposed to it that have spoken before. And I question our ability to store this stuff safely because you haven't been able to do that at Hanford. It's a mess over there. They're still trying to clean it up. It's leaking into the Columbia River. I've followed that since the 1940's. I've heard nothing, but no information or misinformation. You have not been forthright with the American people. You have not been forthright with the citizens and I take with a grain of salt the information and the statistics that you give to us now. The people that were put in danger over in the Hanford area and lied to over the years about the effects, and not given the information to take their families away from the danger over there, and not been informed by our Federal government makes me ashamed, ashamed of our government. And, I am a very patriotic and staunch supporter of our form of government. I am the State Committeewoman for Pierce County from the Democratic Party. I'm active at the National, State, and Federal levels of the Democratic Women -- Federation of Democratic Women -- and have held offices in those areas. And I'll tell you now, if this comes through the Port of Tacoma, we will fight this to the last ditch! And I will be there at the forefront to fight it. [applause]

David Price: Howdy, I'm David Price. I was born here, raised in the area, and been a resident most of the time since 1971. I am a downwinder. I worked at Puget Sound Naval Shipyard for a number of years around radiation, and I do distrust the DOE. That being said, I would like to ask the audience -- think about this: Ft. Louis, McCord, Bremerton, and Bangor have radioactive elements and weapons and fuel there. How did it get there? Okay. How did it get there? Have we been damaged by that? I think that I've heard in the testimony here that there is probably better alternatives. But, if those alternatives are not viable, shipments, if small enough, could be done safely and it could create a lot of good paying jobs in the area. Thank you.

LW: That completes the list of people who had signed up to speak. Is there anyone who didn't have an opportunity to sign up who has a brief comment?

Audience Member: [barely audible -- away from microphone] I'd like to put in my two bits. I've taught school here in Tacoma for 21 years. To augment my teaching in the classroom, I prevailed upon my wife to part from some of our hard-earned cash and I bought that little [sailboat?] you saw coast through the marine parade a few years ago. I find that teaching youngsters in the out-of-doors with sailboats is the easiest way to give grades. You send them out sailing and you come back (?). This is no place for those nuclear aberrations that will reduce the quality of the students who we have to teach. Heaven knows they're bad enough as it is.

Jack Fabulich: I'm one of the Port Commissioners also. I'm just real pleased that you all showed up. I think that we had to send Mr. Head a message, and I think he got it very well. I do appreciate -- he took a lot of gruff tonight -- that's what he gets paid for. You've got to have a message, and I think the message is clearly loud and clear. Believe me, I was very impressed with some of the comments that I hadn't even thought about, and we studied the issues with Mr. Robinson, who is very knowledgeable, so I just say, I think your letter that I received back from you, the one that we asked about -- you know the night that we had the first meeting. That you had some people here that were representing DOE that couldn't answer the simple question that we asked -- that if there was a cask that did have a leak what would happen to the people who would be exposed to it? And they said: "Well, you know, it has not happened", but the event in Oklahoma did not happened before either. I guess our message is, and my message is, just tell me, if I'm standing 2 feet and that cask happens to get blown up or there is a crack in it, what is my danger? And, they said we'll get you an answer to that in three days. That is when I thought we had a bit of a problem. So, with that, I hope you take that message back to the people, and we are very willing to work with that Alternative 2. I think there are some other things we can add to that -- shipping knowledge. Shipping to these countries that are available to take the fuel and reprocess it. That's our opinion. Thank you.

LW: And thank you all for participating, for coming out. It's been a long evening. You've been very patient. They've got your comments. Thank you so much.

ATTACHMENT 2

ATTACHMENT 2
Port and Transportation Accident Analyses of Additional Military Ports

In response to public comments and concerns that the EIS did not adequately consider the use of military ports, eight additional military ports were considered. The selected additional military ports are: the ports of Bremerton, Everett, and Port Hadlock, WA; Port Hueneme, CA; Kings Bay, GA; Mayport and Pensacola, FL; and Yorktown, VA. Additional evaluations addressing the incident-free and accident impacts associated with the transport of foreign research reactor spent nuclear fuel through these eight military ports to the management sites were performed.

Port Activities Impacts

The incident-free risks associated with both at-sea transport and in-port handling of foreign research reactor spent nuclear fuel, as documented in Appendices C and D of the EIS, are applicable to the eight military ports. If military ports were used, there would be no intermediate stops at other U.S. ports. The at-sea accident analysis and results presented in Appendix C of the EIS are applicable to any ports selected.

Port accident impacts were estimated using the MACCS computer program with site-specific population and meteorology as were done for the 13 port cities modeled in Appendix D of the EIS. A summary of mean consequences and risks for port accident analysis is presented in Tables 1, 2, and 3. These results indicate that the consequences of an accident at any of the eight ports is comparable to the range of consequences for the same accident at the similar (intermediate to low) population density ports analyzed in the EIS. For example, among the eight military ports analyzed, for the accident severity category 6, the consequences ranged from a high of 2,600 person-rem (for Port Hueneme, CA), to a low of 55 person-rem (for Pensacola, FL). This compares to a range of consequences from 27 person-rem (for MOTSU, NC), to 6,510 person-rem (for Port Elizabeth, NJ) for the same accident, (see Table 4-6 of Volume 1, or Table D-46 of Appendix D, of the EIS).

Figure 4-1in Section 4 of the EIS presents a consequence versus population curve for population dose within a 16 km (10 mile) radius of the ports. The correlation identified for the 13 port cities analyzed in the EIS holds for these additional eight military ports. When plotted on this figure, the consequence data (population dose) for these ports fall on, or near, the curve generated in the EIS.

Consistent with the approach presented in Appendix D, Section D.5.4.3.2 and Attachment D5 of the EIS, additional analyses were performed to estimate the range of consequences associated with even more improbable accident scenarios, i.e., high temperature fire involving a spent nuclear fuel transportation cask (accident severity categories 5B and 6B). The results for a high temperature accident for the Port of Elizabeth, NJ, is given in Appendix D, Section D.5.4.3.2. The mean consequences of a similar accident at the eight military ports, as presented in Table 4, range from about half, to slightly less than ten percent, of the consequences estimated for the Port of Elizabeth, NJ. These consequences are within the range of those evaluated in the EIS.

Ground Transportation Impacts

The transportation routes, including accident and incident free risks, were analyzed as described in Appendix E. Truck and rail routes were analyzed, using the HIGHWAY and INTERLINE codes, from the node nearest the port to the DOE management sites. No new rail analysis was done for Mayport, FL because the port facilities are not served by rail. The spent nuclear fuel would have to be transported to the same rail node used for the Port of Jacksonville. Table 5 shows the route distances, and is directly comparable to Table E-3. Table 6 summarizes the population along these routes, and is directly comparable to Table E-4.

As described in Appendix E, the RADTRAN 4 computer code was used to analyze the radiological risks associated with overland transportation. Table 7 lists, on a per shipment basis, the incident free risks associated with transporting spent nuclear fuel from the ports to DOE management sites. Table 7 is directly comparable to Table E-8. The accident risks, also determined using the RADTRAN 4 code, are listed in Table 8, which corresponds to Table E-9.

Table 8 lists the non-radiological risks associated with incident-free emissions and vehicle accidents. The analytical results shown in Table 8 can be compared with Table E-10. A comparison of the risk factors from the eight military ports to the risk factors from the ports considered in Appendix E shows that the risk associated with using any of these eight ports falls within the bounds calculated in Appendix E. The public risk associated with the use of any or all of the eight military ports does not differ significantly from the risk associated with using any or all of the previously identified ports.

Table 1 Port Accident Analysis-Total Effective Dose Equivalent Population Dose (person-rem)
for 0-80 kilometers (0-50 miles)

Ports	*BR-2 Spent Nuclear Fuel*			*RHF Spent Nuclear Fuel*			*TRIGA Spent Nuclear Fuel*		
	Accident Severity Category			Accident Severity Category			Accident Severity Category		
	4	5	6	4	5	6	4	5	6
Bremerton	0.084	1200	1300	0.034	450	478	0.010	160	170
Everett	0.051	1300	1400	0.020	510	540	0.006	180	190
Port Hadlock	0.016	740	810	0.0063	280	310	0.002	97	110
Port Hueneme	0.14	2400	2600	0.057	920	1000	0.017	320	350
Kings Bay	0.014	450	480	0.0055	160	180	0.0018	56	61
Mayport	0.048	530	550	0.019	200	200	0.0059	69	70
Pensacola	0.034	420	430	0.014	160	160	0.0041	54	55
Yorktown	0.018	620	650	0.0073	230	240	0.0023	79	84

Table 2 Port Accident Analysis- Consequences (Latent Cancer Fatalities)
for 0-80 kilometers (0-50 miles)

Ports	*BR-2 Spent Nuclear Fuel*			*RHF Spent Nuclear Fuel*			*TRIGA Spent Nuclear Fuel*		
	Accident Severity Category			Accident Severity Category			Accident Severity Category		
	4	5	6	4	5	6	4	5	6
Bremerton	3.2E-05[a]	0.52	0.55	1.3E-05	0.20	0.21	3.8E-06	0.068	0.073
Everett	2.0E-05	0.58	0.62	7.9E-06	0.22	0.24	2.3E-06	0.077	0.081
Port Hadlock	6.5E-06	0.33	0.36	2.6E-06	0.12	0.14	8.1E-07	0.043	0.047
Port Hueneme	5.4E-05	1.0	1.1	2.2E-05	0.39	0.43	6.3E-06	0.14	0.15
Kings Bay	5.9E-06	0.21	0.23	2.3E-06	0.076	0.082	7.6E-07	0.026	0.028
Mayport	1.8E-05	0.24	0.25	7.4E-06	0.089	0.092	2.2E-06	0.031	0.032
Pensacola	1.3E-05	0.19	0.20	5.2E-06	0.071	0.073	1.5E-06	0.024	0.025
Yorktown	7.4E-06	0.28	0.30	2.9E-06	0.10	0.11	9.30-07	0.036	0.038

a 3.2E-5 means 3.2×10^{-5} or 0.000032.

Table 3 Summary of Latent Cancer Fatalities and Population Exposure Risk
per shipment

Ports	*Population Exposure* *(person-rem per shipment)*			*Latent Cancer Fatalities* *(LCF per shipment)*		
	Spent Nuclear Fuel Type			Spent Nuclear Fuel Type		
	BR-2	RHF	TRIGA	BR-2	RHF	TRIGA
Bremerton	7.3E-06 [a]	2.6E-06	9.6E-06	3.1E-09	2.2E-08	4.1E-10
Everett	7.7E-06	3.0E-06	1.1E-06	3.4E-09	1.3E-09	4.5E-10
Port Hadlock	4.3E-06	1.6E-06	5.6E-07	1.9E-09	7.0E-10	2.5E-10
Port Hueneme	1.4E-05	5.5E-06	1.9E-06	6.0E-09	2.3E-09	8.3-10
Kings Bay	2.6E-06	9.1E-07	3.3E-07	1.2E-09	4.3E-10	1.5E-10
Mayport	3.3E-06	1.2E-06	4.2E-07	1.5E-09	5.5-10	1.9E-10
Pensacola	2.6E-06	9.8E-07	3.3E-07	1.2E-09	4.3E-10	1.4E-10
Yorktown	3.6E-06	1.3E-06	4.6E-07	1.6E-09	5.8E-10	2.1E-10

a 7.3E-06 means 7.30×10^{-6} or 0.0000073.

Table 4 Port Accident Analysis- Total Effective Dose Equivalent Population Dose and Latent Cancer Fatalities

Ports	Accident Severity Category 5B						Accident Severity Category 6B					
	Probability of Accident = 5.0E-10						Probability of Accident = 6.0E-11					
	Population Dose (person-rem/accident)			Latent Cancer Fatalities (LCF/accident)			Population Dose (person-rem /accident)			Latent Cancer Fatalities (LCF/accident)		
	BR-2	RHF	TRIGA	BR-2	RHF	TRIGA	BR-2	RHF	TRIGA	BR-2	RHF	TRIGA
Bremerton	1.3E4[a]	4900	4900	5.7	2.1	0.88	1.2E5	4.7E4	5.3E4	53	21	23
Everett	1.4E4	5500	5500	6.3	2.4	0.99	1.4E5	5.4E4	6.0E4	61	24	26
Port Hadlock	8100	3000	3000	3.6	1.4	0.55	8.2E4	3.1E4	3.5E4	37	14	15
Port Hueneme	2.6E4	1.0E4	1.0E4	11	4.3	1.8	2.6E5	1.0E5	1.1E5	110	43	48
Kings Bay	4900	1800	1800	2.3	0.82	0.33	4.7E4	1.8E4	2.0E4	22	8.2	8.9
Mayport	5700	2100	2100	2.6	0.96	0.40	5.0E4	2.0E4	2.2E4	23	8.8	9.6
Pensacola	4500	1700	1700	2.0	0.76	0.31	3.6E4	1.6E4	1.7E4	17	7.0	7.7
Yorktown	6700	2500	2500	3.1	1.1	0.46	6.4E4	2.4E4	2.7E4	29	11	12

a 1.3E4 means 1.3×10^4 or 13,000.

Table 5 Summary of Route Distances for Truck and Rail Modes

Shipments to Kings Bay					
Route	Distance km (mi)		Percentage in Zone		
			Rural	Suburban	Urban
From Eastern Ports					
Truck:					
Mayport, FL	4,745	(2,964)	84.3	14.4	1.3
Kings Bay NSB, GA	4,685	(2,926)	85.9	12.8	1.2
Pensacola, FL	4,430	(2,767)	85.1	13.5	1.4
Yorktown, VA	4,665	(2,914)	85.6	13.2	1.3
Rail:					
Kings Bay NSB, GA	4,942	(3,087)	82.6	15.3	2.1
Pensacola, FL	4,430	(2,767)	90.8	8.2	1
Yorktown, VA	4,717	(2,946)	83.1	14.2	2.7
From Western Ports					
Truck:					
Bremerton, WA	451	(282)	68.2	27.2	4.6
Everett, WA	397	(248)	69.5	26	4.5
Port Hueneme, CA	1,952	(1,219)	82.2	14.8	3
Port Townsend, WA	536	(335)	67.8	28.2	3.9
Rail:					
Bremerton, WA	669	(418)	82.3	15.4	2.3
Everett, WA	717	(448)	67.9	23.2	8.8
Port Hueneme, CA	2,030	(1,268)	75.1	17.3	7.7
Port Townsend, WA	666	(416)	72.4	20.4	7.3

Shipments to Idaho National Engineering Laboratory					
Route	Distance km (mi)		Percentage in Zone		
			Rural	Suburban	Urban
From Eastern Ports					
Truck:					
Mayport, FL	4,076	(2,546)	83	15.5	1.4
Kings Bay NSB, GA	4,017	(2,509)	84.9	13.8	1.3
Pensacola, FL	3,762	(2,350)	83.9	14.7	1.5
Yorktown, VA	3,998	(2,497)	84.5	14.1	1.4
Rail:					
Kings Bay NSB, GA	4,063	(2,538)	84.3	14.7	1.1
Pensacola, FL	3,503	(2,188)	90.6	8.4	1
Yorktown, VA	3,982	(2,487)	87	11.6	1.4
From Western Ports					
Truck:					
Bremerton, WA	1,361	(850)	85.8	12.6	1.7
Everett, WA	1,306	(816)	86.9	11.6	1.5
Port Hueneme, CA	1,599	(999)	78.8	14.9	6.3
Port Townsend, WA	1,446	(903)	84.6	13.8	1.6
Rail:					
Bremerton, WA	1,567	(979)	90.7	8.5	0.8
Everett, WA	1,615	(1,009)	84.1	12.2	3.7
Port Hueneme, CA	1,689	(1,055)	82.3	11.8	6
Port Townsend, WA	1,564	(977)	86.5	10.6	2.9

Table 5 Summary of Route Distances for Truck and Rail Modes

Shipments to Nevada Test Site					
Route	Distance km (mi)		Percentage in Zone		
			Rural	Suburban	Urban
From Eastern Ports					
Truck:					
Mayport, FL	4,196	(2,621)	82.3	16	1.7
Kings Bay NSB, GA	4,135	(2,583)	84.1	14.3	1.6
Pensacola, FL	3,721	(2,324)	83.1	14.4	2.5
Yorktown, VA	4,118	(2,572)	83.7	14.7	1.6
Rail:					
Kings Bay NSB, GA	4,761	(2,974)	85.8	13.1	1.1
Pensacola, FL	4,199	(2,623)	91.3	7.7	1
Yorktown, VA	4,678	(2,922)	88.1	10.5	1.4
From Western Ports					
Truck:					
Bremerton, WA	2,208	(1,379)	84.3	13.2	2.5
Everett, WA	2,153	(1,345)	85	12.6	2.4
Port Hueneme, CA	668	(417)	72.5	16.5	11
Port Townsend, WA	2,293	(1,432)	83.7	14	2.4
Rail:					
Bremerton, WA	2,598	(1,623)	92.2	7	0.8
Everett, WA	2,646	(1,653)	88.2	9.3	2.6
Port Hueneme, CA	796	(497)	72.4	16.9	10.8
Port Townsend, WA	2,595	(1,621)	89.7	8.3	2

Shipments to Oak Ridge Reservation					
Route	Distance km (mi)		Percentage in Zone		
			Rural	Suburban	Urban
From Eastern Ports					
Truck:					
Mayport, FL	940	(587)	65.4	32.8	1.9
Kings Bay NSB, GA	879	(549)	72.8	25.8	1.3
Pensacola, FL	897	(560)	79.8	19.1	1.1
Yorktown, VA	866	(541)	70.6	28.6	0.9
Rail:					
Kings Bay NSB, GA	954	(596)	70	28.7	1.3
Pensacola, FL	873	(545)	76.6	22.7	0.7
Yorktown, VA	909	(568)	60.8	37.7	1.5
From Western Ports					
Truck:					
Bremerton, WA	4,315	(2,695)	87.1	11.6	1.3
Everett, WA	4,260	(2,661)	87.5	11.3	1.2
Port Hueneme, CA	3,612	(2,256)	85.4	11.4	3.2
Port Townsend, WA	4,400	(2,748)	86.7	12.1	1.3
Rail:					
Bremerton, WA	4,790	(2,992)	83	14	3.1
Everett, WA	4,400	(2,748)	85.5	12.2	2.2
Port Hueneme, CA	4,267	(2,665)	88.2	8.8	3.1
Port Townsend, WA	4,451	(2,780)	84.7	12.8	2.5

Table 5 Summary of Route Distances for Truck and Rail Modes

Route	Distance km (nm)	Percentage in Zone		
		Rural	Suburban	Urban
From Eastern Ports				
Truck:				
Mayport, FL	628 (392)	79.2	20.1	0.8
Kings Bay NSB, GA	559 (349)	80.2	19.1	0.7
Pensacola, FL	882 (551)	73.7	24.4	1.9
Yorktown, VA	804 (502)	71.7	27.2	1.1
Rail:				
Kings Bay NSB, GA	461 (288)	79.2	19.2	1.6
Pensacola, FL	890 (556)	69.9	27.7	2.4
Yorktown, VA	925 (578)	71.5	26.6	1.9
From Western Ports				
Truck:				
Bremerton, WA	4,726 (2,952)	84	14.4	1.6
Everett, WA	4,672 (2,918)	84.3	14.2	1.6
Port Hueneme, CA	3,974 (2,482)	78	18.4	3.6
Port Townsend, WA	4,813 (3,006)	83.6	14.8	1.6
Rail:				
Bremerton, WA	5,299 (3,310)	80.8	16.4	2.8
Everett, WA	4,909 (3,066)	83	15	2
Port Hueneme, CA	4,739 (2,960)	82.9	14.6	2.5
Port Townsend, WA	4,960 (3,098)	82.2	15.5	2.3

Table 6 Summary of the Population Distributions Along Routes for Truck and Rail Modes

Shipments to Hanford Site:				
Route	Number of Affected Persons	Average Persons/km^2		
		Rural	Suburban	Urban
From Eastern Ports				
Truck:				
Mayport, FL	624,000	7.2	342	2216
Kings Bay NSB, GA	555,000	7	335.7	2226.7
Pensacola, FL	549,000	6.8	339	2086.6
Yorktown, VA	569,000	7.4	340.1	2186.2
Rail:				
Kings Bay NSB, GA	807,000	7.7	365.7	2053.4
Pensacola, FL	368,000	6.1	324.1	2066.2
Yorktown, VA	866,000	7.8	352.1	2312.1
From Western Ports				
Truck:				
Bremerton, WA	143,000	8.1	366.9	2152.3
Everett, WA	135,000	8.3	449	2168.6
Port Hueneme, CA	386,000	7.8	366.1	2262.4
Port Townsend, WA	159,000	7.9	357.9	2146.4
Rail:				
Bremerton, WA	105,000	11.2	272.4	2149.7
Everett, WA	357,000	10.6	458.8	2353.8
Port Hueneme, CA	855,000	7.7	408.1	2561
Port Townsend, WA	262,000	10.6	415.6	2225.4

Shipments to Idaho National Engineering Laboratory:				
Route	Number of Affected Persons	Percentage in Zone		
		Rural	Suburban	Urban
From Eastern Ports				
Truck:				
Mayport, FL	572,000	7.7	334.4	2228.1
Kings Bay NSB, GA	504,000	7.5	326.5	2240.9
Pensacola, FL	497,000	7.3	330	2089.4
Yorktown, VA	518,000	8	331.4	2196.9
Rail:				
Kings Bay NSB, GA	488,000	7.6	337.6	2041.8
Pensacola, FL	284,000	6.9	305.7	2147.9
Yorktown, VA	467,000	7.6	328.3	2231.3
From Western Ports				
Truck:				
Bremerton, WA	171,000	6.4	325.4	2103.8
Everett, WA	163,000	6.4	376.6	2114.4
Port Hueneme, CA	578,000	4.1	495.6	2483.5
Port Townsend, WA	186,000	6.4	324.6	2101.4
Rail:				
Bremerton, WA	106,000	6.4	243.9	2144.4
Everett, WA	358,000	5.9	411	2363
Port Hueneme, CA	565,000	3.7	481.3	2618.1
Port Townsend, WA	264,000	5.9	366.4	2227.4

Table 6 Summary of the Population Distributions Along Routes for Truck and Rail Modes

Shipments to Nevada Test Site:				
Route	Number of Affected Persons	Percentage in Zone		
		Rural	Suburban	Urban
From Eastern Ports				
Truck:				
Mayport, FL	647,000	7	349.9	2211.9
Kings Bay NSB, GA	578,000	6.7	344.6	2220.8
Pensacola, FL	662,000	5.6	393.4	2158.1
Yorktown, VA	593,000	7.2	348.8	2185.5
Rail:				
Kings Bay NSB, GA	549,000	6.5	352.1	2059.3
Pensacola, FL	346,000	5.8	336.4	2145.3
Yorktown, VA	529,000	6.5	347.2	2217.1
From Western Ports				
Truck:				
Bremerton, WA	380,000	4.9	417.2	2112.8
Everett, WA	372,000	4.8	452.3	2117.4
Port Hueneme, CA	388,000	3.3	502.2	2646.5
Port Townsend, WA	395,000	4.9	408.5	2111.8
Rail:				
Bremerton, WA	167,000	4.9	298.6	2117.8
Everett, WA	420,000	4.6	418.5	2331.3
Port Hueneme, CA	471,000	4	510.6	2723.9
Port Townsend, WA	325,000	4.6	385.1	2205.8

Shipments to Oak Ridge Reservation:				
Route	Number of Affected Persons	Percentage in Zone		
		Rural	Suburban	Urban
From Eastern Ports				
Truck:				
Mayport, FL	222,000	15.9	305.4	2258
Kings Bay NSB, GA	153,000	14.1	275.8	2331.5
Pensacola, FL	123,000	14.2	294.5	1910.1
Yorktown, VA	139,000	18.6	254.9	2079.7
Rail:				
Kings Bay NSB, GA	176,000	11.8	297.6	1911.4
Pensacola, FL	112,000	13.4	256.3	2069.7
Yorktown, VA	202,000	17.1	269	2137.8
From Western Ports				
Truck:				
Bremerton, WA	380,000	4.9	417.2	2112.8
Everett, WA	372,000	4.8	452.3	2117.4
Port Hueneme, CA	388,000	3.3	502.2	2646.5
Port Townsend, WA	395,000	4.9	408.5	2111.8
Rail:				
Bremerton, WA	167,000	4.9	298.6	2117.8
Everett, WA	420,000	4.6	418.5	2331.3
Port Hueneme, CA	471,000	4	510.6	2723.9
Port Townsend, WA	325,000	4.6	385.1	2205.8

Table 6 Summary of the Population Distributions Along Routes for Truck and Rail Modes

Shipments to Savannah River Site				
Route	*Number of Affected Persons*	*Percentage in Zone*		
		Rural	*Suburban*	*Urban*
From Eastern Ports				
Truck:				
Mayport, FL	75,900	13.5	251.5	2215.7
Kings Bay NSB, GA	58,300	13.8	211.2	2155
Pensacola, FL	177,000	13.6	333.9	2023.2
Yorktown, VA	134,000	16.9	270.3	1965.3
Rail:				
Kings Bay NSB, GA	71,000	10.9	300.4	2079.7
Pensacola, FL	211,000	11.9	349	1978.9
Yorktown, VA	185,000	13.1	284.7	2371.1
From Western Ports				
Truck:				
Bremerton, WA	669,000	6.9	347.7	2195.1
Everett, WA	661,000	7	359.9	2201.7
Port Hueneme, CA	977,000	7.8	366.1	2396
Port Townsend, WA	685,000	6.9	346.6	2194.2
Rail:				
Bremerton, WA	1,060,000	7.8	370.1	2231.7
Everett, WA	781,000	7.5	355.5	2138.4
Port Hueneme, CA	901,000	7.1	354	2592.8
Port Townsend, WA	875,000	7.5	367.4	2221.7

Table 7 Incident-Free Dose per Shipment for all Spent Nuclear Fuel Types (Person-Rem/Shipment)

Shipments to Hanford Site						
Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
From Eastern Ports						
Mayport, FL	Truck	2.62E-01	1.05E-02	4.25E-02	6.14E-01	6.67E-01
Kings Bay NSB, GA	Truck	2.54E-01	9.40E-03	4.05E-02	6.06E-01	6.56E-01
	Rail	6.38E-02	3.17E-02	1.24E-03	1.76E-02	5.06E-02
Pensacola, FL	Truck	2.43E-01	9.28E-03	3.95E-02	5.73E-01	6.22E-01
	Rail	5.84E-02	1.42E-02	7.33E-04	1.44E-02	2.94E-02
Yorktown, VA	Truck	2.54E-01	9.62E-03	4.07E-02	6.03E-01	6.54E-01
	Rail	6.14E-02	3.62E-02	1.21E-03	1.64E-02	5.38E-02
From Western Ports						
Bremerton, WA	Truck	2.99E-02	2.50E-03	6.95E-03	5.84E-02	6.78E-02
	Rail	1.87E-02	4.26E-03	1.72E-04	4.82E-03	9.25E-03
Everett, WA	Truck	2.60E-02	2.35E-03	6.01E-03	5.14E-02	5.97E-02
	Rail	1.92E-02	1.59E-02	3.46E-04	8.27E-03	2.46E-02
Port Hueneme, CA	Truck	1.12E-01	6.79E-03	2.26E-02	2.52E-01	2.82E-01
	Rail	3.30E-02	3.95E-02	8.20E-04	1.12E-02	5.15E-02
Port Townsend, WA	Truck	3.54E-02	2.75E-03	7.75E-03	6.94E-02	7.99E-02
	Rail	1.87E-02	1.16E-02	2.80E-04	7.34E-03	1.93E-02

Shipments to Idaho National Engineering Laboratory						
Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
From Eastern Ports						
Mayport, FL	Truck	2.28E-01	9.69E-03	3.77E-02	5.27E-01	5.75E-01
Kings Bay NSB, GA	Truck	2.21E-01	8.54E-03	3.57E-02	5.19E-01	5.64E-01
	Rail	5.45E-02	1.77E-02	8.95E-04	1.42E-02	3.27E-02
Pensacola, FL	Truck	2.09E-01	8.43E-03	3.47E-02	4.87E-01	5.30E-01
	Rail	4.86E-02	1.08E-02	5.79E-04	1.16E-02	2.30E-02
Yorktown, VA	Truck	2.21E-01	8.77E-03	3.59E-02	5.17E-01	5.62E-01
	Rail	5.36E-02	1.82E-02	8.08E-04	1.36E-02	3.26E-02
From Western Ports						
Bremerton, WA	Truck	7.44E-02	2.94E-03	1.26E-02	1.76E-01	1.92E-01
	Rail	2.82E-02	4.03E-03	2.54E-04	5.88E-03	1.02E-02
Everett, WA	Truck	7.05E-02	2.79E-03	1.17E-02	1.69E-01	1.83E-01
	Rail	2.87E-02	1.57E-02	4.28E-04	1.00E-02	2.62E-02
Port Hueneme, CA	Truck	9.85E-02	1.05E-02	2.69E-02	2.07E-01	2.44E-01
	Rail	2.95E-02	2.62E-02	5.35E-04	1.20E-02	3.88E-02
Port Townsend, WA	Truck	7.98E-02	3.18E-03	1.34E-02	1.87E-01	2.04E-01
	Rail	2.81E-02	1.14E-02	3.63E-04	8.83E-03	2.06E-02

Table 7 Incident-Free Dose per Shipment for all Spent Nuclear Fuel Types (Person-Rem/Shipment)

Shipments to Nevada Test Site:						
Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
From Eastern Ports						
Mayport, FL	Truck	2.38E-01	1.10E-02	4.08E-02	5.43E-01	5.94E-01
Kings Bay NSB, GA	Truck	2.30E-01	9.88E-03	3.87E-02	5.35E-01	5.83E-01
	Rail	6.18E-02	2.03E-02	9.92E-04	1.65E-02	3.78E-02
Pensacola, FL	Truck	2.11E-01	1.15E-02	4.01E-02	4.81E-01	5.33E-01
	Rail	5.59E-02	1.35E-02	6.76E-04	1.44E-02	2.86E-02
Yorktown, VA	Truck	2.30E-01	1.01E-02	3.90E-02	5.32E-01	5.81E-01
	Rail	6.10E-02	2.08E-02	9.05E-04	1.61E-02	3.78E-02
From Western Ports						
Bremerton, WA	Truck	1.24E-01	6.60E-03	2.34E-02	2.85E-01	3.15E-01
	Rail	3.91E-02	6.41E-03	3.86E-04	9.40E-03	1.62E-02
Everett, WA	Truck	1.20E-01	6.45E-03	2.24E-02	2.78E-01	3.07E-01
	Rail	3.95E-02	1.81E-02	5.60E-04	1.33E-02	3.20E-02
Port Hueneme, CA	Truck	4.55E-02	7.21E-03	1.62E-02	8.64E-02	1.10E-01
	Rail	2.00E-02	2.23E-02	3.80E-04	9.50E-03	3.22E-02
Port Townsend, WA	Truck	1.29E-01	6.84E-03	2.42E-02	2.96E-01	3.27E-01
	Rail	3.90E-02	1.38E-02	4.95E-04	1.21E-02	2.64E-02

Shipments to Oak Ridge Reservation:						
Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
From Eastern Ports						
Mayport, FL	Truck	6.20E-02	3.69E-03	1.09E-02	1.22E-01	1.36E-01
Kings Bay NSB, GA	Truck	5.41E-02	2.54E-03	8.89E-03	1.14E-01	1.25E-01
	Rail	2.17E-02	6.16E-03	3.29E-04	5.87E-03	1.24E-02
Pensacola, FL	Truck	5.17E-02	2.02E-03	8.15E-03	1.16E-01	1.26E-01
	Rail	2.09E-02	3.76E-03	2.43E-04	4.91E-03	8.91E-03
Yorktown, VA	Truck	5.41E-02	2.25E-03	8.35E-03	1.12E-01	1.23E-01
	Rail	2.12E-02	7.13E-03	3.86E-04	5.22E-03	1.27E-02
From Western Ports						
Bremerton, WA	Truck	2.32E-01	8.34E-03	3.71E-02	5.58E-01	6.03E-01
	Rail	6.21E-02	4.09E-02	1.26E-03	1.88E-02	6.11E-02
Everett, WA	Truck	2.28E-01	8.18E-03	3.61E-02	5.51E-01	5.95E-01
	Rail	5.80E-02	2.85E-02	1.01E-03	1.72E-02	4.66E-02
Port Hueneme, CA	Truck	2.02E-01	1.29E-02	4.20E-02	4.67E-01	5.22E-01
	Rail	5.66E-02	3.55E-02	9.38E-04	1.76E-02	5.40E-02
Port Townsend, WA	Truck	2.37E-01	8.58E-03	3.79E-02	5.69E-01	6.15E-01
	Rail	5.86E-02	3.27E-02	1.07E-03	1.80E-02	5.17E-02

Table 7 Incident-Free Dose per Shipment for all Spent Nuclear Fuel Types (Person-Rem/Shipment)

Shipments to Savannah River Site						
Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
From Eastern Ports						
Mayport, FL	Truck	3.62E-02	1.24E-03	5.43E-03	8.12E-02	8.78E-02
Kings Bay NSB, GA	Truck	3.19E-02	9.54E-04	4.75E-03	7.22E-02	7.79E-02
	Rail	1.65E-02	2.66E-03	1.25E-04	4.87E-03	7.65E-03
Pensacola, FL	Truck	5.42E-02	2.95E-03	9.56E-03	1.14E-01	1.27E-01
	Rail	2.10E-02	7.90E-03	3.24E-04	6.73E-03	1.49E-02
Yorktown, VA	Truck	4.99E-02	2.19E-03	8.00E-03	1.04E-01	1.14E-01
	Rail	2.14E-02	6.97E-03	3.15E-04	5.56E-03	1.28E-02
From Western Ports						
Bremerton, WA	Truck	2.63E-01	1.14E-02	4.45E-02	6.11E-01	6.67E-01
	Rail	6.75E-02	4.33E-02	1.47E-03	1.88E-02	6.36E-02
Everett, WA	Truck	2.59E-01	1.13E-02	4.35E-02	6.04E-01	6.59E-01
	Rail	6.34E-02	3.08E-02	1.21E-03	1.71E-02	4.91E-02
Port Hueneme, CA	Truck	2.39E-01	1.72E-02	5.11E-02	5.14E-01	5.82E-01
	Rail	6.16E-02	3.78E-02	1.21E-03	1.66E-02	5.56E-02
Port Townsend, WA	Truck	2.68E-01	1.17E-02	4.52E-02	6.22E-01	6.79E-01
	Rail	6.39E-02	3.51E-02	1.28E-03	1.78E-02	5.41E-02

Table 8 Accident Dose Risk per Shipment for all Spent Nuclear Fuel Types (Person-Rem/Shipment)

Shipments to Hanford Site			
Source/Route		*Truck*	*Rail*
From Eastern Ports			
Oxidized Target Material			
	Mayport, FL	1.28E-01	1.67E-02
	Kings Bay NSB, GA	1.26E-01	2.50E-02
	Pensacola, FL	5.99E-02	1.16E-02
	Yorktown, VA	1.30E-01	2.15E-02
Calcined Target Material			
	Mayport, FL	5.12E-02	6.66E-03
	Kings Bay NSB, GA	5.06E-02	1.00E-02
	Pensacola, FL	2.40E-02	4.64E-03
	Yorktown, VA	5.21E-02	8.61E-03
BR-2 Belgium SNF			
	Mayport, FL	1.65E-04	1.57E-05
	Kings Bay NSB, GA	1.54E-04	2.78E-05
	Pensacola, FL	9.76E-05	8.33E-06
	Yorktown, VA	1.30E-04	2.89E-05
RHF France SNF			
	Mayport, FL	7.13E-05	6.76E-06
	Kings Bay NSB, GA	6.67E-05	1.20E-05
	Pensacola, FL	4.22E-05	3.58E-06
	Yorktown, VA	5.60E-05	1.24E-05
NRU Canada SNF			
	Mayport, FL	2.28E-04	2.18E-05
	Kings Bay NSB, GA	2.13E-04	3.87E-05
	Pensacola, FL	1.35E-04	1.16E-05
	Yorktown, VA	1.79E-04	4.02E-05
PRR-1 TRIGA SNF			
	Mayport, FL	4.89E-04	8.09E-05
	Kings Bay NSB, GA	4.63E-04	1.43E-04
	Pensacola, FL	2.75E-04	4.91E-05
	Yorktown, VA	4.11E-04	1.40E-04
OSIRIS France SNF			
	Mayport, FL	1.53E-04	1.45E-05
	Kings Bay NSB, GA	1.43E-04	2.56E-05
	Pensacola, FL	9.06E-05	7.69E-06
	Yorktown, VA	1.20E-04	2.67E-05
From Western Ports			
Oxidized Target Material			
	Bremerton, WA	5.58E-03	7.57E-04
	Everett, WA	5.23E-03	1.34E-03
	Port Hueneme, CA	1.73E-02	4.59E-03
	Port Townsend, WA	6.61E-03	1.09E-03
Calcined Target Material			
	Bremerton, WA	2.23E-03	3.02E-04
	Everett, WA	2.09E-03	5.33E-04
	Port Hueneme, CA	6.91E-03	1.83E-03
	Port Townsend, WA	2.64E-03	4.34E-04
BR-2 Belgium SNF			

Table 8 Accident Dose Risk per Shipment for all Spent Nuclear Fuel Types (Person-Rem/Shipment)

	Bremerton, WA	1.24E-05	1.63E-06
	Everett, WA	1.20E-05	5.11E-06
	Port Hueneme, CA	5.64E-05	1.77E-05
	Port Townsend, WA	1.41E-05	3.77E-06
RHF France SNF			
	Bremerton, WA	5.37E-06	7.03E-07
	Everett, WA	5.19E-06	2.21E-06
	Port Hueneme, CA	2.44E-05	7.64E-06
	Port Townsend, WA	6.09E-06	1.63E-06
NRU Canada SNF			
	Bremerton, WA	1.72E-05	2.26E-06
	Everett, WA	1.66E-05	7.06E-06
	Port Hueneme, CA	7.78E-05	2.45E-05
	Port Townsend, WA	1.94E-05	5.22E-06
PRR-1 TRIGA SNF			
	Bremerton, WA	3.42E-05	6.49E-06
	Everett, WA	3.28E-05	1.76E-05
	Port Hueneme, CA	1.48E-04	6.16E-05
	Port Townsend, WA	3.90E-05	1.33E-05
OSIRIS France SNF			
	Bremerton, WA	1.15E-05	1.51E-06
	Everett, WA	1.11E-05	4.74E-06
	Port Hueneme, CA	5.23E-05	1.64E-05
	Port Townsend, WA	1.31E-05	3.50E-06

Shipments to Idaho National Engineering Laboratory			
Source/Route		*Truck*	*Rail*
From Eastern Ports			
Oxidized Target Material			
	Mayport, FL	1.24E-01	N/A
	Kings Bay NSB, GA	1.22E-01	1.66E-02
	Pensacola, FL	5.57E-02	1.02E-02
	Yorktown, VA	1.26E-01	1.74E-02
Calcined Target Material			
	Mayport, FL	4.95E-02	N/A
	Kings Bay NSB, GA	4.89E-02	6.65E-03
	Pensacola, FL	2.23E-02	4.09E-03
	Yorktown, VA	5.05E-02	6.97E-03
BR-2 Belgium SNF			
	Mayport, FL	1.59E-04	N/A
	Kings Bay NSB, GA	1.48E-04	1.43E-05
	Pensacola, FL	9.11E-05	7.62E-06
	Yorktown, VA	1.23E-04	1.38E-05
RHF France SNF			
	Mayport, FL	6.85E-05	N/A
	Kings Bay NSB, GA	6.39E-05	6.16E-06
	Pensacola, FL	3.94E-05	3.28E-06
	Yorktown, VA	5.32E-05	5.92E-06
NRU Canada SNF			
	Mayport, FL	2.19E-04	N/A

Table 8 Accident Dose Risk per Shipment for all Spent Nuclear Fuel Types (Person-Rem/Shipment)

	Kings Bay NSB, GA	2.04E-04	1.99E-05
	Pensacola, FL	1.26E-04	1.06E-05
	Yorktown, VA	1.70E-04	1.92E-05
PRR-1 TRIGA SNF			
	Mayport, FL	4.70E-04	N/A
	Kings Bay NSB, GA	4.44E-04	7.69E-05
	Pensacola, FL	2.56E-04	4.39E-05
	Yorktown, VA	3.92E-04	7.74E-05
OSIRIS France SNF			
	Mayport, FL	1.47E-04	N/A
	Kings Bay NSB, GA	1.37E-04	1.32E-05
	Pensacola, FL	8.46E-05	7.05E-06
	Yorktown, VA	1.14E-04	1.27E-05
	From Western Ports		
Oxidized Target Material			
	Bremerton, WA	1.14E-02	1.95E-03
	Everett, WA	1.10E-02	2.53E-03
	Port Hueneme, CA	1.25E-02	2.63E-03
	Port Townsend, WA	1.24E-02	2.28E-03
Calcined Target Material			
	Bremerton, WA	4.54E-03	7.80E-04
	Everett, WA	4.40E-03	1.01E-03
	Port Hueneme, CA	5.00E-03	1.05E-03
	Port Townsend, WA	4.95E-03	9.11E-04
BR-2 Belgium SNF			
	Bremerton, WA	1.71E-05	3.74E-06
	Everett, WA	1.67E-05	7.22E-06
	Port Hueneme, CA	6.61E-05	1.13E-05
	Port Townsend, WA	1.87E-05	5.89E-06
RHF France SNF			
	Bremerton, WA	7.40E-06	1.61E-06
	Everett, WA	7.21E-06	3.12E-06
	Port Hueneme, CA	2.86E-05	4.89E-06
	Port Townsend, WA	8.10E-06	2.54E-06
NRU Canada SNF			
	Bremerton, WA	2.37E-05	5.19E-06
	Everett, WA	2.31E-05	9.99E-06
	Port Hueneme, CA	9.12E-05	1.57E-05
	Port Townsend, WA	2.59E-05	8.15E-06
PRR-1 TRIGA SNF			
	Bremerton, WA	5.03E-05	1.52E-05
	Everett, WA	4.89E-05	2.63E-05
	Port Hueneme, CA	1.66E-04	3.85E-05
	Port Townsend, WA	5.50E-05	2.20E-05
OSIRIS France SNF			
	Bremerton, WA	1.59E-05	3.47E-06
	Everett, WA	1.55E-05	6.69E-06
	Port Hueneme, CA	6.14E-05	1.05E-05
	Port Townsend, WA	1.74E-05	5.46E-06

Table 8 Accident Dose Risk per Shipment for all Spent Nuclear Fuel Types (Person-Rem/Shipment)

Shipments to Nevada Test Site			
Source/Route		*Truck*	*Rail*
From Eastern Ports			
Oxidized Target Material			
	Mayport, FL	1.01E-01	1.67E-02
	Kings Bay NSB, GA	9.91E-02	1.67E-02
	Pensacola, FL	3.47E-02	1.03E-02
	Yorktown, VA	1.03E-01	1.75E-02
Calcined Target Material			
	Mayport, FL	4.03E-02	6.66E-03
	Kings Bay NSB, GA	3.96E-02	6.66E-03
	Pensacola, FL	1.38E-02	4.10E-03
	Yorktown, VA	4.12E-02	6.98E-03
BR-2 Belgium SNF			
	Mayport, FL	1.84E-04	1.57E-05
	Kings Bay NSB, GA	1.73E-04	1.57E-05
	Pensacola, FL	1.07E-04	9.03E-06
	Yorktown, VA	1.49E-04	1.52E-05
RHF France SNF			
	Mayport, FL	7.95E-05	6.76E-06
	Kings Bay NSB, GA	7.49E-05	6.76E-06
	Pensacola, FL	4.63E-05	3.89E-06
	Yorktown, VA	6.42E-05	6.53E-06
NRU Canada SNF			
	Mayport, FL	2.54E-04	2.18E-05
	Kings Bay NSB, GA	2.39E-04	2.18E-05
	Pensacola, FL	1.48E-04	1.26E-05
	Yorktown, VA	2.05E-04	2.11E-05
PRR-1 TRIGA SNF			
	Mayport, FL	5.09E-04	8.09E-05
	Kings Bay NSB, GA	4.83E-04	8.09E-05
	Pensacola, FL	2.78E-04	4.80E-05
	Yorktown, VA	4.31E-04	8.14E-05
OSIRIS France SNF			
	Mayport, FL	1.71E-04	1.45E-05
	Kings Bay NSB, GA	1.61E-04	1.45E-05
	Pensacola, FL	9.95E-05	8.35E-06
	Yorktown, VA	1.38E-04	1.40E-05
From Western Ports			
Oxidized Target Material			
	Bremerton, WA	1.67E-02	2.35E-03
	Everett, WA	1.64E-02	2.93E-03
	Port Hueneme, CA	6.35E-03	1.92E-03
	Port Townsend, WA	1.78E-02	2.68E-03
Calcined Target Material			
	Bremerton, WA	6.68E-03	9.39E-04
	Everett, WA	6.55E-03	1.17E-03
	Port Hueneme, CA	2.54E-03	7.66E-04
	Port Townsend, WA	7.09E-03	1.07E-03
BR-2 Belgium SNF			
	Bremerton, WA	5.34E-05	5.30E-06

Table 8 Accident Dose Risk per Shipment for all Spent Nuclear Fuel Types (Person-Rem/Shipment)

	Everett, WA	5.29E-05	8.77E-06
	Port Hueneme, CA	3.97E-05	8.85E-06
	Port Townsend, WA	5.50E-05	7.45E-06
RHF France SNF			
	Bremerton, WA	2.31E-05	2.28E-06
	Everett, WA	2.29E-05	3.79E-06
	Port Hueneme, CA	1.72E-05	3.82E-06
	Port Townsend, WA	2.38E-05	3.21E-06
NRU Canada SNF			
	Bremerton, WA	7.36E-05	7.33E-06
	Everett, WA	7.30E-05	1.21E-05
	Port Hueneme, CA	5.47E-05	1.22E-05
	Port Townsend, WA	7.58E-05	1.03E-05
PRR-1 TRIGA SNF			
	Bremerton, WA	1.39E-04	2.05E-05
	Everett, WA	1.37E-04	3.16E-05
	Port Hueneme, CA	9.98E-05	2.99E-05
	Port Townsend, WA	1.43E-04	2.73E-05
OSIRIS France SNF			
	Bremerton, WA	4.95E-05	4.90E-06
	Everett, WA	4.91E-05	8.13E-06
	Port Hueneme, CA	3.69E-05	8.21E-06
	Port Townsend, WA	5.10E-05	6.90E-06

Shipments to Oak Ridge Reservation			
Source/Route		*Truck*	*Rail*
From Eastern Ports			
Oxidized Target Material			
	Mayport, FL	1.57E-02	N/A
	Kings Bay NSB, GA	1.41E-02	2.13E-03
	Pensacola, FL	1.07E-02	1.22E-03
	Yorktown, VA	1.30E-02	1.57E-03
Calcined Target Material			
	Mayport, FL	6.26E-03	N/A
	Kings Bay NSB, GA	5.61E-03	8.52E-04
	Pensacola, FL	4.27E-03	4.88E-04
	Yorktown, VA	5.19E-03	6.26E-04
BR-2 Belgium SNF			
	Mayport, FL	5.56E-05	N/A
	Kings Bay NSB, GA	4.49E-05	5.31E-06
	Pensacola, FL	3.52E-05	2.78E-06
	Yorktown, VA	3.34E-05	4.87E-06
RHF France SNF			
	Mayport, FL	2.40E-05	N/A
	Kings Bay NSB, GA	1.94E-05	2.29E-06
	Pensacola, FL	1.52E-05	1.20E-06
	Yorktown, VA	1.44E-05	2.10E-06
NRU Canada SNF			
	Mayport, FL	7.66E-05	N/A
	Kings Bay NSB, GA	6.19E-05	7.34E-06

Table 8 Accident Dose Risk per Shipment for all Spent Nuclear Fuel Types (Person-Rem/Shipment)

	Pensacola, FL	4.86E-05	3.84E-06
	Yorktown, VA	4.61E-05	6.73E-06
PRR-1 TRIGA SNF			
	Mayport, FL	1.40E-04	N/A
	Kings Bay NSB, GA	1.14E-04	1.96E-05
	Pensacola, FL	8.89E-05	1.05E-05
	Yorktown, VA	8.77E-05	1.73E-05
OSIRIS France SNF			
	Mayport, FL	5.16E-05	N/A
	Kings Bay NSB, GA	4.17E-05	4.93E-06
	Pensacola, FL	3.27E-05	2.58E-06
	Yorktown, VA	3.10E-05	4.52E-06
	From Western Ports		
Oxidized Target Material			
	Bremerton, WA	1.20E-01	2.16E-02
	Everett, WA	1.20E-01	2.07E-02
	Port Hueneme, CA	3.97E-02	1.52E-02
	Port Townsend, WA	1.21E-01	2.10E-02
Calcined Target Material			
	Bremerton, WA	4.80E-02	8.65E-03
	Everett, WA	4.78E-02	8.29E-03
	Port Hueneme, CA	1.59E-02	6.10E-03
	Port Townsend, WA	4.84E-02	8.39E-03
BR-2 Belgium SNF			
	Bremerton, WA	1.32E-04	2.62E-05
	Everett, WA	1.32E-04	2.23E-05
	Port Hueneme, CA	1.44E-04	1.74E-05
	Port Townsend, WA	1.34E-04	2.36E-05
RHF France SNF			
	Bremerton, WA	5.70E-05	1.13E-05
	Everett, WA	5.68E-05	9.57E-06
	Port Hueneme, CA	6.21E-05	7.50E-06
	Port Townsend, WA	5.77E-05	1.01E-05
NRU Canada SNF			
	Bremerton, WA	1.82E-04	3.65E-05
	Everett, WA	1.82E-04	3.10E-05
	Port Hueneme, CA	1.98E-04	2.42E-05
	Port Townsend, WA	1.85E-04	3.29E-05
PRR-1 TRIGA SNF			
	Bremerton, WA	4.09E-04	1.32E-04
	Everett, WA	4.07E-04	1.19E-04
	Port Hueneme, CA	3.70E-04	8.40E-05
	Port Townsend, WA	4.13E-04	1.23E-04
OSIRIS France SNF			
	Bremerton, WA	1.22E-04	2.42E-05
	Everett, WA	1.22E-04	2.05E-05
	Port Hueneme, CA	1.33E-04	1.61E-05
	Port Townsend, WA	1.24E-04	2.17E-05

Table 8 Accident Dose Risk per Shipment for all Spent Nuclear Fuel Types (Person-Rem/Shipment)

Shipments to Savannah River Site			
Source/Route		*Truck*	*Rail*
From Eastern Ports			
Oxidized Target Material			
	Mayport, FL	6.00E-03	N/A
	Kings Bay NSB, GA	5.18E-03	8.21E-04
	Pensacola, FL	1.20E-02	1.88E-03
	Yorktown, VA	1.15E-02	1.55E-03
Calcined Target Material			
	Mayport, FL	2.40E-03	N/A
	Kings Bay NSB, GA	2.07E-03	3.28E-04
	Pensacola, FL	4.81E-03	7.52E-04
	Yorktown, VA	4.58E-03	6.20E-04
BR-2 Belgium SNF			
	Mayport, FL	1.49E-05	N/A
	Kings Bay NSB, GA	1.25E-05	1.85E-06
	Pensacola, FL	4.34E-05	5.78E-06
	Yorktown, VA	2.84E-05	4.42E-06
RHF France SNF			
	Mayport, FL	6.42E-06	N/A
	Kings Bay NSB, GA	5.40E-06	8.00E-07
	Pensacola, FL	1.87E-05	2.50E-06
	Yorktown, VA	1.23E-05	1.91E-06
NRU Canada SNF			
	Mayport, FL	2.05E-05	N/A
	Kings Bay NSB, GA	1.72E-05	2.56E-06
	Pensacola, FL	5.98E-05	7.99E-06
	Yorktown, VA	3.92E-05	6.11E-06
PRR-1 TRIGA SNF			
	Mayport, FL	3.88E-05	N/A
	Kings Bay NSB, GA	3.27E-05	7.03E-06
	Pensacola, FL	1.09E-04	2.03E-05
	Yorktown, VA	7.43E-05	1.59E-05
OSIRIS France SNF			
	Mayport, FL	1.38E-05	N/A
	Kings Bay NSB, GA	1.16E-05	1.72E-06
	Pensacola, FL	4.03E-05	5.36E-06
	Yorktown, VA	2.64E-05	4.10E-06
From Western Ports			
Oxidized Target Material			
	Bremerton, WA	1.30E-01	2.55E-02
	Everett, WA	1.30E-01	2.46E-02
	Port Hueneme, CA	4.12E-02	1.51E-02
	Port Townsend, WA	1.31E-01	2.49E-02
Calcined Target Material			
	Bremerton, WA	5.21E-02	1.02E-02
	Everett, WA	5.19E-02	9.85E-03
	Port Hueneme, CA	1.64E-02	6.02E-03
	Port Townsend, WA	5.25E-02	9.95E-03
	BR-2 Belgium SNF		

Table 8 Accident Dose Risk per Shipment for all Spent Nuclear Fuel Types (Person-Rem/Shipment)

Bremerton, WA		1.82E-04	3.10E-05
	Everett, WA	1.81E-04	2.70E-05
	Port Hueneme, CA	1.44E-04	2.13E-05
	Port Townsend, WA	1.83E-04	2.83E-05
RHF France SNF			
	Bremerton, WA	7.85E-05	1.33E-05
	Everett, WA	7.83E-05	1.16E-05
	Port Hueneme, CA	6.24E-05	9.18E-06
	Port Townsend, WA	7.92E-05	1.22E-05
NRU Canada SNF			
	Bremerton, WA	2.51E-04	4.31E-05
	Everett, WA	2.50E-04	3.76E-05
	Port Hueneme, CA	1.99E-04	2.95E-05
	Port Townsend, WA	2.53E-04	3.94E-05
PRR-1 TRIGA SNF			
	Bremerton, WA	5.31E-04	1.54E-04
	Everett, WA	5.29E-04	1.40E-04
	Port Hueneme, CA	3.68E-04	9.40E-05
	Port Townsend, WA	5.36E-04	1.45E-04
OSIRIS France SNF			
	Bremerton, WA	1.68E-04	2.86E-05
	Everett, WA	1.68E-04	2.49E-05
	Port Hueneme, CA	1.34E-04	1.97E-05
	Port Townsend, WA	1.70E-04	2.61E-05

Table 9 Vehicle-related (Nonradiological) Risk Factors per Shipment for all Spent Nuclear Fuel Types (Fatalities/Shipment)

Shipments to Hanford Site		
Mode	Emission	Accident
From Eastern Ports		
Truck		
Mayport, FL	1.27E-05	1.77E-04
Kings Bay NSB, GA	1.16E-05	1.73E-04
Pensacola, FL	1.21E-05	1.85E-04
Yorktown, VA	1.19E-05	1.61E-04
Rail		
Kings Bay NSB, GA	2.72E-05	6.46E-06
Pensacola, FL	1.21E-05	5.79E-06
Yorktown, VA	3.32E-05	6.16E-06
From Western Ports		
Truck		
Bremerton, WA	4.18E-06	1.14E-05
Everett, WA	3.60E-06	1.01E-05
Port Hueneme, CA	1.17E-05	7.74E-05
Port Townsend, WA	4.25E-06	1.35E-05
Rail		
Bremerton, WA	4.06E-06	8.75E-07
Everett, WA	1.65E-05	9.37E-07
Port Hueneme, CA	4.06E-05	2.65E-06
Port Townsend, WA	1.27E-05	8.70E-07

Shipments to Idaho National Engineering Laboratory		
Mode	Emission	Accident
From Eastern Ports		
Truck		
Mayport, FL	1.19E-05	1.58E-04
Kings Bay NSB, GA	1.07E-05	1.53E-04
Pensacola, FL	1.12E-05	1.65E-04
Yorktown, VA	1.10E-05	1.41E-04
Rail		
Kings Bay NSB, GA	1.13E-05	5.31E-06
Pensacola, FL	8.70E-06	4.58E-06
Yorktown, VA	1.44E-05	5.20E-06
From Western Ports		
Truck		
Bremerton, WA	4.54E-06	4.11E-05
Everett, WA	3.93E-06	3.98E-05
Port Hueneme, CA	2.02E-05	6.42E-05
Port Townsend, WA	4.57E-06	4.32E-05
Rail		
Bremerton, WA	3.26E-06	2.05E-06
Everett, WA	1.57E-05	2.11E-06
Port Hueneme, CA	2.64E-05	2.21E-06
Port Townsend, WA	1.19E-05	2.04E-06

Table 9 Vehicle-related (Nonradiological) Risk Factors per Shipment for all Spent Nuclear Fuel Types (Fatalities/Shipment)

Shipments to Nevada Test Site			
	Mode	Emission	Accident
From Eastern Ports			
Truck			
	Mayport, FL	1.45E-05	1.89E-04
	Kings Bay NSB, GA	1.33E-05	1.85E-04
	Pensacola, FL	1.86E-05	1.67E-04
	Yorktown, VA	1.36E-05	1.72E-04
Rail			
	Kings Bay NSB, GA	1.38E-05	6.22E-06
	Pensacola, FL	1.13E-05	5.49E-06
	Yorktown, VA	1.70E-05	6.11E-06
From Western Ports			
Truck			
	Bremerton, WA	1.09E-05	7.39E-05
	Everett, WA	1.03E-05	7.26E-05
	Port Hueneme, CA	1.47E-05	2.91E-05
	Port Townsend, WA	1.09E-05	7.60E-05
Rail			
	Bremerton, WA	5.19E-06	3.40E-06
	Everett, WA	1.77E-05	3.46E-06
	Port Hueneme, CA	2.24E-05	1.04E-06
	Port Townsend, WA	1.38E-05	3.39E-06

Shipments to Oak Ridge Reservation			
	Mode	Emission	Accident
From Eastern Ports			
Truck			
	Mayport, FL	3.51E-06	4.31E-05
	Kings Bay NSB, GA	2.35E-06	3.85E-05
	Pensacola, FL	2.00E-06	4.08E-05
	Yorktown, VA	1.48E-06	3.57E-05
Rail			
	Kings Bay NSB, GA	3.31E-06	1.25E-06
	Pensacola, FL	1.59E-06	1.14E-06
	Yorktown, VA	3.56E-06	1.19E-06
From Western Ports			
Truck			
	Bremerton, WA	1.11E-05	1.42E-04
	Everett, WA	1.05E-05	1.41E-04
	Port Hueneme, CA	2.35E-05	1.70E-04
	Port Townsend, WA	1.11E-05	1.44E-04
Rail			
	Bremerton, WA	3.85E-05	6.26E-06
	Everett, WA	2.58E-05	5.75E-06
	Port Hueneme, CA	3.41E-05	5.58E-06
	Port Townsend, WA	2.96E-05	5.82E-06

Table 9 Vehicle-related (Nonradiological) Risk Factors per Shipment for all Spent Nuclear Fuel Types (Fatalities/Shipment)

Shipments to Savannah River Site		
Mode	*Emission*	*Accident*
From Eastern Ports		
Truck		
Mayport, FL	9.66E-07	3.01E-05
Kings Bay NSB, GA	8.37E-07	2.68E-05
Pensacola, FL	3.35E-06	3.68E-05
Yorktown, VA	1.83E-06	4.45E-05
Rail		
Kings Bay NSB, GA	1.92E-06	6.03E-07
Pensacola, FL	5.69E-06	1.16E-06
Yorktown, VA	4.48E-06	1.21E-06
From Western Ports		
Truck		
Bremerton, WA	1.54E-05	1.61E-04
Everett, WA	1.47E-05	1.60E-04
Port Hueneme, CA	2.85E-05	1.71E-04
Port Townsend, WA	1.54E-05	1.63E-04
Rail		
Bremerton, WA	3.86E-05	6.92E-06
Everett, WA	2.59E-05	6.42E-06
Port Hueneme, CA	3.12E-05	6.19E-06
Port Townsend, WA	2.97E-05	6.48E-06